ESSEX COUNTY ALL HAZARD MITIGATION PLAN

2015 Update

Volume I

Prepared for:

Essex County Sheriff's Office

Essex County Office of Emergency Management

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EXECUTIVE SUMMARY

The 2015 Update to the 2008 Essex County All Hazard Mitigation Plan (HMP) was prepared in accordance with the Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 requires states and local governments to prepare all hazard mitigation plans in order to remain eligible to receive Public Assistance (Categories C-G), and Pre-Disaster Mitigation, Hazard Mitigation Grant Program and Flood Mitigation Assistance grant funds. To restate, by not participating in this process and adopting the resulting plan, municipalities will not be eligible to receive future pre-disaster mitigation grant funding (404 grant funds). It is also important to remember that pre-disaster mitigation grant funds are separate and distinct from those federal and state funds available for direct post-disaster relief [i.e. Public Assistance (PA) Categories A and B, and Individual Assistance (IA)]. The availability of those funds remains unchanged; if there is a federally-declared disaster in Essex County, the affected municipalities will still receive immediate recovery assistance regardless of their participation in this HMP.

Hazard Mitigation is any sustained action taken to reduce or eliminate the long-term risk and effects that can result from specific hazards.

FEMA defines a ***Hazard Mitigation Plan*** as the documentation of a state or local government's evaluation of natural hazards and the strategy to mitigate such hazards.

However, DMA 2000 effectively improves the disaster planning process by increasing hazard mitigation planning requirements for hazard events and requiring participating municipalities to document their hazard mitigation planning process and identify hazards, potential losses, and mitigation needs, goals, and strategies.

Several major natural hazard events occurred since the adoption of the original 2008 All Hazard Mitigation Plan that signaled a call to action throughout Essex County to review the risks disasters pose and create solutions. In 2011 Hurricane Irene occurred and then 14 months later Hurricane Sandy occurred. To date, properties still remain damaged and communities are still trying to recover from both FEMA disaster declarations. This HMP update provided an opportunity for communities to learn from the past and strengthen policies and actions taken to reduce the impact from natural disasters.

Essex County has seen much success in the implementation of the 2008 HMP. Their past and ongoing activities have contributed to the County's understanding of its hazard preparedness and future mitigation activity needs, costs and benefits. For example, Essex County Office of Emergency Management (ECOEM) continues to provide training, conduct exercises and improve their communications system to ensure connections among local, state and federal partners exist during emergencies. Proactive measures such as the acquisition of flood-prone properties and local stormwater drainage improvements/enhancements have been made at the municipal level to mitigate future risk. In addition, communities have also integrated mitigation into daily operations in an effort to succeed in reducing long-term risk.

The process to update the Essex County HMP incorporated the four major tasks taken to develop hazard mitigation plans and their subsequent updates [including FEMA 386-1 – State and Local Mitigation Planning guidance and the FEMA Local Mitigation Planning Handbook (March 2013)], specifically:

Organize Resources: From the start, communities focused on the resources needed for a successful mitigation planning process. Essential steps included identifying and organizing interested members of the community as well as the technical expertise required during the planning process.

Assess Risk: Next, communities identified characteristics and potential consequences of hazards. It is important to understand how much of the community can be affected by specific hazards and what the impacts would be on important community assets.

Develop a Mitigation Plan: Armed with the understanding of the risks posed by hazards, communities determined what their priorities should be and then looked at possible ways to avoid or minimize the undesired effects. The result was a hazard mitigation plan and strategy for implementation

Implement the Plan and Monitor Progress: Communities can bring the plan to life in a variety of ways ranging from implementing specific mitigation projects to changes in the day-to-day operations of the local government. To ensure the success of an on-going program, it is critical that the plan remains relevant. Thus, it is important to conduct periodic evaluations and make revisions as needed.

The following Executive Summary is organized according to these general steps.

Essex County Multi-Jurisdictional Planning Process

DMA 2000 requires states to submit comprehensive HMPs to the Federal Emergency Management Agency (FEMA) to be eligible for future pre-disaster mitigation funding. Local governments, including counties, municipalities, tribal governments and special purpose districts must also develop HMPs. The DMA 2000 regulations require that local plans be formally updated and adopted every five years, reassessing their risk and updating their local strategies to manage and mitigate those risks.

The County and all municipalities, with the exception of the Township of Cedar Grove, developed and adopted the 2008 Essex County HMP. For the HMP update, extensive outreach efforts by the ECOEM resulted in full participation of all municipalities in the 2015 Essex County HMP Update. Once the mitigation plan is completed and approved, the participating jurisdictions will continue to address and implement the findings, recommendations and mitigation strategies identified in this plan update.

Within this plan update process, Essex County and the participating jurisdictions accomplished the following:

- Developed a Steering Committee and Planning Committee;
- Sought and incorporated the input of the public and stakeholders;
- Reviewed and updated the hazards of concern;
- Profiled and prioritized these hazards;
- Estimated inventory at risk and potential losses associated with these hazards;
- Reviewed and updated hazard mitigation goals and objectives;
- Reviewed and updated the County and local mitigation strategies to address the identified risks and vulnerabilities;
- Updated and developed mitigation plan maintenance procedures to be executed upon plan approval.

The planning process involved a large number of Federal, State, Regional, County and local stakeholders as identified in Section 3.3, “Stakeholder Outreach and Involvement”.

As required by DMA 2000, the participating jurisdictions and Essex County have informed the public about these efforts and provided opportunities for public comment and input on the planning process. In addition, numerous agencies and stakeholders have participated as core or support members to provide input and expertise to the planning process. This HMP documents the process and outcomes of the jurisdictions’ mitigation planning efforts. Announcements regarding the planning process were publicized in local newspapers and on the Essex County Sheriff web site (http://www.hmp.essexsheriff.com/). The website also offered the general public and stakeholder groups an opportunity to provide their input through community surveys.

Essex County Profile

> Development increases population and structures and therefore, can increase the impact of hazards on a community. For example, heavy development planned for a flood-prone area would likely increase the impact of the flood event as time progresses.

Essex County consists of 22 municipalities, ranging over 127 square miles and a total population of 783,969. The County is New Jersey's second most densely populated county, with 6,211.50 persons per square mile, based on 2010 Census data (U.S. Census, 2013). It is an urban county with outlying suburban communities. Essex County is located in northern New Jersey, approximately 20 miles south of the New York State border, and 10 miles west of Manhattan.

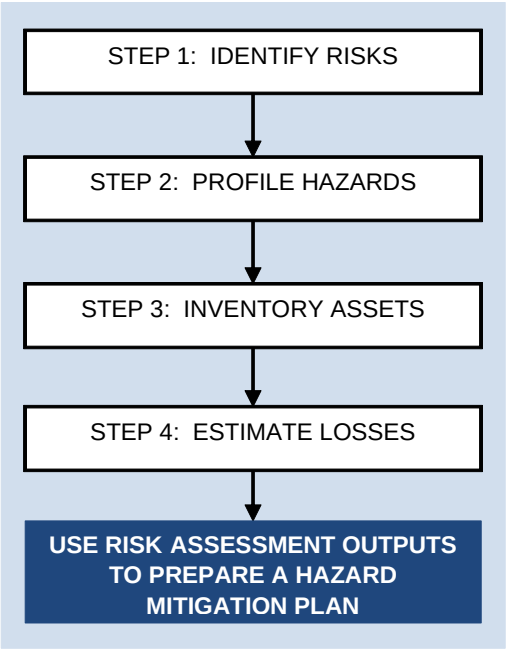
The County is bordered by the Passaic County to the north, Bergen County to the east-northeast, Hudson County to the east, Union County to the south and Morris County to the west. The eastern and western borders of Essex County are defined by the Passaic River. The County is separated from Morris County 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. This combination of natural and developed features lays the foundation for Essex County's vulnerability to natural hazards, both in terms of exposure to hazard events and the potential impact of hazard events.

The Essex County HMP provides a general overview of current and anticipated population and land use within the study area. This information provides a basis for making decisions regarding the type of mitigation approaches to consider and the locations in which these approaches should be applied. This information can also be used to support decisions regarding future development in vulnerable areas. For potential increases in vulnerability, the County and jurisdictions can then plan ahead to mitigate those vulnerabilities early in the development process or can direct development to areas of lower risk. The Planning Committee will revisit the mitigation plan regularly to ensure that mitigation actions support sustainability in order to minimize increased risk and to support the implementation and targeting of specific mitigation actions to address the potential impacts of development over time.

Risk Assessment

A key component of a mitigation plan is the accurate identification of risks posed by a hazard and the corresponding impacts to the community. The process of identifying hazards of concern, profiling hazard events, and conducting a vulnerability assessment is known as a risk assessment. The risk assessment portion of the mitigation planning process included the steps shown in Figure ES-1. Each of these steps is summarized below.

Figure ES-1. Risk Assessment Process



Step 1: The first step of the risk assessment process is to identify the hazards of concern. FEMA's current regulations only require an evaluation of natural hazards. Natural hazards are natural events that threaten lives, property, and many other assets. Often, natural hazards can be predicted, where they tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area.

Essex County focused on considering a full range of natural

and human-caused hazards that could impact the area, and then identified and ranked those hazards that presented the greatest concern. The following list of 17 hazards of concern (natural and human-caused) was selected for further evaluation in the mitigation plan:

- Coastal Erosion and Sea Level Rise
- Coastal Storm
- Drought
- Earthquake
- Extreme Temperature
- Flood
- Geological Hazards
- Severe Weather
- Severe Winter Weather
- Wildfire
- Civil Disorder
- Cyber Attack
- Disease Outbreak
- Hazardous Substances
- Power Outages
- Terrorism
- Transportation Failure

Section 5.2, "Identification of Hazards of Concern" details the process by which all hazards were evaluated, and provides the rationale for selecting the 17 hazards of concern for this plan update.

Step 2: The next step of the risk assessment is to prepare a profile for each hazard of concern. For each hazard, the profile includes: the hazard description; its location and extent; previous occurrences and losses; and the probability of future events. These profiles assist communities in evaluating and comparing the hazards that can impact their area. Each type of hazard has unique characteristics that vary from event to event. That is, the impacts associated with a specific hazard can vary depending on the magnitude and location of each event (a hazard event is a specific, uninterrupted occurrence of a particular type of hazard). Further, the probability of occurrence of a hazard in a given location impacts the priority assigned to that hazard. Finally, each hazard will impact different communities in different ways, based on geography, local development, population distribution, age of buildings, and mitigation measures already implemented.

The full hazard profiles for all hazards of concern, including the vulnerability assessment/loss estimates (see subsequent section), are found in Section 5.4 of this plan update.

Steps 3 and 4: To understand risk, a community must evaluate what assets they possess and which are exposed or vulnerable to the identified hazards of concern. Hazard profile information combined with data regarding population, demographics, general building stock, and critical facilities at risk prepares the community to develop risk scenarios and estimate potential damages and losses for each hazard.

To address the requirements of DMA 2000 and better understand potential vulnerability and losses associated with hazards of concern, Essex County used standardized tools, combined with local, state, and federal data and expertise to conduct the risk assessment. Section 5.1, "Risk Assessment – Methodology and Tools" provides details on the risk and vulnerability assessment process conducted for this plan update. In summary,

custom methodologies in HAZUS-MH version 2.1 (HAZUS-MH) were used to assess potential exposure and losses associated with the hazards of concern for Essex County. This included the following significant upgrades to the default data and vulnerability assessment methodologies provided with the HAZUS-MH platform:

- Building Inventory: The default building inventory in HAZUS-MH was updated and replaced with a custom building inventory developed for the County. The updated building inventory was developed using detailed structure-specific data provided by Essex County Planning parcels and structure-specific assessor data.

- Critical Facility Inventory: The critical facility inventory (essential facilities, utilities, transportation features and user-defined facilities) was updated beginning with all GIS data provided by Essex County Geographic Information Systems and Essex County Office of Emergency Management. Both the critical facility and building inventories were formatted to be compatible with HAZUS-MH and its Comprehensive Data Management System (CDMS). Specific facility information is not provided in this HMP due to the sensitive nature of the critical facility inventory.

The overall vulnerability of Essex County to the hazards of concern cannot be underestimated. In 2011 Hurricane Irene occurred and then 14 months later Hurricane Sandy occurred. Essex County was hit hard by both FEMA disaster declarations. Sections 5.4 and Sections 9.1 through 9.23 describe the historic losses incurred by plan participants as well as the anticipated future losses based on the risk assessment loss estimates.

Essex County Mitigation Strategy

The outcomes of the risk assessment, supplemented by community input, provided a basis to review past mitigation actions, future goals, and appropriate local mitigation actions.

The mitigation strategy portion of the plan includes:

- A summary of past and current mitigation efforts
- Local hazard mitigation goals and objectives
- Identification and analysis of mitigation measures and projects being considered
- Multi-jurisdictional mitigation strategy (goals and objectives)
- Mitigation action plan (summary of specific actions)

Mission Statement, Goals and Objectives

Per prevailing FEMA guidance, a mission statement describes the overall duty and purpose of the planning process, and serves to identify the principle message of the plan. Essex County's mission statement has been updated. It is broad in scope, and provided direction for the plan:

Through strategic planning, partnerships and collaboration, identify and reduce the vulnerability to natural and human caused hazards in order to protect the health, safety, quality of life, environment, and economy of all people and all communities within Essex County.

The 2008 goals and objectives were reviewed by the Steering Committee taking into consideration the hazard events and losses since the 2008 plan, the updated hazard profiles and vulnerability assessment, the goals and objectives established in the updated State HMP, county and local risk management plans, as well as direct input on how the Steering Committee (representing the County and participating municipalities) recognized the need to move forward to best manage their hazard risk.

1. Protect Life
2. Protect Property
3. Increase public preparedness and awareness

4. Develop and maintain an understanding of risks from hazards
5. Enhance County and local mitigation capabilities to reduce hazard vulnerabilities
6. Support continuity of operations pre-, during, and post- hazard events

New to the Essex County HMP update are the objectives. Each goal has a number of corresponding objectives that further define the specific actions or implementation steps. Achievement of these goals will define the effectiveness of the mitigation strategy.

Capability Assessment

A capability assessment was completed by Essex County and each participating jurisdiction. A capability assessment is an inventory of a community's missions, programs and policies; and an analysis of its capacity to carry them out. This assessment is an integral part of the planning process. The capability assessment process includes the identification, review and analysis of local and state programs, policies, regulations, funding and practices currently in place that may either facilitate or hinder mitigation.

By completing this assessment, Essex County and participating jurisdictions learned how or whether they would be able to implement certain mitigation actions by determining the following:

- Types of mitigation actions that may be prohibited by law;
- Limitations that may exist on undertaking actions; and
- The range of local and/or state administrative, programmatic, regulatory, financial and technical resources available to assist in implementing their mitigation actions.

Communities within Essex County updated many of their policies, programs, and responsible parties updated during the five years since the adoption. Changes have led to more comprehensive understandings of natural hazards and stronger understandings of how to respond when natural disasters occur.

Identification, Prioritization, Analysis, and Implementation of Mitigation Actions

Within this planning process, all participants evaluated their risk and known or anticipated losses to the hazards of concern, assessed their capabilities to manage natural hazard risk, reviewed progress on past mitigation efforts, and identified a comprehensive range of mitigation alternatives and actions they endeavor to implement as resources are identified and available. In the HMP, all proposed mitigation actions were identified in relation to the goals and objectives presented above. The County and participating jurisdictions identified appropriate local mitigation actions, along with the hazards mitigated, goals and objectives met, lead agency, estimated cost, potential funding sources and the proposed timeline. These actions are identified in Volume II, Section 9 for the County and each participating jurisdiction.

Updated County and local mitigation strategies consisted of projects, actions and initiatives identified as follows:

- Incomplete or ongoing initiatives from the 2008 strategy being carried forward as determined by the jurisdiction, typically with further detail to support implementation.

- Projects or initiatives identified to address the findings of the updated risk and vulnerability assessment.

- Other projects identified by the jurisdiction during the course of the planning process.

Concerted efforts were made to assure that municipalities developed updated mitigation strategies that included activities and initiatives covering the range of mitigation action types described in recent FEMA planning guidance (FEMA "Local Mitigation Planning Handbook", March 2013), specifically:

- Local Plans and Regulations – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.

- Structure and Infrastructure Projects - These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.

- Natural Systems Protection – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.

- Education and Awareness Programs – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as the National Flood Insurance Program and Community Rating System, StormReady (NOAA) and Firewise (NFPA) Communities.

Examples of projects, actions and initiatives within these four action types from the updated County and local mitigation strategies are presented below. Full updated mitigation strategies are found within each jurisdictional annex in Section 9.

It is the intention of the County to continue to incorporate hazard mitigation planning and natural hazard risk reduction as an integral component of the County's administrative, regulatory and operational framework. This update includes a description of planning mechanisms and programs that have been/will be incorporated into existing County programs and planning mechanisms, which may include former mitigation initiatives that have become continuous/on-going programs and may be considered mitigation "capabilities".

Plan Implementation

New to this plan update was the incorporation of a modified version of FEMA's Project Action Worksheet to present applicable mitigation projects. These worksheets serve to better document the process by which appropriate mitigation projects were identified and evaluated by summarizing the process from project identification, through mitigation alternatives analysis, selected project description, and details to support implementation (costs, benefits, lead agency, timeline, etc.). Further, the Action Worksheet includes documentation of the project prioritization evaluation criteria used to determine project viability and implementation priority (high/medium/low).

Beyond better documenting mitigation projects, the Action Worksheet is designed to capture critical information needed to develop mitigation grant applications, thus supporting implementation of projects that would require outside funding support.

Plan Maintenance Procedures

Hazard mitigation planning is an ongoing process. Section 7 of this plan presents procedures for plan maintenance and updates. The Planning Committee will continue ongoing mitigation efforts to implement the mitigation plan and revise and update the plan as necessary.

To monitor implementation of the mitigation plan, the Planning Committee members will meet annually to discuss the status of plan implementation and will prepare a summary report of the plan status and any needed updates. The mitigation plan evaluation will address changes as new hazard events occur, as the area develops, and as more is learned about hazards and their impacts. The evaluation will include an assessment of whether the planning process and actions have been effective, whether development or other issues warrant changes to the plan or its priorities, if the communities' goals are being reached, and whether changes are warranted. In addition, the mitigation plan will be updated at a minimum within the 5-year cycle specified by DMA 2000.

Point of Contact

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Essex County
All Hazard Mitigation Plan Update

Volume I

JANUARY 2015

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SECTION 1. INTRODUCTION

2015 Plan Update Changes

- Section 1, Introduction, was updated to reflect the organization of the 2015 HMP update.

1.1 BACKGROUND

In response to the requirements of the Disaster Mitigation Act of 2000 (DMA 2000), Essex County, and the cities, towns and boroughs located therein, have developed this All Hazard Mitigation Plan (HMP), which is an update of the 2008 Essex County All Hazard Mitigation Plan. DMA 2000 amends the Stafford Act and is designed to improve planning for, response to, and recovery from, disasters by requiring State and local entities to implement pre-disaster mitigation planning and develop HMPs. The Federal Emergency Management Agency (FEMA) has issued guidelines for HMPs. The New Jersey Office of Emergency Management (NJOEM) also supports plan development for jurisdictions in New Jersey.

Specifically, DMA 2000 requires that States, with support from local governmental agencies, update HMPs on a five year basis to prepare for and reduce the potential impacts of natural hazards. DMA 2000 is intended to facilitate cooperation between state and local authorities, prompting them to work together. This enhanced planning will better enable local and State governments to articulate accurate needs for mitigation, resulting in faster allocation of funding and more effective risk reduction projects.

Hazard Mitigation is any sustained action taken to reduce or eliminate the long term risk and effects that can result from specific hazards.

FEMA defines a ***Hazard Mitigation Plan*** as the documentation of a state or local government evaluation of natural hazards and the strategies to mitigate such hazards.

1.1.1 DMA 2000 Origins -The Robert T. Stafford Disaster Relief and Emergency Assistance Act

The ***Federal Emergency Management Agency*** (FEMA) estimates that for every dollar spent on damage prevention (mitigation), twice that amount is saved through avoided post-disaster damage repair.

In the early 1990s, a new federal policy regarding disasters began to evolve. Rather than simply reacting whenever disasters strike communities, the federal government began encouraging communities to first assess their vulnerability to various disasters and proceed to take actions to reduce or eliminate potential risks. The logic is simply that a disaster-resistant community can rebound from a natural disaster with less loss of property or human injury, at much lower cost, and, consequently, more quickly. Moreover, other costs associated with disasters, such as the time lost from productive activity by business and industries, are minimized.

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 by repealing the previous mitigation planning provisions (Section 409) and replacing them with a new set of requirements (Section 322). This section sets forth the requirements that communities evaluate natural hazards within their respective jurisdictions and develop an appropriate plan of action to mitigate those hazards, while emphasizing the need for State, tribal and local governments to closely coordinate mitigation planning and implementation efforts.

The amended Stafford Act requires that each local jurisdiction identify potential natural hazards to the health, safety and well-being of its residents and identify and prioritize actions that can be taken by the community to mitigate those hazards—before disaster strikes. For communities to remain eligible for hazard mitigation assistance from the federal government, they must first prepare, and then maintain and update an HMP (this plan).

Responsibility for fulfilling the requirements of Section 322 of the Stafford Act and administering the FEMA Hazard Mitigation Program has been delegated to the State of New Jersey, specifically to NJOEM. FEMA also provides support through guidance, resources, and plan reviews.

1.1.2 Benefits of Mitigation Planning

The planning process will help prepare citizens and government agencies to better respond when disasters occur. Also, mitigation planning allows Essex County as a whole, as well as the participating Essex County municipalities to remain eligible for mitigation grant funding for mitigation projects that will reduce the impact of future disaster events. The long-term benefits of mitigation planning include:

- An increased understanding of hazards faced by Essex County communities
- A more sustainable and disaster-resistant community
- Financial savings through partnerships that support planning and mitigation efforts
- Focused use of limited resources on hazards that have the biggest impact on the community
- Reduced long-term impacts and damages to human health and structures and reduced repair costs

1.1.3 Organizations Involved in the Mitigation Planning Effort

Essex County and the participating jurisdictions intend to implement this HMP with full coordination and participation of County and local departments, organizations and groups, as well as by coordinating with relevant State and Federal entities. Coordination helps to ensure that stakeholders have established communication channels and relationships necessary to support mitigation planning and mitigation actions included in Section 6 and in the jurisdictional annexes in Section 9. In addition to Essex County, all municipalities have participated in the planning process (Table 1-1 and Figure 1-1).

Table 1-1. Participating Jurisdictions in Essex County

Townships	
Belleville	Millburn
Bloomfield	Montclair
Cedar Grove	Nutley
Fairfield	South Orange
Irvington	Verona
Livingston	West Caldwell
Maplewood	West Orange
Boroughs	**Cities**
Caldwell	East Orange
Essex Fells	Orange
Glen Ridge	Newark
North Caldwell	**County**
Roseland	Essex County

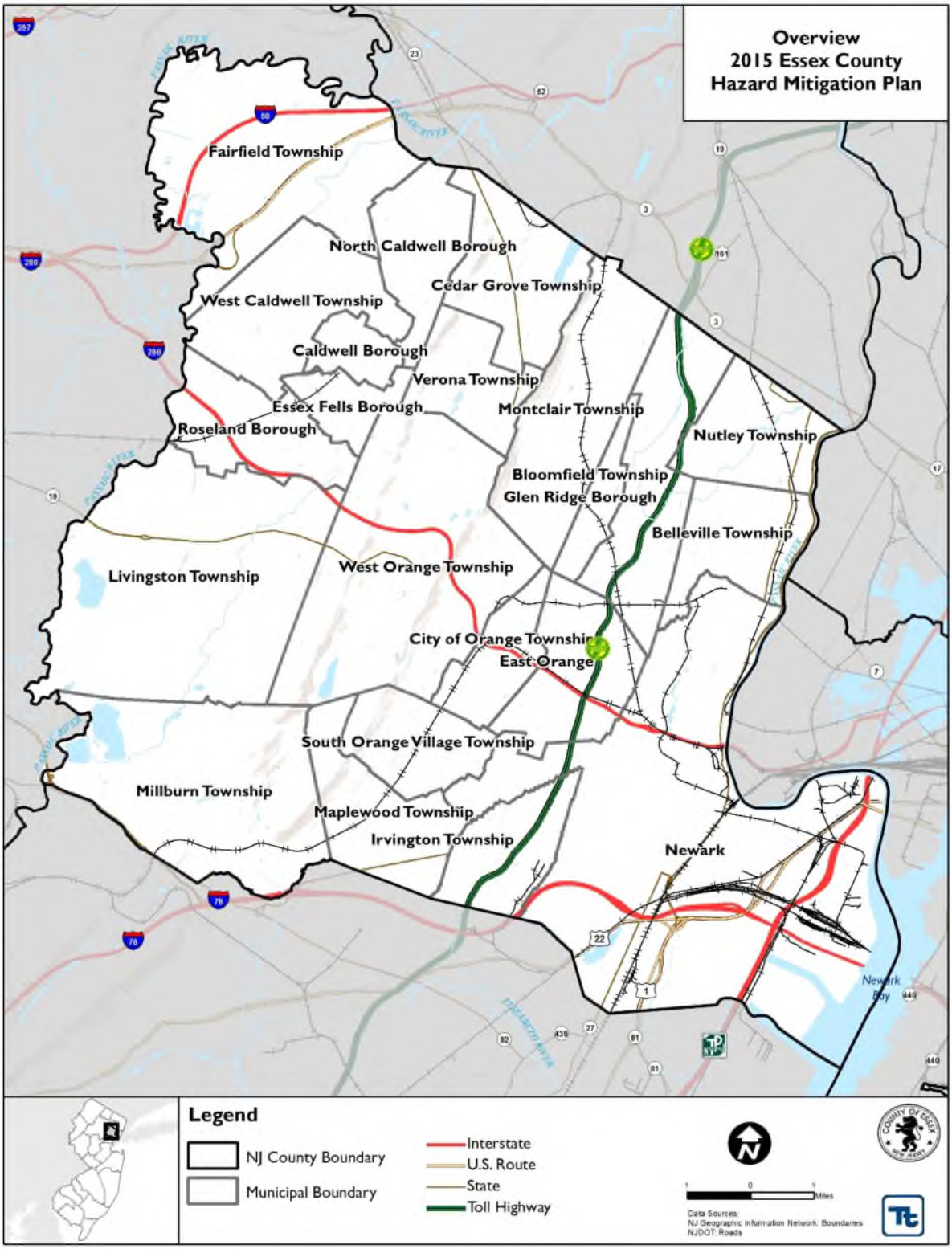
Multiple Agency Support for Hazard Mitigation

Primary responsibility for the development and implementation of mitigation strategies and policies lies with local governments. However, local governments are not alone; various partners and resources at the regional,

state and federal levels are available to assist communities in the development and implementation of mitigation strategies. Within New Jersey, NJOEM is the lead agency providing hazard mitigation planning assistance to local jurisdictions. NJOEM provides guidance to support mitigation planning. In addition, FEMA provides grants, tools, guidance and training to support mitigation planning.

Additional input and support for this planning effort was obtained from a range of agencies and through public involvement (as discussed in Section 3). Under the project management of the Essex County Sheriff Department Office of Emergency Management, oversight for the preparation of this HMP was provided by the Essex County Hazard Mitigation Steering and Planning Committees. Details regarding the roles and responsibilities of the Steering and Planning Committee are also further discussed in Section 3. The Steering Committee includes representatives from County departments and agencies have been formed as a leadership group to plan, guide, expedite, and implement the planning process. A list of Steering Committee and Planning Committee members is provided in Section 3.

Figure 1-1. Essex County, New Jersey Mitigation Plan Area



Source: NJGIN

This HMP was prepared in accordance with the following regulations and guidance:

- FEMA "Local Mitigation Planning Handbook", March 2013
- FEMA "Integrating Hazard Mitigation into Local Planning", March 2013
- Local Mitigation Plan Review Guide, October 1, 2011
- DMA 2000 (Public Law 106-390, October 30, 2000).
- 44 Code of Federal Regulations (CFR) Parts 201 and 206 (including: Feb. 26, 2002, Oct. 1, 2002, Oct. 28, 2003, and Sept. 13, 2004 Interim Final Rules).
- FEMA. 2004. "How-To Guide for Using HAZUS-MH for Risk Assessment." FEMA Document No. 433. February.
- FEMA Mitigation Planning How-to Series (FEMA 386-1 through 4, 2002), available at: http://www.fema.gov/fima/planhowto.shtm.

Table 1-2 summarizes the requirements outlined in the DMA 2000 Interim Final Rule and where each of these requirements is addressed in this HMP.

Table 1-2. FEMA Local Mitigation Plan Review Crosswalk

Plan Criteria	Primary Location in Plan
Prerequisites	
Adoption by the Local Governing Body: §201.6(c)(5)	Volume I, Section 2.0; Appendix A
Planning Process	
Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)	Volume I, Section 3.0
Risk Assessment	
Identifying Hazards: §201.6(c)(2)(i)	Volume I, Sections 5.2
Profiling Hazards: §201.6(c)(2)(i)	Volume I, Section 5.4
Assessing Vulnerability: Overview: §201.6(c)(2)(ii)	Volume I, Section 5.4
Assessing Vulnerability: Identifying Structures: §201.6(c)(2)(ii)(A)	Volume I, Section 4.0 Volume I Section 5.4
Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	Volume I, Section 5.4
Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)	Volume I, Section 4.0; Section 9 Annexes
Mitigation Strategy	
Local Hazard Mitigation Goals: §201.6(c)(3)(i)	Volume I, Section 6.0; Volume II, Section 9 Annexes
Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)	Volume I, Section 6.0; Volume II, Section 9 Annexes
Implementation of Mitigation Actions: §201.6(c)(3)(iii)	Volume I, Section 6.0; Volume II, Section 9 Annexes
Multi-Jurisdictional Mitigation Actions: : §201.6(c)(3)(iv)	Volume I, Section 6.0; Volume II, Section 9 Annexes
Plan Maintenance Process	
Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(i)	Volume I, Section 7.0
Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)	Volume I, Section 7.0; Volume II, Section 9 Annexes
Continued Public Involvement: §201.6(c)(4)(iii)	Volume I, Section 7.0

Organization

The Essex County Hazard Mitigation Plan Update has been organized into a two-volume plan to facilitate use of this plan as a resource for each participant. The HMP update provides a detailed review and analysis of hazards of concern, resources, and demographics of Essex County and participating municipalities.

Volume I is intended for use as a resource for on-going mitigation analysis. Volume II consists of an annex dedicated to each participating jurisdiction. Each annex summarizes the jurisdiction's legal, regulatory, and fiscal capabilities; vulnerabilities to natural hazards; status of past mitigation actions; and provides an individualized mitigation strategy. The annexes are intended to provide an expedient resource for each jurisdiction for implementation of mitigation projects and future grant opportunities.

Hazards of Concern

Essex County and participating jurisdictions reviewed the natural hazards that caused measurable impacts in the planning area, and updated the list of hazards of concern based on events, losses and information available since the 2008 plan. In addition, human-caused hazards were included as well. Essex County and participating jurisdictions evaluated the risk and vulnerability due to each of the hazards of concern on the assets of each participating jurisdiction. Although the resulting hazard risk rankings varied for each jurisdiction, the summary risk rankings corresponded with that of Essex County and are indicated in each jurisdictional annex. The hazard risk ranks were used to focus and prioritize individual jurisdictional mitigation strategies.

Goals and Objectives

The plan has incorporated mitigation goals and objectives as a basis for the planning process and to guide the selection of appropriate mitigation actions addressing all hazards of concern. This HMP update has revised the 2008 mission statement, goals and objectives, as identified in Section 6.

Plan Integration into Other Planning Mechanisms

Effective mitigation is achieved when hazard awareness and risk management approaches and strategies become an integral part of public activities and decision-making. Within the County there are many existing plans and programs that support hazard risk management, and thus it is critical that this hazard mitigation plan integrate and coordinate with, and complement, those mechanisms.

The "Capability Assessment" section of Chapter 6 (Mitigation Strategy) provides a summary and description of the existing plans, programs and regulatory mechanisms at all levels of government (Federal, State, County and local) that support hazard mitigation within the County. Within each jurisdictional annex in Section 9, the County and each participating jurisdiction have identified how they have integrated hazard risk management into their existing planning, regulatory and operational/administrative framework ("integration capabilities"), and how they intend to promote this integration ("integration actions").

A further summary of these continued efforts to develop and promote a comprehensive and holistic approach to hazard risk management and mitigation is presented in Section 7.

1.1.4 Implementation of the 2008 Hazard Mitigation Plan

The status of the mitigation projects in the 2008 HMP are provided in Sections 6 and 9 of this updated HMP. Numerous projects and programs have been implemented that have reduced hazard vulnerability to assets in the planning area. The municipal annexes and plan maintenance procedure have been developed to encourage specific activities such as review of the HMP during update of codes, ordinances, zoning, and development to ensure that a more thorough integration, with its related benefits, will be completed within the upcoming five-year planning period.

1.1.5 Implementation of the Planning Process

The planning process and findings are to be documented in local HMPs. To support the planning process in developing this HMP Update, Essex County and the participating jurisdictions have accomplished the following:

- Developed a Steering Committee and Mitigation Planning Committee
- Reviewed the 2008 Essex County All Hazard Mitigation Plan
- Identified/reviewed hazards that are of greatest concern to the County (hazards of concern) to be included in the update
- Profiled these hazards
- Estimated the inventory at risk and potential losses associated with these hazards
- Reviewed and updated the mitigation goals and added objectives
- Reviewed 2008 mitigation strategy and actions to indicate progress
- Developed new mitigation actions to address reduction of vulnerability of hazards of concern
- Involved a wide range of stakeholders and the public in the plan update process
- Developed mitigation plan maintenance procedures to be executed after obtaining approval of the plan from NJOEM and FEMA

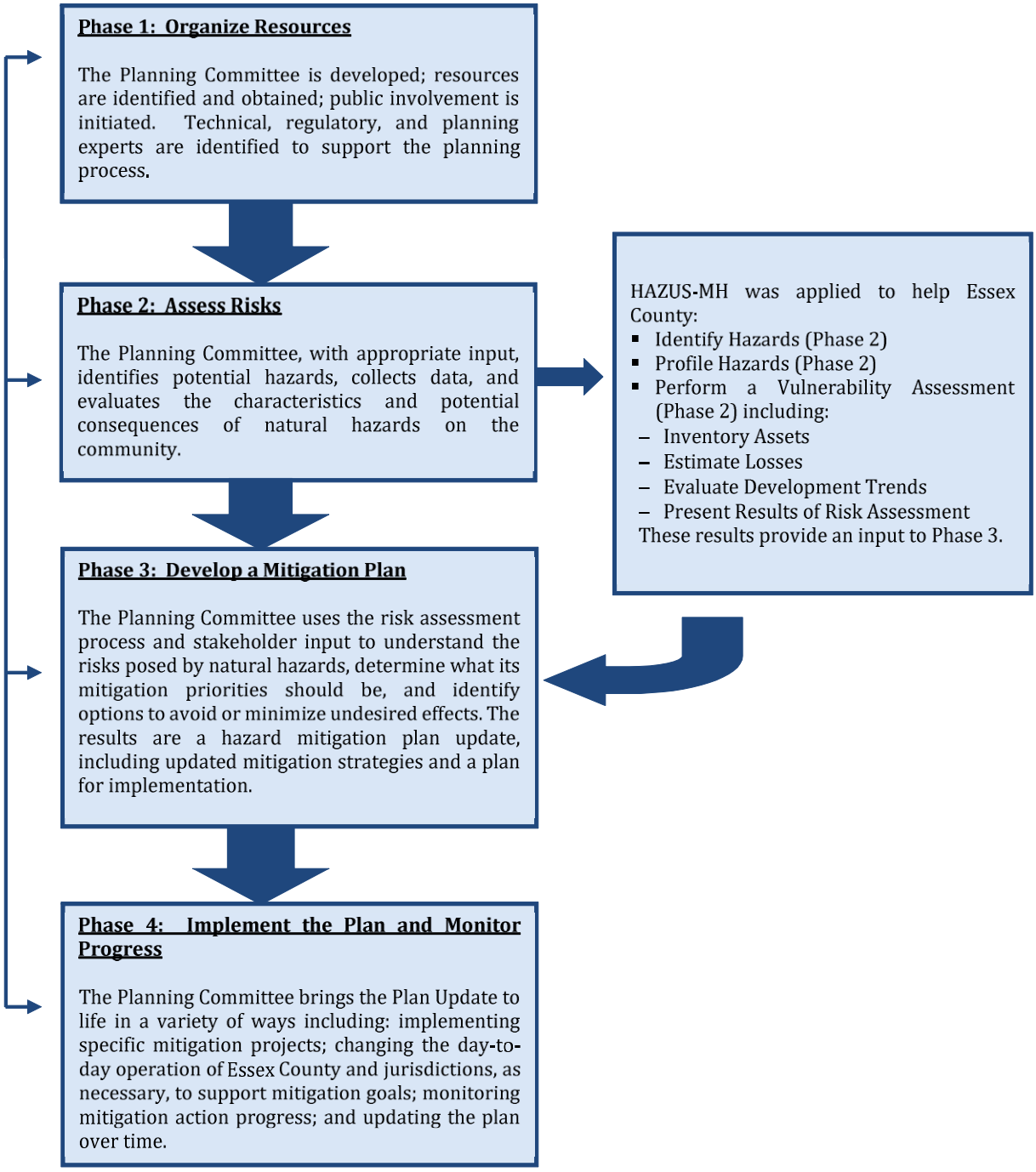
As required by DMA 2000, Essex County and participating jurisdictions have informed the public and provided opportunities for public comment and input. In addition, numerous agencies and stakeholders have participated as core or support members, providing input and expertise throughout the planning process.

This All Hazard Mitigation Plan Update documents the process and outcomes of Essex County and the jurisdictions' efforts. Additional information on the HMP update process is included in Section 3, Planning Process. Documentation that the prerequisites for plan approval have been met is included in Section 2, Plan Adoption.

1.1.6 Organization of This Mitigation Plan

This HMP was organized in accordance with FEMA and NJOEM guidance. The structure of this HMP follows the four-phase planning process recommended by FEMA and summarized in Figure 1-2.

Figure 1-2. Essex County Hazard Mitigation Planning Process



The HMP is organized into two volumes: Volume I includes all information that applies to the entire planning area (Essex County); and Volume II includes participating jurisdiction-specific information.

Volume I of this HMP includes the following sections:

Section 1: Introduction: Overview of participants and planning process

Section 2: Plan Adoption: Information regarding the adoption of the Plan by Essex County and each participating jurisdiction.

Section 3: Planning Process: A description of the HMP methodology and development process, Planning Committee and stakeholder involvement efforts, and a description of how this HMP Update will be incorporated into existing programs.

Section 4: County Profile: An overview of Essex County, including: (1) general information, (2) economy, (3) land use trends, (4) population and demographics, (5) general building stock inventory and (6) critical facilities.

Section 5: Risk Assessment: Documentation of the hazard identification and hazard risk ranking process, hazard profiles, and findings of the vulnerability assessment (estimates of the impact of hazard events on life, safety and health; general building stock; critical facilities and the economy). Description of the status of local data and planned steps to improve local data to support mitigation planning.

Section 6: Mitigation Strategies: Information regarding the mitigation goals and objectives identified by Essex County in response to priority hazards of concern.

Section 7: Plan Maintenance Procedures: The system established by Essex County to continue to monitor, evaluate, maintain and update the HMP.

Volume II of this plan includes the following sections:

Section 8: Planning Partnership: Description of the planning partnership, and jurisdictional annexes.

Section 9: Jurisdictional Annexes: A jurisdiction-specific annex for each participating jurisdiction and Essex County containing their hazards of concern, hazard risk ranking, capability assessments, mitigation actions, action prioritization specific only to Essex County or that jurisdiction, progress on 2008 mitigation actions, and an overview of 2008 plan integration into local planning processes.

Appendices include:

Appendix A: Resolutions of Plan Adoption: Documentation that supports the plan approval signatures included in Section 2 of this HMP. Resolutions from each jurisdiction will be included as they formally adopt the HMP.

Appendix B: Meeting Documentation: Agendas, attendance sheets, minutes, and other documentation (as available and applicable) of planning meetings convened during the development of the HMP.

Appendix C: Participation Matrix: A matrix is presented to give a broad overview of who attended meetings and when input was provided to the HMP update.

Appendix D: Public and Stakeholder Outreach Documentation: Documentation of the public and stakeholder outreach effort including webpages, informational materials, public and stakeholder meetings and presentations, surveys, and other methods used to receive and incorporate public and stakeholder comment and input to the plan update process.

Appendix E: Action Worksheet Template and Instructions

Appendix F: FEMA 386-4 Guidance Worksheets: Examples of plan review templates available to support annual plan review.

Section 2. PLAN ADOPTION

2015 Plan Update Changes

- Section 2 now contains information regarding adoption. In the 2008 HMP, this was discussed in Section 10.
- The resolutions issued to support adoption of the plan by each jurisdiction will be included in Appendix A.

2.1 OVERVIEW

This section contains information regarding adoption of the HMP update by Essex County and each participating jurisdiction.

2.1.1 Plan Adoption by Local Governing Bodies

Adoption by the local governing bodies demonstrates the commitment of Essex County and each participating jurisdiction to fulfill the mitigation goals and objectives outlined in the HMP. Adoption legitimizes the HMP and authorizes responsible agencies to execute their responsibilities.

Each participating jurisdiction will proceed with formal adoption proceedings when FEMA provides conditional approval of this Plan, known as Approval Pending Adoption (APA) and each participating jurisdiction understands that a conditional approval of the HMP will be provided for those municipalities that meet the planning requirements with the exception of the adoption requirement as stated above. The resolution to support adoption of the plan by each jurisdiction is included as Appendix B, Sample Resolution of Plan Adoption.

Following adoption or formal action on the HMP, each participating jurisdiction must submit a copy of the resolution or other legal instrument showing formal adoption (acceptance) of the Plan to the Essex County Hazard Mitigation Coordinator. Essex County will forward the executed resolutions to the NJOEM – Mitigation Division, and they will be subsequently forwarded to FEMA. Each participating jurisdiction understands that FEMA will transmit acknowledgement of verification of formal plan adoption and the official approval of the plan to the mitigation plan coordinator.

The resolutions issued to support adoption of the plan by each jurisdiction will be included as Appendix A, to be entitled Resolutions of Plan Adoption.

In addition to being required by DMA 2000, adoption of the plan is necessary because:

- It lends authority to the plan to serve as a guiding document for all local and state government officials;
- It gives legal status to the plan in the event it is challenged in court;
- It certifies the program and grant administrators that the plan's recommendations have been properly considered and approved by the governing authority and jurisdictions' citizens; and
- It helps to ensure the continuity of mitigation programs and policies over time because elected officials, staff, and other community decision-makers can refer to the official document when making decisions about the community's future.

Source: FEMA. 2003. "How to Series"-*Bringing the Plan to Life* (FEMA 386-4).

Section 3. Planning Process

2015 Plan Update Changes

- Section 3, Planning Process, has been updated in its entirety.
- The Township of Cedar Grove participated in the 2015 HMP update; therefore there was 100% participation from all municipalities in Essex County during this planning process.
- A new addition was the establishment of a Steering Committee in addition to a Planning Committee.

3.1 INTRODUCTION

This section includes a description of the planning process used to update the Essex County All Hazard Mitigation Plan (HMP), including how it was prepared, who was involved in the process, and how the public was involved.

To ensure that the HMP met the requirements of the DMA 2000, as well as to support the long term goal of having all jurisdictions in the County covered under a comprehensive and cohesive county-wide DMA 2000 plan, an approach to the planning process and plan documentation was developed to achieve the following:

- The HMP will be multi-jurisdictional and consider natural and human-caused hazards facing Essex County, thereby satisfying the natural hazards mitigation planning requirements specified in DMA 2000. Essex County invited all municipalities in the county to join with them in the preparation of the Essex County All Hazard Mitigation Plan. Essex County and all its municipalities are participating in the HMP as indicated in Table 3-1 below.

- The HMP shall be developed following the process outlined by DMA 2000, FEMA regulations, and prevailing FEMA and NJOEM guidance. Following this process ensures all the requirements are met and support HMP review.

Table 3-1. Participating Essex County Jurisdictions

Townships	
Belleville	Millburn
Bloomfield	Montclair
Cedar Grove	Nutley
Fairfield	South Orange
Irvington	Verona
Livingston	West Caldwell
Maplewood	West Orange
Boroughs	**Cities**
Caldwell	East Orange
Essex Fells	Orange
Glen Ridge	Newark
North Caldwell	**County**
Roseland	Essex County

The Essex County All Hazard Mitigation Plan update was written using the best available information obtained from a wide variety of sources. Throughout the HMP update process, a concerted effort was made to gather information from municipal and regional agencies and staff as well as stakeholders, federal and state agencies, and the residents of the County. The HMP Steering and Planning Committees solicited information from local agencies and individuals with specific knowledge of certain natural hazards and past historical events, as well as considering planning and zoning codes, ordinances, and other recent planning decisions. The hazard mitigation strategies identified in this HMP have been developed through an extensive planning process involving local, county and regional agencies, County residents and stakeholders.

This section of the HMP describes the mitigation planning process, including (1) Planning Partnership – Organization and Activity; (2) Stakeholder Outreach and Involvement; (3) Public Participation – Citizen Involvement; (4) Integration and Coordination with Existing Mitigation Efforts and Programs; and (5) Continued Public and Stakeholder Involvement.

3.2 PLANNING PARTNERSHIP - ORGANIZATION AND ACTIVITY

Many parties supported the preparation of this HMP update: the Steering Committee, Planning Committee, stakeholders and planning consultant. This planning process does not represent the start of hazard risk management in the County; rather it is part of an ongoing process that various State, County and local agencies and individuals have continued to embrace. A summary of the past and ongoing mitigation efforts is provided in Section 6, as well as in Volume II Section 9, to give an historical perspective of the county and local activities implemented to reduce vulnerablity to hazards in the planning area.

This section of the HMP identifies how the planning process was organized with the many "planning partners" involved, and outlines the major activities that were conducted in the development of this HMP update.

Organization of Planning Partnership

Recognizing the need to manage risk within the County, and to meet the requirements of the DMA 2000, the Essex County Sherriff's Office led the update to the 2008 Essex County Hazards Mitigation Plan. On August 30, 2012 Essex County was notified by NJOEM that their application for a planning grant to update their 2008 Hazard Mitigation Plan under FEMA's Hazard Mitigation Grant Program (HMGP 4021-0016) was approved. The County selected a contract planning consultant (Tetra Tech Inc. – Morris Plains, NJ) to guide the County and participating jurisdictions through the HMP update process. A contract between Tetra Tech Inc. (Tetra Tech) and the County was executed in July 2013. Specifically Tetra Tech, the "contract consultant", was tasked with:

- Assisting with the organization of a Steering and Planning Committee;
- Assisting with the development and implementation of a public and stakeholder outreach program;
- Data collection;
- Facilitation and attendance at meetings (planning committee, stakeholder, public and other);
- Review and update of the hazards of concern, and hazard profiling and risk assessment;
- Assistance with the review and update of mitigation planning goals and objectives;
- Assistance with the review of progress of past mitigation strategies;
- Assistance with the screening of mitigation actions and the identification of appropriate actions;
- Assistance with the prioritization of mitigation actions; and
- Authoring of the Draft and Final HMP documents

In August 2013, Essex County's Office of Emergency Management notified all 22 municipalities within the County of the pending planning process and invited them to formally participate. Municipalities were provided

with a copy of the Planning Partner Expectations and asked to formally notify the County of their intent to participate (via a Letter of Intent) and to identify a planning point of contact to serve on a Planning Committee and represent the interests of their respective community. All 22 municipalities returned their Letter of Intent to Participate.

To facilitate HMP development, with support from their contract planning consultant, Essex County developed a Steering Committee to provide guidance and direction to the planning effort, and to ensure the resulting document will be embraced both politically and by the constituency within the planning area. Steering Committee members are identified in Table 3-2.

The Steering Committee was charged with:

- Providing guidance and overseeing the planning process on behalf of the general planning partnership.
- Attending and participating in Steering Committee meetings.
- Assisting with the development and completion of certain planning elements, including:
    - Identification of "Hazards of Concern"
    - Public and Stakeholder Outreach
    - Mitigation Planning Goals and Objectives
    - Identification and screening of appropriate mitigation strategies and activities.
- Reviewing and commenting on plan documents prior to submission to NJOEM and FEMA.

It is noted that prior to the general project Kick-Off meeting, a more limited Steering Committee was assembled to initiate the planning process and assist with overall project administration and the formation of the full Steering Committee.

A Planning Committee was assembled to represent each of the municipalities participating in the HMP update, with at least one representative from each of the 22 participating municipalities. Each municipality received a copy of the "Planning Partner Expectations" which outlined the responsibilities of the participants and the agreement of the partners to authorize a Steering Committee to represent the jurisdiction in the completion of certain planning elements. Table 3-2 lists the current municipal members of the Planning Committee, at the time of this HMP's publication. Please note that while Steering Committee members are also part of the overall project Planning Committee, this table lists only those Planning Committee members representing participating municipalities.

Table 3-2. Steering and Planning Committee Members

Organization	Name	Title	Steering Committee	Planning Committee	Municipal POC	
					POC	Alternate POC
Essex County	Joseph DiVincenzo	County Executive	X			
	Armando Fontoura	Sheriff/County OEM Coordinator	X			
	Carolyn Murray	County Prosecutor	X			
	Anthony Ambrose	Chief of Detectives	X			
	Kevin Ryan	Undersheriff/Deputy OEM Coordinator	X			
	Garey Chin	Director of Homeland Security	X			
	Ralph Ciallella	County Administrator	X			
	Michael Venezia	Administrator's Assistant	X			
	John Tully	Haz Mat/Bomb Technician	X			
	Lt Edward Esposito	Essex County Sheriff's Office, County Communications	X			
	Maura Lynch	Training Coordinator	X			
	David Antonio	County DPW-Planner	X			
	Darren Marshall	IT/GIS Coordinator	X			
	Luis E. Rodriguez	Supervising Engineer, DPW	X			
	Sanjeev Varghese, PE	County Floodplain Administrator	X			
	Sal Macaluso	Director of County Roads and Bridges	X			
	Peter Smeraldo	Municipal OEM/Fire Chief	X			
	Paul Wannemaker	Municipal OEM/Dep. Chief	X			
	Wayne Smith	Municipal OEM/Mayor	X			
	Frank Del Gaudio	County Risk Manager	X			
	Anthony Puglisi	Public Information Officer	X			
	Lauren Shears	Public Information Officer	X			
	Jean Walker	Essex Regional Health	X			
	Rich Budris	Essex Regional Health	X			
	Daniel Salvante	Director of Parks Department	X			
	Daniel Salvante Jr.	Parks Facility Manager	X			
	Stephen Pringle	Warden ECCF	X			
	James Troisi	Essex County Corrections	X			
	Dr. Joyce Harley	Vice President, ECC	X			
Township of Belleville	George Pedalino	OEM Coordinator		X	X	
	Tom Herits	Town Engineer		X		X
Township of Bloomfield	Fred Menzel	OEM Coordinator		X	X	
	Paul Lasek	Township Engineer		X		X
Borough of Caldwell	Paul M. Carelli	Borough Administrator		X	X	
	Anthony Grenci	OEM Coordinator		X		X
Township of	Jeffrey McElroy	OEM Coordinator/PO		X	X	

Table 3-2. Steering and Planning Committee Members

Organization	Name	Title	Steering Committee	Planning Committee	Municipal POC	
					POC	Alternate POC
Cedar Grove	John D'Ascensio	Deputy Emergency Management Coordinator		X		X
City of East Orange	R.David Williams	OEM Coordinator		X	X	
	Samrah Jones	EOFD		X		X
Borough of Essex Fells	Donald Allen	Dep. Coordinator/Lt		X	X	
	John Schmunk	Sergeant		X		X
Township of Fairfield	William Smith	OEM Coordinator		X	X	
	Lawrence Gonnallo	Engineer		X		X
Borough of Glen Ridge	Michael J. Rohal, P.E., P.P	Borough Administrator/Engineer		X	X	
	Michael Zichelli, AICP, P.P.	Deputy Administrator/Director of Planning		X		X
Township of Irvington	DC Randy Wuest	Deputy Fire Chief		X	X	
	Gary Shumlich	Fire Chief		X		X
Township of Livingston	Chief Craig Handschuch	Police Chief/OEM Coordinator		X	X	
	Chief Christopher Mullin	Fire Chief/Dep.OEM Coordinator		X		X
Township of Maplewood	Joseph Manning	Business Administrator-Administration		X	X	
	Michael Dingelstedt	Fire Chief/Fire Department		X		X
Township of Millburn	Robert Echavarria	Battalion Fire Chief		X	X	
	Michael Roberts	Fire Chief, Deputy OEM Coordinator		X		X
Township of Montclair	Kimberli Craft, P.E.	Township Engineer/Community Services		X	X	
	Tom Diveny	Deputy Chief/Fire Dept.		X		X
City of Newark	Mehdi Mohammadish	Director of Engineering Dept.		X	X	
	Andrea Adebowale	Acting Director of Water & Sewer Dept.		X		X
Borough of North Caldwell	John D'Ascensio	OEM Coordinator		X	X	
	Frank Zichelli	Engineer/Engineering DPW		X		X
Township of Nutley	Salvatore Ferraro	Engineering/Department of Public Works		X	X	
	Thomas Nicolette	OEM Coordinator		X		X
City of Orange Township	John Wade	Deputy OEM Coordinator		X	X	
	Raymond Wingfield	OEM Coordinator		X		X
Borough of Roseland	John Matheis	OEM Coordinator		X	X	
	Gary Schall	Supt. Public Works		X		X
Township of South Orange Village	Alex Torpey	Village President		X	X	
	Adam D.Loehner	Deputy Village Administrator		X		X
Township of Verona	Jeff Hayes	Director OEM, IT & Admin		X	X	
	Dough Huber	Police Chief, Deputy OEM		X		X
Township of	Larry Peter	Emergency Management		X	X	

Table 3-2. Steering and Planning Committee Members

Organization	Name	Title	Steering Committee	Planning Committee	Municipal POC	
					POC	Alternate POC
West Caldwell	John Medina	Emergency Management		X		X
Township of West Orange	Fire Chief Peter F.Smeraldo, Jr.	OEM Coordinator		X	X	
	Deputy Chief Paul Wannemacher	Deputy OEM Coordinator		X		X

The Planning Committee was charged with the following:

- Represent their jurisdiction throughout the planning process;
- Establish Plan development goals;
- Establish a timeline for completion of the Plan;
- Ensure that the Plan meets the requirements of DMA 2000 and FEMA and NJOEM guidance;
- Solicit and encourage the participation of regional agencies, a range of stakeholders, and citizens in the Plan development process;
- Assist in gathering information for inclusion in the Plan, including the use of previously developed reports and data;
- Organize and oversee the public involvement process;
- Involve your local NFIP Floodplain Administrator in the planning process.
- Report on progress of 2008 HMP mitigation actions;
- Identify, develop and prioritize appropriate mitigation initiatives;
- Report on progress of 2008 HMP integration into other planning processes and municipal operations;
- Review, amend and approve all sections of the Plan;
- Develop and author the jurisdictional annex for their jurisdiction;
- Develop, revise, adopt, and maintain the Plan.

It is noted that the Letter of Intent to Participate identifies the above "Planning Partner Expectations" as serving to identify those activities comprising overall participation by jurisdictions throughout the planning process. It is recognized that the jurisdictions in Essex County have differing levels of capabilities and resources available to apply to the planning process, and further have differing exposure and vulnerability to the natural hazard risks being considered in this Plan. It was Essex County's intent to encourage participation by all inclusive jurisdictions, and to accommodate their specific needs and limitations while still meeting the intents and purpose of Plan participation. Such accommodations have included the establishment of a Steering Committee and engaging a contract consultant to assume certain elements of the Planning process on behalf of the jurisdictions, and to provide additional and alternative mechanisms to meet the purposes and intent of mitigation planning.

Ultimately, jurisdictional participation is evidenced by a completed annex (chapter) of the Plan (Section 9) wherein the jurisdiction has identified their planning points of contact, evaluated their risk to the hazards of concern, identified their capabilities to effect mitigation in their community, and identified and prioritized an appropriate suite of mitigation initiatives, actions, and projects to mitigate their natural hazard risk; and eventually by the adoption of the Plan via resolution.

Appendix C identifies those individuals who represented their municipalities during this planning effort, and indicates how they contributed to the planning process. This matrix is intended to give a broad overview of who attended meetings and when input was provided to the plan. All participants were encouraged to attend

the Kick-off Meeting, Mitigation Action Workshops and Jurisdictional Annex Workshop. During the planning process the planning consultant contacted each participant to offer support, explain the process, and to facilitate the submittal and review of critical documents.

Planning Partnership Activities

A summary of Planning and Steering Committee meetings held during the development of this Plan is included in Table 3-3. It must be recognized that this summary table identifies only the formal meetings held during plan development, and does not reflect the planning activities conducted by individuals and groups throughout the planning process. In addition to these meetings there was a great deal of communication between Planning Committee members through electronic mail (email), and by phone.

After completion of the HMP update, implementation and ongoing maintenance will become a function of the Planning Committee. The Planning Committee will review the HMP and accept public comment as part of the five year mitigation plan update.

Table 3-3 presents a summary of the planning partnership efforts implemented during the development process for this Plan, as well as key milestones in the Plan's development. It also identifies which DMA 2000 requirements the activities satisfy. Documentation of meetings (agendas, sign-in sheets, minutes, etc.) may be found in Appendix B.

The New Jersey Department of Community Affairs (NJDCA) established a Post Sandy Planning Assistance Grant Program. The purpose of this program is to support long-range planning for community redevelopment in the municipalities and counties sustaining damage from Superstorm Sandy. The Essex County SRPR was closely coordinated with the Essex County Hazard Mitigation Plan Update.

The County and the SRPR consultant team, which included Tetra Tech, conducted extensive outreach efforts to stakeholders including the public. These stakeholders were invited to the SRPR public meeting which covered mitigation topics to ensure there was integration of these two planning processes. This meeting appears in Table 3-3 because agenda topics included strengths/weaknesses/obstacles/threats exercise and mitigation action development relevant to both plans. Additional information on the SRPR may be found later in this section (Section 3) and in Section 9.1 (Essex County Annex).

Table 3-3. Summary of Planning Outreach

Date	Activity/DMA 2000 Requirement	Key Outcomes/Purpose	Attendees
September 9 and 25, 2013	1c, 2, 3a-c, 3e, 4a, 4b	Municipal Kick-Off Meeting: Presentation and discussion on the planning process, and discussion regarding municipal participation expectations. Initial data and information gathering including distribution of worksheets on a CD for completion to each municipality.	Belleville (T): George Pedalino (OEM Coordinator) Bloomfield (T): Tom Pelara (OEM), Fred Menzel (OEM Coordinator) Caldwell (B): Anthony Grenci (OEM Coordinator), Paul Carelli (Borough Administrator), Ann Dassing (Mayor), Glen Beckmayer (Engineer) Cedar Grove (T): Jeffery McElroy (OEM) East Orange (C): Antoine Lambert Essex Fells (B): Donald Allen (Dep. Coordinator/Lt), Roger Kerr (DPW Supervisor), Vincent Kulik (Chief of Police), Edward Abbot (Mayor/OEM) Fairfield (T): William Smith (OEM Coordinator) Glen Ridge (B): Michael Rohal (Borough Administrator) Irvington (T): Randy West (Deputy Chief Fire Department), Gary Shumlier (Chief) Livingston (T): Craig Handschuch (Police Chief, OEM Coordinator) Maplewood (T): Michael Dingelstedt (Fire Chief) Millburn (T): Tim Gordon (Business Administrator), Michael Roberts (Fire Chief) Montclair (T): Kim Craft (Township Engineer), Tom Diveny (Deputy Fire Chief) North Caldwell (B): Frank Zicheli (Engineer), John D'Ascensio (Fire Chief/OEM) Newark (C): Mehdi Mohammedish (Engineering Director), Robert Thomas (OEM), Peter Pinckney (OEM), Andrewa Adebenale (Director) Nutley (T): Thomas Nicoletti (OEM Coordinator), Paul Confone Orange (C): John Wade (Deputy OEM Coordinator), Lance D. Webb (DPW Supervisor), Anthony Green (Director) Roseland (B): Tom Jacobsen (OEM) South Orange (T): Alex Torpey (Village President), Adam Loehner (Deputy Village Administrator) Verona (T): Jeff Hayes (Direction OEM, IT& Admin) West Caldwell (T): John Medina (Emergency Management) West Orange (T): Peter F.Smeraldo, Jr. (Fire Chief/OEM Coordinator) Essex County DPW: Sal Macaluso (Director of County Roads and Bridges), Luis Rodriguez (Supervising Engineer), Jacqueline Bourdony (Engineering Aid) Essex County Sheriff's Office: Sheriff Fontoura, Kevin Ryan (Undersheriff), John Tully (HazMat), Maura Lynch (Training Coordinator), Edward Esposito (County Communications), Maria Adamo, NJOEM: Marc Pelligrino (Regional Representative out of North Region Office) Seton Hall University: Thomas Giordano United Water: Bob Galante (Project Manager), Kevin Bilin (Crew Chief)
November 25, 2013	1b, 1c, 2, 3a, 4a	Steering Committee Meeting #1: The project schedule and data requests discussed, hazards identified, stakeholders identified,	Fairfield: William Smith (OEM Coordinator) Essex Fells and North Caldwell: Frank Zichelli (Engineer) West Orange: Peter F.Smeraldo, Jr. (Fire Chief/OEM Coordinator), Paul Wannemacher (Deputy OEM Coordinator) Essex County DPW: Sal Macaluso (Director of County Roads and Bridges), Jacqueline Bourdony

Table 3-3. Summary of Planning Outreach

Date	Activity/DMA 2000 Requirement	Key Outcomes/Purpose	Attendees
		outreach was discussed (press releases, website, brochures), mission statement and goals discussed.	(Engineering Aid) Essex County Department of Corrections: James Troisi (Lt) Essex Administrator: Michael Venezia (Administrative Aid) Essex County Parks: FJ Salvante (Division of Operations) Essex County Sheriff's Office: Darren Marshall (IT), Kevin Ryan (Undersheriff), John Tully (HazMat), Maura Lynch (Training Coordinator), Edward Esposito (County Communications), Gary Chin (Director) Essex Regional Health Commission: Jean Walker (Chief Enforcement Officer)
December 16, 2013	1b, 1c, 2, 3a, 4a	Steering Committee Meeting #2 (via teleconference): The Steering Committee guidelines were addressed, hazards of concern finalized, the tri-fold public brochure was distributed for review, and the mission statement, goals and objectives were finalized.	Essex County Sherriff's Office: Armando Fontoura (Sheriff/County OEM Coordinator); Kevin Ryan (Undersheriff/Deputy OEM Coordinator); Edward Esposito (County Communications); Maura Lynch (Training Coordinator); Garey Chin (Director of Homeland Security) Essex County DPW: Dave Antonio (County Planner); Anthony Puglisi (Public Information Officer); Sanjeev Varghese, PE (County Engineer and Floodplain Administrator) Essex County: Darren Marshall (IT/GIS Coordinator); Frank Del Gaudio (County Risk Manager) Essex Regional Health Commission: Jean Walker (Chief Enforcement Officer) Essex County Parks Department: Daniel Salvante (Director)
January 10, 2014	1b, 1c, 2, 3a	Stakeholder Meeting: Discussed the purpose and importance of the plan; reviewed hazards of concern, goals and objectives, and informed how stakeholders can stay involved via upcoming meetings, surveys published on the Essex County Sherriff's website, and distributed via email.	Nutley: David Hamilton (Fire/HAZMAT) Essex County Sheriff's Office: Sheriff Fontoura, John Tully (HazMat), Maura Lynch (Training Coordinator), Edward Esposito (County Communications), Maria Adamo (OEM), Bert Moita (OEM), John D'Ascensio (OEM) Essex County Executive: Michael Festa, Ph.D. (Health Officer, Executive Director – Hazardous Response) Essex Regional Health Commission: Jean Walker (Chief Enforcement Officer) NJ State Police: James Dunham, Steve Tiboni NJ Judiciary: Sheila Deveraux Superior Court: Paulyn Holandex Passaic Valley Sewage Commission: Chris O'Shea JCP&L / First Energy: Addie Colon PSE&G: Eric Boston Colonial Pipeline: Fred Morillo, Peter Mongeau, Anthony Untimiglin Verizon NJ, Inc.: Jasmine Pierce University Hospital Newark: John Grembowia (UH-EMS), Joe Burton (UH-EMS), Tim Phelan (UH-EMS) Turtle Back Zoo: Jessica Reid Kessler Institute: Mario Santos Salvation Army: Michael Clayton Port Authority OEM: Michael Ricker Tetra Tech: Paul Miller, Alison Miskiman
February 18,	1b, 2	Public Meeting #1:	Essex County Sheriff's Office: John Tully

Table 3-3. Summary of Planning Outreach

Date	Activity/DMA 2000 Requirement	Key Outcomes/Purpose	Attendees
2014		This meeting was to inform the public about the kick-off of the hazard mitigation plan update.	Essex County Director: George Serio Millburn Fire Department: Michael Roberts Millburn Mayor: Robert Tillotson Millburn Committee Members: Ian Mount, Sandra Haimoff, Ted Bourke Millburn Township Clerk: Christine Gatti Millburn Township Attorney: Christopher Falcon
February 24, 2014	1b, 1c, 2, 3a, 4a	Steering Committee Meeting #3:	North Caldwell: Frank Zichelli (Engineer) West Orange: Peter F. Smeraldo, Jr. (Fire Chief, OEM Coordinator), Paul Wannemacher (Deputy Chief) Essex County Sheriff's Office: Edward Esposito (County Communications), Michael Capodanno Essex County Department of Corrections: Lt. James Troisi (Bureau Commander) Essex Regional Health Commission: Jean Walker (Chief Enforcement Officer) Essex County DPW: Sal Macaluso (Director of County Roads and Bridges), Jacqueline Bourdony (Engineering Aid), Lois Rodriguez (Assistant County Engineer) Jack McGarry (ECPO) Essex County Parks: DJ Salvante
March 4, 2014	3a, 3c, 3d	Meeting with County GIS to review and obtain Data	Essex County GIS Office, Darren Marshall
March 12, 13, 14, 2014	2, 3a, 3d, 4a, 4b	Mitigation Action Municipal Workshops: These workshops were to evaluate, identify and prioritize a comprehensive range of mitigation alternatives as a result of historic losses and the risk assessment; and discuss integration of mitigation	Bloomfield (T): Tom Pelara (OEM), Fred Menzel (OEM Coordinator) Caldwell (B): Tony Grener (OEM), Gerard Grenci (OEM) Cedar Grove (T): Jeffery McElroy (OEM), Alex Palumbo (Township Engineer) East Orange (C): Samrah Jones (Fire Department) Essex Fells (B): Don Allen (Deputy OEM Coordinator) Fairfield (T): Lawrence Gonnello (Engineer), Philip Cheff (Floodplain Administrator), Robert Payne (Director DPW), William Smith (OEM Coordinator) Glen Ridge: Michael Rohal (Borough Administrator), Michael Zichelli (Deputy Administrator) Irvington (T): Antonio Gary (Captain Fire Department), John Wiggins (Township Engineer) Livingston: Craig Handschuch (Police Chief, OEM Coordinator), Michael Anello (Superintendent DPW), Richard Calbi (Livingston Engineer), Christopher Mullin (Fire Chief) Maplewood (T): Joseph Manning (OEM Coordinator), Robert Mittermaide (Construction Official), Robert Cimino (Police Chief), Michael Dingelstedt (Fire Chief), Thomas Malavasi (Engineer), John Singleton (Code Enforcement Supervisor) Millburn (T): Martha Annoni (Assistant Town Engineer), Robert Echavarria (OEM Battalion Chief) Montclair (T): Kimberli Craft (Township Engineer) North Caldwell (B): Frank Zicheli (Engineer) Newark (C): Mehdi Mohammedish (Engineering Director), Robert Thomas (OEM Deputy Coordinator), Tharien Arnold (Deputy Coordinator), Keith Isaac (Director OEM) Nutley (T): Salvatore Ferraro (Engineero Coord.) Orange (C): John Wade (Deputy OEM Coordinator)

Table 3-3. Summary of Planning Outreach

Date	Activity/DMA 2000 Requirement	Key Outcomes/Purpose	Attendees
			Roseland (B): Gary Schall (Superintendent DPW) South Orange (T): Sal Renda (Engineer), Adam Loehner (Deputy Village Administrator) Verona (T): Jeff Hayes (Direction OEM, IT& Admin) West Caldwell (T): Bob McLoughlin (Construction Official), Larry Peter (OEM), John Medina West Orange (T): Leonard Lepore (Municipal Engineer), Thomas Tracey (Code Officer), Paul Wannemacher Essex County: Ed Esposito; Maura Lynch
March 20, 2014	1b, 2	Public Meeting #2: This meeting was to inform the public about the kick-off of the hazard mitigation plan update.	The following municipalities were present: Bloomfield, Cedar Grove, East Orange, Irvington, Fairfield, Livingston, Montclair, Newark, Orange, Verona, West Orange
March 20, 2014	2, 4b	Municipal Mitigation Action Workshop Make-up Session	Belleville: George Pedalino (OEM Coordinator) Essex County: Ed Esposito (OEM), David Antonio (County Planner)
May 5, 2014	2, 4b	East Orange Conference Call to work on annex	East Orange, Tetra Tech
May 14, 2014	2, 4b	Essex County Open Homework Session	Bloomfield: Fred Menzel (OEM Coordinator) Caldwell: Anthony Grenci (OEM Coordinator) Cedar Grove: Jeffery McElroy (OEM Coordinator) Essex Fells: Lt Don Allen, Sgt John Schmunk Newark: Robert Thomas (Deputy Coordinator), Keith Isaac (Director OEM), Peter Pinkney (Analyst) South Orange: Adam Loehner (Deputy Village Administrator) Verona: Jeff Hayes (Director OEM) Tetra Tech
June 9, 2014	2, 4b	Meeting with West Orange to work on annex	West Orange, Tetra Tech
June 10, 2014	2, 4b	Meeting with West Caldwell to work on annex	West Caldwell, Tetra Tech
June 17, 2014	2, 4b	Meeting with Essex County DPW ref. obtain info on past actions and discuss ongoing/new actions	Luis Rodriguez (Assistant Count Engineer); Tetra Tech
June 19, 2014	4b, 4c, 5a, 5b	Jurisdictional Annex Workshop: Discussed risk assessment results; identification of mitigation measures; stakeholder outreach; plan maintenance procedures	Belleville (T): George Pedalino (OEM Coordinator) Bloomfield (T): Fred Menzel (OEM Coordinator) Caldwell (B): Anthony Grenci (OEM) East Orange (C): R. David Williams (OEM Coordinator), Naiima Fauntheroy (OEM/Planning) Essex Fells (B): Don Allen (Deputy OEM Coordinator) Fairfield (T): William Smith (OEM Coordinator) Glen Ridge: Michael Rohal (Borough Administrator)

Table 3-3. Summary of Planning Outreach

Date	Activity/DMA 2000 Requirement	Key Outcomes/Purpose	Attendees
			Irvington (T): Randy West (Deputy Chief Fire Department) Livingston: Craig Handschuch (Police Chief, OEM Coordinator), Christopher Mullin (Fire Chief) Maplewood (T): Thomas Malavasi (Engineer), Carlos Klingin (Deputy Chief) Millburn (T): Martha Annoni (Assistant Town Engineer), Robert Echavarria (OEM Battalion Chief), Mike Roberts (Fire Chief) Montclair (T): Kimberli Craft (Township Engineer), Tom Diveny (Deputy Fire Chief) Newark (C): Peter Pinkney (OEM) Nutley (T): Salvatore Ferraro (Engineero Coord.), Todd Hay (Town Engineer) Orange (C): John Wade (Deputy OEM Coordinator) Roseland (B): John Matheis (OEM) South Orange (T): Adam Loehner (Deputy Village Administrator) Verona (T): Jeff Hayes (Direction OEM, IT& Admin) West Caldwell (T): Larry Peter (OEM) West Orange (T): Peter Smeraldo (Fire Chief, OEM Coordinator) Essex County: Ed Esposito (Lt; OEM); Luis Rodriguez (Assistance County Engineer); Kevin Ryan (Undersheriff) NJOEM: Shenetia Henderson (Planner); Laura Connolly (Planner); Patrick Jones (OEM) Tetra Tech
June 23, 2014	2, 4b	Meeting with West Orange to finalize annex	West Orange, Tetra Tech
June 27, 2014	2, 4b	Meeting with West Caldwell to finalize annex	West Caldwell, Tetra Tech
July 8, 2014	2, 4b	Meeting with Cedar Grove to finalize annex	Cedar Grove, Tetra Tech
July 9, 2014	2, 4b	Meeting with East Orange to finalize annex	OEM, Councilman, Planner, Tetra Tech
July 15, 2014	1b, 4c	Public Meeting #3: This meeting had a dual role for both the SRPR and the HMP update. The agenda topics included mitigation action development and a strengths/weaknesses/obstacles and threat exercise.	Essex County DPW, Ironbound Community Corporation, Maser Consulting, North Jersey Transportation Planning Authority, West Orange OEM, TESC, Tetra Tech.
July 21, 2014	3a, 4b	FEMA Risk MAP Resilience Meeting	FEMA Region 2, NJOEM, Essex County OEM, Essex County Engineer, City of Newark, Tetra Tech
July 24, 2014	2, 4b	Meeting with County Dept. of Public Works to finalize information on past, present and new strategies	Luis Rodriguez (Assistant Count Engineer); Tetra Tech

Table 3-3. Summary of Planning Outreach

Date	Activity/DMA 2000 Requirement	Key Outcomes/Purpose	Attendees
September 24, 2014	4b, 5a	Meeting with Municipal Coordinators. Update of process, public comment period, plan maintenance and final information requests	Belleville (T): George Pedalino (OEM Coordinator) Bloomfield (T): Fred Menzel (OEM Coordinator) Caldwell (B): Anthony Grenci (OEM Coordinator) East Orange (C): David Williams (OEM Coordinator) Essex Fells (BJohn Schmunk (Dep. Coordinator/Sgt) Fairfield (T): William Smith (OEM Coordinator) Glen Ridge (B): Sean Quinn (Deputy OEM) Irvington (T): Anthony Gary (Deputy OEM, Fire Department) Livingston (T): Christopher Mullen (Fire Chief, Deputy OEM) Millburn (T): Michael Roberts (Fire Chief), Robert Echavarria (OEM Battalion Chief) Montclair (T): Kenneth Miscia (Police Chief, OEM) Newark (C): Dorian Herrell (Director, OEM), Gerrell Elliott (Chief of Staff, OEM) Nutley (T): Paul Confone (Deputy OEM) Orange (C): John Wade (Deputy OEM Coordinator) Roseland (B): John Matheis (OEM) South Orange (T): Adam Loehner (Deputy Village Administrator) Verona (T): Jeff Hayes (Direction OEM, IT& Admin) West Caldwell (T): Larry Peter (OEM) West Orange (T): Peter F.Smeraldo, Jr. (Fire Chief/OEM Coordinator) Essex County: Ed Esposito (Lt; OEM); Maura Lynch (OEM), Maria Adamo (OEM), Kevin Ryan (Undersheriff), Tim Phelan (University Hospital, OEM) NJOEM: Steven Tiboni (North Region Rep) Tetra Tech

Note: Each number in column 2 identifies specific DMA 2000 requirements, as follows:
1a – Prerequisite – Adoption by the Local Governing Body
1b – Public Participation
2 – Planning Process – Documentation of the Planning Process
3a – Risk Assessment – Identifying Hazards
3b – Risk Assessment – Profiling Hazard Events
3c – Risk Assessment – Assessing Vulnerability: Identifying Assets
3d – Risk Assessment – Assessing Vulnerability: Estimating Potential Losses
3e – Risk Assessment – Assessing Vulnerability: Analyzing Development Trends
4a – Mitigation Strategy – Local Hazard Mitigation Goals
4b – Mitigation Strategy – Identification and Analysis of Mitigation Measures
4c – Mitigation Strategy – Implementation of Mitigation Measures
5a – Plan Maintenance Procedures – Monitoring, Evaluating, and Updating the Plan
5b – Plan Maintenance Procedures – Implementation through Existing Programs
5c – Plan Maintenance Procedures – Continued Public Involvement

3.3 STAKEHOLDER OUTREACH AND INVOLVEMENT

This section presents (1) municipal involvement, (2) state and regional agency involvement, (3) public participation – citizen involvement, and outreach to business, utility, educational, transportation, non-profits, and other stakeholders.

Diligent efforts were made to assure broad regional, county and local representation in this planning process. To that end, a comprehensive list of stakeholders was developed with the support of the Steering and Planning Committee. Stakeholder outreach was performed early on, and continually throughout, the planning process. Information and input provided by these stakeholders has been included throughout this Plan where appropriate, as identified in the references.

This summary discusses the various stakeholders that were invited to participate in the development of this HMP update, and how these stakeholders participated and contributed to the HMP. It should be noted that this summary listing cannot possibly represent the sum total of stakeholders that were aware of and/or contributed to this HMP update, as outreach efforts were being made, both formally and informally, throughout the process by the many planning partners involved in the effort, and documentation of all such efforts is impossible. Instead, this summary is intended to demonstrate the scope and breadth of the stakeholder outreach efforts made during the plan update process.

In May 2014, focused stakeholder group response surveys were sent to the stakeholders indicated in the following table. The surveys were designed to garner information from a range of specific stakeholders and community members across the county, with unique questions directed towards each user group. The outreach emails also requested the stakeholders' wider participation in the development of the HMP Update, and provided links to the HMP website for further information. For more information on the focused stakeholder surveys, see Appendix D – Public and Stakeholder Outreach.

On July 15, 2014 an SRPR public/stakeholder meeting was held at the Richard Codey Arena. As discussed earlier, the HMP updated was closely coordinated with the SRPR planning process. This meeting's agenda included topics that would benefit both plans (e.g., mitigation action identification). The following stakeholders were invited to attend the meeting and their attendance is noted. A summary of mitigation actions/projects identified by meeting participants is provided in Appendix B (Meeting Documentation).

- All municipalities in Essex County (West Orange OEM attended*)
- Essex County Departments (Essex County DPW attended*)
- PSE&G
- Newark Public Library
- Ironbound Community Corporation*
- NJ Transit
- NJ Future
- North Jersey Transportation Planning Authority*
- Essex Community College
- Newark Regional Bus Partnership
- Thomas Edison State College - North Central Region of New Jersey Comprehensive Economic Development Strategy Steering Committee Member Alex Rivera*

**Attended the meeting*

On August 18, 2014, the Essex County Office of Emergency Management sent a request to all neighboring county emergency management offices via email and letter indicating that the draft HMP update was available for review and requesting input and comments as appropriate. Letters and emails were sent to the following

counties: Bergen, Hudson, Morris, Passaic, and Union. In addition, the County notified engaged stakeholders that the draft HMP update was also available for review and comment. These letters may be found in Appendix D.

The following subsection identifies those stakeholders that were invited to participate in the planning process, identifies the nature of their involvement, and indicates how their input was incorporated in this plan as applicable.

Federal Agencies

Please see Appendix C (Participation Matrix) for further details regarding federal agency participation. All responses to the surveys may be found in Appendix D.

FEMA Region II: Provided updated planning guidance; provided summary and detailed NFIP data for planning area; held the FEMA Risk MAP resilience meeting in the City of Newark; conducted plan review.

National Weather Service (NWS): Provided data and information, provided subject matter expert review of atmospheric/weather-related hazard profile.

Information regarding hazard identification and the risk assessment for this HMP update was also requested and received or incorporated by reference from the following agencies and organizations:

- National Climatic Data Center (NCDC)
- National Hurricane Center (NHC)
- National Oceanic and Atmospheric Administration (NOAA)
- National Resources Conservation Service (NRCS)
- National Weather Service (NWS)
- Storm Prediction Center (SPC)
- U.S. Army Corps of Engineers (USACE)
- U.S. Census Bureau
- U.S. Department of Agriculture (USDA)
- U.S. Department of Health and Human Services
- U.S. Environmental Protection Agency (USEPA)
- U.S. Geological Survey (USGS)
- U.S. Fish and Wildlife Service

State Agencies

Please see Appendix C (Participation Matrix) for further details regarding state agency participation. All responses to the surveys may be found in Appendix D.

New Jersey Office of Emergency Management (NJOEM): Administered planning grant; provided updated planning guidance; attended meetings including the Kick-Off meeting in September 2013; attended the January 2014 Stakeholder meeting; facilitated the Jurisdictional Annex Workshop and FEMA Risk MAP meeting in the City of Newark; provided review of the Draft HMP update.

New Jersey Judiciary: Attended the January 2014 Stakeholder Meeting

Port Authority of New York New Jersey: Attended the January 2014 Stakeholder Meeting; was requested to complete and return a stakeholder survey.

New Jersey Transit: Was requested to complete and return a stakeholder survey.

County and Regional Agencies, Commissions and Non-Profits

Please see Appendix C (Participation Matrix) for further details regarding county agency participation. All responses to the surveys may be found in Appendix D.

- Essex Administrator - Attended the November 2013 Steering Committee Meeting
- Essex County Department of Corrections – Attended the September 2013 Kick-Off Meeting, and the November 2013 and February 2014 Steering Committee Meetings
- Essex County Department of Public Works - Attended the September 2013 Kick-Off Meeting, the November and December 2013 and February 2014 Steering Committee Meetings; Attended the FEMA Risk MAP Resilience meeting in July 2014
- Essex County Sheriff's Office – Attended all Stakeholder, Steering Committee and Planning Committee Meetings; led the HMP update; returned stakeholder surveys
- Essex County Parks Department - Attended the November and December 2013 and February 2014 Steering Committee Meetings
- Essex Regional Health Commission - Attended the November and December 2013, and February 2014 Steering Committee Meetings; Completed and returned stakeholder survey
- Essex County Health Officer – Attended the January 2014 Stakeholder Meeting
- Essex County Geographic Information Systems Department - Attended the November 2013 and February 2014 Steering Committee Meetings; Provided spatial data for the risk assessment
- Turtle Back Zoo – Attended the January 2014 Stakeholder Meeting

Regional and Local Stakeholders

Please see Appendix C (Participation Matrix) for further details regarding regional and local stakeholder agencies. All responses to the surveys may be found in Appendix D.

Health

The following hospitals and health agencies/organizations were contacted directly by Essex County OEM to take a stakeholder survey which included the identification of specific mitigation actions/projects. In addition, other areas of involvement in the planning process are noted below.

- Essex County Health Officer
- Veterans Affairs Health
- Kessler Institute – Attended the January 2014 Stakeholder Meeting
- East Orange General Hospital – Completed and returned stakeholder survey
- Newark Beth Israel – Completed and returned stakeholder survey
- Daughters of Israel – Completed and returned stakeholder survey
- University Hospital – Attended the January 2014 Stakeholder Meeting
- Saint Michaels Medical Center
- Saint James Hospital
- Essex County Hospital Center
- Clara Mass Medical Center
- Columbus Hospital
- Hackensack / UMC Mountainside Hospital – Completed and returned stakeholder survey
- Saint Barnabas and NJ Burn MCC – Completed and returned stakeholder survey
- American Red Cross

- Essex Regional Health – Completed and returned stakeholder survey
- Essex County Health Department
- Overlook Hospital – Completed and returned stakeholder survey
- The Department of Health or Health Official in each of the 22 municipalities was contacted. The following completed the stakeholder survey:
    - Maplewood Health Department – Completed and returned stakeholder survey
    - Alaris Health at West Orange – Completed and returned stakeholder survey
    - Foresthill Healthcare Center – Completed and returned stakeholder survey
    - Job Haines Home (Bloomfield) – Completed and returned stakeholder survey
    - Summit Ridge Center (West Orange) – Completed and returned stakeholder survey
    - Green Hill (West Orange) – Completed and returned stakeholder survey
    - Windsor Gardens Care Center (East Orange) – Completed and returned stakeholder survey
    - VA Medical Center (East Orange) – Completed and returned stakeholder survey
    - Brookhaven Health Care Center (East Orange) – Completed and returned stakeholder survey
    - Emeritus at West Orange – Completed and returned stakeholder survey
    - Gates Manor (Montclair) – Completed and returned stakeholder survey
    - Winchester Gardens (Maplewood) – Completed and returned stakeholder survey
    - Broadway House for Continuing Care (Newark) – Completed and returned stakeholder survey

Utilities

The following utilities were contacted directly by Essex County OEM to take a stakeholder survey which included the identification of specific mitigation actions/projects. In addition, other areas of involvement in the planning process are noted below.

- PSE&G Electric/Gas – Attended the January 2014 Stakeholder Meeting; Completed and returned stakeholder survey
- NJ American Water
- Passaic Valley Sewerage Commission – Attended the January 2014 Stakeholder Meeting; Completed and returned stakeholder survey
- Passaic Valley Water Commission
- East Orange Water Commission
- Newark Water Utility
- Essex County Utilities Authority
- Verizon – Attended the January 2014 Stakeholder Meeting; Completed and returned stakeholder survey
- Comcast
- Cablevision
- JCP&L – Attended the January 2014 Stakeholder Meeting; Completed and returned stakeholder survey
- Colonial Pipeline – Attended the January 2014 Stakeholder Meeting
- United Water – Attended the September 2013 Kick-Off meeting
- Township of Livingston Water Pollution Control Facility – Completed and returned stakeholder survey
- Essex Fells Water Company – Completed and returned stakeholder survey

Fire

The Fire Chiefs of all 22 municipalities and the Essex County Fire Coordinator were contacted directly by Essex County OEM to take a stakeholder survey customized to fire coordinators and municipal fire chiefs which included the identification of specific mitigation actions/projects. In addition, other areas of involvement in the planning process are noted below.

- Millburn Fire Department – Completed and returned seven (7) surveys
- Essex Fells Fire Department – Completed and returned stakeholder survey; Participated on the Planning Committee
- Cedar Grove Fire Department – Completed and returned stakeholder survey
- West Caldwell Fire Department – Completed and returned stakeholder survey
- North Caldwell Fire Department – Completed and returned stakeholder survey
- Caldwell Fire Department – Completed and returned stakeholder survey
- Montclair Fire Department – Completed and returned stakeholder survey
- Bloomfield Fire Department – Completed and returned stakeholder survey; Participated on the Planning Committee
- Irvington Fire Department – Completed and returned stakeholder survey
- Maplewood Fire Department – Completed and returned stakeholder survey
- Fairfield Volunteer Fire Department – Completed and returned stakeholder survey
- West Orange Fire Department – Completed and returned stakeholder survey
- Newark Fire Department – Completed and returned stakeholder survey
- Livingston Fire Department – Completed and returned stakeholder survey
- South Orange Fire Department – Completed and returned stakeholder survey

Emergency Medical Services

The following were contacted directly by Essex County OEM to take a stakeholder survey customized for emergency medical service providers which included the identification of specific mitigation actions/projects. In addition, other areas of involvement in the planning process are noted below.

- Essex County EMS Coordinators
- MONOC– Completed and returned stakeholder survey
- Atlantic Ambulance
- McCabe Ambulance
- All 22 municipal EMS/Rescue Squad/Ambulance Service were contacted. The following completed stakeholder surveys:
    - West Essex First Aid Squad – Completed and returned stakeholder survey
    - South Orange Rescue Squad – Completed and returned stakeholder survey
    - West Orange Fire Department/EMS – Completed and returned stakeholder survey
    - Livingston First Aid Squad – Completed and returned stakeholder survey
    - Maplewood Fire Department – Completed and returned stakeholder survey
    - Bloomfield Emergency Medical Services – Completed and returned stakeholder survey
    - Atlantic Ambulance Corp – Completed and returned stakeholder survey
    - Montclair State University EMS – Completed and returned stakeholder survey
    - Atlantic Ambulance Paramedics– Completed and returned stakeholder survey
    - Nutley Volunteer Emergency Rescue Squad – Completed and returned stakeholder survey
    - Montclair Ambulance Unit – Completed and returned stakeholder survey

Business Commerce

The Chamber of Commerce and LEPC businesses in each municipality were contacted directly by Essex County OEM to take a stakeholder survey customized business commerce which included the identification of specific mitigation actions/projects. The following entities completed and returned stakeholder surveys:

- Jarmel Kizel Architects and Engineers, Inc. – Completed and returned business/commerce stakeholder survey
- Signal Sign Co. – Completed and returned business/commerce stakeholder survey
- JanPress/Photo Media – Completed and returned business/commerce stakeholder survey
- New World Manga – Completed and returned business/commerce stakeholder survey
- Livingston Family Eyecare – Completed and returned business/commerce stakeholder survey
- Rubin & Poor, Inc. – Completed and returned business/commerce stakeholder survey
- The Able Baker – Completed and returned business/commerce stakeholder survey

Law Enforcement

Each Chief of Police in the 22 participating municipalities, and the following were contacted directly by Essex County OEM to take a stakeholder survey customized business commerce which included the identification of specific mitigation actions/projects. In addition, other areas of involvement in the planning process are noted below.

- NJ State Police
- NJ Transit Police Department
- Port Authority Police Department
- Rutgers Police Department
- NJIT Police
- Essex County College Police Academy
- Essex County Prosecutor's Office – Completed and returned law enforcement stakeholder survey
- Essex County Department of Corrections – Completed and returned law enforcement stakeholder survey
- Essex County Homeland Security
- All 22 municipal police departments were contacted. The following completed stakeholder surveys:
    - Caldwell Police Department – Completed and returned law enforcement stakeholder survey
    - Cedar Grove Police Department – Completed and returned law enforcement stakeholder survey
    - Essex Fells Police Department – Completed and returned law enforcement stakeholder survey
    - Fairfield Police Department – Completed and returned law enforcement stakeholder survey
    - Livingston Police Department – Completed and returned law enforcement stakeholder survey
    - Maplewood Police Department – Completed and returned law enforcement stakeholder survey
    - North Caldwell Police Department – Completed and returned law enforcement stakeholder survey
    - South Orange Police Department – Completed and returned law enforcement stakeholder survey
    - West Caldwell Police Department – Completed and returned law enforcement stakeholder survey

Academia

Each of the 22 participating municipality's board of education, and the following were contacted directly by Essex County OEM to take a customized academia stakeholder survey which included the identification of specific mitigation actions/projects. In addition, other areas of involvement in the planning process are noted below.

- Essex County Vocational Schools
- Caldwell College
- University Of Medicine And Dentistry
- Essex County College Police Academy – Completed and returned academic stakeholder survey
- Seton Hall University– Attended the September 2013 Kick-Off Meeting
- Rutgers University - Newark
- New Jersey Institute Of Technology
- Bloomfield College – Completed and returned academic stakeholder survey
- Gibbs College
- Montclair State University
- Jonathan Dayton High School – Completed and returned academic stakeholder survey
- Essex Fells School – Completed and returned academic stakeholder survey
- Cedar Grove School District – Completed and returned academic stakeholder survey
- YCS Sawtelle Learning Center – Completed and returned academic stakeholder survey
- Montclair Kimberley Academy – Completed and returned academic stakeholder survey
- Montclair Board of Education – Completed and returned academic stakeholder survey
- Essex County Vocational Technical School District – Completed and returned academic stakeholder survey
- Fairfield Public School System – Completed and returned academic stakeholder survey
- Rutgers University Health Sciences Campus at Newark (formerly UMDNJ) – Completed and returned academic stakeholder survey
- Newark Academy – Completed and returned academic stakeholder survey

Transportation

Each of the 22 participating municipalities' public works/roads and bridges departments, and the following entities were contacted directly by Essex County OEM to take a stakeholder survey customized for transportation agencies which included the identification of specific mitigation actions/projects. In addition, other areas of involvement in the planning process are noted below.

- Essex County Department of Public Works/Roads and Bridges – Completed and returned stakeholder survey; Identified capabilities; Identified mitigation actions included in Section 9.1
- Essex County Special Transportation System
- NJ Transit – Invited to January Stakeholder meeting.
- Port Authority of New York and New Jersey (PANYNJ) – Attended the January 2014 Stakeholder Meeting
- Newark Liberty International Airport, PATH, Port Newark Marine Terminal – Completed and returned stakeholder survey
- North Caldwell Department of Public Works – Completed and returned stakeholder survey
- Roseland Department of Public Works – Completed and returned stakeholder survey
- Irvington Department of Public Works – Completed and returned stakeholder survey
- Bloomfield Department of Public Works – Completed and returned stakeholder survey

- Maplewood Department of Public Works – Completed and returned stakeholder survey
- Nutley Department of Public Works – Completed and returned stakeholder survey
- Glen Ridge Department of Public Works – Completed and returned stakeholder survey
- Montclair Department of Public Works – Completed and returned stakeholder survey
- Essex Fells Department of Public Works – Completed and returned stakeholder survey
- Millburn Public Works Department – Completed and returned stakeholder survey

Other Stakeholders

- Salvation Army – Attended the January 2014 Stakeholder Meeting

3.4 PUBLIC PARTICIPATION - CITIZEN INVOLVEMENT

In order to facilitate better coordination and communication between the Planning Committee and citizens and to involve the public in the planning process, it was determined that draft documents will be made available to the public via the Essex County Sheriff's Office website dedicated to the HMP update. The participating partners also feel that community input on the HMP will increase the likelihood of hazard mitigation becoming one of the standard considerations in the evolution and growth of the County.

The Planning Committee has made the following efforts toward public participation in the development and review of the Plan:

- The public was informed of the hazard mitigation planning effort commencement through press releases, public meetings and the Essex County Hazard Mitigation website.

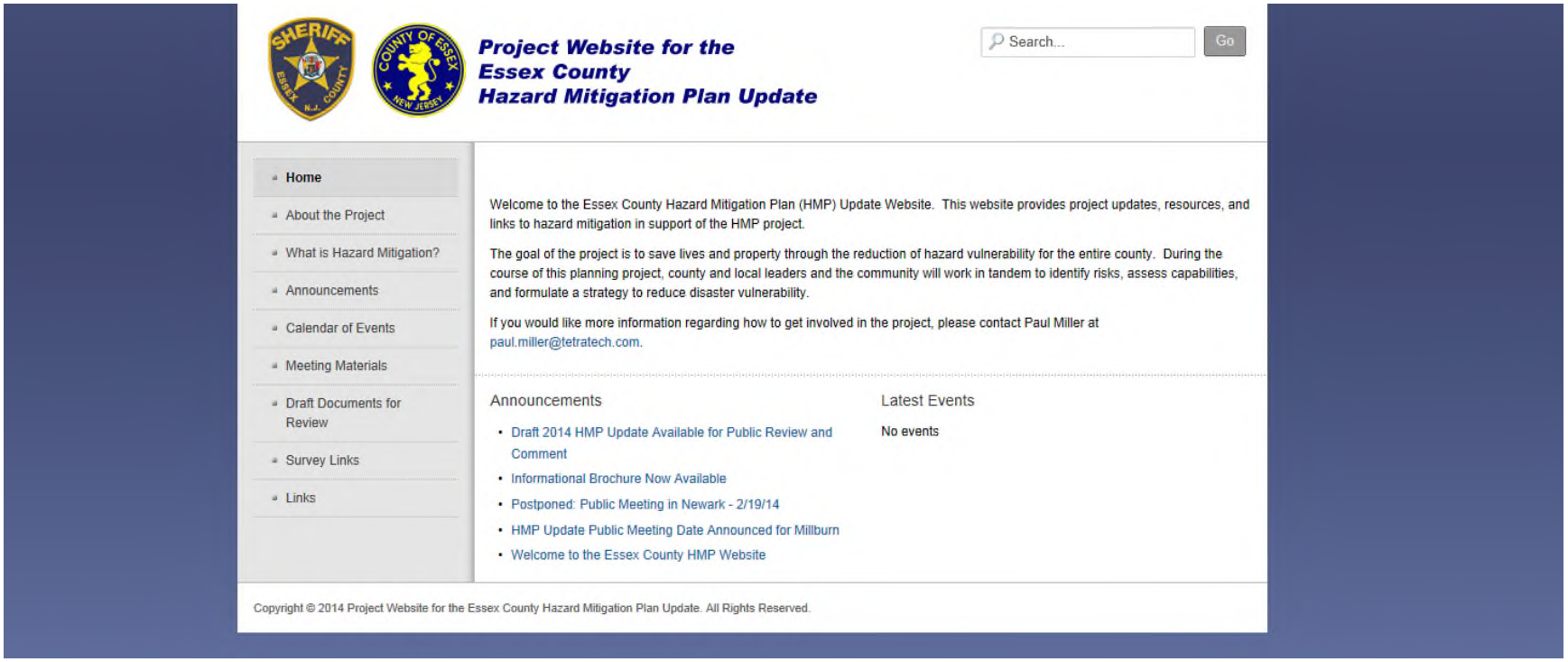
  The Essex County Sheriff's Office distributed a news release on December 4, 2013 urging Essex County residents to participate in hazard mitigation plan update. This news release was distributed by the Essex County Public Information Officer to the following venues:
  - Patch.com
  - Montclair Times
  - Verona Cedar Grove Times
  - The Record
  - The Home Tribune
  - The Millburn Item
  - The Italian Tribune
  - NJ.com
  - The Star Ledger
  - West Orange Patch
  - The Alternative Press
  - The Independent Press
  - The Brazilian Voice
  - NJ Brazilian News
  - Baristanet.com
- The Essex County Sheriff's Office created a dedicated website to hazard mitigation. This public website is being maintained as a way to facilitate communication between the Planning Committee and County residents (http://hmp.essexsheriff.com/index). The website went live in November 2013 and was continuously updated throughout the planning process.

The public website contains a project overview, project announcements, meeting materials, draft documents for review and comment, and a link to the county resident survey. See Figures 3-1 and 3-2 for screenshots of this public website.

- A link to the hazard mitigation plan public website noted above was established by the Town of North Caldwell (Figure 3-3). If the municipality has a public website, they were requested to post a link to the HMP website to provide ongoing public outreach.
- An on-line natural hazards preparedness citizen survey was developed to gauge household preparedness that may impact the County and to assess the level of knowledge of tools and techniques to assist in reducing risk and loss of those hazards (http://hmp.essexsheriff.com/index). The questionnaire asked quantifiable questions about citizen perception of risk, knowledge of mitigation, and support of community programs. The questionnaire also asked several demographic questions to help analyze trends. The questionnaire has been available on the public website since December 2013, and further advertised on their website devoted to Hazard Mitigation Planning. Reponses were collected and provided back to plan participants for consideration in the mitigation action development. Response rates to date are considered good. Appendix D includes the questions in the questionnaire and a summary of the public input received by question through the website, the online survey, and other sources.
- There were two public meetings held to kick-off the hazard mitigation planning project to the public. One was held in the Township of Millburn at the Town Hall on February 18, 2014; and the second was held at the Police Academy in Cedar Grove on March 20, 2014. The public was provided the link to the Essex County Hazard Mitigation website and requested to participate in the citizen survey referenced above. This meeting was advertised in 'The Item of Millburn and Short Hills' newspaper. Refer to Appendix D.
- A public meeting was held as part of the County Strategic Recovery Planning Report (SRPR) planning process. As part of the meeting agenda, mitigation topics were covered including the identification of mitigation actions. Refer to Appendix D for further details on this public meeting.
- A hazard mitigation planning tri-fold brochure (see Appendix D) was developed to inform the public of the planning process, provide local contact information, and encourage the public to review the plan and provide input. This brochure was provided to all plan participants to distribute in their communities. It was also available for download on the hazard mitigation plan website.
- On August 11, 2014 the Draft HMP update was posted to the public website.

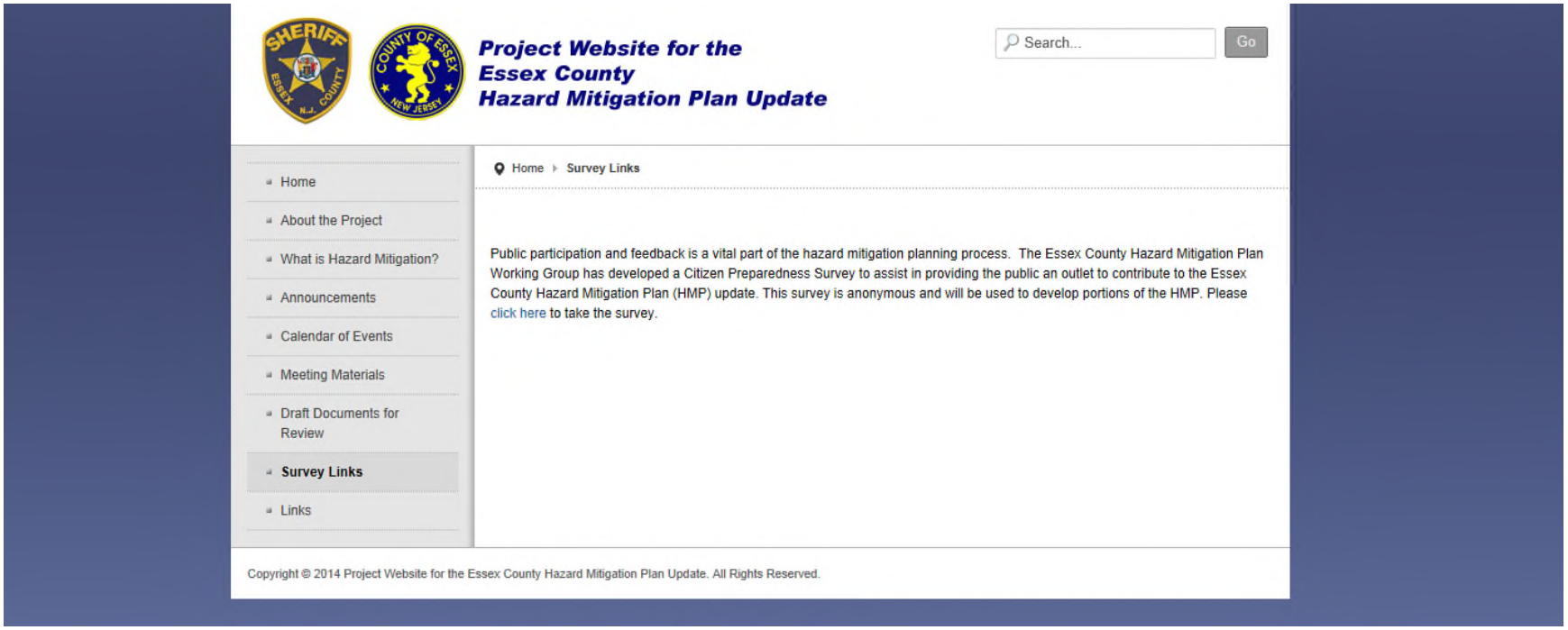
Examples of public outreach efforts are presented in Appendix D. The community residents had an opportunity to comment on the draft HMP before submittal to FEMA. The HMP was posted on the public website on August 11, 2014 for review. Public comments that have been received to date are documented in Appendix D and were distributed to the members of the Planning Committee for their consideration.

Figure 3-1. Screenshot of the Essex County Sheriff Hazard Mitigation Website Home Page



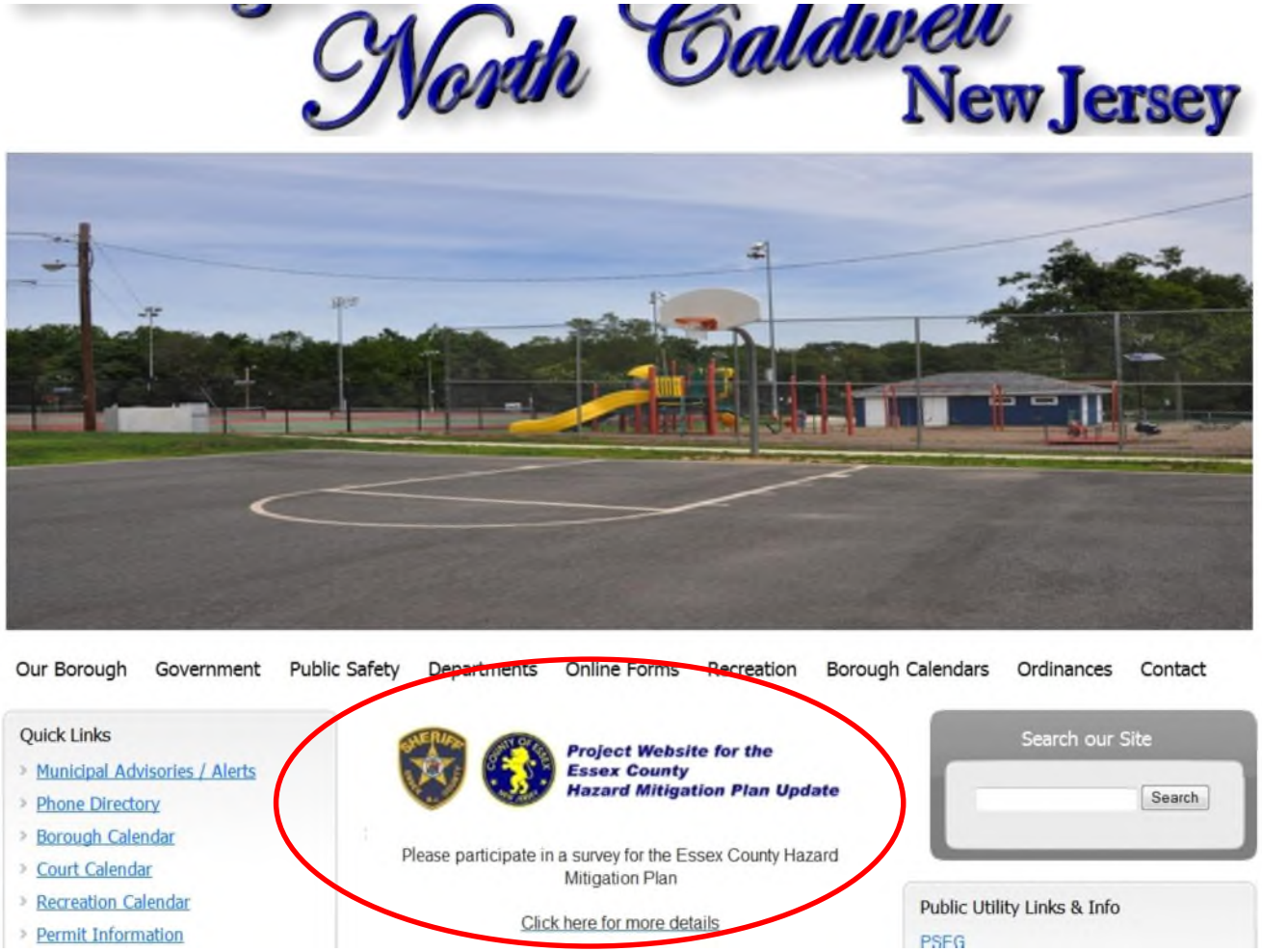
Source: http://hmp.essexsheriff.com

Figure 3-2. Screenshot of the Essex County Sheriff Hazard Mitigation Website Public Survey



Source: http://hmp.essexsheriff.com

Figure 3-3. Screenshot of the North Caldwell Website with the Hazard Mitigation Website Link on the Home Page



Source: http://www.northcaldwell.org

3.5 INCORPORATION OF EXISTING PLANNING EFFORTS AND PROGRAMS

Local municipalities are charged with the development of local HMPs required under Section 322 of the Stafford Act by New Jersey. In New Jersey, local municipalities are authorized to prepare local disaster plans based on the contention that they are best equipped to assess their strengths and weaknesses, opportunities, and constraints. Local governments have intimate knowledge of the local geography, and in a disaster, local government personnel are on the front lines providing personnel and equipment to support the community. Essex County and the participating jurisdictions are involved in this above program, hence the update of this HMP.

Examples of other hazard mitigation programs within Essex County include the National Flood Insurance Program (NFIP), Hazard Mitigation Grant Program (HMGP) and the Community Rating System (CRS). These programs assist the County in receiving funding for flood mitigation projects and flood insurance (the HMGP also can provide funds to mitigate other natural hazards). Data from the County, based on participation in these programs, was incorporated in the risk assessment in Section 5 and used to identify mitigation options in Section 9. Continued involvement in these flood-related programs will help to administer funds and resources to support this HMP update.

It is the intention of this County to incorporate hazard mitigation planning and natural hazard risk reduction as an integral component of the County's administrative, regulatory and operational framework. A summary of how the County currently integrates hazard mitigation into existing planning efforts, programs and daily operations is presented below. In addition, the County and participating communities identified specific integration activities that will be incorporated into procedures and are included in their updated mitigation strategy. Refer to Volume II, Section 9 for further details.

Hazard Mitigation Assistance

Federal mitigation grant funding (Stafford Act 404 and 406) is available to all communities with a current hazard mitigation plan (this plan); however most of these grants require a "local share" in the range of 0-25% of the total grant amount. FEMA's Hazard Mitigation Assistance (HMA) grant programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. Currently, FEMA administers the following HMA grant programs: 1) Flood Mitigation Assistance (FMA); 2) Hazard Mitigation Grant Program; and 3) Pre-Disaster Mitigation (PDM).

Participation in FEMA 404 HMGP may cover mitigation activities including raising, removing, relocating or replacing structures within flood hazard areas. The Letters of Intent submitted as a result of Hurricane Sandy were included in each community's mitigation strategy (refer to Section 9).

National Flood Insurance Program

Established in 1968, the NFIP provides federally-backed flood insurance to residents of communities that enact and enforce regulations that more carefully regulate development within floodplain areas. For individual property owners to be eligible to buy the federally-backed flood insurance, their property must be located within a community that participates in NFIP.

In New Jersey, the NFIP is administered by the NFIP Coordinator within NJDEP. The NFIP Coordinator works closely with NJOEM on all NFIP issues, since eligibility for pre- and post-disaster programs relies on participation in the program. The three components of the program are: flood insurance, floodplain management, and flood hazard mapping. The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in the participating communities. Community participation in the

NFIP is voluntary. Gaining municipality participation in the NFIP and encouraging property owners to purchase flood insurance significantly reduces disaster costs. Together these programs systematically reduce flood exposure to people and their property. The NFIP Coordinator works closely with FEMA to educate and inform communities of their responsibilities to maintain compliance. For a community to be eligible in NFIP, it must adopt and enforce a floodplain management ordinance to regulate proposed development in floodplains and officially designate a local floodplain coordinator/administrator. The intent of the program is to ensure that new construction does not exacerbate existing flood hazards and is designed to better withstand flooding. All jurisdictions in Essex County participate in the NFIP. The communities also have Flood Insurance Rate Maps (FIRM) that at a minimum shows the FEMA Special Flood Hazard Area (SFHA). Mitigation activities related to this program are included in Section 9 and data from FEMA Region II regarding NFIP Insurance Reports was used in the risk assessment for the flood hazard included in Section 5.

Each municipality in the county has a local floodplain manager. Floodplain managers have been informed of the planning process, reviewed the plan documents, and provided direct input to the HMP update. Refer to Section 9 which identifies the Floodplain Administrator for each municipality, and a subsection in the Capability Assessment which is dedicated to the Floodplain Administrator and NFIP.

Community Rating System (CRS)

The NFIP's Community Rating System (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.

CRS is a voluntary program designed to reward participating jurisdictions for their efforts to create more disaster-resistant communities using the principles of sustainable development and management. Currently, three communities in Essex County participate in CRS: Townships of Bloomfield, Fairfield and Montclair. The Townships of Bloomfield and Montclair are currently identified as "rescinded" with CRS ratings of 10 (no discount). The Township of Fairfield is currently identified as "current" with a CRS rating of 6 (20% discount in SFHA and 10% in non-SFHA).

Several other communities are considering or have started the process of enrolling in CRS as indicated in their annexes in Section 9 of this plan. By enrolling in CRS, county municipalities can leverage greater flood protection while receiving flood insurance discounts. Active involvement in this program is included as mitigation activities in several of the municipal annexes in Section 9. Below is a summary of CRS ranking for participating communities in the County.

Table 3-4. CRS Participating Communities in Essex County

Municipality	CRS Entry Date	Current Effect Date	Current CRS Class	% Discount for SFHA	% Discount for Non-SFHA	Status
Bloomfield, Township of	10/1/1992	10/1/1997	10	0	0	R
Fairfield, Township of	5/1/2013	5/1/2013	6	20%	10%	C
Montclair, Township of	10/1/1994	10/1/1995	10	0	0	R

Source: FEMA 2014
C Current
CRS Community Rating System
R Rescinded
SFHA Special Flood Hazard Area

Incorporation of Federal and State Data and Programs

Federal and State data and resources were collected and used throughout the mitigation process including but not limited to:

- U.S. Census data
- HAZUS-MH
- FEMA "How To" Series (386-1 to 386-7 and 386-7)
- FEMA Local Mitigation Planning Handbook (March 2013)
- FEMA Mitigation Ideas (January 2013)
- FEMA Local Plan Review Tool
- FEMA Risk MAP regulatory and non-regulatory products
- NOAA's National Climatic Data Center
- NOAA's Storm Prediction Center
- New Jersey State Hazard Mitigation Plan (2014)
- New Jersey Geographic Information System (GIS) data
- New Jersey Climate Adaptation Alliance NJADAPT ranking of coastal flooding exposure for Townships of Belleville, Nutley and the City of Newark
- New Jersey Geological and Water Survey seismic soil classes and landslide susceptibility data
- New Jersey Forest Fire Service (NJFFS) Wildfire Fuel Hazard data
- Public laws and other programs such as the NFIP were examined to complete this plan update.

A complete list of the existing data and plans used to support this HMP is included in the references section of this document. By incorporating data from existing programs into this mitigation plan, the County also was able to identify the relevance of mitigation planning to these existing programs. Implementation of this Plan through these existing plans is identified as a specific mitigation action in several areas in Section 9 of this Plan.

Incorporation of Local Data, Plans and Technical Information

The Planning Committee reviewed and incorporated existing local data and plans to support the mitigation plan update, including:

- Essex County GIS data
- Documentation of mitigation actions, letters of intent, and grant applications
- Historic maps and local inventory data

The asset and inventory data used for the risk and vulnerability assessments is presented in the County Profile (Section 4). Details of the source of this data, along with technical information on how the data was used to develop the risk and vulnerability assessment, is presented in the Hazard Profiling and Risk Assessment Section (Section 5), specifically within Section 5.3 (Methodology), as well as throughout the hazard profiles in Section 5.4. Further, the source of technical data and information used may be found within the References section.

Plans, reports and other technical information were identified and provided directly by the County, participating jurisdictions and numerous stakeholders involved in the planning effort, as well as through independent research by the planning consultant. The County and participating jurisdictions were tasked with updating the inventory of their Planning and Regulatory capabilities (see Capability Assessment section of

each jurisdictional annex in Section 9), and providing relevant planning and regulatory documents as applicable. Relevant documents, including plans, reports, and ordinances were reviewed to identify:

- Existing municipal capabilities;
- Needs and opportunities to develop or enhance capabilities, which may be identified within the County or local mitigation strategies;
- Mitigation-related goals or objectives, considered in the review and update of the overall Goals and Objectives (see Section 6);
- Proposed, in-progress, or potential mitigation projects, actions and initiatives to be incorporated into the updated County and local mitigation strategies.

A number of electronic and hard copy documents were made available to support the Planning process. A complete listing is included in Table 3-5. Cross-referencing this Plan with existing planning documents has been included in Section 9 as mitigation activities (plan integration). The following local regulations, codes, ordinances and plans were reviewed during this planning process in an effort to develop mitigation planning goals, objectives and mitigation strategies that are consistent across local and regional planning and regulatory mechanisms; and thus develop complementary and mutually supportive plans.

- Master Plans
- Building Codes
- Zoning Ordinances
- Subdivision Ordinances
- NFIP Flood Damage Prevention Ordinances
- Site Plan Requirements
- Stormwater Management
- Emergency Response Plans
- Capital Plans
- State of New Jersey 2014 State Hazard Mitigation Plan Update

The "Legal and Regulatory" capability assessment of each participating jurisdiction is included in Section 9, Jurisdictional Annexes and provides a listing of the local codes, ordinances, regulations and planning mechanisms available in the jurisdictions and reviewed during this planning process.

A partial listing of the plans, reports and technical documents reviewed in the preparation of this plan is included in Table 3-5.

Table 3-5. Record of the Review of Existing Programs, Policies, and Technical Documents for Participating Jurisdictions

Existing plan, program or technical documents	Jurisdictional Applicability
Borough of Glen Ridge 2010 Master Plan Re-Examination Report (2010)	Borough of Glen Ridge
City of East Orange 2006 Comprehensive Master Plan	City of East Orange
City of Newark Master Plan, Mobility Element (June 2012)	City of Newark
City of Newark Master Plan Re-Examination Report (February 2009)	City of Newark
City of Newark's Master Plan (September 2012)	City of Newark
Comprehensive Energy Master Plan (2011)	County and all municipalities
Essex County Comprehensive Transportation Plan (June 2013)	County and all municipalities
Essex County Hazard Mitigation Plan (2007)	County and all municipalities

Table 3-5. Record of the Review of Existing Programs, Policies, and Technical Documents for Participating Jurisdictions

Existing plan, program or technical documents	Jurisdictional Applicability
Essex County Park System Park, Recreation and Open Space Master Plan (April 2003)	County and all municipalities
Environmental Resource Inventory (2007)	County and all municipalities
FEMA Essex County, NJ Coastal Hazard Analysis Flood Risk Review Meeting PowerPoint (October 2013)	County and all municipalities
FEMA Flood Insurance Study for Essex County (preliminary) (May 2013)	County and all municipalities
Park, Recreation, and Open Space Master Plan (April 2003)	County and all municipalities
Township of Belleville Master Plan (2009)	Township of Belleville
Township of Bloomfield Master Plan	Township of Bloomfield
Township of Livingston Master Plan (December 2007)	Township of Livingston
Township of Nutley Master Plan (December 2012)	Township of Nutley
Master Plan Reexamination Report – Township of Maplewood (July 2011)	Township of Maplewood
Master Plan Reexamination Report – Township of Millburn (2008)	Township of Millburn
Environmental Resource Inventory (March 2014)	Township of Millburn
Stormwater Management Plan, an element to their Master Plan (April 2005)	Township of Montclair
Township of South Orange Village Smart Growth Plan (June 2007)	Township of South Orange Village
2009 Master Plan & Reexamination Report for Verona, New Jersey (2009)	Township of Verona
U.S. Army Corps of Engineers Phase 1 Study of Passaic River Bain Flood Management Options	Passaic River Basin Communities

3.6 INTEGRATION WITH EXISTING PLANNING MECHANISMS AND PROGRAMS

Effective mitigation is achieved when hazard awareness and risk management approaches and strategies become an integral part of public activities and decision-making. Within the County there are many existing plans and programs that support hazard risk management, and thus it is critical that this hazard mitigation plan integrate and coordinate with, and complement, those mechanisms.

The "Capability Assessment" section of Chapter 6 (Mitigation Strategy) provides a summary and description of the existing plans, programs and regulatory mechanisms at all levels of government (Federal, State, County and local) that support hazard mitigation within the County. Within each jurisdictional annex in Chapter 9, the County and each participating jurisdiction have identified how they have integrated hazard risk management into their existing planning, regulatory and operational/administrative framework ("integration capabilities"), and how they intend to promote this integration ("integration actions").

Numerous municipalities have identified a new mitigation action to utilize the 2014 HMP update as a guide when updating their Master Plan. Refer to the mitigation strategy tables in Sections 9.1 through 9.23.

The New Jersey Department of Community Affairs (NJDCA) has established a Post Sandy Planning Assistance Grant Program. The purpose of this program is to support long range planning for community redevelopment in the municipalities and counties sustaining damage from Superstorm Sandy. The Program provides grants to municipalities and counties to hire American Institute of Certified Planners/New Jersey

Board of Professional Planners (AICP/PP) licensed planners to address conditions created or exacerbated by the storm, identify approaches to rebuilding that will be more resistant to damage from future storm events, and encourage sustainable economic growth. The first step in the grant process is the preparation of a Strategic Recovery Planning Report (SRPR). The Essex County Strategic Recovery Planning Report (SRPR) was closely coordinated with the 2015 HMP update.

As part of the SRPR planning process that took place concurrent with the HMP update, an evaluation of the County's strengths, weaknesses, obstacles and opportunities was conducted. The details of this evaluation are included in Section 6 (Mitigation Strategy). The spatial analysis conducted for the Hazard Mitigation Plan appears in the SRPR for the flood, storm surge, and sea level rise hazards. In addition, the County mitigation actions are listed in the SRPR as well as the mitigation action types by municipality. A more detailed land use analysis was conducted for the SRPR. For example, an exposure analysis was completed to assess the vulnerability of the residential and non-residential land uses with in the County to flooding. This has been included in the 2015 HMP update in the appropriate hazard profiles.

A further summary of these continued efforts to develop and promote a comprehensive and holistic approach to hazard risk management and mitigation is presented in Section 7.

3.7 CONTINUED PUBLIC INVOLVEMENT

Essex County is committed to the continued involvement of the public. Therefore, copies of the HMP update will be made available for review on their HMP public website. Each jurisdiction's Supervisor/Mayor shall be responsible for receiving, tracking, and filing public comments regarding this HMP update.

The public will have an opportunity to comment on the HMP update as a part of the annual mitigation planning evaluation process and the next five-year mitigation plan update. The HMP Coordinator (currently Lt. Edward Esposito, Office of Emergency Management) is responsible for coordinating the plan evaluation portion of the meeting, soliciting feedback, collecting and reviewing the comments, and ensuring their incorporation in the 5-year plan update as appropriate; however, members of the Planning Committee will assist the HMP Coordinator. Additional meetings may also be held as deemed necessary by the Planning Committee. The purpose of these meetings would be to provide the public an opportunity to express concerns, opinions, and ideas about the Plan.

Further details regarding continued public involvement are provided in Section 7.

After completion of this HMP Update, implementation and ongoing maintenance will continue to be a function of the Planning Committee. The Planning Committee will review the plan and accept public comment as part of an annual review and as part of five-year mitigation plan updates.

A notice regarding annual updates of the plan will be publicized annually after the HMP Committee's annual evaluation and posted on the public web site.

Lt. Edward Esposito of the Essex County Office of Emergency Management has been identified as the ongoing County All Hazard Mitigation Plan Coordinator (see Section 7), and is responsible for receiving, tracking, and filing public comments regarding this HMP Update. Contact information is:

Name: Lt. Edward Esposito
Email Address: essexoem@essexsheriff.com

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SECTION 4 COUNTY PROFILE

This profile describes the general information of the County (physical setting, population and demographics, general building stock, and land use and population trends) and critical facilities located within Essex County. In Section 5, specific profile information is presented and analyzed to develop an understanding of the study area, including the economic, structural, and population assets at risk and the particular concerns that may be present related to hazards analyzed (for example, a high percentage of vulnerable persons in an area).

2015 Plan Update Changes

- Section 4, County Profile, was updated in its entirety using best available data.
- Individual 'profiles' with statistics regarding each municipality located in Section 4 of the 2008 HMP may be found in Volume 2, Annexes, for the 2015 update.

4.1 GENERAL INFORMATION

Essex County consists of 22 municipalities, ranging over 127 square miles and a total population of 783,969. The County is New Jersey's second most densely populated county, with 6,211.50 persons per square mile, based on 2010 Census data (U.S. Census, 2013). It is an urban county with outlying suburban communities. 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 history of Essex County dates back to the early 1600's when the area was first explored by the English and Dutch for its potential attraction of fur trade. Several attempts were made by English, Dutch and Swedish colonists to form colonies to establish trading routes back to Europe. Most of these colonies were destroyed by native Indian tribes. One of the first successful settlements was established in 1666 by thirty Connecticut families, who, headed by Robert Treat, established a settlement along the banks of the Passaic River in what is now the City of Newark. In 1667, the settlers purchased the land from the Lenni Lenape Indians for $800.00 (Essex County, 2013).

Essex County was officially established in 1682 by the East Jersey Legislature as one of the four original counties of present day New Jersey. The other four counties included Bergen, Monmouth and Middlesex. Essex County had become prosperous before the American Revolutionary War, as its location was ideal for trade and commerce between New York City and Philadelphia. After the war, the County entered into a period of unprecedented industrial growth. This was due in part to improved transportation including the completion of the New Jersey Railroad, the Morris Canal and the establishment of the Morris and Essex Railroad. Factories that were established near the rail and canal arteries drew an increased number of immigrants from Europe causing the population to increase significantly. As industrial and commercial establishments continued to locate in the County grow through the 1800's, Essex County had the foresight to establish the first Countywide park system in the United Stated to preserve open and undeveloped areas of the County. The County Parks Commission started with sixty acres and has since grown to 5,745 acres of green space including reservations, developed parks, golf courses, tennis courts, ice and roller skating complexes and a zoo (Essex County, 2013).

The County continued to develop through the latter half of the 1800s and the early 1900s and realized significant growth in the 1920's with the construction of the first skyscraper in Newark and the development of Newark Airport, Port Newark and the Newark Subway System. New industry to the area included industrial shipping and warehousing facilities as well as breweries. The economy was temporarily stalled after the stock market crash in 1929 and the enforcement of prohibition. After the repeal of prohibition, Essex County's economy began

to grow once again with the reopening of its major breweries and the gradual increasing trend of national economic recovery (Essex County, 2013).

Development throughout the County continued as alternate forms of travel were developed 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 Caldwell's, 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, 2013).

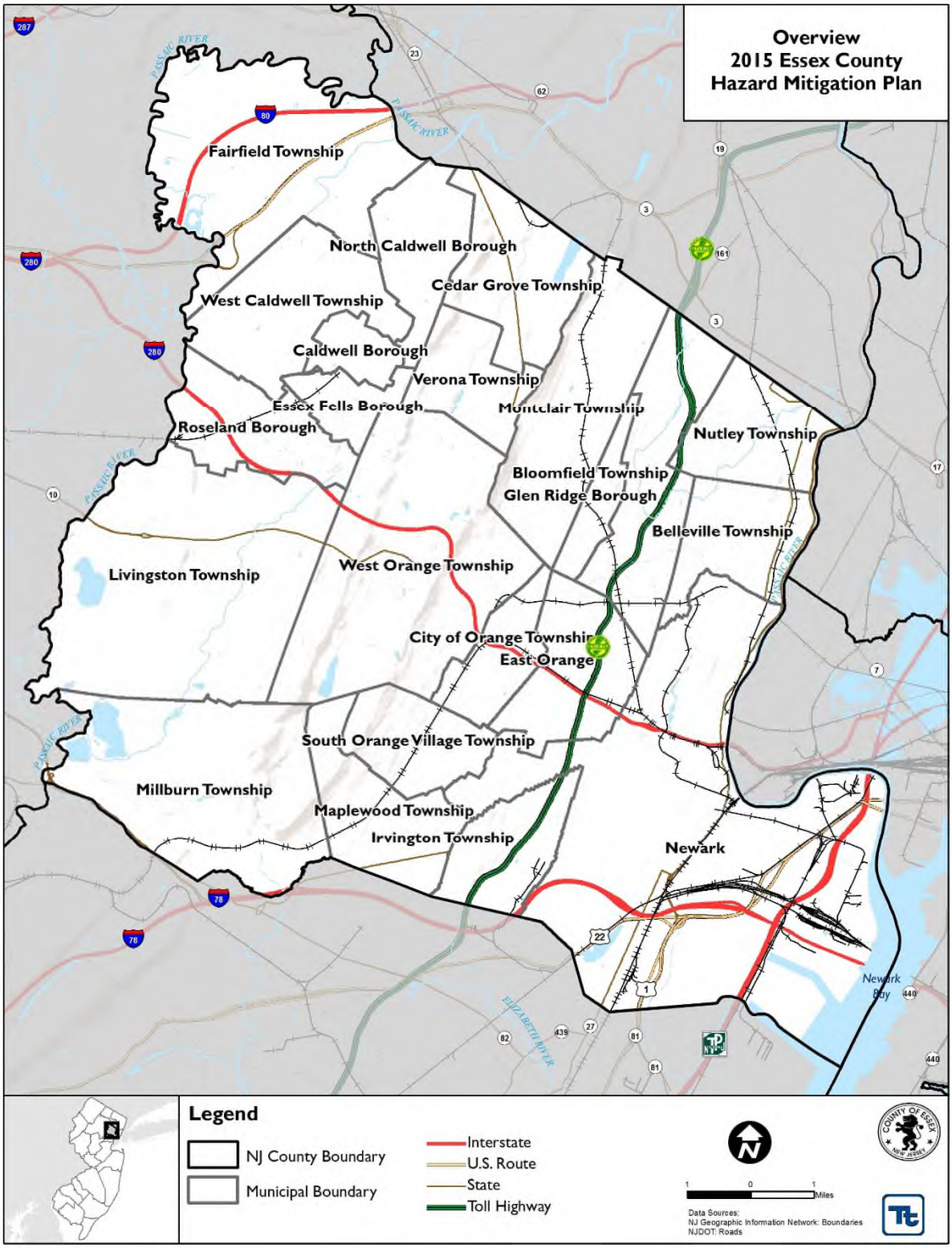
4.1.1 Physical Setting

This section presents the physical setting of the County, including: location, hydrography and hydrology, topography and geology, climate, and land use/land cover.

Location

Essex County is located in the northeastern section of New Jersey and encompasses a total area of 126.21 square miles. 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 (Figure 4-1).

Figure 4-1. Overview Map Essex County, New Jersey



Source(s): NJGIN

Hydrography and Hydrology

Numerous ponds, lakes, creeks, and rivers make up the waterscape of Essex County. The major waterways within the County include: Passaic River, Peckman River, Second River, Rahway River (east and west branches), and the Newark Bay.

Most of Essex County surface hydrology is linked to the Passaic River. The Passaic River is a 90-mile mud and sand bottom river that takes a course from Morris County to Newark Bay. It follows the Millington Gorge, forming the Paterson Falls and in the process, defining both the eastern and western boundaries of Essex County. The Passaic River and much of its associated wetlands are the remnants of a huge 11,000 year-old post-glacial lake originally centered in the wetland complexes of Morris County. The lake was the result of meltwater from the retreating Wisconsin Glacier (Essex County Environmental Resource Inventory, 2007).

The path of the Passaic River runs through several municipalities including Belleville, Fairfield, Livingston, Millburn, Newark, Nutley, Roseland and West Caldwell. Three other significant rivers are located in the County; The Second River runs through Belleville, Bloomfield, Orange and East Orange; The Peckman River runs through Verona, Cedar Grove and West Orange; and the West Branch of the Rahway River runs through Verona, West Orange and Millburn and the East Branch of the Rahway River runs through West Orange, Montclair, South Orange and Maplewood. Other aquatic features in the County include Branch Brook Park Lake in Newark, Brookdale Park in Bloomfield, Weequahic Park Lake in Newark, Orange Park Lake in Orange, Verona Park Lake in Verona, Cable Lake, Crystal Lake and Vincent's Lake in West Orange, and Grover Cleveland Park Lake in Caldwell and Essex Fells. There are also ten Class I, II or III level dams located in the County as classified by the Army Corp of Engineers. These dams are located in Millburn, West Orange, Cedar Grove, Verona and Livingston and further discussed in the Critical Facilities section of this profile.

Downstream on the Passaic River, where the Pompton River joins the Passaic at Two Bridges, the North Jersey District Water Supply Commission pumped out about 53 million gallons per day. This water is used in many places in northeastern New Jersey, including municipalities in Essex County. Other streams flowing off of the First Watchung Mountain into the Lower Passaic River include Third River, Second River, and Branch Brook. There are parks along portions of these streams. The largest park areas are along the ridge of the First Watchung Mountain at Eagle Rock Reservation and Mills Reservation. Most of the Essex County land in the watershed has been developed for human uses. None of these 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).

The major lakes and streams of Essex County include the following: Beech Brook (impoundment), Butler Pond, Cable Lake, Campbells Pond, Canoe Brook (impoundment), Cedar Grove, Clarks Pond, Commonwealth Pond, Crystal Lake, Diamond Mill Pond, Branch Brook Park Lake, Newark Bay, Orange, Passaic River, Second River, Taylor Lake, Verona Lake, Vincent Lake, Weequahic Lake, Bear Brook, Canoe Brook, Clarks (Yantacaw Brook), Cub Brook, Deepavaal Brook, Elizabeth Channel, Elizabeth River, Foulertons Brook North and South Branch, Green Brook, Irvington Brook, Nishvane Brook, North Branch Wigwam Brook, Passaic River, Peckman River, Pine Brook, Rahway River, Rockaway River, Second River, Slough Brook, Spring Brook, Taylor Brook, Third River, Turtle Brook, Van Winkle Brook, West Branch Rahway River, Wigwam Brook, and Willow Brook (Essex County Environmental Resource Inventory, 2007).

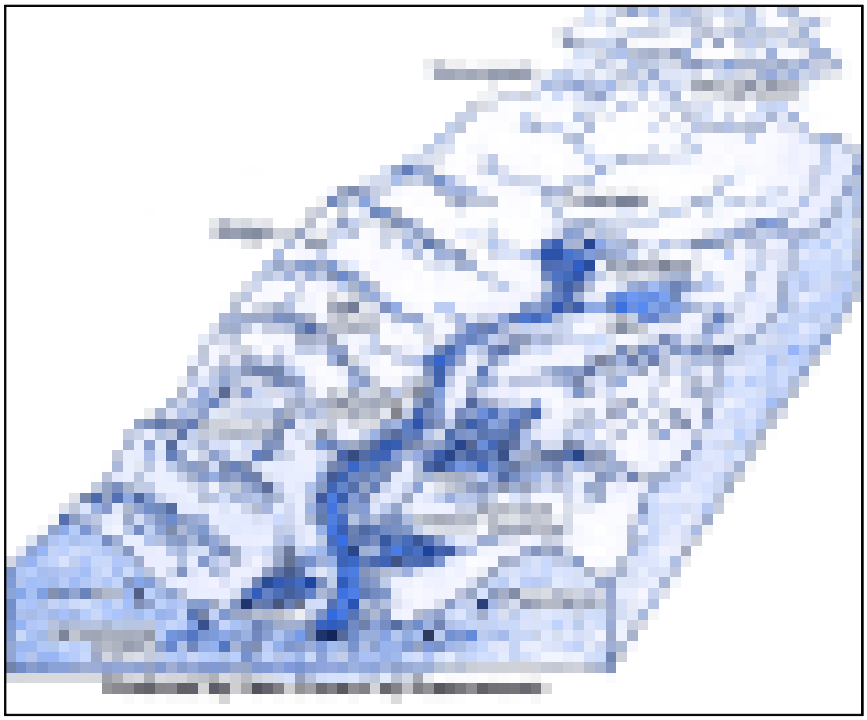
Watersheds

A watershed is an area of land that drains all the streams and rainfall to a common outlet, such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel. Watersheds consist of surface water (lakes, streams, reservoirs, and wetlands) and all the underlying groundwater. They are separated from other systems by high points in the area such as hills or slopes. If water enters a watershed too quickly for the land to absorb,

flooding can occur. Watersheds in urban areas with lots of impervious surfaces (concrete, pavement, etc.) shed water quickly while forested and grassy rural areas absorb more water (NOAA 2011).

Watersheds not only include the waterway itself but also the entire land area that drains to it. For example, the watershed of a lake would include not only the streams entering the lake but also the land area that drains into those streams and eventually the lake. Drainage basins generally refer to large watersheds that encompass the watersheds of many smaller rivers and streams. Figure 4-2 depicts the hydrologic system of a watershed.

Figure 4-2. Watershed

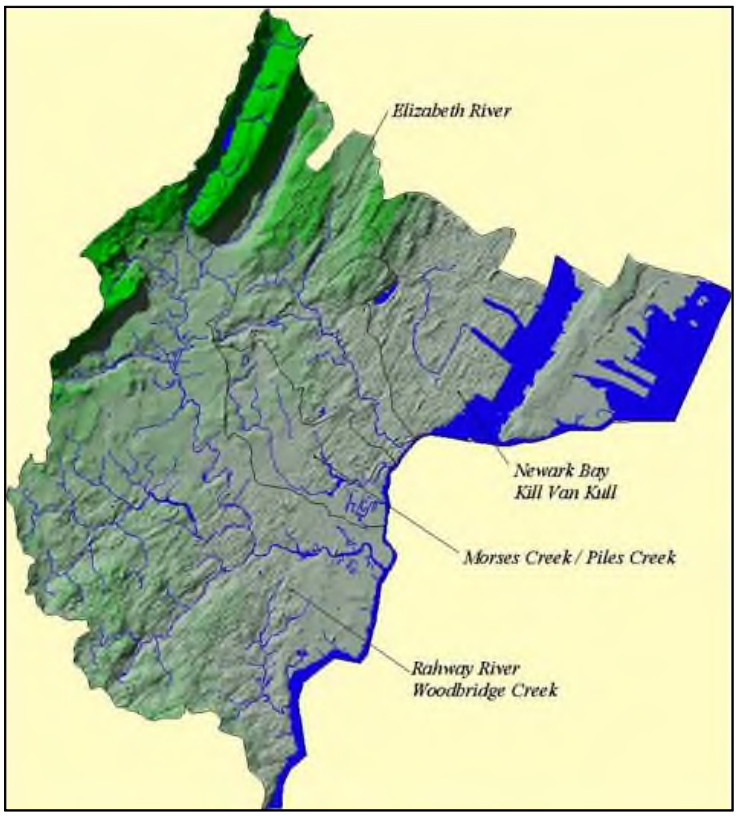


Source: U.S. Environmental Protection Agency (EPA) 2012

Watersheds come in all shapes and sizes and can cross municipal and county boundaries. Twenty watersheds make up the State of New Jersey. Essex County is located in three of the 20 watersheds: Arthur Kill; Lower Passaic, Saddle; and the Upper and Mid Passaic, Whippany, Rockaway.

The Arthur Kill 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. Major impoundments are the Middlesex Reservoir, Orange Reservoir, Lower and Upper Echo Lakes, and Diamond Mill Pond, as shown in Figure 4-3. The Elizabeth River is 11 miles long, much of it channelized for flood control purposes. Land uses in the Rahway and Elizabeth Watersheds are mainly residential, commercial and industrial (NJDEP, 2012).

Figure 4-3. WMA 7 – Arthur Kill



Source: NJDEP, 2012

The water quality of the Rahway and Elizabeth Rivers are reflective of urbanized streams and past industrial uses. Hazardous waste sites are present in these watersheds. Another potential problem could be landfill leachate, which may contribute to the degradation of the tidal Rahway River as well as to the adjacent Arthur Kill, Marshes Creek, and Kings Creek (NJDEP, 2012).

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. All of these conditions have contributed to high stream temperatures, sediment and nutrient loadings, periodic low dissolved oxygen levels and fish kills (NJDEP, 2012).

The Lower Passaic, Saddle Watershed Management Area 4 (WMA 4), shown in Figure 4-4, 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.

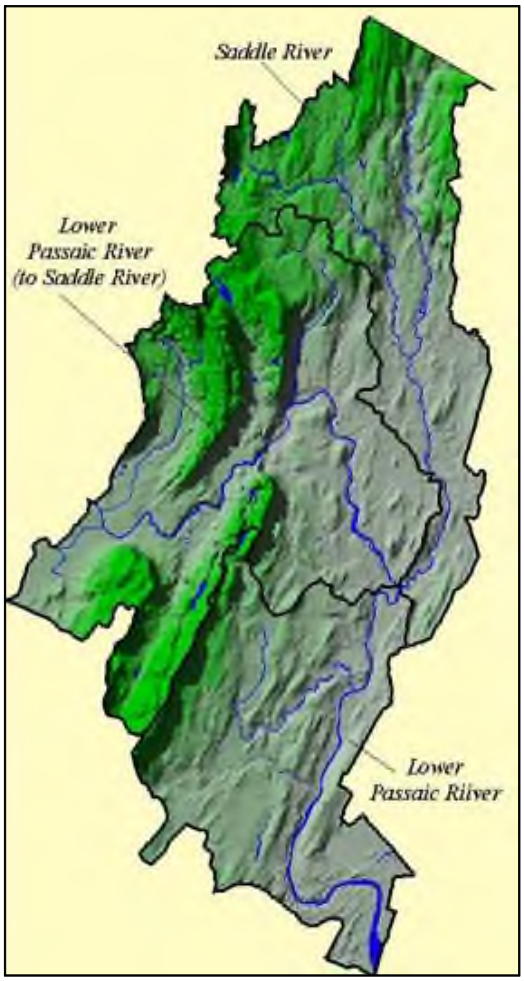
The 129 square miles of land in the Lower Passaic River Watershed is primarily urban/suburban. As a result, water quality conditions along this 33-mile section of the Passaic River are poor, reflective of numerous point sources, significant nonpoint source contributions, and high sediment oxygen demands.

Reflecting the area's industrialized history, the conditions are affected by the number of hazardous waste sites and contamination problems found in these areas.

The Lower Passaic includes a number of waterfalls, culminating in the Great Falls at Paterson.

The Saddle River Watershed has a drainage area of 51 square miles. This watershed is extensively developed and contains many older cities and industrial centers including Newark, Paterson, Clifton, and East Orange. Like the Lower Passaic, the Saddle River's water quality is affected by its industrial past, current point sources of pollution and urban runoff.

Figure 4-4. WMA 4 – Lower Passaic, Saddle



The Upper and Mid-Passaic, Whippany, Rockaway 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.

This area is situated in Morris, Essex, and Sussex Counties and includes the Upper and Middle Passaic River, Whippany River, and Rockaway River Watersheds, as illustrated in Figure 4-5. 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. This watershed has experienced key development in the more rural undeveloped areas.

Figure 4-5. WMA 6 – Upper and Mid-Passaic, Whippany, Rockaway

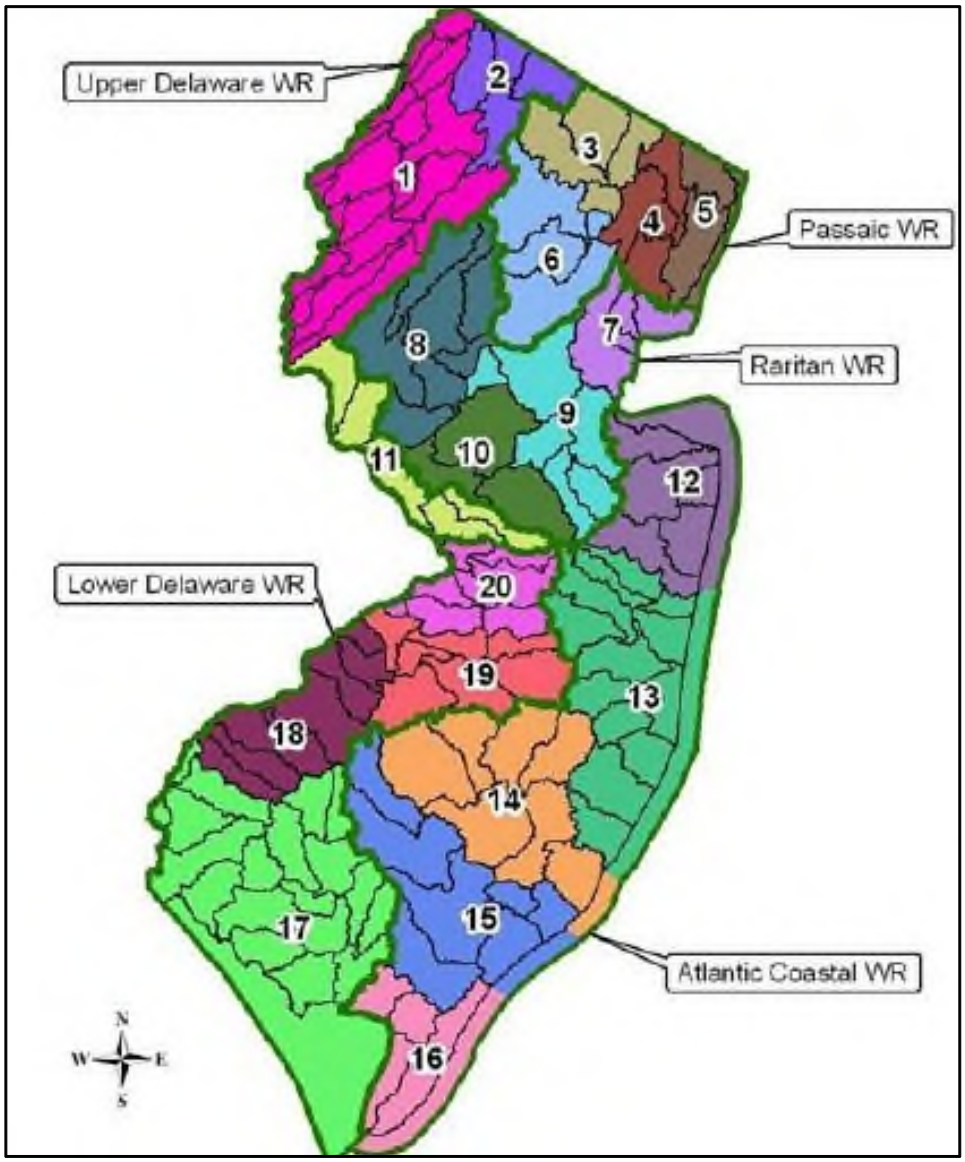
The land use patterns in the Rockaway River area are complex and include wooded/vacant areas, parklands, and residential development. There are also some areas having industrial and commercial uses. Suburban development is on the rise.

Urban/suburban development is causing the water quality of the Whippany River to be degraded. Runoff from construction activity, stormwater discharges, urban surfaces, and the loss of riparian vegetation are suspected of contributing to siltation in the river. This has resulted in reduction in the trout holding capacity of the waterway.

This area has been severely impacted by urban/suburban development. The quality of water is affected by these conditions. Sources such as construction activities and urban runoff from storm sewers and urban surfaces have resulted in siltation, high stream temperatures and losses of riparian vegetation.

Figure 4-6 shows the locations of the watersheds in New Jersey.

Figure 4-6. Watersheds of New Jersey.



Source: NJDEP, 2013

Note:

1	Upper Delaware	11	Central Delaware
2	Walkill	12	Monmouth
3	Pompton, Pequanock, Wanaque, Ramapo	13	Barnegat Bay
4	Lower Passaic, Saddle	14	Mullica
5	Hackensack, Hudson, Pascack	15	Great Egg Harbor
6	Upper and Mid Passaic, Whippany, Rockaway	16	Cape May
7	Arthur Kill	17	Maurice, Salem, Cohansey
8	North and South Branch Raritan	18	Lower Delaware
9	Lower Raritan, South River, Lawrence	19	Rancocas
10	Millstone	20	Assiscunk, Crosswick, Doctors

Topography and Geology

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. All of these elevation points are located more than 600 feet above sea level, 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.

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).

Figure 4-7. Physiographic Provinces in Essex County

Source: New Jersey Geological Survey, 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).

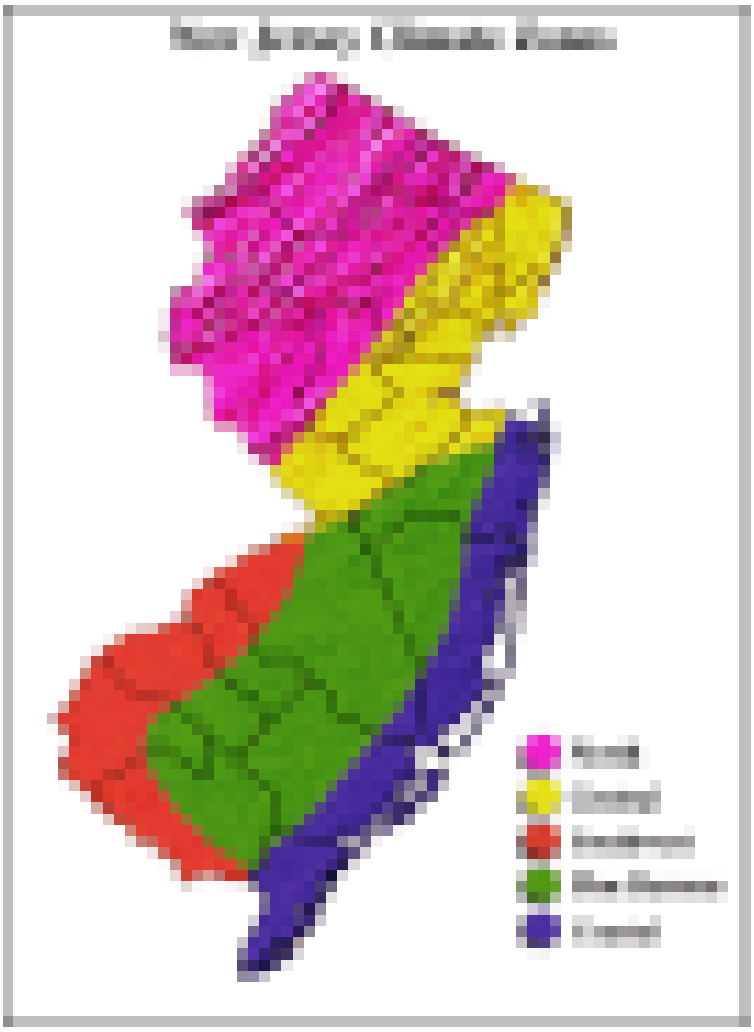
Climate

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 (Office of the New Jersey State Climatologist [ONJSC], Date Unknown).

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 about October 15 to April 30 in the Highlands and 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 about 120 days each year. The fall months are typically the driest, with an average of eight days of measureable precipitation. Other seasons average between nine and twelve days each month with measurable precipitation. New Jersey also has approximately five tornadoes each year, which generally tend to be weak (ONJSC Date Unknown).

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. The five climate zones in New Jersey, illustrated in Figure 4-8, are: Northern, Central, Pine Barrens, Southwest, and Coastal (ONJSC Date Unknown). Each climate zone is described below.

Figure 4-8. Climate Regions of New Jersey



Source: ONJSC Date Unknown
Note: Essex County is located in the Central Climate Zone

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 near the City of Trenton. The northern edge of the Central Zone is often the boundary between freezing and non-freezing precipitation in the State (ONJSC Date Unknown).

The climate in Essex County is temperate as the County experiences all four seasons. Average yearly temperatures are around 54°F with temperatures, on average, as low as 24°F in January and high temperatures topping out, on average, in July at 86°F. The average rainfall/precipitation for the County is between 44 and 48 inches a year and is distributed moderately-evenly each month at 3.1 to 4.7 inches per month, with no seasonable dry months or wet months.

Land Use and Land Cover

The County maintains a park system of almost 6,000 acres that includes 20 parks, five reservations and various facilities.

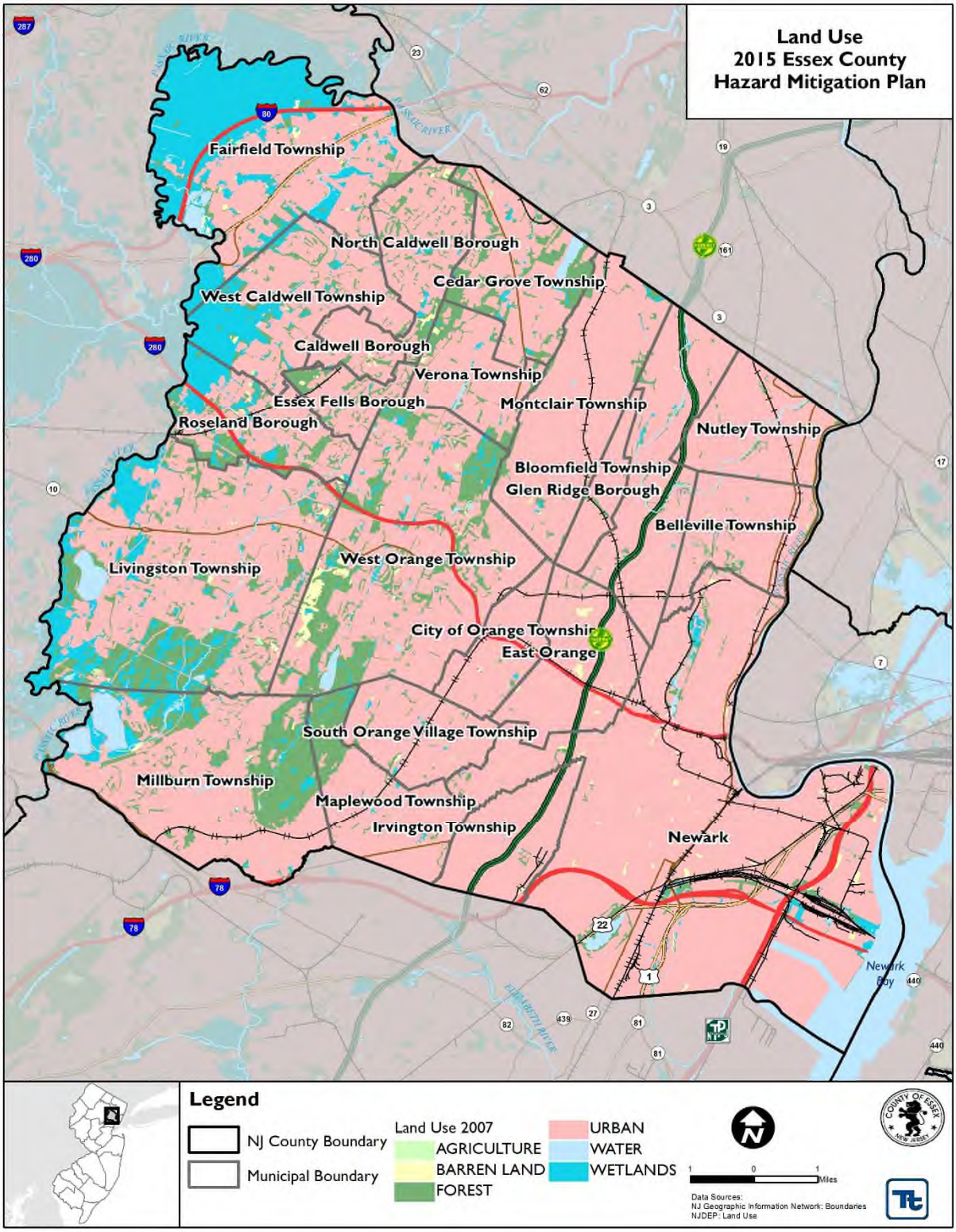
Essex County is one of the most intensely developed Counties in the State and is home to the State's largest and most populous city, Newark. Most of the land in Essex County is either developed or preserved. In 2002, the majority or 75.4 percent of the land in Essex County was used for residential, industrial, transportation, and recreational purposes. The 2007 figures do not show a substantial amount of change as much of the land is either permanently preserved or developed, indicating that 76.7 percent of the County was in the urban land use category. In 2002 12.6 percent was forested land; 7.9 percent was wetlands land; 0.9 percent was barren land; and 0.1 percent was agricultural lands. When compared with the land use land cover data set from 2007, there has been a slight decrease in agricultural land (-less than 0.1 percent), barren land (-0.2 percent), forest (-1.0 percent) and wetlands (-0.2 percent) with an increase in urban land use (+ 1.3 percent). The decrease in barren, forested, and wetlands is most likely due to the increase in urban land and development. Refer to Table 4-1 and Figure 4-9 below.

Table 4-1. Land Use Summary for Essex County, 2002 & 2007

Land Use Category	2002 Data		2007 Data	
	Acreage	Percent of Essex County	Acreage	Percent of Essex County
Agriculture	67.50	0.1%	57.55	0.1%
Barren	723.41	0.9%	585.34	0.7%
Forest	10,500.27	12.6%	9,620.88	11.6%
Urban	62,596.24	75.4%	63,667.41	76.7%
Wetlands	6,552.38	7.9%	6,398.99	7.7%

Source: NJDEP (2007 LULC)
Note: Urban land includes residential, industrial, transportation, and recreational land. Water is excluded from the table above.

Figure 4-9. 2007 Land Use Land Cover for Essex County



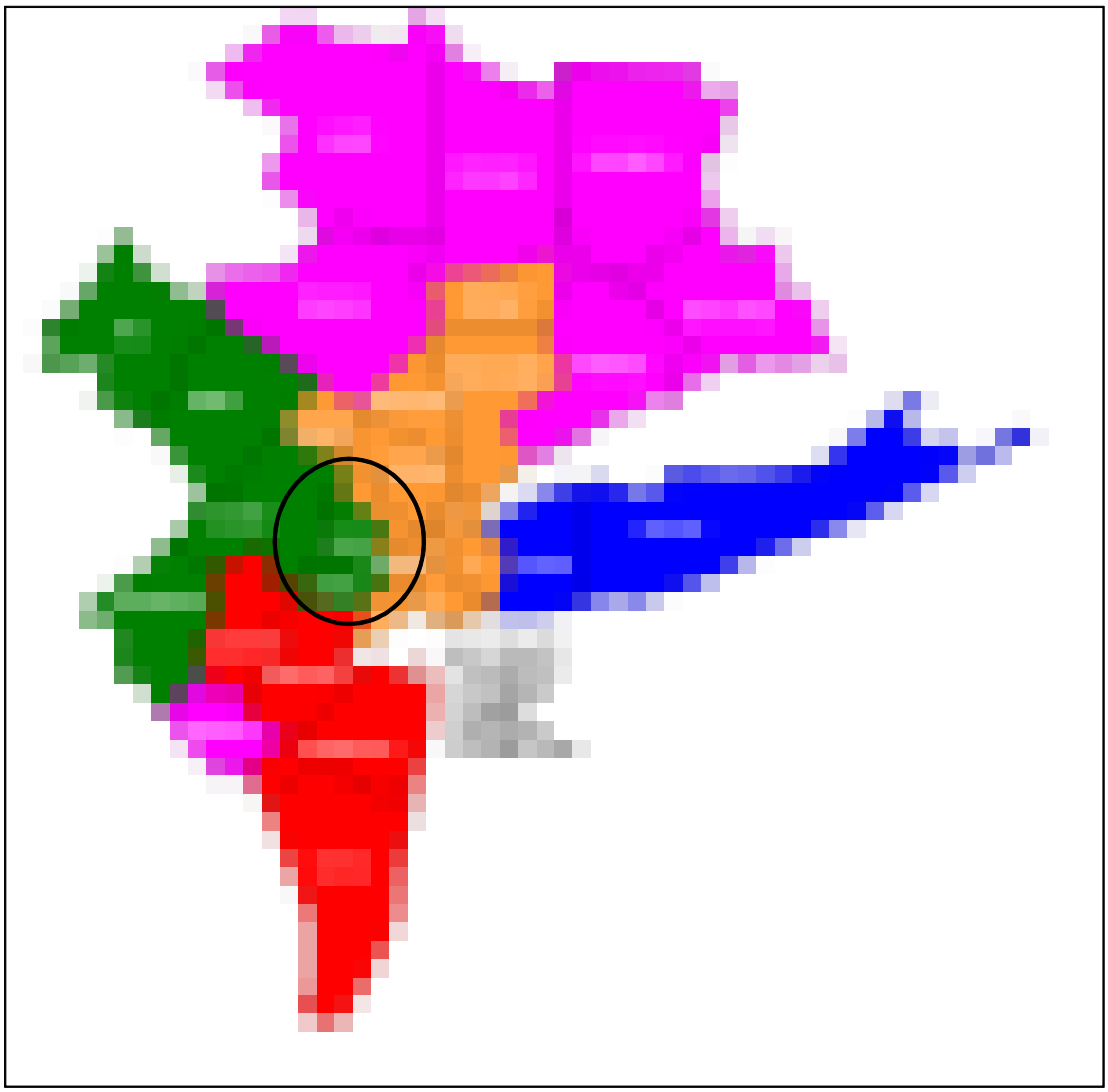
Source: NJDEP 2007

Metropolitan/Urban Area

The Census Bureau classifies 'urban' as all territory, population, and housing units located within an urbanized area (UA) or an urban cluster (UC). It delineates UA and UC boundaries to encompass densely settled territory, which consist of core census block groups or blocks that have a population density of at least 1,000 people per square mile; and surrounding census blocks that over an overall density of at least 500 people per square mile. An urbanized area is a densely populated area with a population density of more than 1,000 people per square mile and a population of more than 50,000 (Demographia, 2001). Urban clusters are defined in the same manner as urbanized areas; however, an urban cluster has a population density of 2,500 people per square mile and a population of more than 50,000 (Center for Information Development and Service, Date Unknown). With a population of over 300,000 and a population density of over 1,000 people per square mile, Essex County is considered an urban area.

Essex County is one of the 23 counties within the New York–Northern New Jersey–Long Island NY-NJ-PA Metropolitan Statistical Area, which is the most populous metropolitan area in the United States and the fourth most populous in the world. The largest urbanized area in the United States is at the heart of the metropolitan area, the New York-Newark, NY-NJ-CT Urbanized Area (with a 2010 population of 18,897,109 by the U.S. Census), which includes Essex County. With approximately 3,353 square miles of land, it is the largest urbanized area in the United States. It is also the fourth most densely populated urbanized area in the country, with 5,635 persons per square mile (as of the 2010 Census) (U.S. Census Bureau). Based on commuting patterns, the Census Bureau also defines a wider functional metropolitan area, the *New York-Newark-Bridgeport, NY-NJ-CT-PA* Combined Statistical Area with an estimated population of 22,085, (as of 2012). This metropolitan area is made up of 5 divisions as indicated in Figure 4-10.

Figure 4-10. New York-Northern New Jersey-Long Island, NY-NJ-PA Metropolitan Statistical Area



Source: U.S. Census, 2007
Note: Essex County is located in the Newark-Union, NJ-PA Metropolitan Division (circle)

New York-White Plains-Wayne, NY-NJ Metropolitan Division
Nassau-Suffolk, NY Metropolitan Division
Newark-Union, NJ-PA Metropolitan Division
Edison, NJ Metropolitan Division
Rest of the New York-Newark-Bridgeport, NY-NJ-CT Combined Statistical Area

4.2 POPULATION AND DEMOGRAPHICS

According to the 2010 U.S. Census, Essex County had a population of 783,969 people which represents a slight decrease from the 2000 U.S. Census population of 793,633 people. HAZUS-MH demographic data will be used in the loss estimating analyses in Section 5 of this plan. All demographic data in HAZUS corresponds to the 2000 U.S. Census data.

Table 4-2 presents the population statistics for Essex County based on the 2000 and 2010 U.S. Census data. Figure 4-11 shows the distribution of the general population density (persons per square mile) in 2010 by Census block. For the purposes of this plan, the 2010 Census was used where the data was available and supplemented with HAZUS-MH data (representing 2000 data).

DMA 2000 requires that HMPs consider socially vulnerable populations. These populations can be more susceptible to hazard events, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. For the purposes of this study, vulnerable populations shall include (1) the elderly (persons aged 65 and over) and (2) those living in low-income households.

Table 4-2. Essex County Population Statistics

	U.S. Census 2010			U.S. Census 2000*				
Municipality	Total	Pop. 65+	% Pop. 65+	Total	Pop. 65+	Percent Pop. 65+	Low-Income Pop.*	% Low-Income Pop. of Total
Township of Belleville	35,926	4,263	11.9	35,928	4,806	13.4	2,939	8.2
Township of Bloomfield	47,315	5,665	12.0	47,683	6,827	14.3	2,772	5.9
Borough of Caldwell	7,822	1,257	16.1	7,584	1,350	17.8	347	4.8
Township of Cedar Grove	12,411	2,947	23.7	12,300	2,766	22.5	230	2
City of East Orange	64,270	7,572	11.8	69,824	7,845	11.2	13,159	19.2
Borough of Essex Fells	2,113	341	16.1	2,162	318	14.7	23	1.1
Township of Fairfield	7,466	1,528	20.5	7,063	1,065	15.1	195	2.8
Borough of Glen Ridge	7,527	718	9.5	7,271	757	10.4	219	3
Township of Irvington	53,926	4,829	9.0	60,695	4,576	7.5	10,420	17.4
Township of Livingston	29,366	4,942	16.8	27,391	4,221	15.4	480	1.8
Township of Maplewood	23,867	2,623	11.0	23,868	2,890	12.1	1,049	4.4
Township of Millburn	20,149	2,275	11.3	19,765	2,581	13.1	288	1.5
Township of Montclair	37,669	4,266	11.3	38,977	4,665	12.0	2,149	5.6
City of Newark	277,140	23,699	8.6	273,546	25,306	9.3	74,263	28.4
Borough of North Caldwell	6,183	870	14.1	7,375	801	10.9	75	1.2
Township of Nutley	28,370	4,115	14.5	27,362	4,402	16.1	1,312	4.8
City of Orange Township	30,134	3,364	11.2	32,868	3,562	10.8	6,078	18.8
Borough of Roseland	5,819	1,282	22.0	5,298	1,044	19.7	88	1.7
Township of South Orange Village	16,198	1,705	10.5	16,964	2,024	11.9	791	5.3
Township of Verona	13,332	2,570	19.3	13,533	2,614	19.3	441	3.3
Township of West Caldwell	10,759	2,094	19.5	11,233	2,142	19.1	227	2.1
Township of West Orange	46,207	7,362	15.9	44,943	7,818	17.4	2,461	5.6
Essex County (TOTAL)	**783,969**	**90,287**	11.5	**793,633**	**94,380**	11.9	**120,006**	**15.6**

Source: Census 2010 (U.S. Census Bureau); HAZUS-MH (for 2000 U.S. Census data)

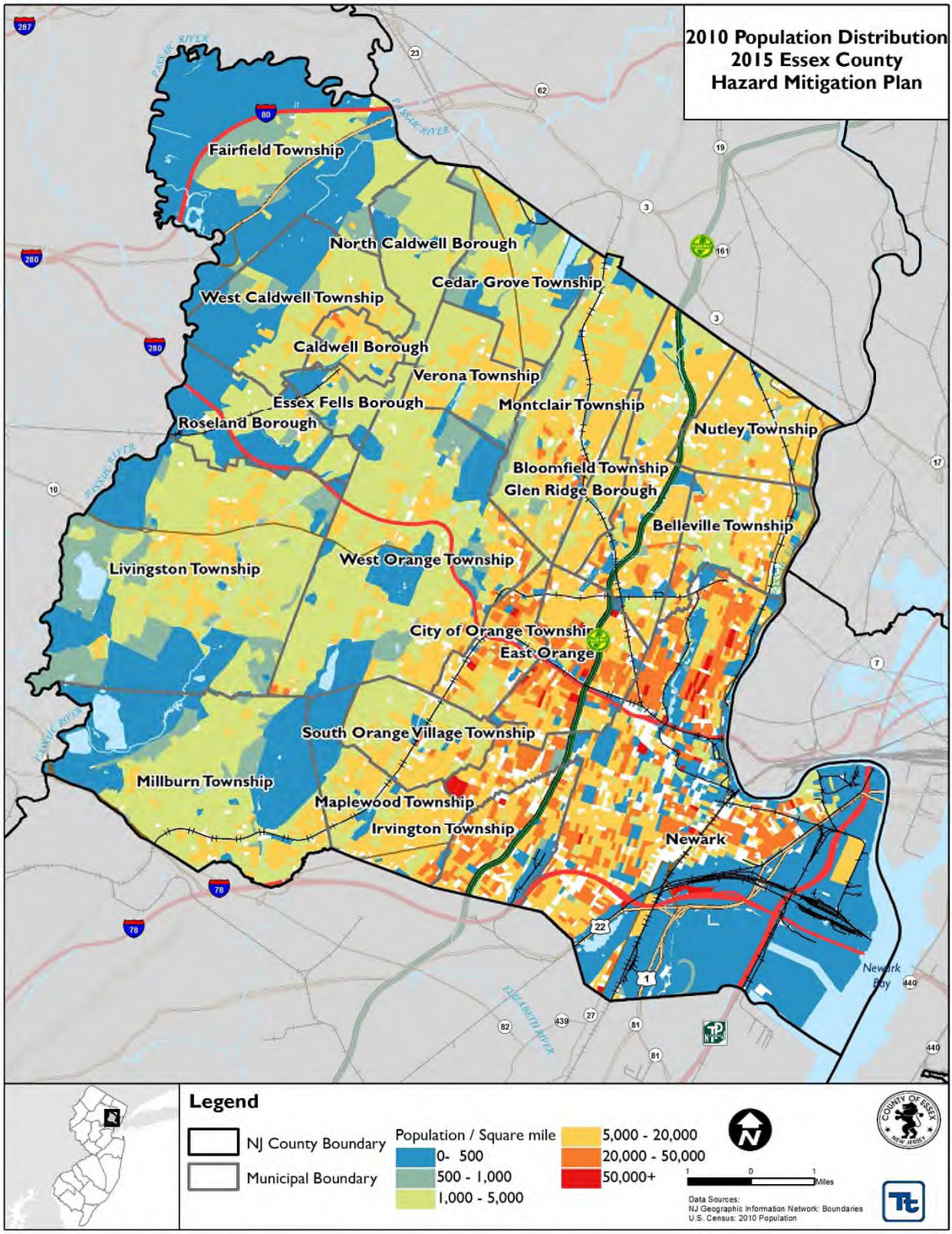
Note: Pop. = population
** Individuals below poverty level (Census poverty threshold for a 3-person family unit is approximately $15,000)*

It is noted that the Census data for household income provided in HAZUS-MH includes three ranges ($0-10,000, $10,000-$15,000, and $15,000-$25,000/year) that were totaled to provide the "low-income" data used in this study. This does not correspond exactly with the "poverty" thresholds established by the 2012 U.S. Census Bureau, which identifies households with two adults and two children with an annual household income below $23,283 per year as "low income" for this region. This difference is not believed to be significant for the purposes of this planning effort.

The 2012 U.S. Census American Community Survey data identified approximately 75,000 households as having an annual income of less than $25,000. Figure 4-12 shows the distribution of persons over age 65 in Essex County, while Figure 4-13 shows the distribution of low income persons.

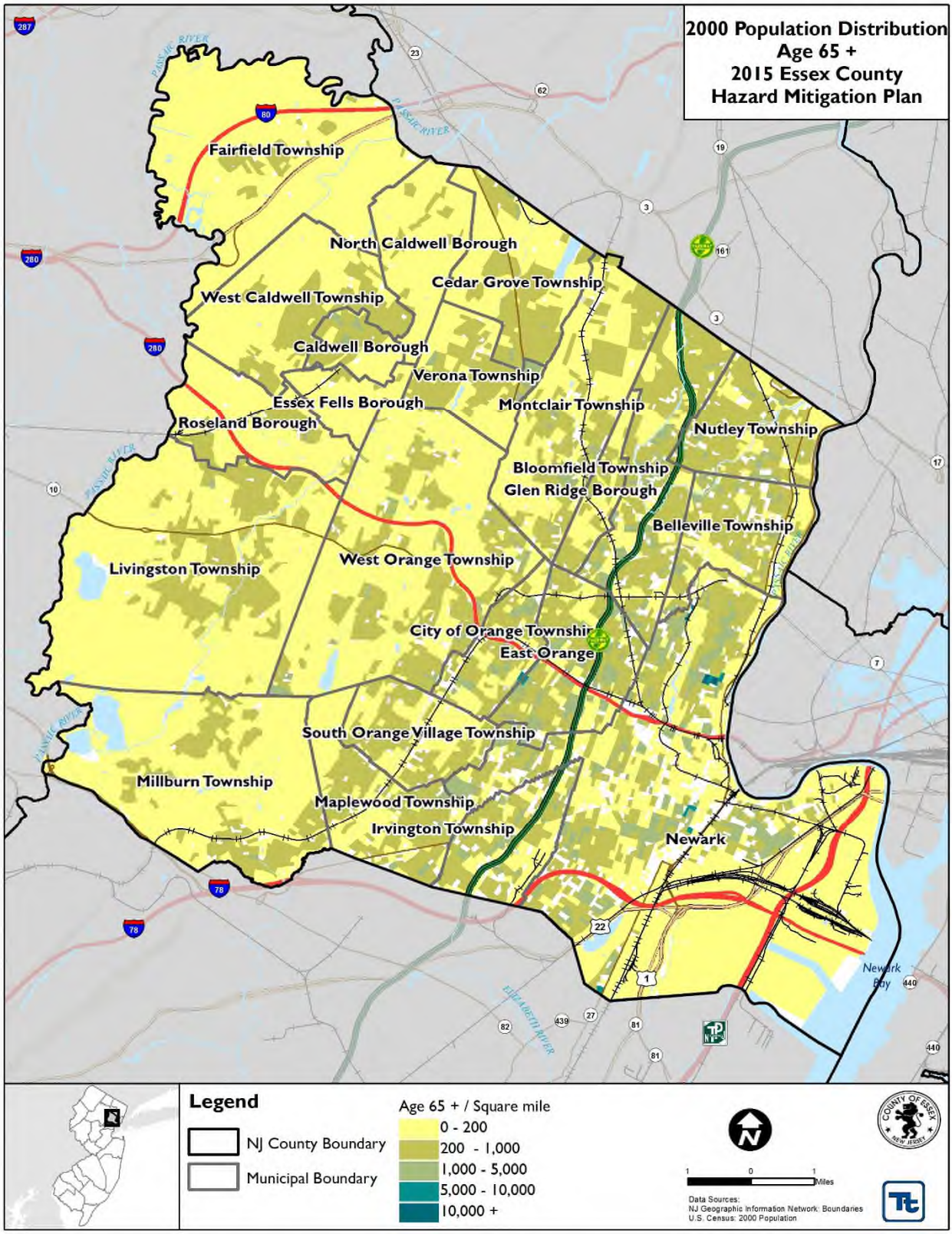
The following maps indicate distribution based on Census Block designations.

Figure 4-11. Distribution of General Population for Essex County, New Jersey



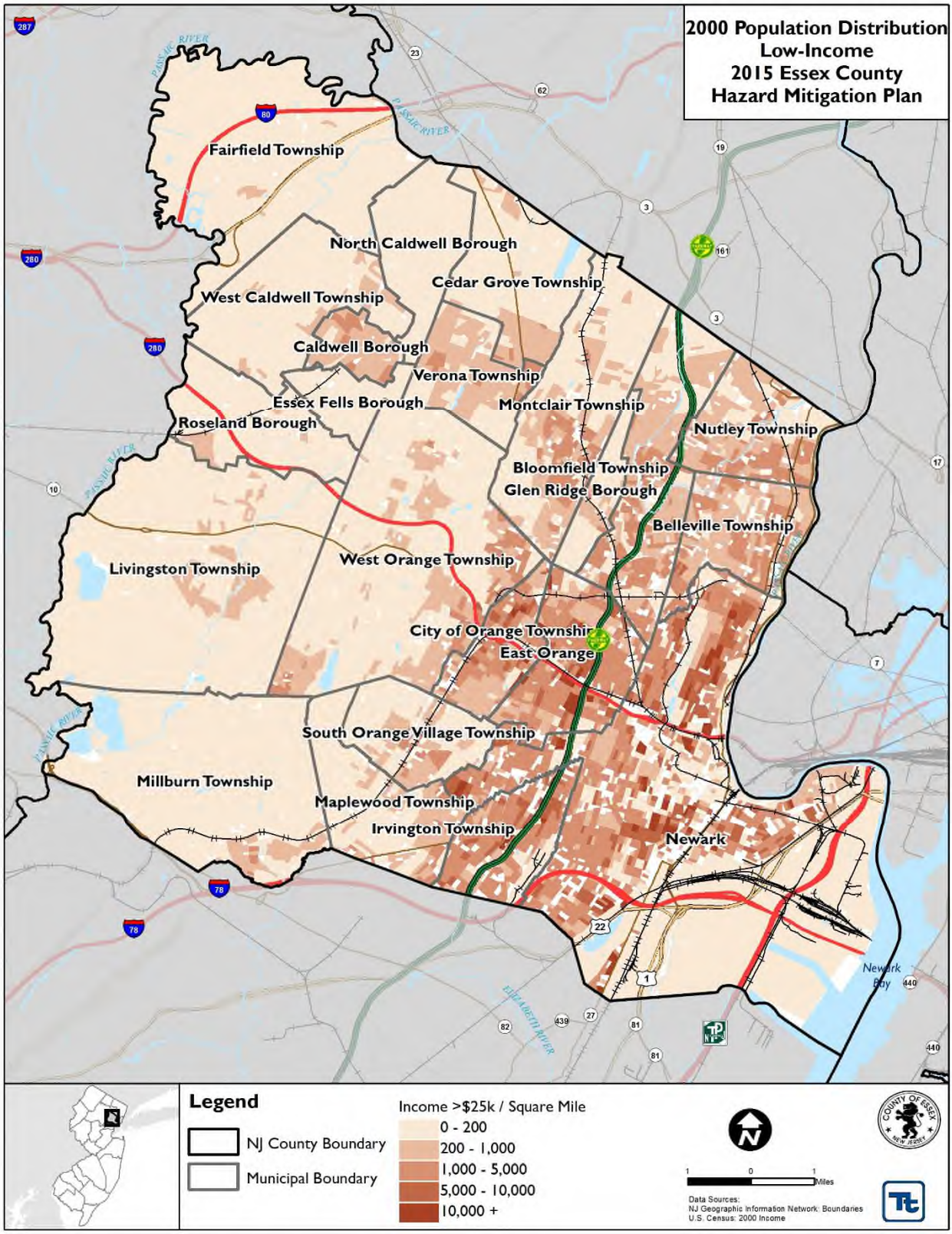
Source: U.S. Census 2010

Figure 4-12. Distribution of Persons over the Age of 65 in Essex County, New Jersey



Source: HAZUS-MH

Figure 4-13. Distribution of Low-Income Population in Essex County, New Jersey



Source: HAZUS-MH

4.3 GENERAL BUILDING STOCK

The 2000 U.S. Census data identified 283,736 households (301,011 housing units) in Essex County. The 2010 U.S. Census reported 283,712 households (312,954 housing units) in Essex County. The County experienced an increase in both households and housing units from 2000 to 2010. As for households, between 2000 and 2010, the County saw a 0.08% increase. As for housing units, the County experienced an increase of 3.97% between 2000 and 2010. The U.S. Census defines household as all the persons who occupy a housing unit, and a housing unit as a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. Therefore, you may have more than one household per housing unit. The median price of a single family home in Essex County was estimated at $376,900 (U.S. Census, 2014).

For this update, the default general building stock in HAZUS-MH was updated and replaced with a custom building inventory for Essex County both at the aggregate and structure level. The building stock update was performed using the most current parcel and tax assessment data provided by the Essex County Planner in the Department of Public Works. The improved value was utilized on a parcel by parcel basis. For the purposes of this plan, there are approximately 164,666 parcels with improved values identified by the tax data available. These improved parcels account for a value of approximately $51 billion. Estimated content value was calculated by using 50-percent of the residential improvement value, and 100-percent of the non-residential improvement values. Using this methodology, there is approximately $34 billion in contents within these improved properties. Approximately 89 percent of the total buildings in the County are residential, which make up approximately 47-percent of the building stock structural value associated with residential housing. Table 4-3 presents building stock statistics by occupancy class for Essex County.

Table 4-3. Number of Buildings and Improvement Value by Occupancy Class

Municipality	All Occupancies				Residential		Commercial		Industrial	
	Count	Improved Value	Estimated Contents	Total (Improved + Contents)	Count	Improved Value	Count	Improved Value	Count	Improved Value
Township of Belleville	9,154	$1,780,790,900	$1,124,656,250	$2,905,447,150	8,460	$1,312,269,300	473	$247,042,600	120	$95,054,100
Township of Bloomfield	11,383	$2,357,334,000	$1,469,978,350	$3,827,312,350	10,541	$1,774,711,300	633	$326,045,300	39	$35,589,700
Borough of Caldwell	2,116	$473,112,350	$280,527,425	$753,639,775	1,880	$385,169,850	188	$57,259,300	0	$0
Township of Cedar Grove	3,815	$1,033,371,891	$623,717,191	$1,657,089,082	3,611	$819,309,400	115	$90,528,600	42	$52,768,800
City of East Orange	9,310	$3,307,598,833	$2,513,001,046	$5,820,599,879	8,380	$1,589,195,575	619	$285,846,158	36	$28,212,800
Borough of Essex Fells	760	$372,840,100	$194,266,600	$567,106,700	739	$357,147,000	4	$6,379,600	0	$0
Township of Fairfield	3,169	$1,851,889,900	$1,522,897,300	$3,374,787,200	2,489	$657,985,200	368	$516,081,300	282	$640,545,000
Borough of Glen Ridge	2,214	$636,208,000	$350,071,500	$986,279,500	2,158	$572,273,000	21	$31,857,400	0	$0
Township of Irvington	9,312	$1,713,187,200	$1,107,200,850	$2,820,388,050	8,262	$1,211,972,700	692	$215,846,300	174	$79,221,900
Township of Livingston	9,510	$3,377,301,894	$2,170,401,636	$5,547,703,530	9,124	$2,413,800,516	256	$663,620,278	42	$65,517,000
Township of Maplewood	7,275	$1,710,931,300	$1,022,438,200	$2,733,369,500	6,879	$1,376,986,200	294	$203,086,400	32	$16,080,500
Township of Millburn	6,291	$4,983,926,600	$3,061,606,850	$8,045,533,450	6,001	$3,844,639,500	220	$1,027,109,600	17	$33,459,100
Township of Montclair	10,486	$3,674,389,469	$2,215,736,010	$5,890,125,479	9,680	$2,917,306,919	590	$374,000,650	3	$3,719,900
City of Newark	38,329	$10,389,656,399	$8,319,961,999	$18,709,618,398	29,769	$4,139,388,800	5,175	$1,737,057,200	897	$440,012,900
Borough of North Caldwell	1,951	$907,763,000	$523,678,250	$1,431,441,250	1,924	$768,169,500	12	$12,280,100	2	$1,737,300
Township of Nutley	8,884	$2,140,629,971	$1,369,640,621	$3,510,270,592	8,300	$1,541,978,700	456	$472,524,012	26	$11,656,800
City of Orange Township	4,354	$1,134,204,300	$733,197,050	$1,867,401,350	3,715	$802,014,500	476	$159,915,800	49	$33,400,600
Borough of Roseland	1,616	$811,613,700	$624,014,550	$1,435,628,250	1,518	$375,198,300	60	$376,688,500	19	$38,609,700
Township of South Orange Village	4,508	$1,887,112,250	$1,221,575,875	$3,108,688,125	4,198	$1,331,072,750	175	$114,454,400	6	$1,004,600
Township of Verona	3,907	$990,817,150	$607,201,175	$1,598,018,325	3,685	$767,231,950	168	$115,026,900	6	$5,196,100
Township of West Caldwell	3,634	$1,193,780,164	$847,171,114	$2,040,951,278	3,449	$693,218,100	85	$199,766,400	67	$231,773,800
Township of West Orange	12,688	$3,379,895,883	$2,123,888,933	$5,503,784,816	12,071	$2,512,013,900	433	$562,485,603	31	$34,176,000
Essex County	**164,666**	**$50,108,355,254**	**$34,026,828,774**	**$84,135,184,028**	**146,833**	**$32,163,052,960**	**11,513**	**$7,794,902,401**	**1,890**	**$1,847,736,600**

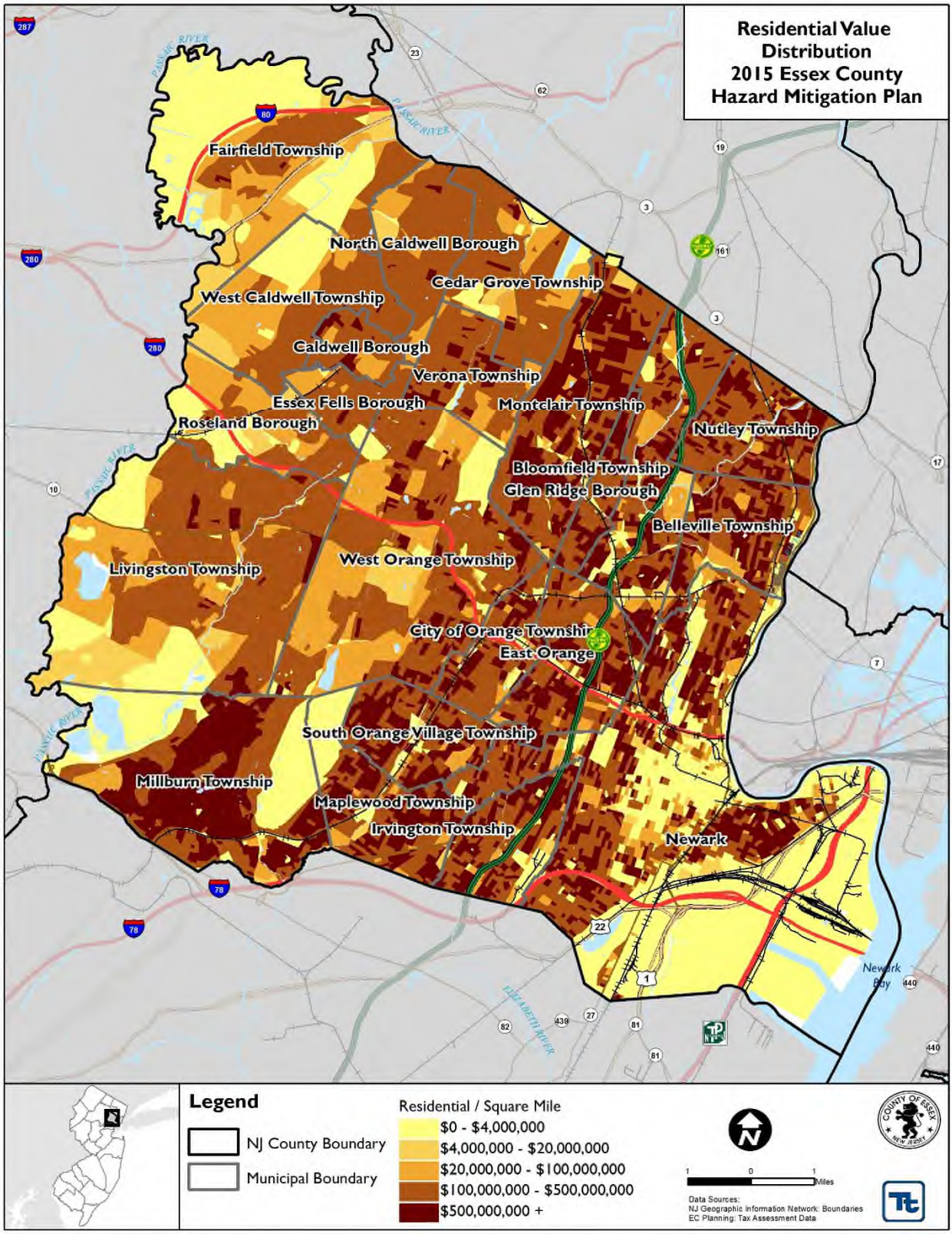
Source: EC DPW, 2014

The 2010 Census data identified that the majority of housing units (34.1% or 106,730 units) in Essex County are single-family detached units. The 2011 U.S. Census Bureau's County Business Patterns data identified 18,681 business establishments employing 288,475 people in Essex County. The retail trade industry has the most number of establishments in the County, with 2,723 establishments. This is followed by the health care and social assistance industry with 2,575 establishments and the professional, scientific, and technical services industry with 2,260 establishments (U.S. Census, 2011).

Figure 4-14 through Figure 4-16 show the distribution and exposure density of residential, commercial and industrial buildings in Essex County. Exposure density is the dollar value of structures per unit area, including building content value. Generally, contents for residential structures are valued at about 50 percent of the building's value. For commercial facilities, the value of the content is generally about equal to the building's structural value. Actual content value varies widely depending on the usage of the structure. The densities are shown in units of $1,000,000 ($M) per square mile.

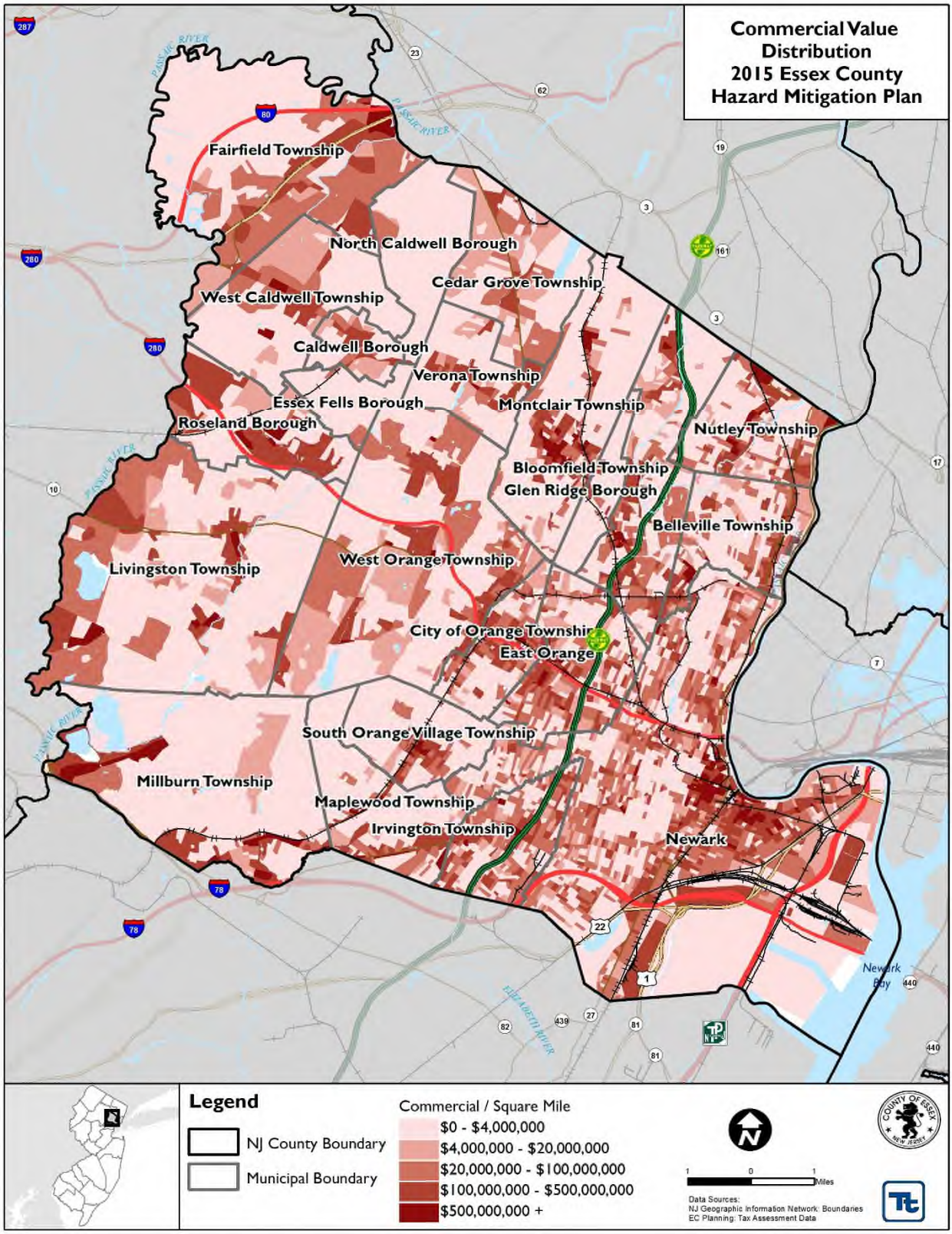
Viewing exposure distribution maps, such as Figure 4-14 through Figure 4-16, can assist communities in visualizing areas of high exposure and in evaluating aspects of the study area in relation to the specific hazard risks.

Figure 4-14. Distribution of Residential Building Stock and Value Density in Essex County



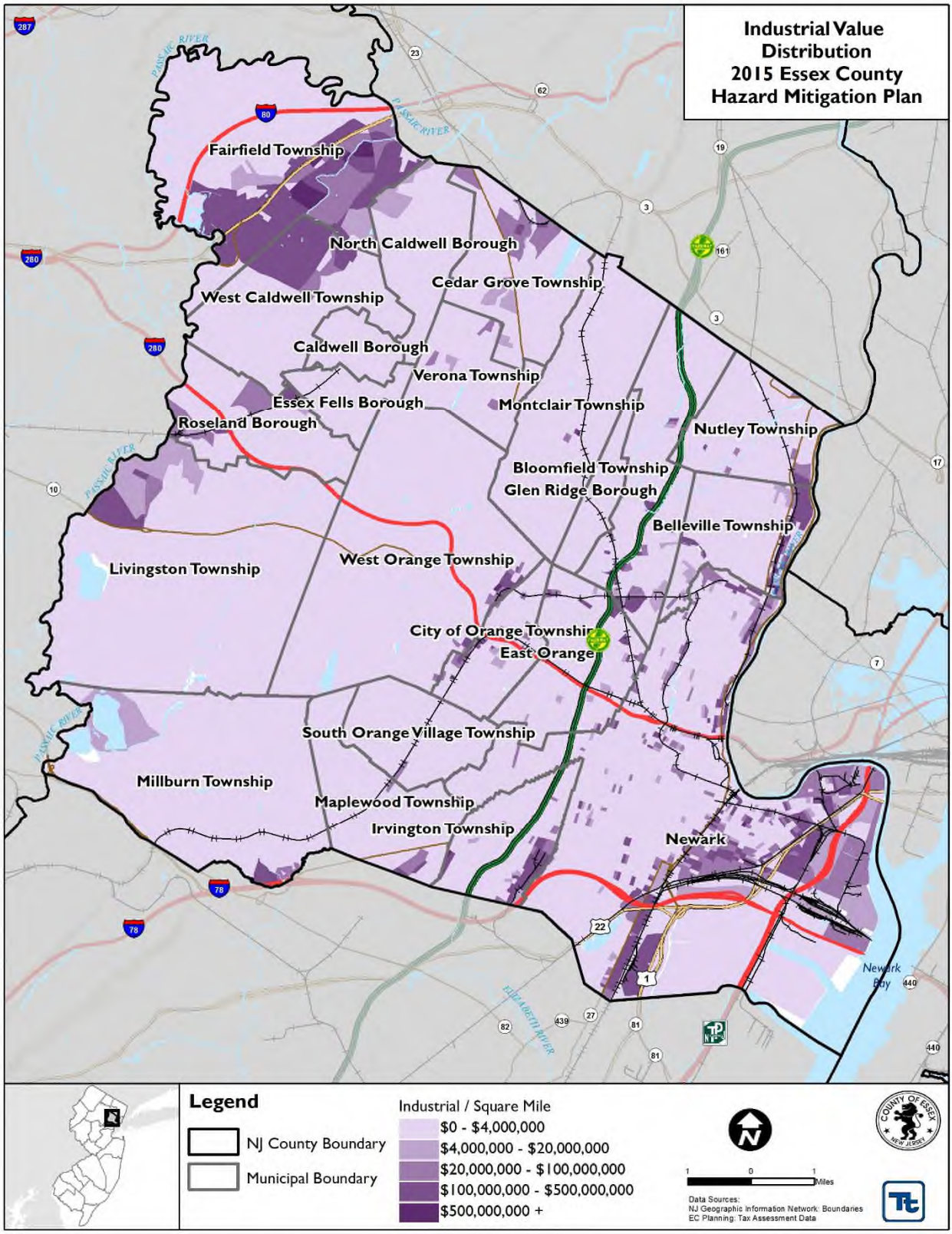
Source: EC Planning, 2014

Figure 4-15. Distribution of Commercial Building Stock and Exposure Density in Essex County



Source: EC Planning, 2014

Figure 4-16. Distribution of Industrial Building Stock and Value Density in Essex County



Source: *EC Planning, 2014*

4.4 LAND USE AND POPULATION TRENDS

Local zoning and planning authority is provided for under the New Jersey Municipal Land Use Law, which gives municipalities zoning and planning authority. DMA 2000 requires that communities consider land use trends, which can impact the need for, and priority of, mitigation options over time. Land use trends significantly impact exposure and vulnerability to various hazards. For example, significant development in a hazard area increases the building stock and population exposed to that hazard.

This plan provides a general overview of population and land use and types of development occurring within the study area. An understanding of these development trends can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place to protect human health and community infrastructure.

4.4.1 Land Use Trends

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 like the baby boomers to urban centers further increasing the demand for housing in these areas. The continued redevelopment in the urban areas of the County in close proximity to public transportation will likely remain an important component of the future development of the County.

According to the 2013 Essex County Transportation Plan, approximately 270 acres of new development has approval and may begin construction in the near future. Much of this development will be in the form of redevelopment of existing developed properties. Many of the future development projects in the County are Transit Oriented Development (TOD) projects which are usually mixed use developments that are in close proximity to transportation hubs. Where the information was available, specific development projects are listed in each Municipality's Annex in Section 9 of this plan.

Open Space

There are 28 County parks in Essex County, with a total acreage of approximately 6,172 acres. Essex County parks and reservations contain a wide range of facilities including open waters for fishing, boating and canoeing; opportunities for wildlife viewing; numerous fields and facilities for sports and recreation; interpretive trails; walking and hiking paths; and other uses. The largest wildlife preserves in the County are South Mountain and West Essex Park (Essex County Environmental Resource Inventory, 2007). Table 4-4 lists the parks, acreage and location in Essex County.

Table 4-4. Essex County Parks

County Park	Acreage	Municipality
Anderson	14.85	Montclair
Becker	147	Roseland
Belleville	32.70	Belleville
Branch Brook	359.72	Newark
Brookdale	121.41	Montclair
Eagle Rock Reservation	408.33	West Orange
Francis A. Byrne Golf Course	167.71	West Orange
Glenfield	20.01	Montclair

Table 4-4. Essex County Parks

County Park	Acreage	Municipality
Grover Cleveland	41.61	Essex Fells
Hendricks Field Golf Course	124.99	Belleville
Hilltop Reservation	284.16	Cedar Grove
Independence	12.69	Newark
Irvington	24.38	Irvington
Ivy Hill	19.96	Newark
Kip's Castle Park	11	Verona and Montclair
Mills Reservation	157.19	Cedar Grove
Monte Irvin Orange Park	47.63	Orange
Riker Hill Complex	204.68	Livingston
Riverbank	10.77	Newark
South Mountain Reservation	2,047.14	West Orange
Vailsburg	30.32	Newark
Verona	54.32	Verona
Walter Kidde Dinosaur	16	Roseland
Watsessing	69.67	Bloomfield
Weequahie	311.33	Newark
West Essex	1,361.33	Eagle Rock Ave. and Passaic River
West Side	31.36	Newark
Yanticaw	28.75	Nutley

Source: Essex County Environmental Resource Inventory, 2007

Along with the County parks, there are 176 municipal, school and private recreation and open space areas within Essex County. Of those 176, 70 are identified as municipal parks. The largest non-park open space areas are 15 (as of 2004) private golf course. A majority of these golf courses are located in western Essex County. The remainder of these areas is recreation areas (picnic areas, campgrounds, lawns, cultural centers, etc.) and playgrounds (Essex County Environmental Resource Inventory, 2007).

Forests

The major forest cover types of Essex County include deciduous, shrub, and coniferous. The Watchung Mountains contain the most forest area in the County. Deciduous forests are the dominant upland forest community in the County, occupying approximately 9,620 acres (11.6%) of the County's upland forest complex. Approximately 881 acres of the County are considered shrub forest. Coniferous forest in Essex County covers approximately 223 acres of land. These areas are typically small patches of planted coniferous stands comprised of various species in the County. Coniferous forest land can be found in the South Mountain reservation in the County (Essex County Environmental Resource Inventory, 2007).

Recreational

Recreational coverage represents areas that include ball fields, golf courses, and similar areas dominated by maintained cool season grasses and utilized for sports activities. Recreational land use is scattered throughout the County. The largest recreational areas in Essex County are represented by golf courses (Essex County Environmental Resource Inventory, 2007).

Urban Land

Urban land includes most of what normally would be considered developed land. Residential areas, commercial areas, services and institutions, industrial areas, and those developed for transportation and utilities are the primary land uses included in urban land. There are several other open land categories that are included with urban land. Developed recreation areas, whether a part of a park, educational facility, or private concern (e.g. golf course), are also considered a part of urban land. Also included are areas such as large, landscaped lawns in corporate businesses and service centers, parks, and residential areas (NJDEP, 2014).

Urban land encompasses more area in Essex County than any other type of land use, approximately 63,667 acres of the County. It is the County's primary land use and includes residential land use as well. Areas classified as urban land have been altered, excavated, or disturbed to a significant extent and no longer have distinguishable morphologic features (Essex County Environmental Resource Inventory, 2007).

Wetlands

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 (Essex County Environmental Resource Inventory, 2007).

Essex County includes a total of approximately 6,572 acres of land (7.93%) is currently mapped as wetland by the NJDEP which is somewhat consistent with the 2007 NJDEP land use layer which indicates there is approximately 6,398 acres of wetlands (7.7% %) . The vast majority of these wetlands are the freshwater forested, shrub and marsh wetlands associated with the Passaic Meadows Complex. These wetlands are non–tidal (palustrine) wetland. The wetland communities are classified following a system identified by Cowardin (1979), which separates wetlands into one of five basic ecological systems: Marine, Estuarine, Riverine, Palustrine, and Lacustrine (Essex County Environmental Resource Inventory, 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) (Essex County Environmental Resource Inventory, 2007).

Most of Essex County's wetlands are considered palustrine. Palustrine wetlands include all non-tidal wetlands dominated by trees, shrubs and persistent emergent vegetation. These wetlands are usually bordered by uplands and shoreward of lakes and river channels and typically include all wetlands termed marsh, bogs, swamps, and fens. Palustrine wetlands may include small shallow intermittent or permanent ponds, such as vernal pools (Essex County Environmental Resource Inventory, 2007).

Also present in Essex County are limited areas of estuarine wetlands, including the low marsh wetlands. Within the low salt marsh, salt marsh cordgrass (*Spartina alterniflora*) is the typical dominant species. Other species may include salt meadow grass (*Spartina patens*), spike grass (*Distchilis spicata*), and about a dozen other species. The higher fringes of these communities tend to be dominated by *Phragmites australis* (common reed). Saline marsh wetlands represent a small (less than 1%) portion of Essex County's mapped wetlands. This

percentage represents only a fraction of the pre-industrial proportions of Essex County's high and low salt marsh. Salt marsh habitats once flourished around present day Newark. Salt marsh losses comprise a large proportion of the estimated 88% reduction in Lower Passaic/Newark Bay Wetlands. Most remaining marsh wetlands within the lower Passaic are likely to be altered marsh patches consisting of common reed monocultures (Essex County Environmental Resource Inventory, 2007).

The remaining pockets of the estuarine habitats within Essex County are primarily intertidal mudflats with little vegetation. Despite lacking vegetation, these areas are important to migrating foraging shorebirds and fish (Essex County Environmental Resource Inventory, 2007).

4.4.2 Population Trends

This section discusses population trends to use as a basis for estimating future changes of the population and significantly change the character of the area. Population trends can provide a basis for making decisions on the type of mitigation approaches to consider and the locations in which these approaches should be applied. This information can also be used to support planning decisions regarding future development in vulnerable areas.

According to the U.S. Census Bureau Essex County's 2010 population was 783.969 persons, which is 1.22% decrease from the 2000 Census population of 793,633. From 1790 to 1970, the County has experienced a constant growth in population. Between 1970 and 2012, the County then started seeing a slight decrease in total population. The largest increase was seen between the years 1840 to 1850, when the County experienced a 65.73% (29,329 persons) population increase. The smallest increase was seen between the years 1930 and 1940, when Essex County only experienced a 0.46% (3,827 persons) population increase. More recently, from 1970 to 1980, the County saw its largest decrease of 8.73% (81,410 persons) and then experienced another decrease between 1980 and 1990 (8.57% decrease). Table 4-5 displays the population and change in population from 1790 to 2012 in Essex County.

Table 4-5. Essex County Population Trends, 1790 to 2012

Year	Population	Change in Population	Percent (%) Population Change
1790	17,785	N/A	N/A
1800	22,269	4,484	25.21
1810	25,984	3,715	16.68
1820	30,793	4,809	18.51
1830	41,911	11,118	36.11
1840	44,621	2,710	6.47
1850	73,950	29,329	65.73
1860	98,877	24,927	33.71
1870	143,839	44,962	45.47
1880	189929	46,090	32.04
1890	256,098	66,169	34.84
1900	359,053	102,955	40.20
1910	512,886	153,833	42.84
1920	652,089	139,203	27.14
1930	833,513	181,424	27.82

Table 4-5. Essex County Population Trends, 1790 to 2012

Year	Population	Change in Population	Percent (%) Population Change
1940	837,340	3,827	0.46
1950	905,949	68,609	8.19
1960	923,545	17,596	1.94
1970	932,526	8,981	0.97
1980	851,116	-81,410	-8.73
1990	778,206	-72,910	-8.57
2000	793,633	15,427	1.98
2010	783,969	-9,664	-1.22
2012	787,744	3,775	0.48

Source: U.S. Census Bureau, 2014
Note: Change in population and percent in population change was calculated from available data

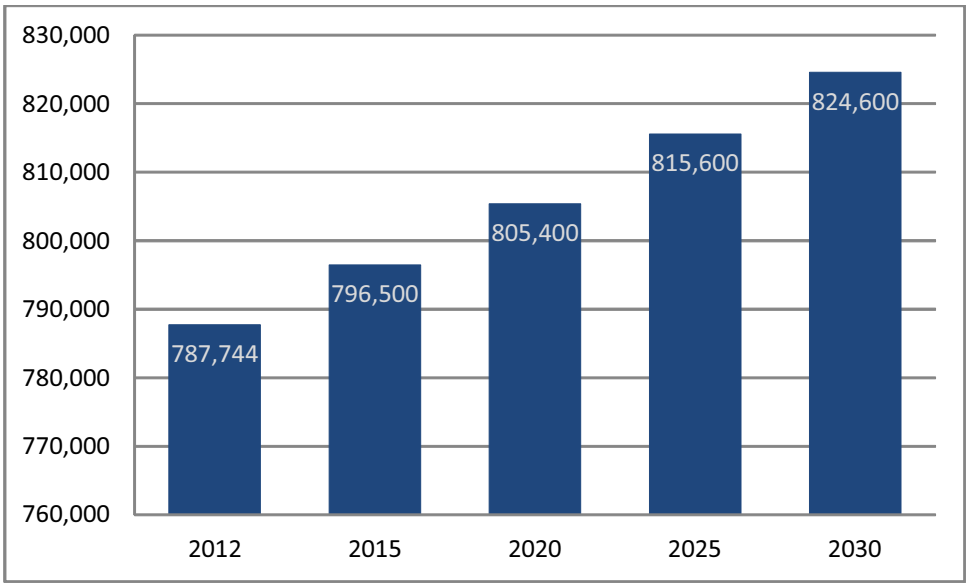
Table 4-6 displays the ten largest municipalities in Essex County. Over the next fifteen years, from 2015 to 2030, Essex County has a projected population growth of 3.5% percent. Based on New Jersey Department of Labor population projections, the County population is expected to reach 796,500 by 2015 and 824,600 by 2030 (Figure 4-17).

Table 4-6. Ten Largest Municipalities in Essex County

Rank	Municipality	2010 Population
1	City of Newark	277,140
2	City of East Orange	64,270
3	Township of Irvington	53,926
4	Township of Bloomfield	47,315
5	Township of West Orange	46,207
6	Township of Montclair	37,669
7	Township of Belleville	35,926
8	City of Orange Township	30,134
9	Township of Livingston	29,366
10	Township of Nutley	28,370

Source: U.S. Census, 2010

Figure 4-17. Essex County Population Projections, 2012 to 2030



Source: New Jersey Department of Labor and Workforce Development, 2013

Between 2000 and 2010, many of the County's municipalities experienced a decrease in population. The Borough of North Caldwell experienced the largest decrease in population (16.16%). The Borough of Roseland experienced the largest increase of population (9.83%), most likely due to the construction of new residential apartment complexes.

Table 4-7. Population Trends in Essex County by Municipality

Municipality	2000 Census	2010 Census	Change in Population	Percent (%) Population Change
Township of Belleville	35,928	35,926	-2	-0.01
Township of Bloomfield	47,683	47,315	-368	-0.77
Borough of Caldwell	7,584	7,822	238	3.14
Township of Cedar Grove	12,300	12,411	111	0.90
City of East Orange	69,824	64,270	-5,554	-7.95
Borough of Essex Fells	2,162	2,113	-49	-2.27
Township of Fairfield	7,063	7,466	403	5.71
Borough of Glen Ridge	7,271	7,527	256	3.52
Township of Irvington	60,695	53,926	-6,769	-11.15
Township of Livingston	27,391	29,366	1,975	7.21
Township of Maplewood	23,868	23,867	-1	0.00
Township of Millburn	19,765	20,149	384	1.94
Township of Montclair	38,977	37,669	-1,308	-3.36
City of Newark	273,546	277,140	3,594	1.31
Borough of North Caldwell	7,375	6,183	-1,192	-16.16
Township of Nutley	27,362	28,370	1,008	3.68

Table 4-7. Population Trends in Essex County by Municipality

Municipality	2000 Census	2010 Census	Change in Population	Percent (%) Population Change
City of Orange Township	32,868	30,134	-2,734	-8.32
Borough of Roseland	5,298	5,819	521	9.83
Township of South Orange Village	16,964	16,198	-766	-4.52
Township of Verona	13,533	13,332	-201	-1.49
Township of West Caldwell	11,233	10,759	-474	-4.22
Township of West Orange	44,943	46,207	1,264	2.81

4.4.3 Future Growth and Development

The Essex County Investment Framework is intended to depict the desire for greater protection of environmentally sensitive areas and scenic vistas, while taking greater advantage of lands located close to transportation hubs and existing growth nodes. Over the past year, Essex County has been creating a Priority Investment Framework for the County that is based upon the principles and policies contained in the Draft State Strategic Plan. This effort combined with the County's work to develop a Comprehensive Economic Development Strategy (CEDS) demonstrates the County's desire to maximize the benefits that it will accrue when investment and infrastructure improvements are made in a coordinated manner. The Priority Investment Framework and the CEDS efforts are highly coordinated and work together to prioritize investments in Essex County.

The County has identified twenty three Priority Growth Investment Areas in coordination with our municipal partners. These investment areas provide the geographic framework for investment decisions. They were identified using a criteria based framework of essential and supplemental criteria ranging from proximity to transit and interchanges, availability of public water and sewer to the availability of 69Kv electrical service to name a few.

Potential future development in the County as identified by each municipality is noted in the following table and figure.

Table 4-8. Potential New Development in Essex County

Municipality	Property Name	Type	Number of Structures	Address/Block and Lot	Description/Status
Township of Belleville	Former Essex County Property	Mixed-Use	Unknown	570 Belleville Ave.	Recently Sold
Township of Belleville	Former Roche Diagnostic	Mixed-Use	Unknown	11 Franklin Ave.	In Progress
Township of Belleville	Former School #1	Mixed-Use	Unknown	190 Cortland St.	In Progress
Township of Belleville	Liquid Carbonic	Mixed-Use	Unknown	666 Washington Ave.	On Hold
Township of Belleville	Senior Citizen Housing	Residential	Unknown	125 Franklin Ave.	In Progress
Township of Bloomfield	192 Bloomfield, LLC	Mixed-Use	312 units	B: 64 L: 1, 4	App/Rej.
Township of Bloomfield	Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 1, 4, 5, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 21, 24, 27, 28, 29, 30, 31, 33, 35	N/A
Township of Bloomfield	Urban Smart Growth	Residential	114 units	B: 335 L: 26, 30	App/Rej.
Borough of Caldwell	Sisters of St. Dominic of Caldwell	Institutional	33 units	B: 64 L: 1, 2	App.
Township of Cedar Grove	Grove Avenue LLC	Residential	24 units	B: 71 L: 2	App/Rej.
City of East Orange	120 Halstead Street	Residential	50+ units	120 Halstead St.	In progress
City of East Orange	125 South Harrison	Residential	103 units	125 South Harrison	Planned
City of East Orange	144 South Harrison	Residential	50+ units	144 South Harrison	Planned
City of East Orange	20 Evergreen Place	Residential		20 Evergreen Pl.	Planned
City of East Orange	30 Evergreen Place	Residential	200 units	30 Evergreen Pl.	Planned
City of East Orange	742 Park Avenue	Residential	50+ units	742 Park Ave.	Planned
Township of Fairfield	Oak Park Construction	Residential	18 units	B: 5003 L: 3 / B: 4701 L: 3.03	Preliminary approval
Township of Irvington	Hilltop Partners, LLC	Residential	704 units	B: 324 L: 1	Municipal Hospital sold for site redevelopment as a 700 unit residential community. Project has been approved by the Planning Board.
Township of Irvington	Valley Plaza Mall	Commercial	1 unit	480 Chancellor Ave.	Rehabilitation/upgrading of existing commercial structure.

Table 4-8. Potential New Development in Essex County

Municipality	Property Name	Type	Number of Structures	Address/Block and Lot	Description/Status
Township of Livingston	Hillside Northfield	Residential	80 units	B: 5500 L: 5, 7, 8, 9	PB approved
Township of Livingston	Squiretown	Residential	220 units	B: 5900 L: 33, 34, 35, 36, 37, 42	PB approved
Township of Maplewood	71 Dunnell Road	Residential	10 units	67-79 Dunnell Rd.	PB approved
Township of Maplewood	CVS	*Commercial*	13,000 SF	453 Valley St.	PB approved
Township of Maplewood	DAIBES	Commercial	6 units/10,000 SF Commercial	1611 Springfield Ave.	5% Complete
Township of Maplewood	Elite Properties	Residential	126 units	B: 48.47 L: 5.01, 6.01, 7	50% complete
Township of Maplewood	Elite Properties	Residential	134 units	92 Burnett Ave.	N/A
Township of Maplewood	Parke Place at Maplewood LLC	Residential	235 units	B: 44.02 L: 2	N/A
Township of Maplewood	Post Office Redevelopment	Mixed-Use	24 units/15,000 SF Commercial	160 Maplewood Ave.	Conceptual
Township of Maplewood	PSEG Redevelopment	Residential	235 units	200 Boyden Ave.	Redevelopment, Approved by Planning Board
Township of Millburn	Special Improvement District	Mixed-Use	Unknown	179 Millburn Ave.	Storm Water/Sewer
Township of Millburn	Stop and Shop (Springfield NJ) Bordering Short Hills	Commercial	1 unit	520-550 Millburn Ave.	Unknown
Township of Millburn	Toll Brothers-The Enclaves	Residential	30 units	1 Short Hills Ave.	Installed Tension Basin/Relocate Join Meeting Line
Township of Montclair	190-192 Bloomfield Avenue	Residential	11 units	190-192 Bloomfield Ave.	Under Construction
Township of Montclair	Centro Verde	Mixed-Use	226 units/ 40,000 SF Commercial	638 Bloomfield Ave.	Under Construction
Township of Montclair	Kensington	Residential	88 units	65 Church St.	Construction
Township of Montclair	Montclairion II	Residential	40 units	10 Pine St.	Planning Board
Township of Montclair	HD Orange 2013 Urban Renewal	Commercial	148 room hotel	Block 1401, Lot 1.01	

Table 4-8. Potential New Development in Essex County

Municipality	Property Name	Type	Number of Structures	Address/Block and Lot	Description/Status
City of Newark	Chadwick Capital/Clinton Newark, LLC	Residential	7 Story Building	505-509 Clinton Ave.	N/A
City of Newark	HELP | Springfield Avenue Urban Renewal Company LP	Residential	45 units	B: 2614 L: 1, 2, 4, 5, 30, 31, 32, 33, 34	App/Rej.
City of Newark	Hess NEC, LLC	Industrial	655 MW Electrical Generation Plant	B: 5074 L: 25, 25.01	N/A
City of Newark	Mid-Atlantic Investment Alliance, LLC	Residential	24 units	90-96 Clinton Ave.	N/A
City of Newark	TDAF | Springfield Avenue Urban Renewal Company LP	Mixed-Use	152 units	B: 236 L: 1.01, 1.02, 1.03, 1.04	App.
City of Newark	The Plaza at Springfield, LP	Mixed-Use	5 Story Mixed-Use w/ 50 units	B: 253 L: 27, 29, 30, 37	N/A
Borough of North Caldwell	Block 50, Lots 1 & 2	Residential	5 units	600 Mountain Ave.	5 single family homes/ Approved
Borough of North Caldwell	Hilltop Drive	Residential	62 units	B: 101 L: 3	62 single family homes/Planning
Township of Nutley	East Centre Street	Residential	3 structures	B: 9604 L: 13	Project completed
Township of Nutley	East Centre Street	Residential	4 structures	B: 9700 L: 1	Project initiated
Township of Nutley	Hillside Avenue	Mixed-Use	Unknown	B: 2000 L: 27	Project not yet determined
Township of Nutley	River Road	Residential	2 structures	B: 9701 L: 7	Project completed
Township of Nutley	Roche	Mixed-Use	Unknown	B: 102 L: 2, 9	Project not yet determined
Township of Nutley	Roche	Mixed-Use	Unknown	B: 2101 L: 1	Project not yet determined
Township of Nutley	Roche	Mixed-Use	Unknown	B: 2000 L: 4, 5	Project not yet determined
Township of Nutley	Roche	Mixed-Use	Unknown	B: 200 L: 2, 3, 4, 5, 6, 24	Project not yet determined
Township of Nutley	Roche	Mixed-Use	Unknown	B: 201 L: 1	Project not yet determined
Township of Nutley	Roche	Mixed-Use	Unknown	B: 300 L: 1	Project not yet determined
Township of Nutley	Roche	Mixed-Use	Unknown	B: 2304 L: 18 Q: C0001-C0003	Project not yet determined

Table 4-8. Potential New Development in Essex County

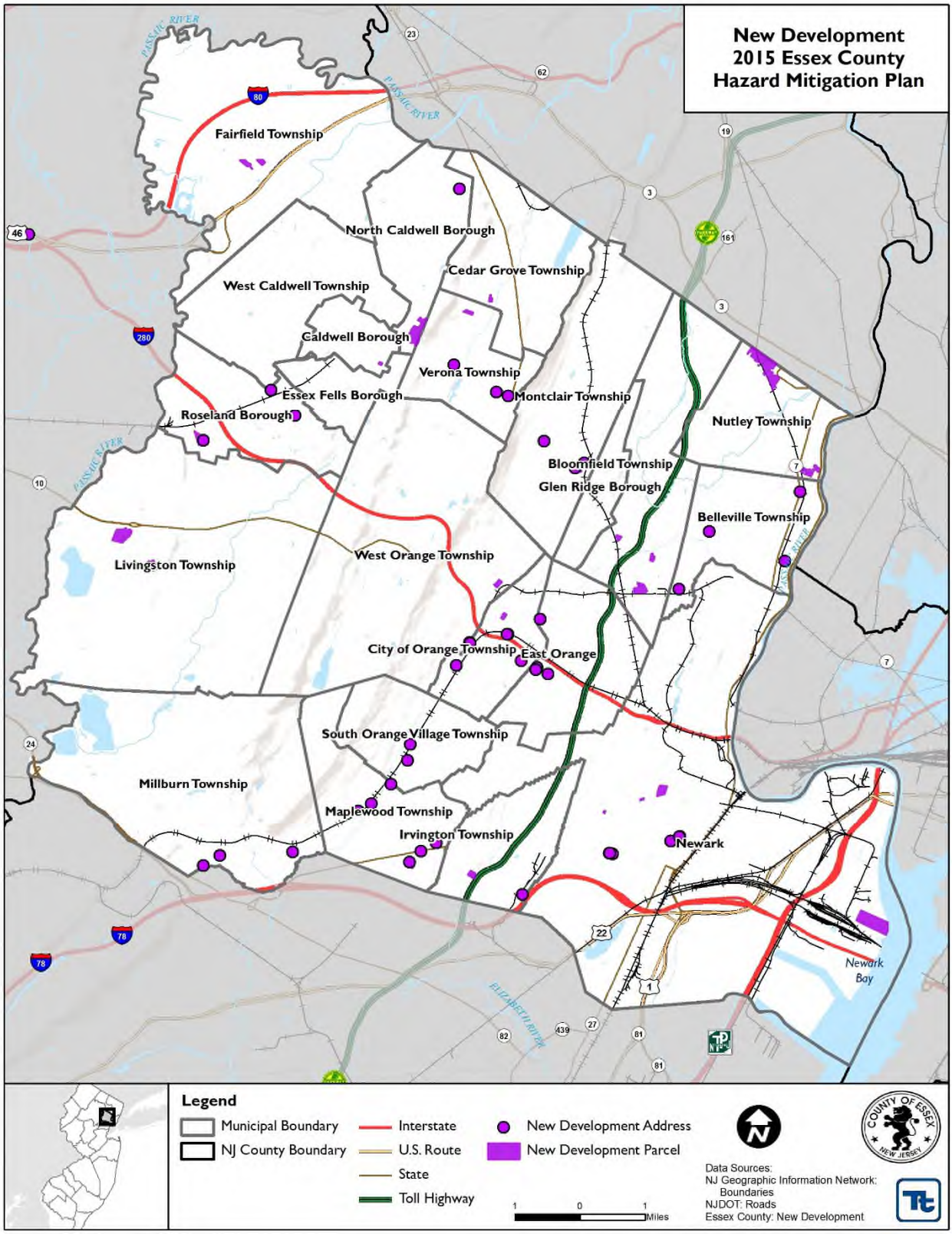
Municipality	Property Name	Type	Number of Structures	Address/Block and Lot	Description/Status
Township of Nutley	Roche	*Mixed-Use*	Unknown	B: 2100 L: 9 Q: C0101-C0107 B: 2100 L: 9 Q: C0110-C0111	Project not yet determined
City of Orange Township	Franklin Development Group, LLC	Residential	14 units	B: 2201 L: 21	App.
City of Orange Township	Franklin Development Group, LLC	Residential	136 units	B: 2201 L: 19, 20	App.
City of Orange Township	Berg Hat Factory-HANDS	Mixed-Use	38 units	475 S. Jefferson St.	App.
City of Orange Township	Harvard Development Association	Residential	128 units	550 Central Ave.	Remediation plan approved
City of Orange Township	L&M Development	Mixed-Use	74 units	50 & 55 S. Essex Ave.	Under construction
City of Orange Township	Living Fountain	Mixed-Use	40 units	169-177Central Ave.	Site plans approved
City of Orange Township	Nat West Realty	Mixed-Use	19 units	555 Central Ave.	Under construction
Borough of Roseland	Avalon Bay Subdivision, Locust Avenue	Residential	130 units	55 Locust Ave.	130 unit apartment complex rentals
Borough of Roseland	Avalon Bay Communities, Inc.	Residential	136 units	B: 32 L: 13	App.
Borough of Roseland	Eagle Rock Avenue, B-1 zone office development	Commercial	1 unit	161 Eagle Rock Ave.	Multi-office; 6,000 square feet
Borough of Roseland	Woodland Road redevelopment office site	Unknown	Unknown	9 Woodland Rd.	Unknown
Township of South Orange Village	The Gateway	Residential	57 units	9-25 W. South Orange Ave.	57 Apartments / 9100 feet retail space
Township of South Orange Village	Third & Valley	Residential	215 units	165 Valley St.	215 Apartments / 3000 square feet retail space
Township of South Orange Village	Third & Valley Urban Renewal, LLC	Mixed-Use	215 units	B: 2304 L: 3, 4, 5, 6, 7, 8, 9	App/Rej.
Township of Verona	163 Bloomfield Avenue	Mixed-Use	Unknown	163 Bloomfield Ave.	Planning stage
Township of Verona	200 Bloomfield Avenue	Mixed-Use	Unknown	200-210 Bloomfield Ave.	Planning stage

Table 4-8. Potential New Development in Essex County

Municipality	Property Name	Type	Number of Structures	Address/Block and Lot	Description/Status
Township of Verona	623-625 Bloomfield Avenue	Commercial	Unknown	623-625 Bloomfield Ave.	Planning stage
Township of Verona	860 Bloomfield Avenue	Commercial	Unknown	860 Bloomfield Ave.	Planning stage
Township of Verona	DMH 2, LLC	Mixed-Use	15 units/7000 SF Commercial	B: 8 L: 1, 23	App.
Township of Verona	US Home Corporation d/b/a Lennar	Residential	33 units	B: 72 L: 1	In progress. Multiple townhouses and single family homes have been built.
Township of West Orange	Harvard Development Urban Renewal Associates	Residential	228 Units	B: 9 L: 1, 7, 44, 50, 56	See Orange SP 061113
Township of West Orange	Prism Green Urban Renewal Associates	Residential	334 units	B: 66 L: 1, 5, 7	App/Rej.

Source: Planning Committee

Figure 4-18. Potential New Development in Essex County



Source: Planning Committee; Essex GIS

4.5 CRITICAL FACILITIES

Critical facilities include essential facilities, transportation systems, lifeline utility systems, high potential loss facilities, and hazardous materials facilities. Essential facilities include police, fire, EMS, EOCs, schools, shelters, senior facilities and medical facilities. Transportation systems include roadways, bridges, airways, and waterways. Lifeline utility systems include potable water, wastewater, oil, natural gas, electric power facilities, and emergency communication facilities.

A comprehensive inventory of critical facilities in Essex County was developed from various sources including Essex County Sheriff's Office and Essex County Office of Emergency Management. The inventory presented in this section represents the current state of this effort at the time of the publication of the HMP Update and used for the risk assessment in Section 5.

Critical facilities are those facilities considered critical to the health and welfare of the population and that are especially important following a hazard. As defined for this HMP, critical facilities include essential facilities, transportation systems, lifeline utility systems, high-potential loss facilities and hazardous material facilities.

Essential facilities are a subset of critical facilities that include those facilities that are important to ensure a full recovery following the occurrence of a hazard event. For the County risk assessment, this category was defined to include police, fire, EMS, EOCs, schools, shelters, senior facilities and medical facilities.

Emergency Facilities are for the purposes of this Plan, emergency facilities include police, fire, emergency medical services (EMS) and emergency operations centers (EOC).

The inventory of critical facilities identified for the HMP is considered sensitive information. It is protected by the Protected Critical Infrastructure Information (PCII) program and under New Jersey Executive Order 21. Therefore individual facility names and addresses are not provided in this HMP. A summary of the facility types used for the risk assessment are presented further in this section.

4.5.1 Essential Facilities

This section provides information on emergency facilities, hospital and medical facilities, schools, shelters and senior care and living facilities.

Emergency Facilities

The infrastructure of Essex County is a highly developed network of civil services, healthcare, utility, education, and transportation facilities. All services are interconnected through the Essex County Office of Emergency Management (OEM). The OEM maintains a list of each service. In the case of an emergency, the OEM can coordinate response activities with each service relative to the emergency issue.

For the purposes of this Plan, emergency facilities include police, fire, emergency medical services (EMS) and emergency operations centers (EOC). Figure 4-18 illustrates the inventory of these emergency facilities in Essex County.

Every municipality maintains its own police department, fire department and emergency operations center (EOC). The one exception is Glen Ridge whose fire services are provided through Montclair's Fire Department. In addition, municipalities offer their services to neighboring comminutes in times of emergency. There are 15 major medical and hospital centers located within the County.

Correctional Facilities

The mission of the Essex County Department of Corrections is to ensure that all persons committed to the County correctional institutions are confined with the level of custody necessary to protect the public and that they are

provided with the care, discipline, training, and treatment needed to prepare them for reintegration into the community. Essex County maintains one prison facility located in the City of Newark.

Schools

Essex County has a rich diversity of people served by close to 400 schools. Schools can function as shelters in times of needs and are important resources for the community.

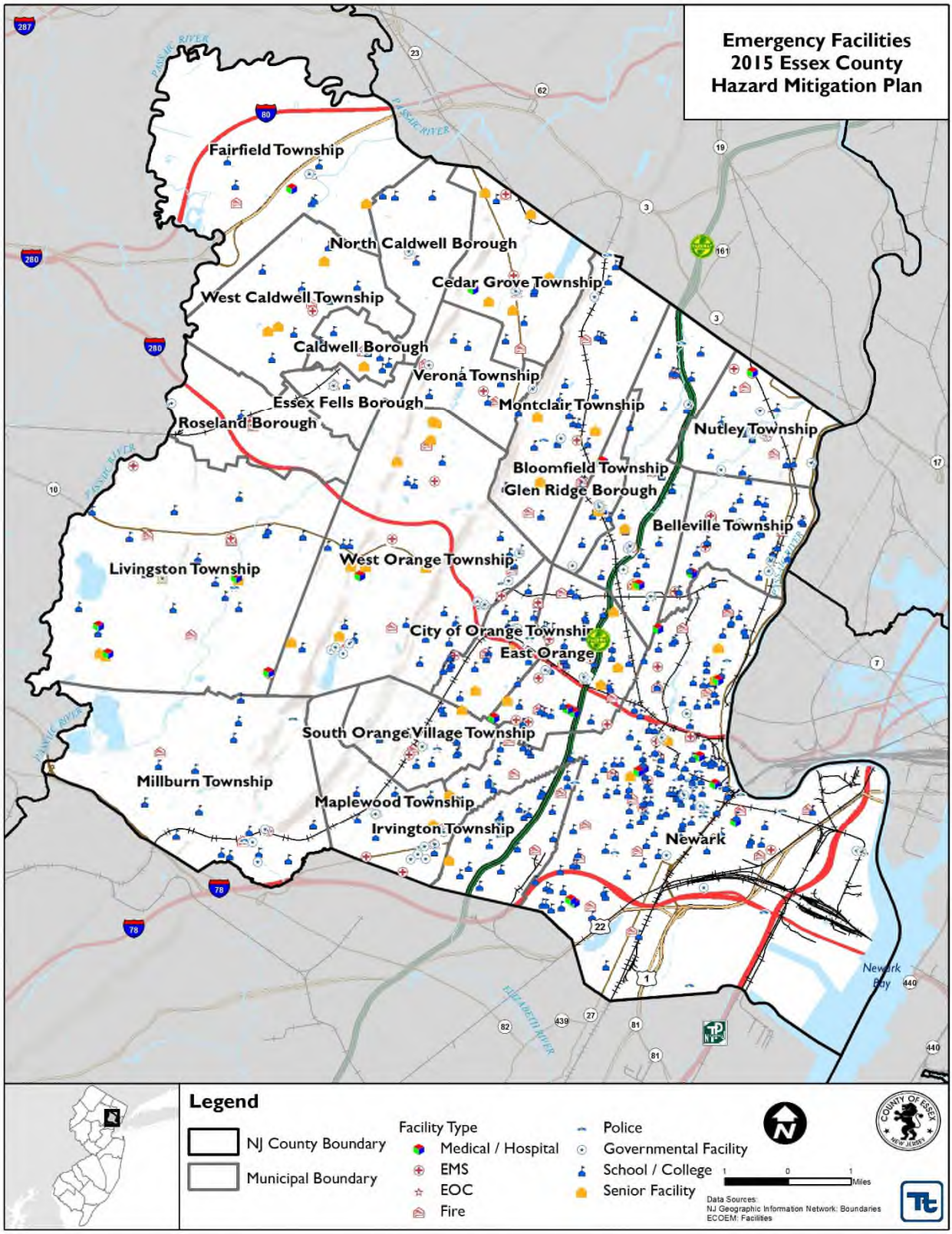
Senior Facilities

It is important to identify and account for senior facilities, as they are highly vulnerable to the potential impacts of disasters. Understanding the location and numbers of these types of facilities can help manage an effective response plan post disaster.

Government Buildings

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. These facilities are included in the risk assessment.

Figure 4-19. Emergency Facilities in Essex County



Source: ECOEM

4.5.2 Transportation Systems

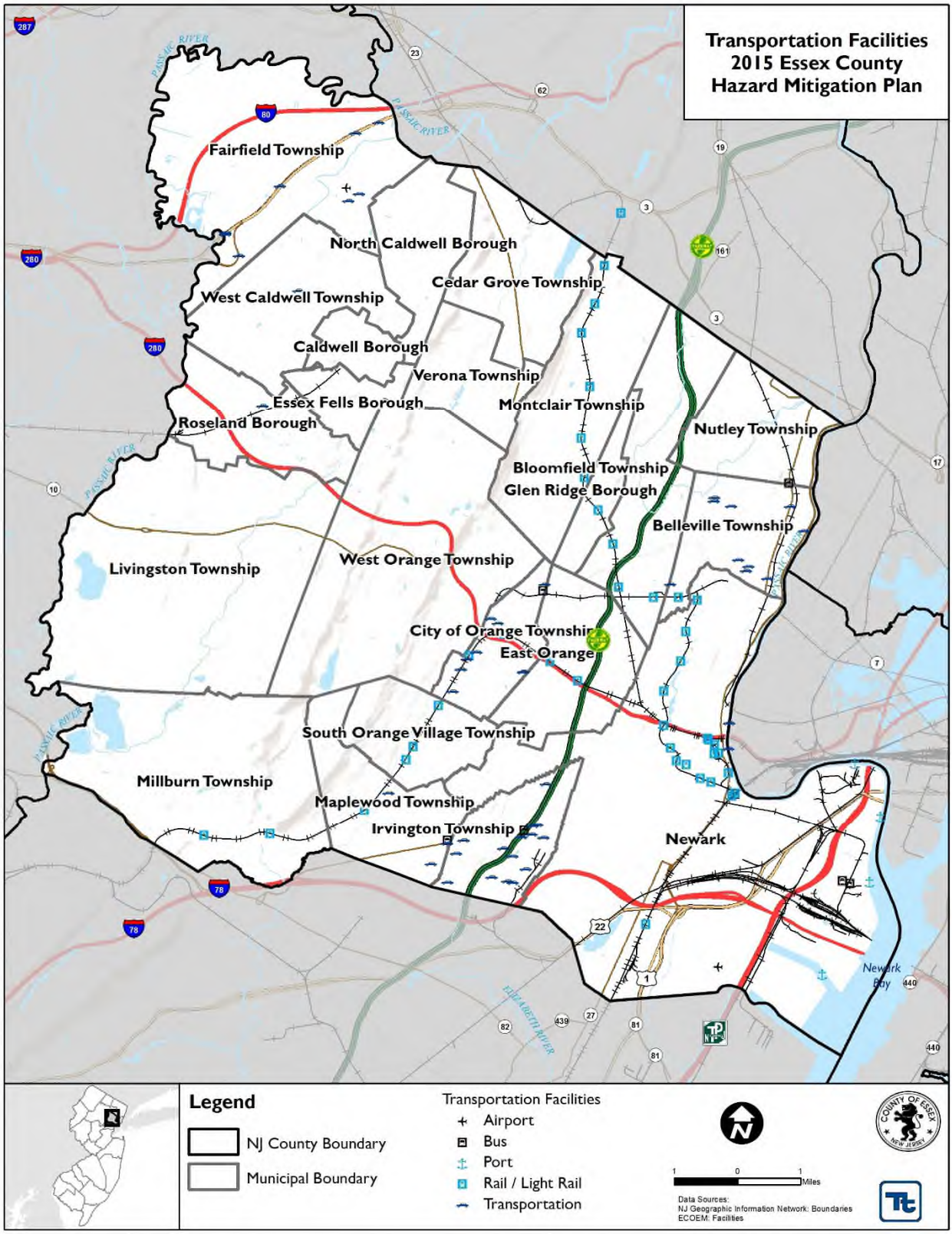
Essex County transportation system is a network of roadways, highways, airports, rail lines and waterways that provide for the movement of goods and people on an enormous scale. Port Newark is equally important to the transfer of goods, shipping, and receiving due to its convenient and accessible location on the Newark Bay in Newark. Truck and rail are also major components for the shipment of materials as well as the transportation of person to and from the County. This section presents available inventory data for roadways, airports, railways and other transportation systems in Essex County.

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. 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 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. In addition to these major roadways, numerous state routes and county routes are present throughout the County. The area maintains two commercial airports: Newark Liberty International Airport in Newark and Essex County Airport in Fairfield.

Essex County has an extensive transportation network that includes numerous rail and fixed route bus services. A majority of fixed route service in Essex County is provided by New Jersey Transit, with 46 bus and light rail routes and two commuter rail lines (Essex County Coordinated Transportation Plan, 2008). New Jersey Transit operates commuter rail, light rail, and bus service in Essex County. Commuter rail service is provided on the Morris and Essex and Boonton Rail Lines. Morris and Essex service operates to Hoboken Terminal and New York Penn Stations. Rail service is also provided to Hoboken on the Boonton Line. New Jersey Transit also provided service on 46 bus routes and one light rail route in Essex County (Essex County Coordinated Transportation Plan, 2008).

Figure 4-20 illustrates the regional transportation lifelines serving the County. The transportation inventory included as part of this HMP includes airports, major bus stations, ports, rail and light rail stations, and bridges.

Figure 4-20. Transportation Facilities in Essex County



Source: ECOEM

4.5.3 Lifeline Utility Systems

This section presents communication, potable water, wastewater, and energy resource utility system data. Due to heightened security concerns, local utility lifeline data sufficient to complete the analysis have only partially been obtained.

Communication

Essex County has a network of radio and cell towers that are considered essential. These locations are included in the inventory and risk assessment.

Potable Water

In Essex County, water is supplied by 21 sources. The community water systems of the County utilize water from four different sources: wells within the individual system; surface water intakes such as reservoirs; surface water purchased from an outside location; or groundwater purchased from an outside location (Essex County Environmental Resource Inventory, 2007).

Wastewater Facilities

Wastewater treatment facilities and wastewater pump stations in the County were identified and included in the risk assessment.

Energy Resources

JCP&L and PSE&G are the primary electric and gas utility companies in Essex County. There are oil (Sun Pipe Line Company and Tidewater Oil), natural gas (Algonquin Gas Transmission Company and Texas Eastern Transmission Company), electric and communication (AT&T, Verizon, and Embarq) lines that run throughout the County.

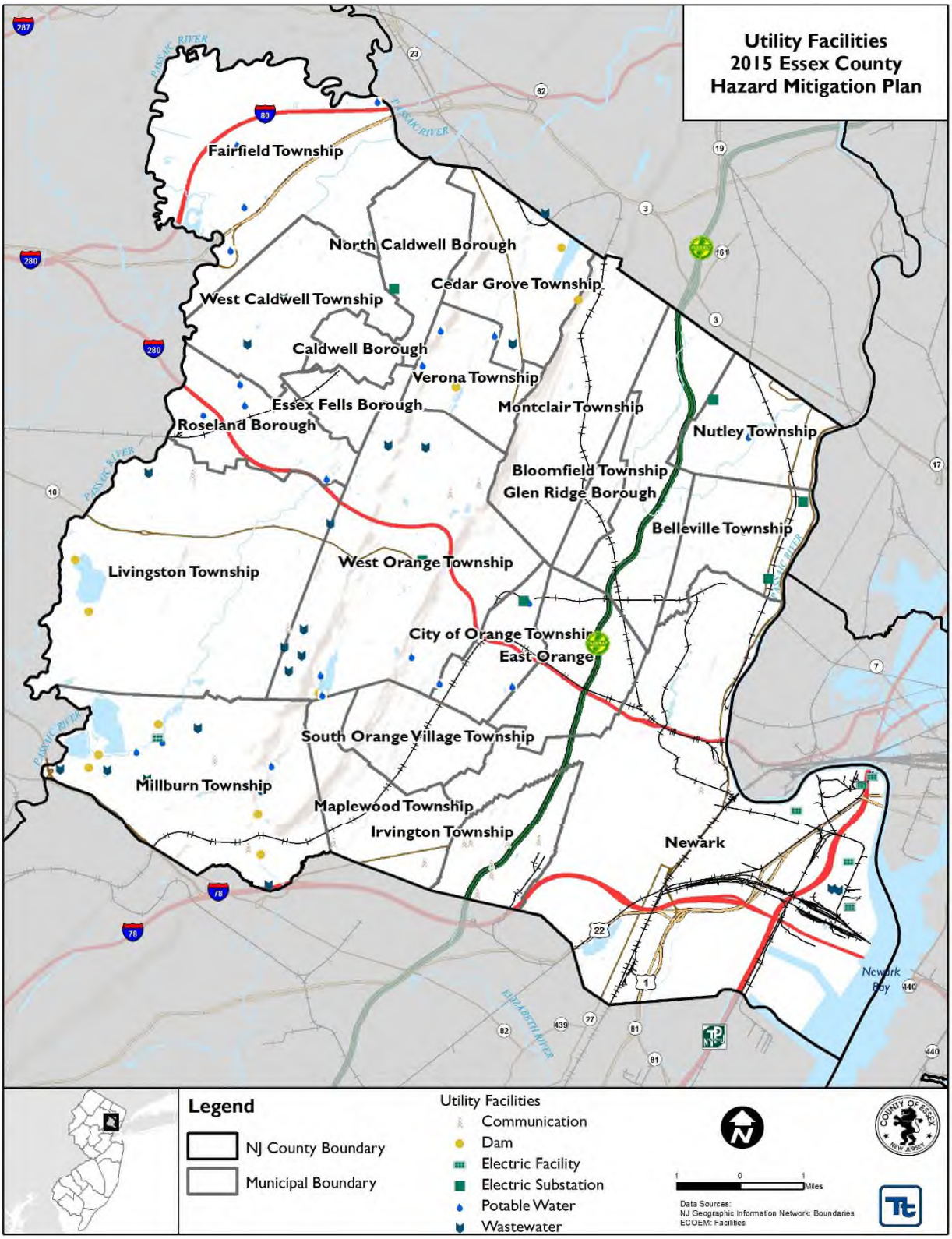
A number of utility providers supply various services throughout the County as noted in Figure 4-21. Figure 4-22 shows the distribution of the utility lifelines within the County.

Figure 4-21. Utility Service Providers in Essex County

Utility Company	Service
Passaic Valley Sewer Commission	Sewer and Water
New Jersey American Water	Water
Essex County Improvement Authority	Airport
NJ Transit	Train, Bus, Light Rail, Subway
Port Authority of NY and NJ	Airport, Bus, Train, PATH, Tunnels, Bridges
Public Service Electric and Gas	Natural Gas, Electricity
Constellation New Energy, INC	Natural Gas, Electricity
Jersey Central Power and Light	Electricity
Direct Energy Services, LLC	Electricity
Comcast	Cable Television, Internet, Telephone
Cablevision	Cable Television, Internet, Telephone
Verizon	Communications
AT&T	Communications
Sprint	Communications
IDT	Communications

Source: ECOEM

Figure 4-22. Utility Lifelines in Essex County



Source: ECOEM

4.5.4 High-Potential Loss Facilities

High-potential loss facilities include dams, levees, chemical storage facilities and military installations. Figure 4-18 displays the general locations of these facilities in the County. Dams are discussed further below.

Dams and Levees

According to the New Jersey Department of Environmental Protection (NJDEP), there are four hazard classifications of dams in New Jersey. The classifications relate to the potential for property damage and/or loss of life should the dam fail:

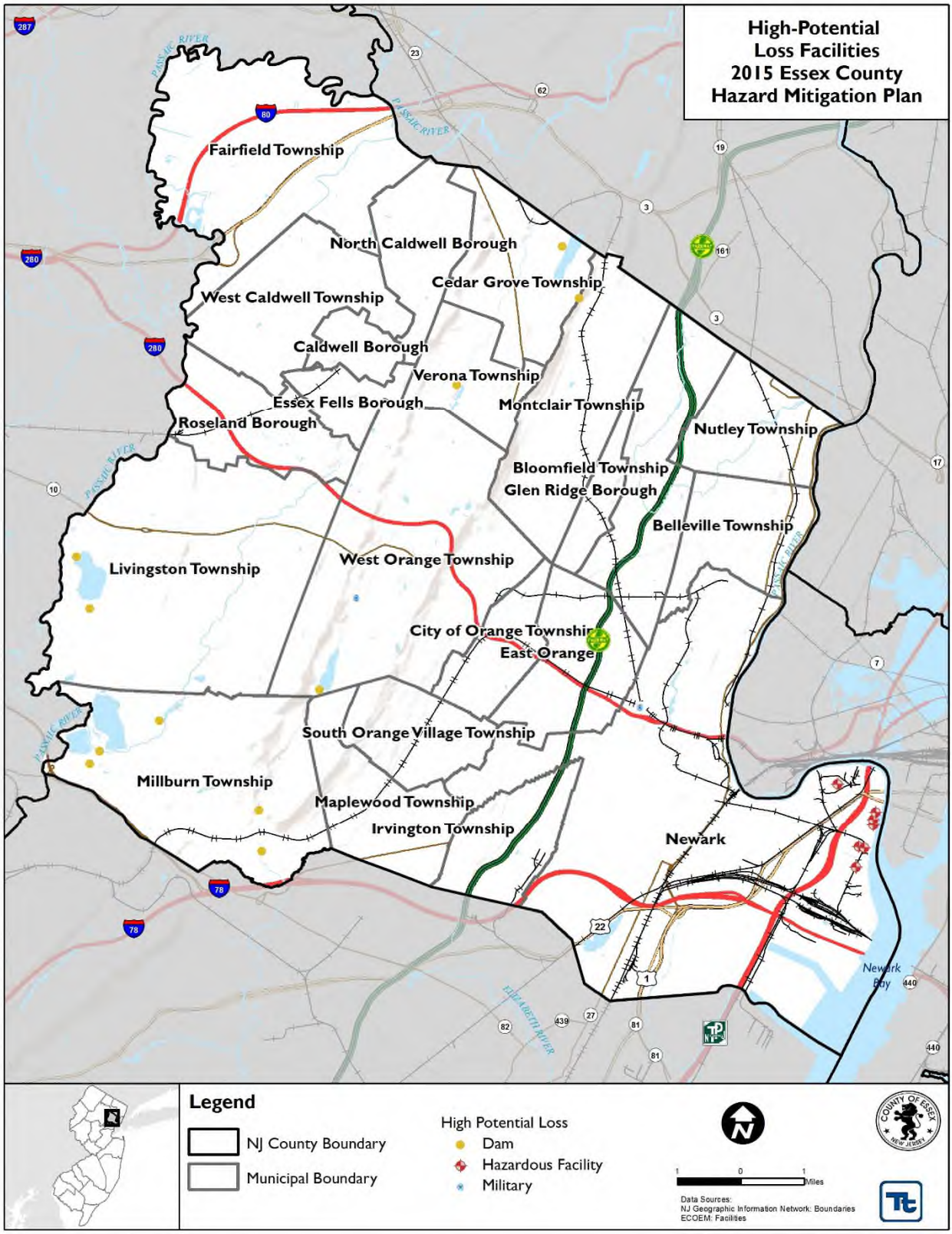
- Class I (High-Hazard Potential) - Failure of the dam may result in probable loss of life and/or extensive property damage
- Class II (Significant-Hazard Potential) - Failure of the dam may result in significant property damage; however loss of life is not envisioned.
- Class III (Low-Hazard Potential)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

According to the NJDEP Bureau of Dam Safety, there are 33 dams located in Essex County, eight (8) of which are classified with a high-hazard potential.

4.5.5 Other Facilities

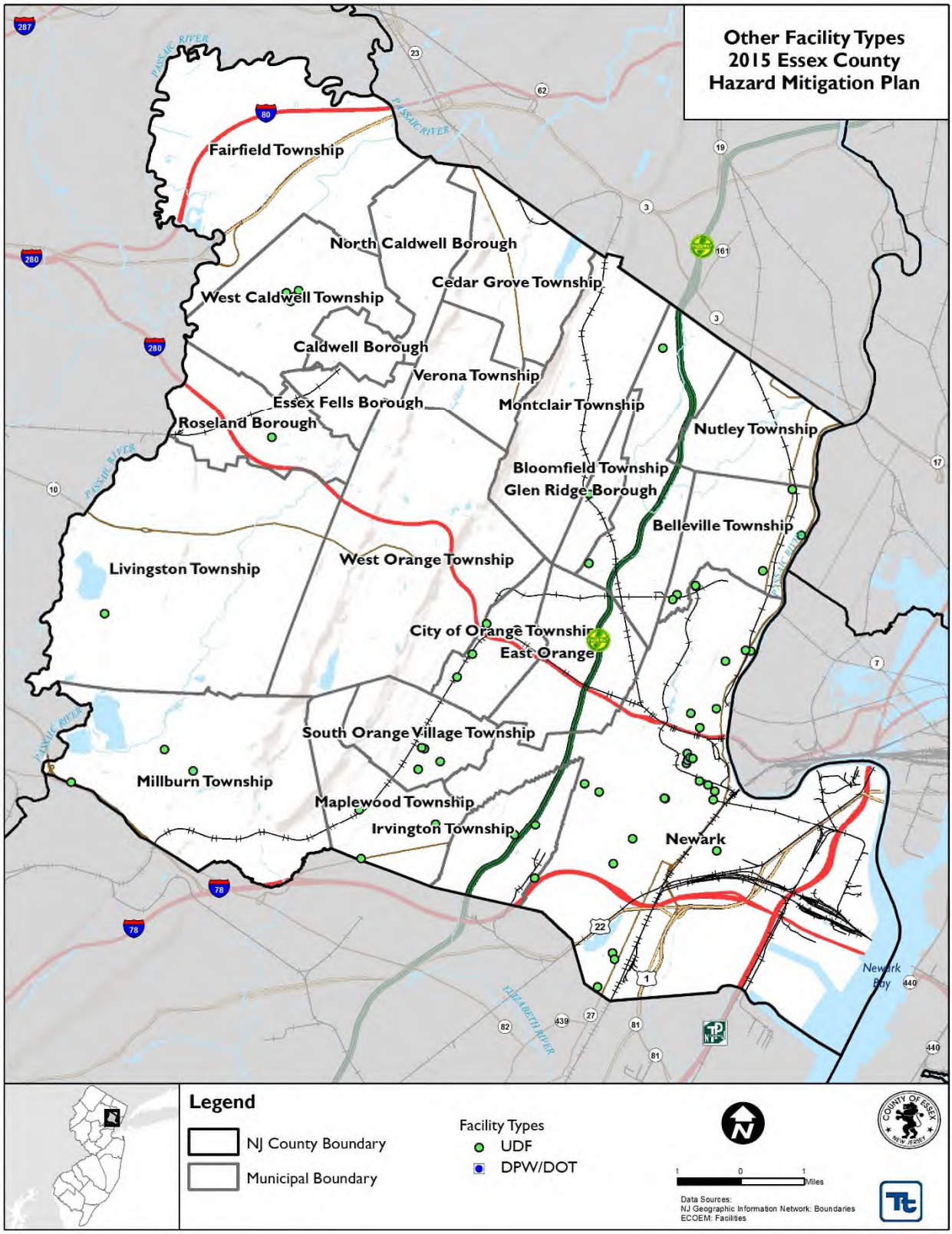
The Planning Committee identified additional facilities (user-defined facilities) as critical. These facilities include but are not limited to additional municipal and county-owned facilities and essential commercial and retail locations. Figure 4-23 illustrates the general locations of these facilities in the County.

Figure 4-23. High-Potential Loss Facilities in Essex County



Source: ECOEM

Figure 4-24. Other Facilities in Essex County



Source: ECOEM

5.1 METHODOLOGY AND TOOLS

2015 Plan Update Changes

- This is a new subsection to Essex County's HMP. This subsection describes the methodology and tools used to support the risk assessment process.

5.1.1 Methodology

The risk assessment process used for this Plan is consistent with the process and steps presented in FEMA 386-2, State and Local Mitigation Planning How-to-Guide, Understanding Your Risks – Identifying Hazards and Estimating Losses (FEMA, 2001). This process identifies and profiles the hazards of concern and assesses the vulnerability of assets (population, structures, critical facilities and the economy) at risk in the community. A risk assessment provides a foundation for the community's decision makers to evaluate mitigation measures that can help reduce the impacts of a hazard when one occurs (Section 9 of this plan).

Step 1: The first step of the risk assessment process is to identify the hazards of concern. FEMA's current regulations only require an evaluation of natural hazards. Natural hazards are natural events that threaten lives, property, and many other assets. Often, natural hazards can be predicted, where they tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area.

Step 2: The next step of the risk assessment is to prepare a profile for each hazard of concern. These profiles assist communities in evaluating and comparing the hazards that can impact their area. Each type of hazard has unique characteristics that vary from event to event. That is, the impacts associated with a specific hazard can vary depending on the magnitude and location of each event (a hazard event is a specific, uninterrupted occurrence of a particular type of hazard). Further, the probability of occurrence of a hazard in a given location impacts the priority assigned to that hazard. Finally, each hazard will impact different communities in different ways, based on geography, local development, population distribution, age of buildings, and mitigation measures already implemented.

Steps 3 and 4: To understand risk, a community must evaluate what assets it possesses and which assets are exposed or vulnerable to the identified hazards of concern. Hazard profile information combined with data regarding population, demographics, general building stock, and critical facilities at risk, located in Section 4, prepares the community to develop risk scenarios and estimate potential damages and losses for each hazard.

5.1.2 Tools

To address the requirements of DMA 2000 and better understand potential vulnerability and losses associated with hazards of concern, Essex County used standardized tools, combined with local, state, and federal data and expertise to conduct the risk assessment. Our standardized tools used to support the risk assessment are described below.

Hazards U.S. – Multi-Hazard (HAZUS-MH)

In 1997, FEMA developed a standardized model for estimating losses caused by earthquakes, known as Hazards U.S. or HAZUS. HAZUS was developed in response to the need for more effective national-, state-, and community-level planning and the need to identify areas that face the highest risk and potential for loss. HAZUS was expanded into a multi-hazard methodology, HAZUS-MH with new models for estimating potential losses from wind (hurricanes) and flood (riverine and coastal) hazards. HAZUS-MH is a Geographic Information System (GIS)-based software tool that applies engineering and scientific risk calculations, which

have been developed by hazard and information technology experts, to provide defensible damage and loss estimates. These methodologies are accepted by FEMA and provide a consistent framework for assessing risk across a variety of hazards. The GIS framework also supports the evaluation of hazards and assessment of inventory and loss estimates for these hazards.

HAZUS-MH uses GIS technology to produce detailed maps and analytical reports that estimate a community's direct physical damage to building stock, critical facilities, transportation systems and utility systems. To generate this information, HAZUS-MH uses default HAZUS-MH provided data for inventory, vulnerability, and hazards; this default data can be supplemented with local data to provide a more refined analysis. Damage reports can include induced damage (inundation, fire, threats posed by hazardous materials and debris) and direct economic and social losses (casualties, shelter requirements, and economic impact) depending on the hazard and available local data. HAZUS-MH's open data architecture can be used to manage community GIS data in a central location. The use of this software also promotes consistency of data output now and in the future and standardization of data collection and storage. The guidance Using HAZUS-MH for Risk Assessment: How-to Guide (FEMA 433) was used to support the application of HAZUS-MH for this risk assessment and plan. More information on HAZUS-MH is available at http://www.fema.gov/plan/prevent/HAZUS/index.shtm.

In general, probabilistic analyses were performed to develop expected/estimated distribution of losses (mean return period losses) for the flood and wind hazards. The probabilistic hazard generates estimates of damage and loss for specified return periods (e.g., 100- and 500-year). For annualized losses, HAZUS-MH version 2.1 calculates the maximum potential annual dollar loss resulting from various return periods averaged on a "per year" basis. It is the summation of all HAZUS-supplied return periods (e.g., 10, 50, 100, 200, 500) multiplied by the return period probability (as a weighted calculation). In summary, the estimated cost of a hazard each year is calculated.

Custom methodologies in HAZUS-MH version 2.1 (HAZUS-MH) were used to assess potential exposure and losses associated with hazards of concern for Essex County:

Inventory: The 2010 U.S. Census data at the Census-block level was used to estimate hazard exposure at the municipal level. The default demographic data in HAZUS-MH 2.1, based on the 2000 U.S. Census, was used to estimate potential sheltering and injuries for this analysis.

The default building inventory in HAZUS-MH was updated and replaced with a custom building inventory developed for the County. The updated building inventory was developed using structure-specific assessor data, as well as parcel information. Attributes provided in the spatial files were used to further define each structure in terms of occupancy class, construction type etc. Because square footage was not available for each structure, the improvement value was used to estimate the cost of the structure and contents were estimated based on the occupancy class (residential contents estimated as 50% of the improved value; non-residential contents estimated as 100% of the improved value).

The critical facility inventory (essential facilities, utilities, transportation features and user-defined facilities) was updated beginning with all GIS data provided by Essex County Geographic Information Systems and Essex County Office of Emergency Management. Both the critical facility and building inventories were formatted to be compatible with HAZUS-MH and its Comprehensive Data Management System (CDMS) and posted on a secure online mapping portal for review by the County. Once approved, HAZUS-MH was updated with the final inventory and used for the risk assessment.

Specific facility information is not provided in this HMP due to the sensitive nature of the critical facility inventory.

Flood: The 1- and 0.2-percent annual chance flood events were examined to evaluate the County's risk to the flood hazard. These flood events are generally those considered by planners and evaluated under federal programs such as the NFIP. The FEMA preliminary work map released in July 2013 and FEMA DFIRM from 2007, for the remainder of the County, were used to evaluate the County's exposure to this hazard.

To estimate potential losses, the Hazards U.S. Multi-Hazard (HAZUS-MH) flood model was used. Preliminary work map depth grids for the coastal areas provided by NJDEP were incorporated into HAZUS-MH. Where existing depth grids were not available, approximate depth grids were generated using the DFIRM databases for detailed study areas or HAZUS-MH for reaches without detailed studies. The digital elevation models (DEM) provided by New Jersey Office of Information Technology were used to generate the depth grids. The depth grids were integrated into HAZUS-MH and the model was run to estimate potential losses at the structure level using the County's custom structural building inventory.

The HAZUS-MH model uses 2000 U.S. Census demographic data. This data was not updated for this analysis; however, the 2010 U.S. Census data was used to estimate population exposure to provide the best available output. In addition, to estimate exposure, the DFIRM flood boundaries were used. HAZUS-MH 2.1 calculated the estimated damages to the general building stock and critical facilities based on the depth grid generated and the default HAZUS damage functions in the flood model.

Coastal Erosion: The New Jersey Administrative Code (N.J.A.C.) Coastal Zone Management Rules, amended July 15, 2013, defines erosion hazard areas as, "shoreline areas that are eroding and/or have a history of erosion causing them to be highly susceptible to further erosion, and damage from storms. Erosion hazard areas may be identified by any one of the following characteristics:

- Lack of beaches
- Lack of beaches at high tide
- Narrow beaches
- High beach mobility
- Foreshore extended under boardwalk
- Low dunes or no dunes
- Escarped foredune
- Steep beach slopes
- Cliffed bluffs as adjacent to beach
- Exposed, damaged, or breached jetties, groins, bulkheads, or seawalls
- High long-term erosion rates
- Pronounced downdrift effects of groins (jetties)" (N.J.A.C. 2013)

Further, erosion hazard areas are defined as extending inland from the edge of a stabilized upland area to the limit of the area likely to be eroded in 30 years for one- to four-unit dwelling structures, and 60 years for all other structures, including developed and undeveloped areas (N.J.A.C. 2013). The extent of an erosion hazard area may be calculated by multiplying the projected annual erosion rate at a site by 30 for the development of one- to four-unit dwelling structures, and by 60 for all other developments.

A USGS report for the National Assessment of Shoreline Change entitled *Historical Shoreline Change along the New England and Mid-Atlantic Coasts* was released in 2011. The New England and Mid-Atlantic shores were subdivided into a total of 10 analysis regions for the purpose of reporting regional trends in shoreline change rates. The average rate of long-term shoreline change for the New England and Mid-Atlantic coasts was -0.5 meters per year.

There are no NJDEP-identified shoreline types in Essex County characterized as vulnerable to erosion. However, to estimate exposure to long-term coastal erosion for purposes of this risk assessment, the entire shoreline was analyzed. To generate the extent of the estimated coastal erosion hazard area (CEHA), an erosion rate of 0.5 meters per year was multiplied by 60 to include all structure types and developed/undeveloped areas (annual erosion rate of 0.5 meters x 60 years = 30 meters or approximately 98 feet). Therefore, population, buildings, and infrastructure within 98 feet of the shoreline are identified as vulnerable to long-term coastal erosion. Please note this methodology assumes that once lost to erosion, an area of land is not subsequently restored.

Coastal Storm: A HAZUS-MH probabilistic analysis was performed to analyze the wind hazard losses for Essex County. The probabilistic hurricane hazard activates a database of thousands of potential storms that have tracks and intensities reflecting the full spectrum of Atlantic hurricanes observed since 1886 and identify those with tracks associated with the County. Annualized losses and the 100- and 500-year MRPs were examined for the storm hazard. Default demographic data in HAZUS-MH and updated building and critical facility data were used for the analysis.

The "Sea – Lake Overland Surge from Hurricanes – SLOSH Model, which represents potential flooding from worst-case combinations of hurricane direction, forward speed, landfall point, and high astronomical tide was used to estimate exposure. Please note these inundation zones do not include riverine flooding caused by hurricane surge or inland freshwater flooding. The model, developed by the National Weather Service 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 analysis for the exposure of population, general building stock, and critical facilities are cumulative in nature. For example, if a facility is located within the category 1 SLOSH zone is also located within the category 2 SLOSH zone. The assumption is that if a facility is affected by a category 1 storm it would also be affected by a category 2 or 3 storm event. For this purposes of this assessment, the population/demographic data presented include only those Census blocks whose geometric centers fall within the identified hazard areas. Therefore, the assessment is likely to underestimate the population exposed.

Earthquake: A probabilistic assessment was conducted for Essex County for the 100-, 500- and 2,500-year MRPs through a Level 2 analysis in HAZUS-MH 2.1 to analyze the earthquake hazard and provide a range of loss estimates for Essex County. The probabilistic method uses information from historic earthquakes and inferred faults, locations and magnitudes, and computes the probable ground shaking levels that may be experienced during a recurrence period by Census tract.

As noted in the HAZUS-MH Earthquake User Manual '*Uncertainties are inherent in any loss estimation methodology. They arise in part from incomplete scientific knowledge concerning earthquakes and their effects upon buildings and facilities. They also result from the approximations and simplifications that are necessary for comprehensive analyses. Incomplete or inaccurate inventories of the built environment, demographics and economic parameters add to the uncertainty. These factors can result in a range of uncertainly in loss estimates produced by the HAZUS Earthquake Model, possibly at best a factor of two or more*.' However, HAZUS' potential loss estimates are acceptable for the purposes of this HMP.

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). The 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.

When unchanged, HAZUS-MH default soil types are class "D". However, for this analysis HAZUS-MH was updated with the specific NEHRP soil types for Essex County as provided by the New Jersey Geological and Water Survey.

In addition, an exposure assessment was conducted for population and buildings on liquefaction. This assessment was conducted using the susceptibility spatial layer created based on grain-size, compaction, and degree of saturation of soils as determined from published and unpublished geologic-map and well-log data on file at the NJ Geological Survey.

Geologic Hazards: The New Jersey Geologic Survey (currently known as the New Jersey Geological and Water Survey) determined landslide susceptibility for nine counties in New Jersey (Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Essex, and Union). Based upon the analysis using NJGWS data, the areas of landslide susceptibility are specific to hilly or mountainous areas with steep slopes and erodible soils. This spatial data set was used to estimate population, building stock and critical facility exposure in Essex County.

Wildfire: The New Jersey Forest Fire Service (NJFFS) uses Wildfire Fuel Hazard data to assign wildfire fuel hazard rankings across the State. This data, developed in 2009, is based upon NJDEP's 2002 Land Use/Land Cover datasets and NJDEP's 2002 10-meter Digital Elevation Grid datasets. Figure 5.4.10-2, presented in Section 5.4.10 (Wildfire), illustrates the defined wildfire fuel hazard rankings for Essex County. For the wildfire hazard, the NJFFS Wildfire Fuel Hazard "extreme', 'very high' and 'high' areas are identified as the wildfire hazard area. The statistics in the 'moderate' to 'low' areas are also reported.

To determine vulnerability, a spatial analysis was conducted using the NJFFS Fuel Hazard Area guidelines. When the analysis determined the hazard area would impact the area in a jurisdiction, or the location of critical facilities, these locations were deemed vulnerable to the hazard. The limitations of this analysis are recognized, and as such the analysis is only used to provide a general estimate.

Other Hazards: HAZUS-MH support was used to evaluate other hazards, as feasible. For many of the hazards evaluated in this risk assessment, historic data are not adequate to model future losses at this time. However, HAZUS-MH can map hazard areas and calculate exposures if geographic information on the locations of the hazards and inventory data are available. For some of the other hazards of concern, areas and inventory susceptible to specific hazards were mapped and exposure was evaluated to help guide mitigation efforts discussed in Section 9. For other hazards, a qualitative analysis was conducted using the best available data and professional judgment.

For this risk assessment, the 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 Essex County and the amount of advance notice residents have to prepare for a specific hazard event

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 assist in developing refined estimates of vulnerabilities to natural hazards.

5.2 IDENTIFICATION OF HAZARDS OF CONCERN

2015 Plan Update Changes

- The 2008 HMP 'Hazard Identification' was presented in subsection 5.1. For the 2015 HMP update, it is presented in subsection 5.2 (Identification of Hazards of Concern).
- The Steering Committee chose to group some natural hazards together based on the similarity of hazard events, their typical occurrence or impacts, and consideration of hazard grouping in the 2014 State of New Jersey HMP.
- During the 2015 HMP update, sea level rise was added to the list of hazards of concern for Essex County.

Hazards of Concern are defined as those hazards that are considered most likely to impact a community. These are identified using available data and local knowledge.

To provide a strong foundation for mitigation strategies considered in Section 6, Essex County considered a full range of natural hazards that could impact the area, and then identified and ranked those hazards that presented the greatest concern. The natural hazard of concern identification process incorporated input from the County and participating jurisdictions; review of the State of New Jersey Hazard Mitigation Plan (NJ HMP) and previous hazard identification efforts; research and local, state, and federal information on the frequency, magnitude, and costs associated with the various hazards that have previously, or could feasibly, impact the region; and qualitative or anecdotal information regarding natural hazards and the perceived vulnerability of the study area's assets to them. Table 5.2-1 documents the process of identifying the natural hazards of concern for further profiling and evaluation.

For the purposes of this planning effort, the Steering Committee chose to group some natural hazards together, based on the similarity of hazard events, their typical concurrence or their impacts, consideration of how hazards have been grouped in Federal Emergency Management Agency (FEMA) guidance documents (FEMA 386-1, "Understanding Your Risks, Identifying Hazards and Estimating Losses; FEMA's "Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy"), and consideration of hazard grouping in the NJ HMP.

The "Flood" hazard includes riverine (inland) flooding and dam flooding. Other types of flooding that can occur in the County include coastal and storm surge, which is further discussed in in Section 5.4.2 (Coastal Storm). Inclusion of the various forms of flooding under a general "Flood" hazard is consistent with that used in FEMA's "Multi-Hazard Identification and Risk Assessment" guidance.

Tropical cyclones (hurricanes, tropical storms and tropical depressions) and extra-tropical cyclones (Nor'Easters) shall be grouped under the "Coastal Storm" hazard. Due to the great amount of post-Katrina and post-Sandy media attention on the exposure and risk of coastal areas in New Jersey to hurricanes, the planning committee felt that having hurricanes identified separately from extra-tropical storms and other Severe Weather events was prudent.

The "Severe Weather" hazard includes windstorms that often entail a variety of other influencing weather conditions including thunderstorms, hail, lightning, and tornadoes. Tropical and extra-tropical cyclones, sometimes grouped together under a coastal storms hazard (FEMA 386-2), are being grouped in separate hazard categories as explained above.

The "Severe Winter Weather" hazard includes heavy snowfall, blizzards, freezing rain/sleet, and ice storms. This grouping is consistent with that used in the NJ HMP.

Please note that technological [e.g. hazardous material incidents] and man-made hazards (e.g. terrorism) are being addressed in this planning process. However, the DMA 2000 regulations do not require consideration of such hazards. The County, Steering and Planning Committees chose to include these hazards in the 2015 Plan Update.

Table 5.2-1. Identification of Natural Hazards of Concern for Essex County

Hazard	Is this a hazard that may occur in Essex County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
Avalanche	No	No	• The NJ HMP does not identify avalanche as a hazard of concern for New Jersey. • The topography and climate of Essex County does not support the occurrence of an avalanche event. • New Jersey in general has a very low occurrence of avalanche events based on statistics provided by the American Avalanche Association (AAA) between 1950 and 2014.	• NJ HMP • Review of NAC-AAA database between 1998 and 2014. • Steering and Planning Committee Input
Coastal Erosion	Yes	Yes	• The NJ HMP identifies coastal erosion as a hazard of concern for New Jersey. Counties bounded by coastal waters are most affected by coastal erosion. A small portion of Essex County (City of Newark only) is bounded by coastal waters; therefore, coastal erosion was identified as a hazard of concern by the county. • The eastern border of Essex County is located in the Coastal Erosion Hazard Area (CEHA); therefore, these areas are vulnerable to erosion. • As for sea level rise, between 16,104 and 24,007 Essex County residents are potentially vulnerable to sea level rise by the year 2050.	• NJ HMP • NOAA • Steering and Planning Committee Input

Coastal Storm	Yes	Yes	• The NJHMP identifies coastal storms as a hazard of concern for New Jersey.
			• The southeastern portion of the County is bounded by coastal waters. Due to its close proximity to the Atlantic Ocean, Essex County is susceptible to hurricanes, tropical storms, and Nor'Easters.
			• Since 2007, Essex County has been included in three FEMA declarations related to coastal storms:
			  ○ April 15-17, 2007 – FEMA-DR-1694 – Severe Weather and Inland and Coastal Flooding
			  ○ August 26-September 5, 2011 – FEMA-DR-4021 – Hurricane Irene
			  ○ October 26-November 8, 2012 – FEMA-DR-4048 – Hurricane Sandy
			• Between 1842 and 2012, 32 tropical cyclones tracked within 65 nautical miles of Essex County, with only two of those occurring between 2008 and 2012.
				• NJHMP
				• FEMA
				• NOAA
				• NOAA-NCDC Storm Database
				• Steering and Planning Committee Input

Drought	Yes	Yes	• The NJ HMP identifies drought as a hazard of concern for New Jersey. • According to the NJHMP, counties most often affected by a drought are densely populated areas that rely on above-ground reservoirs for water supplies. Essex County fits into this description. The drought hazard is a concern for Essex County because the County's water is supplied by both surface water and groundwater. Surface water supplies are affected more quickly during droughts than groundwater sources. • Since 2007, the County has been impacted by one drought:	• NJ HMP • USGS • NRCC • NOAA • NOAA-NCDC Storm Database • Steering and Planning Committee Input

Hazard	Is this a hazard that may occur in Essex County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
			○ 2010 • Essex County is located in the Northern Climate Division. According to the NRCC, this climate division has been impacted by the following periods of severe and extreme drought: ○ August – September 1932 ○ November 1949 – January 1950 ○ September – November 1957 ○ August 1964 – August 1966 ○ December 1980 – January 1981 ○ March – April 1985 ○ August – September 1995 ○ July – August 1999 ○ December 2001 – May 2002 ○ July – September 2002	
Earthquake	Yes	No	• The NJ HMP identifies earthquake as a hazard of concern for New Jersey. Although they are known to occur on a regular basis, records indicate that no major earthquakes have struck the state since the establishment of historical record-keeping (1500's). Between 1783 and 2014, there have been 181 documented earthquakes in New Jersey. Three of these events have been epicentered in Essex County.	• NJ HMP • NJDEP • NJGS • Steering and Planning Committee Input
Expansive Soils	No	No	• The NJ HMP does identify expansive soils as a hazard of concern for New Jersey; however, the Planning Committee did not identify this as a hazard of concern for Essex County. • USGS indicated that less than 50% of Essex County is underlain by soils with abundant clays of slight to moderate swelling potential and there are areas in Essex County underlain by soils with little to no clays with swelling potential.	• NJ HMP • USGS 1989 Swelling Clays Map of the Conterminous U.S. • Steering and Planning Committee Input
Extreme Temperature	Yes	Yes	• The NJ HMP identifies extreme temperature as a hazard of concern for New Jersey. • On average, Essex County can have an average of 17 to 28 days each year above 90° F and an average of 34.3 days below 20° F. • The highest temperatures recorded in Essex County were collected in 2010 and 2011: ○ Caldwell/Essex County Airport – 102.9° F – July 2011 ○ Canoe Brook – 107.1° F – July 2010 ○ Newark International Airport - 108° F - July 2011 • The NOAA-NCDC storm event database indicated that between 2007 and 2014,	• NJ HMP • NOAA – NCDC Storm Database • Utah Climate Center • ONJSC • Steering and Planning Committee Input

Hazard	Is this a hazard that may occur in Essex County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
			Essex County had six reported extreme temperature events; all of which were identified as excessive heat events.	

Flood (Riverine and Dam Flooding)	Yes	Yes	• NJHMP identifies flooding as a hazard of concern in New Jersey. However, ice jams were not identified as a hazard of concern in Essex County due to the face that they have not occurred and/or impacted the County.
			• The northwestern and southeastern corners of Essex County are located in the 1% annual chance flood zone. There are 30,213 people in Essex County living in the 1% annual chance flood zone and 50,396 living in the 0.2% annual chance flood zone. Over 16,000 acres of the County is located in the 1% annual chance flood zone and over 21,000 acres in the 0.2% zone.
			• The County has 4,419 NFIP policies with total loss payments equaling over $107 million.
			• Areas around the Passaic, Peckman, Second, and Third Rivers are subject to flooding.
			• Essex County has a total of 33 dams; eight of which are identified as high hazard.
			• Between 2007 and 2014, Essex County was included in four FEMA declarations related to flooding:
			  ○ April 15-17, 2007 – FEMA-DR-1694 – Severe Weather and Inland and Coastal Flooding
			  ○ March 12-April 15, 2010 – FEMA-DR-1897 - Severe Weathers and Flooding
			  ○ August 26-September 5, 2011 – FEMA-DR-4021 – Hurricane Irene
			  ○ October 26-November 8, 2012 – FEMA-DR-4048 – Hurricane Sandy
			• According to NOAA NCDC storm database, Essex County had 39 flood events reported between 2007 and 2014.
				• NJ HMP
				• FEMA
				• FEMA FIS
				• NFIP
				• NOAA-NCDC Storm Database
				• Steering and Planning Committee Input

Geological Hazards	Yes	Yes	• The NJHMP identifies geological hazards as a hazard of concern for New Jersey. • For the 2015 Plan Update, the Planning Committee identified landslides and land subsidence as hazards of concern for Essex County. • Essex County contains a number of steep slope areas, particularly along the Watchung Ridges in central Essex County. • A majority of the County does not have landslide susceptibility. There are small areas in the central portion of the County that are susceptible to landslide events (Class AI, AII, AIV, AVI, BIII, and BIV). Townships of Fairfield and Millburn have the largest areas landslide susceptible areas. Overall, approximately 130 square miles of Essex County is susceptible to landslides, with 0.42 square miles in Class A and 0.94 square miles in Class B. • Between 2007 and 2014, there have been eight identified geological hazard events in Essex County.	• NJHMP • NJGWS • NJDEP • Steering and Planning Committee Input

Hazard	Is this a hazard that may occur in Essex County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
Hailstorm	Yes	Yes	Please see Severe Weather	
Hurricane (and other Tropical Cyclones)	Yes	Yes	Please see Coastal Storm	
Ice Storm	Yes	Yes	Please see Severe Winter Weather	
Infestation (Disease Outbreak)	Yes	Yes	• The NJ HMP does identify infestation as a hazard of concern for New Jersey. • The Planning Committee considers infestation as a hazard of concern for Essex County due to its high population density and close proximity to urban areas. The County has a high risk to lyme disease, caused by infected ticks. Essex County has also had history of known human cases of West Nile Virus. • In 2009, Essex County was impacted by H1N1, which killed one person in the County. • Although some infestations of ticks, mosquitoes, and/or other types of pest may be present, no sources indicate that this is a major hazard of concern for the county.	• NJ HMP • USGS • NJDOH • Steering and Planning Committee Input
Land Subsidence	Yes	No	Please see Geological Hazards	
Landslide	Yes	No	Please see Geological Hazards	
Nor'Easters	Yes	Yes	Please see Coastal Storms	

Severe Weather (Windstorms, Thunderstorms, Hail, Lightning, and Tornados)	Yes	Yes	• NJ HMP identifies thunderstorms, lightning, tornadoes, hurricanes and extreme winds as hazards of concern for New Jersey.
			• According to FEMA, between 2007 and 2014, Essex County was included in four declarations associated with Severe Weather events.
			  ○ April 15-17, 2007 – FEMA-DR-1694 – Severe Weather and Inland and Coastal Flooding
			  ○ March 12 – April 15, 2010 – FEMA-DR-1897 – Severe Weathers and Flooding
			  ○ October 29, 2011 – FEMA-DR-4048 – Severe Weather
			  ○ October 26 – November 8, 2012 – FEMA-DR-4048 – Hurricane Sandy
			• NOAA's NCDC storm events database indicates that Essex County was impacted by approximately 58 Severe Weather events between 2008 and 2014 causing a total of three injuries, one fatality, and approximately $2.4 million in property damages.
			• New Jersey has experienced 144 tornadoes between 1950 and 2013, with two of those occurring in Essex County.
				• NJ HMP
				• NOAA – NCDC
				• FEMA
				• NJ OEM
				• SPC
				• Steering and Planning Committee Input

Severe Winter	Yes	Yes	• The NJHMP identifies Severe Winter Weather as a hazard of concern for New	• NJ HMP

Hazard	Is this a hazard that may occur in Essex County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)

Weather (Heavy Snow, Blizzards, Freezing Rain/Sleet, Ice Storms)			Jersey.
			• Normal seasonal snowfall in Essex County ranges from 25 to 28 inches.
			• According to FEMA, between 2007 and 2014, Essex County was included in two declarations associated with Severe Winter Weather events.
			  ○ December 26-27, 2010 – FEMA-DR-1954 – Severe Winter Weather and Snowstorm
			  ○ October 29, 2011 – FEMA-DR-4048 – Severe Weather
			• NOAA-NCDC has indicated that Essex County has experienced the impacts of 26 winter storm events between 2007 and 2014.
				• FEMA
				• NOAA – NCDC Storm Database
				• ONJSC
				• Steering and Planning Committee Input

Tornado	Yes	Yes	Please see Severe Weather	
Tsunami	No	No	• The NJ HMP does identify tsunami as a hazard of concern for New Jersey. • Only the City of Newark is bounded by coastal waters; therefore, tsunami is not identified as a hazard of concern by Essex County.	• NJ HMP • Steering and Planning Committee Input
Volcano	No	No	• The NJ HMP does not identify volcano as a hazard of concern for New Jersey.	• NJ HMP
Wildfire	Yes	Yes	• The NJHMP identifies as wildfire as a hazard of concern for New Jersey. • In Essex County, approximately 38 square miles of the County are located in the low to moderate NJFFS Risk Area and 2.05 square miles is located in the high to extreme risk area. The northwestern corner of the County has the highest risk. • Between 2007 and 2014, there have no reports of wildfires in Essex County. However, based on input from the Planning Committee, wildfire is considered a hazard of concern for Essex County. • Approximately 8% of the County's population is exposed to a moderate/low risk area and 0.2% of the population is exposed to an extreme/very high/high risk area.	• NOAA – NCDC Storm Events Query • USGS • NJ HMP • NJFFS • Steering and Planning Committee Input
Windstorm	Yes	Yes	Please see Severe Weather	

DIR	*Drought Impact Reporter*
DR	*Presidential Disaster Declaration Number*
EM	*Presidential Disaster Emergency Number*
FEMA	*Federal Emergency Management Agency*
HMP	*Hazard Mitigation Plan*
K	*Thousands ($)*
M	*Millions ($)*
NCDC	*National Oceanic and Atmospheric Administration National Climatic Data Center*
NJ	*New Jersey*
NJDEP	*New Jersey Department of Environmental Protection*
NJDOH	*New Jersey Department of Health*
NJFFS	*New Jersey Forest Fire Service*
NJGS	*New Jersey Geological Survey (as part of the NJDEP)*
NOAA	*National Oceanic and Atmospheric Administration*
NRCC	*Northeast Regional Climate Center*
NWS	*National Weather Service*
OEM	*Office of Emergency Management*
ONJSC	*Office of New Jersey State Climatologist*
SPC	*Storm Prediction Center*
USGS	*U.S. Geologic Survey*

Table 5.2-2. Identification of Non-Natural Hazards of Concern for Essex County

Hazard	Is this a hazard that may occur in Essex County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
Civil Disorder	Yes	Yes	• The NJ HMP identifies civil disorder as a hazard of concern for New Jersey. • Any areas of Essex County can experience a civil disorder; however, government facilities, landmarks, prisons, and universities are common locations for civil disorders. • Between 2007 and 2014, Essex County had four civil disorder events: ○ March 7, 2010 – Protest ○ July 20, 2013 – Protest/Rally ○ April 3, 2014 – Walkout/Protest ○ April 30, 2014 – Protest • The Planning Committee identified civil disorder as a hazard of concern for Essex County due to its vulnerability and impact on the County and the previous occurrences.	• NJ HMP • NJ.com • Steering and Planning Committee Input
Cyber Attack	Yes	Yes	• The NJ HMP identifies cyber attack as a hazard of concern for New Jersey. • Although there are have been no major direct attacks impacted Essex County, the Planning Committee identified cyber as a hazard of concern for Essex County due to its vulnerability and impact on the County and the previous occurrences. • New Jersey is a vulnerable target to cyber attacks due to its location, critical information infrastructures, and home to many Fortune 500 companies. In Essex County, there are several Fortune 500 companies. Any disruption to these businesses could have an impact on the County and State's economy.	• NJ HMP • Choose NJ • Steering and Planning Committee Input
Hazardous Substances	Yes	Yes	• The NJ HMP identifies hazardous substances as a hazard of concern for New Jersey. • Essex County contains numerous roadways, railways, and ports that transport hazardous substances. Between 2007 and 2014, there have been 255 hazardous material incidents in the County (121 air; 127 highway; and 5 rail). Between 2007 and 2012, the County had a total of over 470,000 gallons of chemical released on-site and over 1.3 million gallons released off-site. Other incidents in the County include fuel oil spills and chemical explosions. • The Planning Committee identified hazardous substances as a hazard of concern for Essex County due to its extensive transportation network and vulnerability.	• NJ HMP • NJ.com • USEPA • PHMSA • Steering and Planning Committee Input
Power Outages	Yes	Yes	• The NJ HMP identifies power outages as a hazard of concern for New Jersey. • Between 2007 and 2014, there have been numerous weather events that have caused extensive power outages in Essex County. ○ March-April 2010 – Severe Weathers and Flooding ○ August 2011 – Hurricane Irene – Residents without power for several days	• NJHMP • NJ.com • NOAA • Steering and Planning Committee Input

Hazard	Is this a hazard that may occur in Essex County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
			○ October 2011 – Severe Weather ○ October-November 2012 – Hurricane Sandy – 2.5 million people in State without power, including residents of Essex County ○ October 2013 – Strong Storms – over 4,000 customers without power in Bergen and Essex Counties ○ January 2014 – Power Outage – 15,000 customers without power in Newark, Irvington, and Maplewood due to an issue with a substation. • The Planning Committee identified hazardous substances as a hazard of concern for Essex County due to its population and vulnerability.	
Terrorism	Yes	Yes	• The NJ HMP identifies terrorism as a hazard of concern for New Jersey. • Between 2007 and 2014, there have been no terrorism events in Essex County; however, there have been several in the vicinity of the County. • Due to the County's close proximity to New York City, its population and vulnerability, the Planning Committee identified terrorism as a hazard of concern for Essex County.	• NJHMP • Input from Steering and Planning Committee
Transportation Failure	Yes	Yes	• The NJ HMP identifies transportation failure as a hazard of concern for New Jersey. • Essex County is located adjacent to New York City and along the major transportation routes connecting the New York and Philadelphia metropolitan areas. Port Newark is also located within the County. Traffic flow through the County is critical to economic prosperity in the entire region. • Between 2007 and 2014, there have been numerous transportation failure incidents in the County, including vehicular accidents, railroad/highway collisions, and aviation accidents. • The Planning Committee identified transportation failure as a hazard of concern for Essex County due to its extensive transportation network and vulnerability.	• NJHMP • NJDOT • Federal Railroad Administration • NTSB • Input from Steering and Planning Committee

DR	*Presidential Disaster Declaration Number*
EM	*Presidential Disaster Emergency Number*
FEMA	*Federal Emergency Management Agency*
HMP	*Hazard Mitigation Plan*
K	*Thousands ($)*
M	*Millions ($)*
NJ	*New Jersey*
NJDOT	*New Jersey Department of Transportation*
NOAA	*National Oceanic and Atmospheric Administration*
NTSB	*National Transportation Safety Board*
OEM	*Office of Emergency Management*

According to input from the County, and review of all available resources, a total of 10 natural hazards and seven human-caused hazards of concern were identified as significant hazards affecting the entire planning area, to be addressed at the county level in this plan:

Natural Hazards of Concern

- Coastal Erosion and Sea Level Rise
- Coastal Storm (including Nor'Easter, Hurricane, Tropical Storm, Storm Surge)
- Drought
- Earthquake
- Geological Hazards
- Extreme Temperatures
- Flooding (including Dam Failure)
- Severe Weather (High Winds, Tornadoes, Thunderstorms, Hail)
- Severe Winter Weather (Heavy Snow, Blizzards, Ice Storms)
- Wildfire

Human-Caused Hazards of Concern

- Civil Disorder
- Cyber Attack
- Disease Outbreak
- Hazardous Substances (Fixed Sites and Transportation)
- Power Outages
- Terrorism
- Transportation Failure (Bridge, Railway, Roadway, Aviation)

Other natural and human-caused hazards of concern have occurred within Essex County, but have a low potential to occur and/or result in significant impacts within the County. Therefore, these hazards will not be further addressed within this version of the Plan. However, if deemed necessary by the County, these hazards may be considered in future versions of the Plan.

5.3 HAZARD RANKING

After the hazards of concern were identified for Essex County, the hazards were ranked to describe their probability of occurrence and their impact on population, property (general building stock including critical facilities) and the economy. Each participating city, township, or borough may have differing degrees of risk exposure and vulnerability compared to the County as a whole; therefore each jurisdiction ranked the degree of risk to each hazard as it pertains to their community using the same methodology as applied to the County-wide ranking. This assured consistency in the overall ranking of risk process. The hazard ranking for the County and each participating district can be found in their jurisdictional annex in Volume II of this plan.

2015 Plan Update Changes

- The 2008 HMP hazard ranking was presented in Section 6. For the 2015 update, the hazard ranking is presented in subsection 5.3 (Risk Assessment – Hazard Ranking).
- The 2008 HMP hazard ranking methodology considered impact. The 2015 update hazard ranking methodology was expanded to include probability of occurrence and impact.

5.3.1 Hazard Ranking Methodology

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 and generated by FEMA's HAZUS-MH risk assessment tool.

Probability of Occurrence

The probability of occurrence is an estimate of how often a hazard event occurs. A review of historic events assists with this determination. Each hazard of concern is rated in accordance with the numerical ratings and definitions in Table 5.3-1.

Table 5.3-1. Probability of Occurrence Ranking Factors

Rating	Probability Category	Definition
1	Rare	Hazard event is not likely to occur within 100 years (>1% chance of occurrence in any given year)
2	Occasional	Hazard event is likely to occur within 100 years (1% chance of occurrence in any given year)
3	Frequent	Hazard event is likely to occur within 25 years (4% chance of occurrence in any given year)

Impact

The impact of each hazard is considered in three categories: impact on population, impact on property (general building stock including critical facilities), and impact on the economy. Based on documented historic losses and a subjective assessment by the Planning Committee, an impact rating of high, medium, or low is assigned with a corresponding numeric value for each hazard of concern. In addition, a weighting factor is assigned to each impact category: three (3) for population, two (2) for property, and one (1) for economy. This gives the impact on population the greatest weight in evaluating the impact of a hazard.

Table 5.3-2 presents the numerical rating, weighted factor and description for each impact category.

Table 5.3-2. Numerical Values and Definitions for Impacts on Population, Property and Economy

Category	Weighting Factor	Low Impact* (1)	Medium Impact (2)	High Impact (3)
Population	3	14% or less of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location	15% to 29% of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location	30% or more of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location
Property	2	Property exposure is 14% or less of the total replacement cost for your community	Property exposure is 15% to 29% of the total replacement for your community	Property exposure is 30% or more of the total replacement cost for your community
Economy	1	Loss estimate is 9% or less of the total replacement cost for your community	Loss estimate is 10% to 19% of the total replacement cost for your community	Loss estimate is 20% or more of the total replacement cost for your community

Note: A numerical value of zero is assigned if there is no impact.
**For the purposes of this exercise, "impacted" means exposed for population and property and loss for economy.*

Risk Ranking Value

The risk ranking for each hazard is then calculated by multiplying the numerical value for probability of occurrence by the sum of the numerical values for impact. The equation is as follows: Weighting Factor (1, 2, or 3) X Impact Value (6 to 18) = Hazard Ranking Value. Based on the total for each hazard, a priority ranking is assigned to each hazard of concern (high, medium, or low).

5.3.2 Hazard Ranking Results

Using the process described above, the risk ranking for the identified hazards of concern was determined for Essex County. Based on the combined risk values for probability of occurrence and impact to Essex County, a priority ranking of "high", "medium" or "low" risk was assigned. The hazard ranking for the Essex County planning area is detailed in the subsequent tables that present the step-wise process for the ranking. The county–wide risk ranking includes the entire planning area and may not reflect the highest risk indicated for any of the participating jurisdictions. The resulting ranks of each municipality indicate the differing degrees of risk exposure, and vulnerability. The results support the appropriate selection and prioritization of initiatives to reduce the highest levels of risk for each municipality. Both the County and the participating jurisdictions have applied the same methodology to develop the county-wide risk and local rankings to ensure consistency in the overall ranking of risk.

This risk ranking exercise serves two purposes: 1) to describe the probability of occurrence for each hazard, and 2) to describe the impact each would have on the people, property and economy of Essex County. Estimates of risk for Essex County were developed using methodologies promoted by FEMA's hazard mitigation planning guidance and generated by FEMA's HAZUS-MH risk assessment tool.

Table 5.3-3 shows the probability ranking assigned for likelihood of occurrence for each hazard.

Table 5.3-3. Probability of Occurrence Ranking for Hazards of Concern for Essex County

Hazard of Concern	Probability	Numeric Value
Coastal Erosion and Sea Level Rise	Occasional	2
Coastal Storm	Occasional	2
Drought	Occasional	2
Earthquake	Occasional	2
Extreme Temperature	Frequent	3
Flood	Frequent	3
Geological Hazards	Occasional	2
Severe Storm	Frequent	3
Winter Storm	Frequent	3
Wildfire	Frequent	3
Civil Disorder	Occasional	2
Cyber Attack	Occasional	2
Disease Outbreak	Frequent	3
Hazardous Substances	Frequent	3
Power Outages	Frequent	3
Terrorism	Occasional	2
Transportation Failure	Frequent	3

Table 5.3-4 shows the impact evaluation results for each hazard of concern, including impact on property, structures, and the economy on the County level. It is noted that several hazards that have a high impact on the local jurisdictional level, may have a lower impact when analyzed county-wide. Jurisdictional ranking results are presented in each local annex in Section 9 of this plan. The weighting factor results and a total impact for each hazard also are summarized.

Table 5.3-4. Impact Ranking for Hazards of Concern for Essex County

Hazard of Concern	Population			Property			Economy			Total Impact Rating (Population + Property + Economy)
	Impact	Numeric Value	Multiplied by Weighing Factor (3)	Impact	Numeric Value	Multiplied by Weighing Factor (2)	Impact	Numeric Value	Multiplied by Weighing Factor (1)	
Coastal Erosion and Sea Level Rise	Low	1	1 x 3 = 3	Low	1	1 x 2 = 2	Medium	2	2 x 1 = 2	7
Coastal Storm	Low	1	1 x 3 = 3	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	6
Drought	Medium	2	2 x 3 = 6	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	9
Earthquake	Medium	2	2 x 3 = 6	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	9
Extreme Temperature	Medium	2	2 x 3 = 6	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	9
Flood	Low	1	1 x 3 = 3	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	6
Geological Hazards	Low	1	1 x 3 = 3	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	6
Severe Storm	High	3	3 x 3 = 9	High	3	3 x 2 = 6	Low	1	1 x 1 = 1	16
Winter Storm	High	3	3 x 3 = 9	High	3	3 x 2 = 6	High	3	3 x 1 = 3	18
Wildfire	Low	1	1 x 3 = 3	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	6
Civil Disorder	High	3	3 x 3 = 9	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	12
Cyber Attack	High	3	3 x 3 = 9	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	12
Disease Outbreak	High	3	3 x 3 = 9	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	12
Hazardous Substances	High	3	3 x 3 = 9	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	12
Power Outages	High	3	3 x 3 = 9	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	12
Terrorism	High	3	3 x 3 = 9	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	12
Transportation Failure	High	3	3 x 3 = 9	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	12

Table 5.3-5 presents the total ranking value for each hazard.

Table 5.3-5. Total Risk Ranking Value for Hazards of Concern for Essex County

Hazard of Concern	Probability	Impact	Total = (Probability x Impact)
Coastal Erosion and Sea Level Rise	Occasional	7	14
Coastal Storm	Occasional	6	12
Drought	Occasional	9	18
Earthquake	Occasional	9	18
Extreme Temperature	Frequent	9	27
Flood	Frequent	6	18
Geological Hazards	Occasional	6	12
Severe Storm	Frequent	16	48
Winter Storm	Frequent	18	54
Wildfire	Frequent	6	18
Civil Disorder	Occasional	12	24
Cyber Attack	Occasional	12	24
Disease Outbreak	Frequent	12	36
Hazardous Substances	Frequent	12	36
Power Outages	Frequent	12	36
Terrorism	Occasional	12	36
Transportation Failure	Frequent	12	36

Table 5.3-6 presents the hazard ranking category by jurisdiction assigned for each hazard of concern. The ranking categories are determined by an evaluation of the total risk ranking score into three categories, low, medium, and high whereby a total score of 14 and below is categorized as low, 15 to 30 is medium, and 31 and over is considered a high risk category.

These rankings have been used as one of the bases for identifying the jurisdictional hazard mitigation strategies included in Section 9 of this plan. The summary rankings for the County reflect the results of the vulnerability analysis for each hazard of concern and vary from the specific results of each jurisdiction. For example the severe storm hazard may be ranked high in one jurisdiction, but due to the exposure and impact county-wide, it is ranked as a medium hazard and is addressed in the county mitigation strategy accordingly.

Table 5.3-6. Summary of Overall Ranking of Natural Hazards by Municipality

Municipality	Hazard Ranking																
	Coastal Erosion and Sea Level Rise	Coastal Storm	Drought	Earthquake	Extreme Temp	Flood	Geological Hazards	Severe Storm	Severe Winter Storm	Wildfire	Civil Disorder	Cyber Attack	Disease Outbreak	Haz. Substances	Power Outages	Terrorism	Trans. Failure
Belleville, Township of	Medium	Medium	Medium	Low	Medium	Medium	Low	High	High	Medium	Low	Low	Medium	Medium	Low	Low	Low
Bloomfield, Township of	Low	Low	Medium	Low	Medium	Medium	Low	High	High	Medium							
Caldwell, Borough of	Low	Low	Medium	High	Medium	Medium	Low	High	High	Medium							
Cedar Grove, Township of	Low	Low	Medium	Medium	Medium	Medium	Low	High	High	Medium							
East Orange, City of	Low	Low	Medium	Low	High	Medium	Low	High	High	Medium							
Essex Fells, Borough of	Low	Low	Medium	Low	Medium	Medium	Low	High	High	Medium							
Fairfield, Township of	Low	Low	Medium	High	Medium	High	Low	High	High	Medium							
Glen Ridge, Borough of	Low	Low	Medium	Low	Medium	Medium	Low	High	High	Medium							
Irvington, Township of	Low	Low	Medium	Low	Medium	Medium	Low	High	High	Medium							
Livingston, Township of	Low	Low	Medium	Low	Medium	Medium	Low	High	High	Medium							
Maplewood, Township of	Low	Low	Medium	Low	Medium	Medium	Low	High	High	Medium							
Millburn, Township of	Low	Low	Medium	Medium	Medium	Medium	Low	High	High	Medium							
Montclair, Township of	Low	Low	Medium	Low	Medium	Medium	Low	High	High	Medium							
Newark, City of	Medium	Medium	Medium	High	High	High	Low	High	High	Medium							
North Caldwell, Borough of	Low	Low	Medium	Low	Medium	Medium	Low	High	High	Medium							
Nutley, Township of	Low	Medium	Medium	Low	Medium	Medium	Low	High	High	Medium							
Orange, City of	Low	Low	Medium	Low	Medium	Medium	Low	High	High	Medium							
Roseland, Borough of	Low	Low	Medium	Medium	Medium	Medium	Low	High	High	Medium							
South Orange, Township of	Low	Low	Medium	Low	Medium	Medium	Low	High	High	Medium							
Verona, Township of	Low	Low	Medium	Medium	Medium	Medium	Low	High	High	Medium							
West Caldwell, Township of	Low	Low	Medium	High	Medium	Medium	Low	High	High	Medium							
West Orange, Township of	Low	Low	Medium	Low	Medium	Medium	Low	High	High	Medium							

The hazard rankings indicated in this plan update have been adjusted from the 2008 plan due to the improved vulnerability assessment based on structure-specific data available from the County rather than HAZUS default aggregate data as discussed in Section 5.1 (Methodology). Any changes to the ranking results therefore do not necessarily reflect significant changes in exposure, but a more refined vulnerability analysis methodology. The summary County level values reflect the vulnerability data on the county level and do not represent an average of jurisdiction ranks or the highest rank indicated in Essex County. These designations are an element of the prioritization criteria as detailed in Section 6 of this plan.

5.3.3 Hazards Profiles and Vulnerability Assessment

The following sections profile and assess vulnerability for each hazard of concern. For each hazard, the profile includes: the hazard description; its location and extent; previous occurrences and losses; and the probability of future events. The vulnerability assessment for each hazard includes: an overview of vulnerability; the data and methodology used; the impact on life, health and safety; impact on general building stock; impact on critical facilities; impact on the economy; additional data needs and next steps; and the overall vulnerability assessment finding. Hazards are presented as listed above, starting with the severe storm hazard and ending with the earthquake hazard.

5.4.1 Coastal Erosion and Sea Level Rise

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the coastal erosion and sea level rise hazards in Essex County.

2015 Plan Update Changes

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the coastal erosion hazard is discussed.
- Sea level rise was added to the Coastal Erosion and Sea Level Rise section.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- The vulnerability assessment is a new addition for this hazard. It directly follows the hazard profile.

5.4.1.1 Profile

Hazard Description

Coastal Erosion

Erosion and flooding are the primary coastal hazards that lead to the loss of lives or damage to property and infrastructure in developed coastal areas. Coastal storms are an intricate combination of events that impact a coastal area. They can occur any time of the year and at varying levels of severity. One of the greatest threats from a coastal storm is coastal flooding caused by storm surge. See Section 5.4.6 (Flood) for information regarding coastal flooding and Section 5.4.2 (Coastal Storm) for information regarding storm surge.

Coastal erosion is the gradual breakdown and removal of land material into a sea or lake due to physical and chemical, natural processes such as wind, wave and tide action, with contribution from man-made interferences. Coastal erosion can take place at two different rates: gradual erosion which occurs on a daily basis along all coastlines; and sudden or catastrophic events primarily due to storms which can result in changes to coasts over a very short period of time (Essex County HMP 2008).

Many natural factors influence the coastline. Constant wave action, ocean currents, daily tides, and wind are the primary energy sources for erosion. Coastal shorelines change constantly in response to wind, waves, tides, sea-level fluctuation, seasonal and climatic variations, human alteration, and other factors that influence the movement of sand and material within a shoreline system. Coastal erosion can result in significant economic loss through the destruction of buildings, roads, infrastructure, natural resources, and wildlife habitats. Damage often results from an episodic event with the combination of severe storm waves and dune or bluff erosion.

Methods and construction of artificial structures by humans (piers and jetties), as well as activities such as beach and sand mining, dredging, and the damming of rivers, are all factors in coastal erosion. Coastlines are constantly changing as a result of wind, currents, storms and sea level rise which leads to the stabilization of developed shorelines with hardened structures (Essex County HMP 2008; Frizzera 2011). In New Jersey, there are a number of shoreline structures off the coastline of the Atlantic Ocean and Inland Bays; however, the NJDEP did not identify any shoreline structures in Essex County (NJDEP 1993).

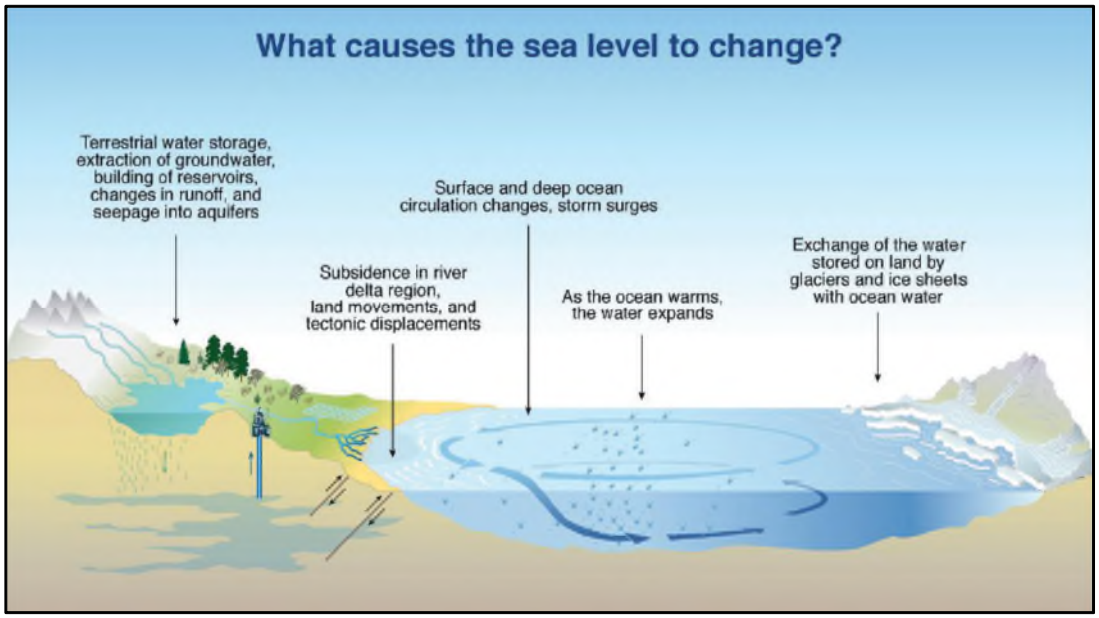
Sea Level Rise

There is evidence that global sea is rising at an increased rate and will continue rising over the next century. The two major causes of sea level rise are thermal expansion caused by the warming of the oceans and the loss of

land-based ice (glaciers and polar ice caps) due to increased melting. Thermal expansion can account for 50% of sea level rise and is a result of warming atmospheric temperatures and subsequent warming of ocean waters causing the expansion. Since 1900, records and research have shown that sea level has been steadily rising at a rate of 0.04 to 0.1 inches per year (NOAA 2013).

There are two types of sea level: global and relative. Global sea level rise refers to the increase currently observed in the average global sea level trend (primarily attributed to changes in ocean volume due to ice melt and thermal expansion). The melting of glaciers and continental ice masses can contribute significant amounts of freshwater input to the earth's oceans. In addition, a steady increase in global atmospheric temperature creates an expansion of salt water molecules, increasing ocean volume. Figure 5.4.1-1 illustrates the causes of sea level change.

Figure 5.4.1-1. The Causes of Sea Level Change



Source: NOAA Climate Program Office 2012

Local sea level refers to the height of the water as measuring along the coast relative to a specific point on land. Water level measurements at tide stations are referenced to stable vertical points on the land and a known relationship is established. Measurements at any given tide station include both global sea level rise and vertical land motion (subsidence, glacial rebound, or large-scale tectonic motion). The heights of both the land and water are changing; therefore, the land-water interface can vary spatially and temporally and must be defined over time. Relative sea level trends reflect changes in local sea level over time and are typically the most critical sea level trend for many coastal applications (coastal mapping, marine boundary delineation, coastal zone management, coastal engineering, and sustainable habitat restoration) (NOAA 2013).

Short-term variations in sea level typically occur on a daily basis and include waves, tides, or specific flood events. Long-term variations in sea level occur over various time scales, from monthly to several years and may be repeatable cycles, gradual trends, or intermittent differences. Seasonal weather patterns (changes in the earth's declination), changes in coastal and ocean circulation, anthropogenic influences, vertical land motion, etc. may influence changes in sea level over time. When estimating sea level trends, a minimum of 30 years of data are used in order to account for long-term sea level variations and reduce errors in computing sea level trends based on monthly mean sea level (NOAA 2013).

During the 20th century, global sea level rose at an average rate of 0.6 inches per decade. Thermal expansion of a warming ocean and the melting of glaciers and ice sheets were the primary reasons for this rise in global sea level. Thermal expansion made the same amount of water take up more space, and the melting of glaciers and ice sheets added water to the ocean. The rate of global sea level rise has increased, with an average rate of 1.2 inches per decade since the early 1990s. Rates of sea level rise vary globally, and sea levels along the New Jersey coastline have risen faster than the global average. The rate of sea level rise is greater along the coastal plain of New Jersey due to the land subsiding at the same time that water levels are rising (Rutgers 2013).

NOAA tide gauge data shows that sea level at Atlantic City, Cape May, and Sandy Hook is rising at a rate of approximately 0.15 inches per year (inches/year) since recording began in the early to mid-1900s. Recent research completed by the NJDEP shows that pre-anthropogenic sea levels rise in New Jersey was approximately 0.08 inches/year. This suggests that the anthropogenic contribution to the recent higher rate of rise is approximately 0.08 inches/year (NJDEP 2013).

There is currently no coordinated, interagency effort to identify agreed upon estimates for future sea level rise. The U.S. National Climate Assessment Development and Advisory Committee, a federal committee writing the next National Climate Assessment, outlines sea level rise scenarios in the National Oceanic and Atmospheric Administration's Office of Oceanic and Atmospheric Research, Climate Program Office, Technical Report OAR CPO-1 entitled 'Global Sea Level Rise Scenarios for the United States National Climate Assessment'. FEMA's best available special flood hazard area (SFHA), or the 1-percent annual chance flood, has been integrated with four scenarios of sea level rise (referred to as lowest, intermediate – low, intermediate - high and highest). Please note these scenarios do not predict future changes but describe estimated potential future conditions. This report notes that the greatest uncertainty surrounding estimates is the rate and magnitude of ice sheet loss, primarily from Greenland and West Antarctica. Global sea level rise scenarios for New Jersey and New York State are provided in Table 5.4.1-1. These four scenarios reflect different degrees of ocean warming and ice sheet loss.

Table 5.4.1-1. NOAA Sea Level Rise Scenarios for New Jersey

Scenario	2050 (feet of rise)	2100 (feet of rise)
Lowest	SFHA + 0.3 feet	SFHA + 0.7 feet
Intermediate - Low	SFHA + 0.7 feet	SFHA + 1.6 feet
Intermediate - High	SFHA + 1.3 feet	SFHA + 3.9 feet
Highest	SFHA + 2.0 feet	SFHA + 6.6 feet

Source: NOAA 2012
SFHA Special Flood Hazard Area

There are additional contributing variables that are not reflected in NOAA's global sea level rise scenarios such as vertical land movement (subsidence or uplift), ocean basin trend, total relative sea level change and extreme water levels from existing flood models or long-term tide gauges. Rutgers University has developed a dataset based on NOAA's data which accounts for local variables. This is further discussed in Climate Change Impacts presented later in this section.

As sea levels rise globally, the current, low-lying coastal areas will become inundated. According to NOAA, higher MSLs will increase the frequency, magnitude, and duration of flooding associated with storms. Extreme weather events will continue to be the primary driver of the highest water levels. However, a consensus has not yet been reached on how the frequency and magnitude of storms may change in coastal regions of the U.S. (NOAA 2012).

According to NOAA, sea level rise can amplify factors that currently contribute to coastal flooding: high tides, storm surge, high waves, and high runoff from rivers and creeks. All of these factors change during extreme

weather and climate events (NOAA 2012). Other secondary hazards that could occur along the mid-Atlantic coast in response to sea-level rise:

- Bluff and upland erosion – shorelines composed of older geologic units that form headland regions of the coast will retreat landward with rising sea level. As sea level rises, the uplands are eroded and sandy materials are incorporated into the beach and dune systems along the shore and adjacent compartments (Gutierrez et al. 2007).
- Overwash, inlet processes, shoreline retreat, and barrier island narrowing – as sea-level rise occurs, storm overwash will become more likely. Tidal inlet formation and migration will become important components of future shoreline changes. Barrier islands are subject to inlet formation by storms. If the storm surge produces channels that extend below sea level, an inlet may persist after the storm. The combination of rising sea level and stronger storms can create the potential to accelerate shoreline retreat in many locations. Assessments of shoreline change on barrier islands have shown that barrier island narrowing has been observed on some islands over the last 100 years (Gutierrez et al. 2007).
- Threshold behavior – changes in sea level rise can lead to conditions where a barrier system becomes less stable and crosses a geomorphic threshold; making the potential for rapid barrier-island migration or segmentation/disintegration high. Unstable barriers may be defined by rapid landward recession of the ocean shoreline, decrease in barrier width and height, increased overwashing during storms, increased barrier breaching and inlet formation, or chronic loss of beach and dune sand volume. With the rates of sea-level rise and climate change, it is very likely that these conditions will worsen (Gutierrez et al. 2007).
- Loss of critical habitat – natural ecosystems may be impacted by warmer temperatures and associated changes in the water cycle. The changes could lead to loss of critical habitat and further stresses on some threatened and endangered species (Rutgers 2013).

Location

NJDEP defines 'coastal' as any land adjacent to a tidally influenced waterway. New Jersey has three primary coastal regions: the Atlantic Coast which includes communities along the Atlantic Ocean and communities that lie inland of the Atlantic coast barrier islands; the Delaware Bayshore; and the urban coast that lie along the tidal portion of the Hudson River (Rutgers 2014).

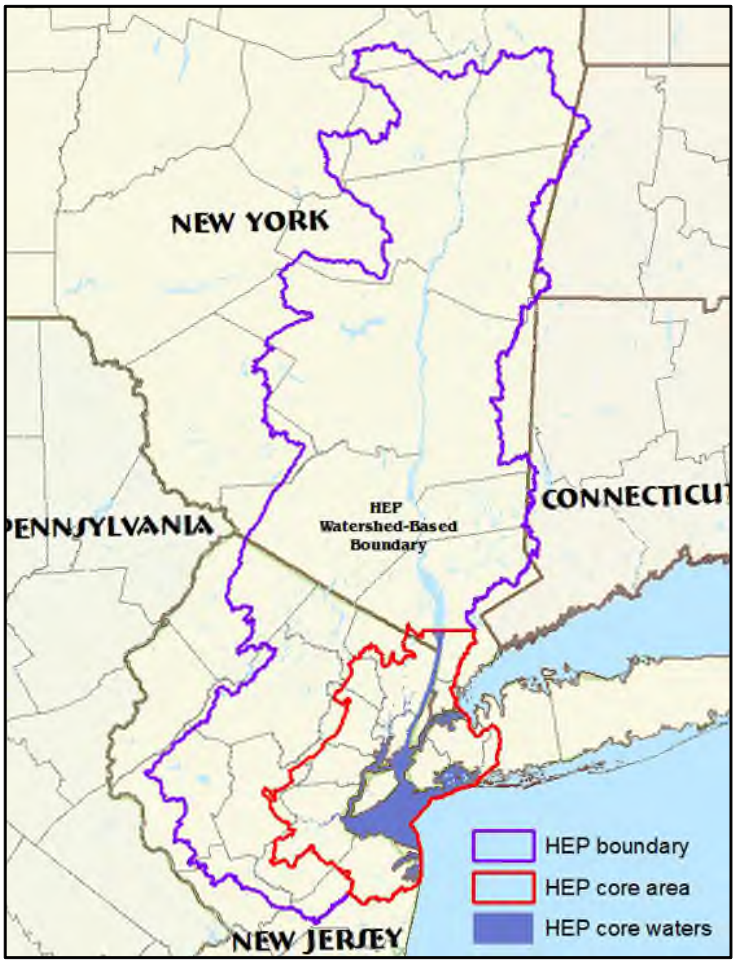
The coastal boundary of New Jersey encompasses the Coastal Area Facility Review Act (CAFRA) area and the New Jersey Meadowlands District. Figure 5.4.2-2 shows New Jersey and the highlighted coastal zone area. Essex County is not located in either the CAFRA zone or Meadowlands; however, the County is considered a coastal area. The coastal area includes coastal waters to the limit of tidal influence including: the Atlantic Ocean (to the limit of New Jersey's seaward jurisdiction); Upper New York Bay, Newark Bay, Raritan Bay and the Arthur Kill; the Hudson, Raritan, Passaic, and Hackensack Rivers, and the tidal portions of the tributaries to these bays and rivers. The Delaware River and Bay and other tidal streams of the Coastal Plain are also in the coastal area, as is a narrow band of adjacent uplands in the Waterfront Development area beyond the CAFRA area (NJDEP 2014). As previously stated, a coastal area is any land adjacent to a tidally influenced waterway; therefore, Essex County is considered a coastal county because the City of Newark lies along the tidal portion of the Hudson River.

New Jersey has 127 miles of Atlantic coastline and approximately 1,800 miles of tidal shoreline. Twenty of New Jersey's 21 counties are defined as coastal counties by NOAA (Rutgers 2014). The entire coastal area of the State is vulnerable to the damaging impacts of major storms along its coastline. As development and re-development increase, less-intense storms and sea-level rise will lead to costly storm damage.

New York-New Jersey Harbor Estuary (Newark Bay)

Essex County has a very limited coastline, present only in the City of Newark and significant coastal erosion is not identified along the limited coastline, which is only present in the City of Newark (Essex County HMP 2008). The County is located within the New York-New Jersey Harbor Estuary (Newark Bay). An estuary is a body of water where rivers meet the ocean and salt water meets fresh water. The Harbor Estuary is positioned at the confluence of the Hudson River and smaller rivers such as the East, Hackensack, and Raritan Rivers. It then opens into the New York Bight and Long Island Sound. The watershed of the Harbor Estuary encompasses a large area that includes the Hudson River watershed up to the Troy Dam, as well as the watersheds of the Raritan, Passaic, and Hackensack Rivers. Coastal storms can cause significant impacts to coastlines, both to the built and natural environments. In an urban region like the Harbor Estuary, the impacts to the built environment can exacerbate the level of impact incurred by natural systems (New York-New Jersey Harbor & Estuary Program 2014). Figure 5.4.1-2 shows the location of the New York-New Jersey Harbor Estuary and its boundaries.

Figure 5.4.1-2. New York-New Jersey Harbor Estuary

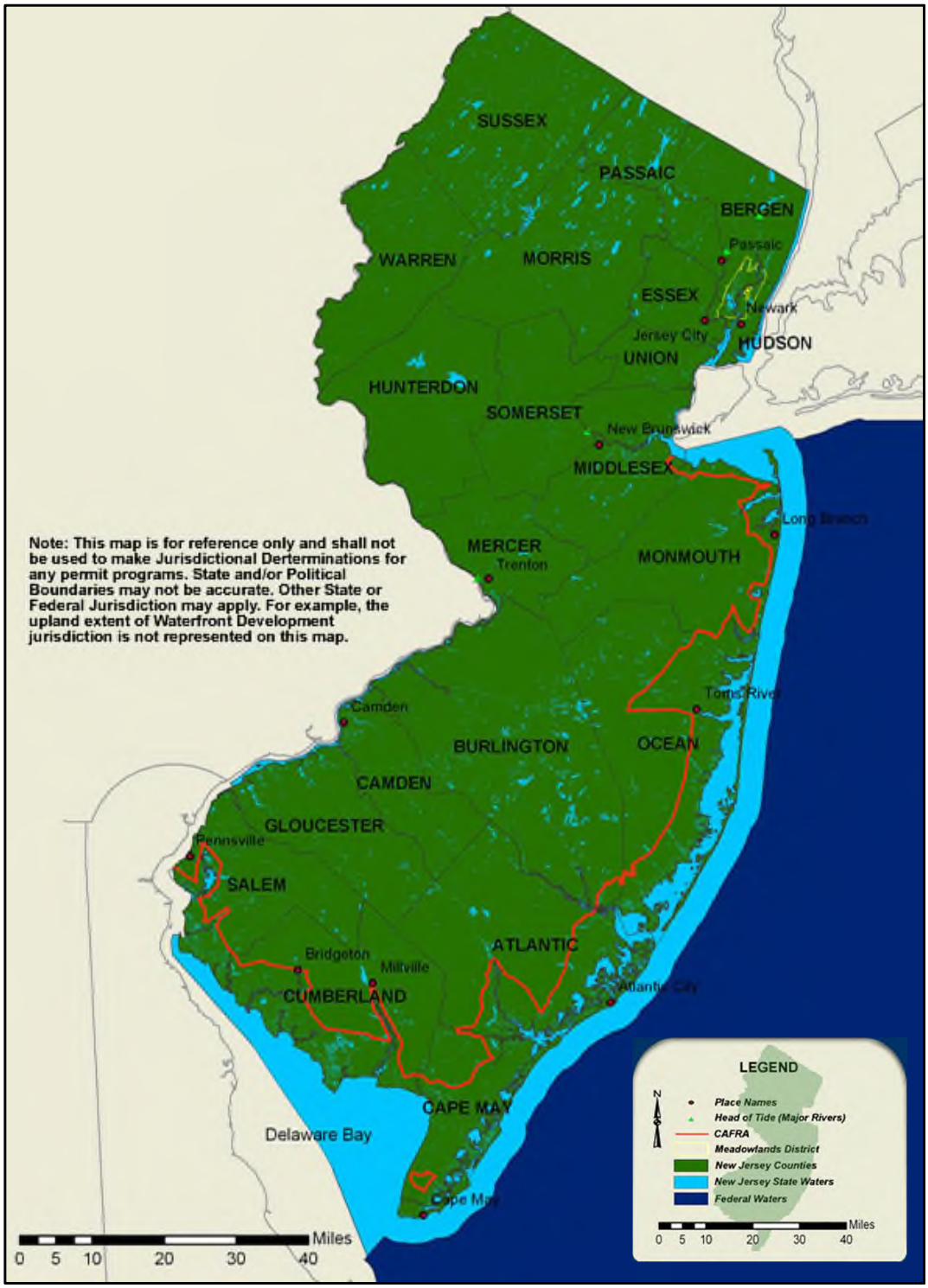


Source: New York-New Jersey Harbor & Estuary Program 2014

Located in the New York & New Jersey Harbor Estuary, Newark Bay is the center of the most urbanized and industrialized parts of the country. Newark Bay is approximately six miles long and one mile wide and is located at the confluence of the Passaic and Hackensack Rivers, between the shores of Newark and Elizabeth to the west, Jersey City and Bayonne to the east, and Staten Island to the south. Newark Bay is linked to Upper and Lower

New York Bay by the Kill van Kull and the Arthur Kill. Port Newark is located on the western shore of Newark Bay (Our Newark Bay 2014).

Figure 5.4.1-3. New Jersey Coastal Zone Area



Source: New Jersey Department of Environmental Protection (NJDEP) 2007

Extent

Coastal Erosion

Coastal erosion is measured as the rate of change in the position or horizontal displacement of a shoreline over a period of time (FEMA 1996). A number of factors determine whether a community exhibits greater long-term erosion or accretion:

- Exposure to high-energy storm waves,
- Sediment size and composition of eroding coastal landforms feeding adjacent beaches,
- Near-shore bathymetric variations which direct wave approach,
- Alongshore variations in wave energy and sediment transport rates,
- Relative sea level rise,
- Frequency and severity of storm events, and
- Human interference with sediment supply (e.g. revetments, seawalls, jetties) (Woods Hole Sea Grant 2003).

Such erosion may be intensified by activities such as boat wakes, shoreline hardening, or dredging. Natural recovery after erosive episodes can take months or years. If a dune or beach does not recover quickly enough via natural processes, coastal and upland property may be exposed to further damage in subsequent events. Coastal erosion can cause the destruction of buildings and infrastructure (FEMA 1996).

Sea Level Rise

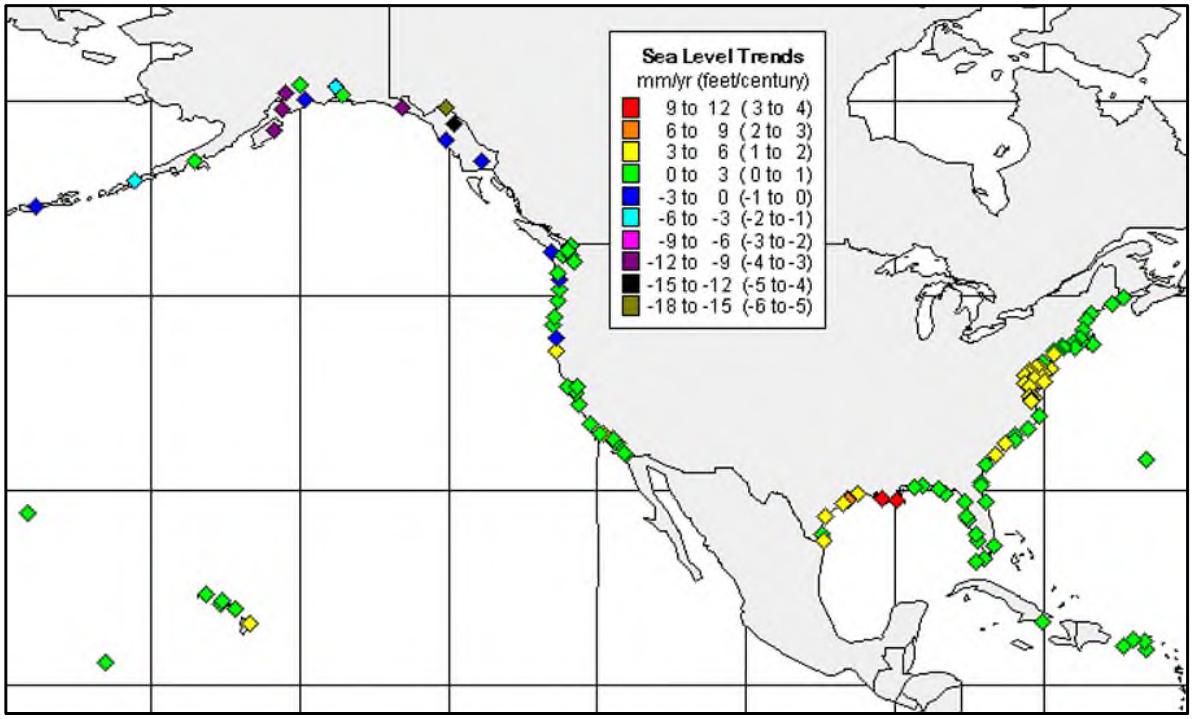
According to the USGS, the coastal vulnerability index (CVI) provides a preliminary overview, at a National scale, of the relative susceptibility of the Nation's coast to sea-level rise. This initial classification is based upon variables including geomorphology, regional coastal slope, tide range, wave height, relative sea-level rise, and shoreline erosion and accretion rates. The combination of these variables and the association of these variables to each other furnish a broad overview of coastal regions where physical changes are likely to occur due to sea-level rise.

The Center for Operational Oceanographic Products and Services have been measuring sea level for over 150 years, with tide stations of the National Water Level Observation Network operating on all coastlines of the U.S. Changes in mean sea level (MSL), either a sea level rise or sea level fall, has been computed at128 long-term water level stations using a minimum span of 30 years of observations at each location. The measurements have been averaged by month to remove the effect of higher frequency phenomena (storm surge) in order to compute an accurate linear sea level trend (NOAA 2013).

Figure 5.4.1-4 is a map of regional MSL in the U.S. This map provides an overview of variations in the rates of relative local MSL at long-term tide stations. The variations in sea level trends primarily reflect differences in rates and sources of vertical land motion. Areas that experienced little-to-no change in MSL are shown in green, including stations consistent with average global sea level rise rate of 1.7 to 1.8 mm/year. These stations do not experience significant vertical land motion. Stations that experienced positive sea level trends (yellow to red) experience both global sea level rise and lowering or sinking of the local land, causing an apparent exaggerated rate of relative sea level rise. Stations that are blue to brown have experienced global sea level rise and a greater vertical rise in local land, causing an apparent decrease in relative sea level. The rates of relative sea level rise reflect actual observations and must be accounted for in any coastal planning or engineering applications (NOAA 2013). Figure 5.4.1-5 shows these changes for Atlantic City, Sandy Hook, and Cape May.

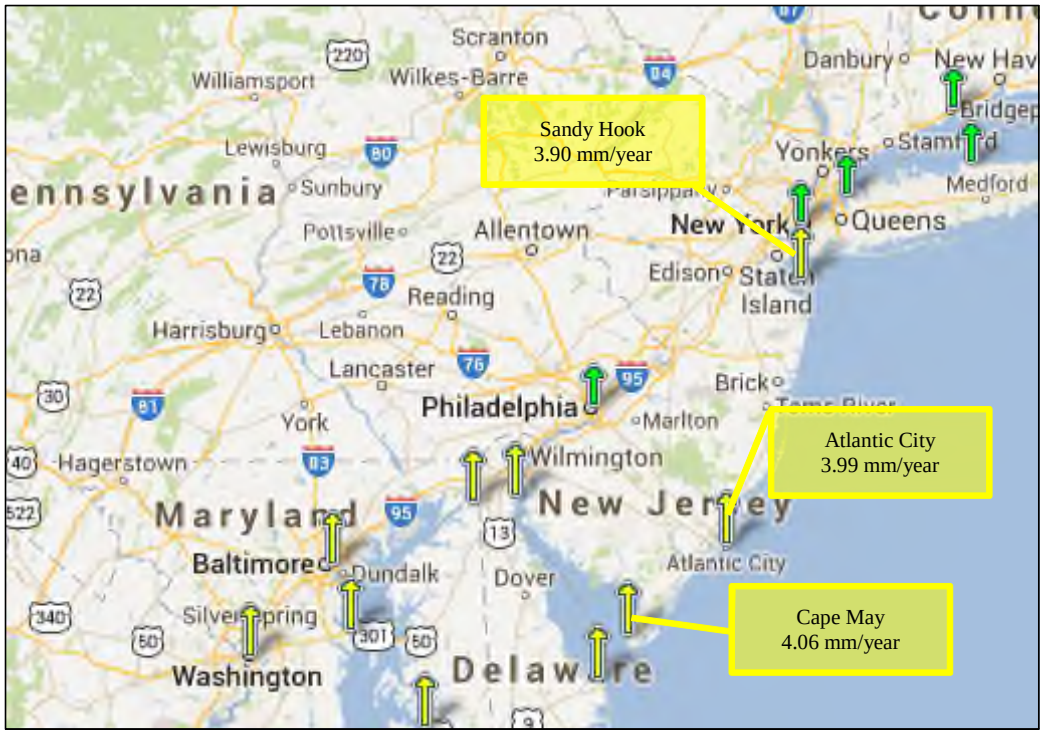
The global sea level trend has been recorded by satellite altimeters since 1992 and the latest calculation can be obtained from NOAA's Laboratory for Satellite Altimetry. The University of Colorado's Sea Level Research Group compares global sea level rates calculated by different research organizations and provides detailed explanations about the issues involved (NOAA 2013). Table 5.4.1-1 presents the most recent NOAA relative sea level variations along the Mid-Atlantic coast. Three NOAA tide gauge stations are located on the New Jersey coastline, where tide gauge measurements are made with respect to a local fixed reference level on land. Table 5.4.1-2 presents the history and MSL trends at the three New Jersey stations, which show the result of a combination of the global sea level rate and the local vertical land motion.

Figure 5.4.1-4. Relative Sea Level Variations of the U.S.



Source: NOAA 2013

Figure 5.4.1-5. Sea Level Trends in New Jersey



Source: NOAA 2013

Table 5.4.1-2. Linear MSL Trends and 95% Confidence Intervals

Station Name	First Year	Year Range	For all data to 2006		Previously Published Trends	
			MSL Trend (mm/year)	+/- 95% Confidence Interval	MSL Trend (mm/year)	+/- 95% Confidence Interval
Atlantic City	1911	96	3.99	0.18	3.98	0.21
Sandy Hook	1932	75	3.90	0.25	3.88	0.29
Cape May	1965	42	4.06	0.74	3.88	1.04

Source: NOAA 2013
mm/year millimeter per year
MSL Mean Sea Level

As more data is collected at water level stations, the linear MSL trends can be recalculated each year. Table 5.4.1-3 below shows the MSL trends calculated from the beginning of the station record to recent years (2006 to 2012). The values do not indicate the trend in each year, but the trend of the entire data period up to that year.

Table 5.4.1-3. Update Mean Sea Level Trends

Station Name	2006	2007	2008	2009	2010	2011	2012
Atlantic City	3.99 mm/yr	3.98 mm/yr	3.98 mm/yr	4.01 mm/yr	4.04 mm/yr	4.07 mm/yr	4.10 mm/yr
Cape May	3.90 mm/yr	3.87 mm/yr	3.88 mm/yr	3.93 mm/yr	4.00 mm/yr	4.05 mm/yr	4.06 mm/yr
Sandy Hook	4.06 mm/yr	3.99 mm/yr	4.00 mm/yr	4.22 mm/yr	4.45 mm/yr	4.53 mm/yr	4.64 mm/yr

Source: NOAA 2013
Mm/year millimeter per year

Previous Occurrences and Losses

As mentioned previously, coastal erosion can occur gradually as a result of natural processes or from episodic events such as hurricanes, Nor'easters, and tropical storms. Coastal erosion also results from sea-level rise, which occurs for a variety of reasons. Many sources provided historical information regarding previous occurrences and losses associated with coastal erosion events throughout the State of 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.

Between 1954 and 2014, the State of New Jersey was included in eight FEMA coastal erosion-related disasters (DR) or emergencies (EM), classified as one or a combination of the following event types: severe storm, flood, coastal storm, high tides, heavy rain, Nor'easter, tropical storm, and hurricane. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Of those eight declarations, Essex County was included in five of the declarations (FEMA 2014).

For this 2015 Plan Update, known coastal erosion events that have impacted Essex County between 2007 and 2014 are identified in Table 5.4.1-4. With coastal erosion documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, the table may not include all events that have occurred in the County. Please see Section 9 for detailed information regarding impacts and losses to each municipality.

Table 5.4.1-4. Coastal Erosion Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
August 26 – September 5, 2011	Hurricane Irene	DR-4021	Yes	Hurricane Irene moved north along the Atlantic Coast, making landfall near Cape Lookout, North Carolina, on August 27th. The hurricane moved back over open water before making landfall for a second time at Little Egg Inlet in New Jersey on August 28th. This was the first time since 1903 that a hurricane made landfall in New Jersey. Rain fell for an 18-hour period, with totals ranging from six to eight inches across New Jersey. Higher amounts were observed in southwestern, central, and northeastern New Jersey. The heavy rain from the storm caused record-breaking floods on many streams throughout the State. Thirty-nine of the 94 USGS gages with greater than or equal to 20 years of record, had record high peaks. Thirty-three gages experienced peaks equal to or greater than the 100-year recurrence interval. NWS climate site at Newark recorded 8.92 inches of rain. In Essex County, in West Orange Township, nearly 15 homes were damaged from fallen trees. Emergency crews responded to 120 calls and closed several streets. Rainfall totals ranged from 7.32 inches in Essex Fells to 9.96 inches in Orange; with 7.69 inches falling at Newark Airport which was the highest one-day total for Newark Airport. Peak wind gusts of 40 mph and 61 mph were recorded at Caldwell and Newark Airports, respectively. In Belleville, downed trees were reported on Watchung Avenue. Overall, the municipalities experienced flooding, downed trees, power outages, flooding, evacuations, and over $1.8 million in clean-up and other costs to the municipalities. The Passaic River gage at the Passaic Valley Sewage Commission recorded a peak stage of 7.11 feet, 0.64 feet higher than the previous peak of record on March 13, 2010.
October 29, 2011	Severe Storm	DR-4048	Yes	Rain began to fall in southern New Jersey early on October 29, 2011 and spread north. Some northern areas of the State saw the precipitation begin as snow and during the morning, the rain turned to snow in central and northern New Jersey. Moderate to heavy snow continued into the afternoon, mixing with sleet in lower elevations. Once the snow tapered off during the morning of October 30, 2011, New Jersey had experienced its largest October snowstorm since the late 18th century. Once several inches of snow had accumulated, tree branches and entire trees began to snap and crash onto homes, power lines and cars. By the end of the storm, over 600,000 customers lost power, with some remaining without power for over a week. In Essex County, snowfall totals ranged from 4.9 inches in Belleville Township to 8 inches in West Orange Township. In Verona Township, the wastewater treatment plant flooded and sustained damage to its system. Many municipalities

Table 5.4.1-4. Coastal Erosion Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				reported road closures, loss of utilities, closed schools and debris removal. Several residents were evacuated from their homes in Roseland Borough. Shelters were open throughout the County as well. Overall, the County had over $1.5 million in clean-up costs and other expenses to the municipalities.
October 26 – November 8, 2012	Superstorm Sandy	DR-4086	Yes	The storm tide caused inundations of two to four feet in Bergen and Essex Counties. The deepest water occurred in areas that border Lower New York Bay, Raritan Bay, and the Raritan River. As storm surge from Sandy was pushed into New York and Raritan Bays, sea water piles up within the Hudson River and the coastal waterways and wetlands of northeastern New Jersey, including Newark Bay, the Passaic and Hackensack Rivers, Kill Van Kull, and Arthur Kill. Inundations of four to six feet were measured across Newark Bay in Elizabeth and the area around Newark Liberty International Airport. In Essex County, inundations of four to six feet were measured across Newark Bay in Elizabeth and the area around Newark Airport. Storm tide at Newark was 11.6 feet with an estimated inundation (maximum depth of water on land) of 3.5 feet. The City of Newark had 7.65 inches of rainfall. Peak wind gusts ranged from 70 mph at Caldwell Airport to 78 mph at Newark Airport. In Fairfield, peak wind gusts measured at 72 mph and Reef Road flooded to Howard Street.. Overall, the municipalities of Essex County experienced flooding, power outages, evacuations, opening of shelters, and evacuations. The Passaic Valley Sewerage Commission treatment plant was flooded by the 12-foot storm surge and inoperable due to shutdowns and power loss. It released an estimated 400 to 500 million gallons of untreated wastewater into Newark Bay for several days, with the total amount discharged to be in the billions of gallons.

Source: FEMA 2014; NHC 2013; Input from Planning Committee
MLLW Mean Lower Low Water
Mph miles per hour
NJDEP New Jersey Department of Environmental Protection
yd^3/ft Cubic Yards per Feet

Probability of Future Occurrences

Long-term coastal erosion is a continuous and dynamic process, impacting the coastal counties along the Atlantic Ocean and those with shorelines along the Great Lakes. It is anticipated that coastal erosion will continue due to the predicted increase in sea level rise and storm frequency and intensity. In New Jersey, coastal erosion will continue to be an on-going problem along many areas of coastline. It is difficult to assign a probability to the near constant small on-going erosion that may occur over a continuous period of time. However, a probability can be assigned to larger storm events such as Nor'easters and hurricanes, which can result in significant, rapid coastal erosion. The period of time suggest the probability of coastal erosion will be about the same in the future, with year-to-year variations. As for sea level rise, it is predicted that it will cause direct and indirect impacts for the State. Predictions of future global sea level rise are uncertain; however, it can be estimated to increase by approximately 0.75 to 1.9 meters by 2100. In New Jersey, impacts will vary from place to place along the shore and will depend on other aspects of climate change and local scale factors such as coastal morphology, human modifications, and the general starvation of beaches in this region.

Based upon risk factors for and past occurrences, it is likely that coastal erosion events and sea level rise will continue to occur and impact New Jersey and Essex County. In addition, as temperatures increase (see climate change impacts), the probability for future events will likely increase as well. It is estimated that Essex County will continue to experience direct and indirect impacts of coastal erosion on occasion.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for coastal erosion in the County is considered 'occasional' (likely to occur within 100 years, as presented in Table 5.3-3).

Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC, 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4°F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).

Both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over five inches (12%) greater than the average from 1895-1970. Southern New Jersey was two inches (five-percent) wetter late in the 20th century (Office of New Jersey State Climatologist). Average annual precipitation is projected to increase in the region by five-percent by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New York City Panel on Climate Change [NPCC] 2009). In addition, heavy precipitation events have increased in the past 20 years.

Coastal Erosion

Coastal areas may be impacted by climate change in different ways. Coastal areas are sensitive to sea-level rise, changes in the frequency and intensity of storms, increase in precipitation, and warmer ocean temperatures. According to NASA, warmer temperatures may lead to an increase in frequency of storms, thus leading to more weather events that cause coastal erosion.

Sea Level Rise

Changes in global temperatures, hydrologic cycles, coverage of glaciers and ice sheets, and storm frequency and intensity are captured in long-term sea level records. Sea levels provide a key to understanding the impact of climate change (NOAA 2013).

Sea level rise increases the risks coastal communities face from coastal hazards (floods, storm surges, and chronic erosion). It may also lead to the loss of important coastal habitats. The historical rate of sea level rise along the New Jersey coast over the past 50 years was 0.12 to 0.16 inches per year. Future rates are predicted to increase to 0.5 inches/year (Miller and Kopp 2013). By 2050, the sea level is expected to rise 16 inches from the current mean (Rutgers 2013).

5.4.1.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. Coastal erosion can threaten public safety and impact property, infrastructure, environmental resources and local economies. In addition to coastal erosion, projected sea level rise scenarios were evaluated in this vulnerability assessment. The following text evaluates and estimates the potential impact of coastal erosion and sea level rise on Essex County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Coastal erosion and sea-level rise are a significant concern because of the large number of communities and cultural resources located along the coast in the State of New Jersey. Beach dunes and other protective measure like sea walls serve as a buffer and protect the built environment and other natural resources on the mainland from coastal storm events such as hurricanes, tropical storms, and Nor'Easters, which can cause shoreline erosion or accretion. In addition, projected sea level rise scenarios indicate the New Jersey shoreline's vulnerability to this hazard. A changing climate and rising sea levels will have devastating impacts on New Jersey's economy, the health of its residents, the State's natural resources, and the extensive infrastructure system that provides transportation services, energy and clear water to millions of people in New Jersey (Rutgers University 2014). Please refer to Section 5.4.5 (Flood) for more information on the County's coastal vulnerability index that assesses the County's vulnerability to coastal hazards.

Data and Methodology

The New Jersey Administrative Code (N.J.A.C.) Coastal Zone Management Rules, amended July 15, 2013, defines erosion hazard areas as, "shoreline areas that are eroding and/or have a history of erosion causing them to be highly susceptible to further erosion, and damage from storms. Erosion hazard areas may be identified by any one of the following characteristics:

- Lack of beaches
- Lack of beaches at high tide
- Narrow beaches
- High beach mobility
- Foreshore extended under boardwalk
- Low dunes or no dunes
- Escarped foredune
- Steep beach slopes
- Cliffed bluffs as adjacent to beach
- Exposed, damaged, or breached jetties, groins, bulkheads, or seawalls
- High long-term erosion rates
- Pronounced downdrift effects of groins (jetties)" (N.J.A.C. 2013)

Further, erosion hazard areas are defined as extending inland from the edge of a stabilized upland area to the limit of the area likely to be eroded in 30 years for one- to four-unit dwelling structures, and 60 years for all

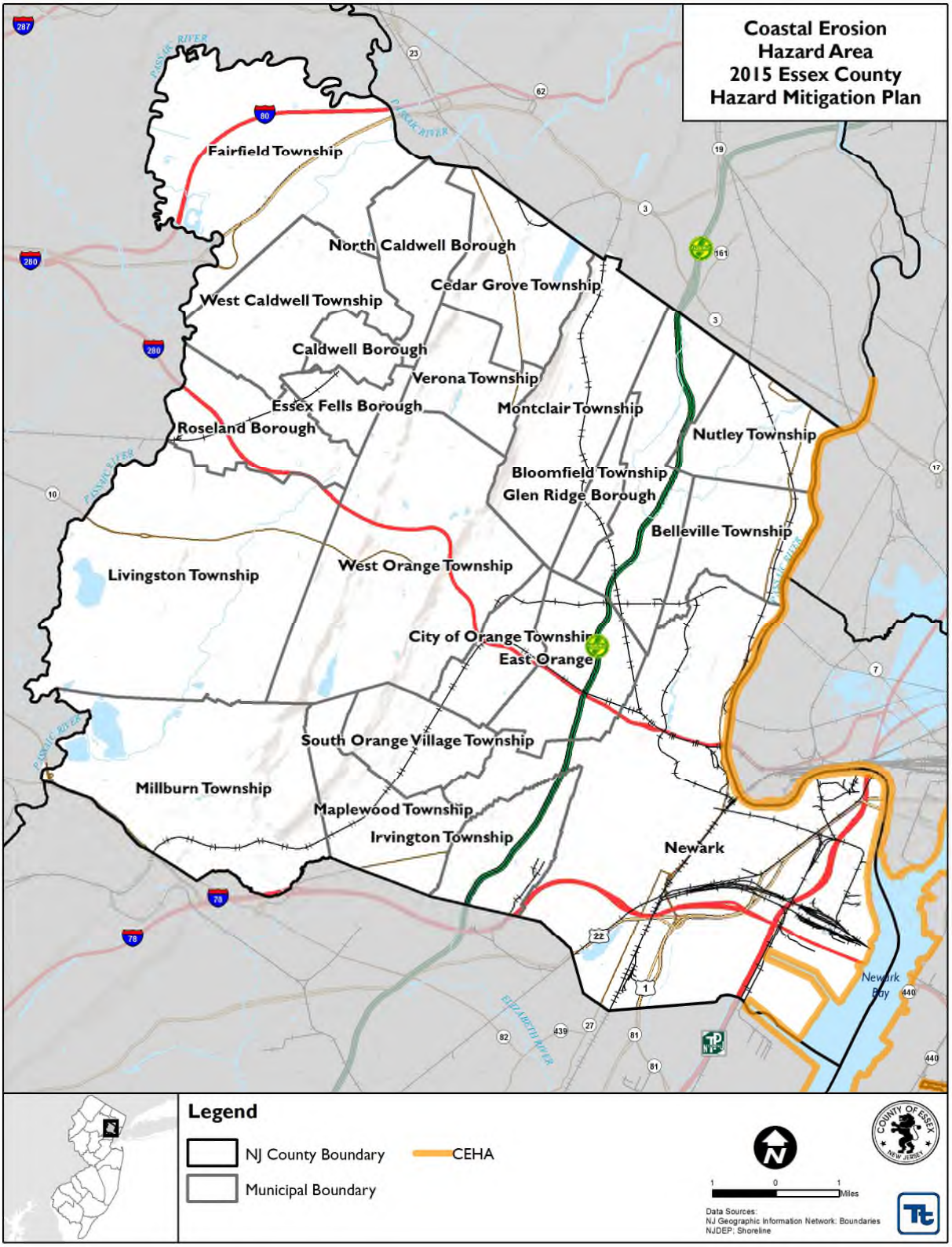
other structures, including developed and undeveloped areas (N.J.A.C. 2013). The extent of an erosion hazard area may be calculated by multiplying the projected annual erosion rate at a site by 30 for the development of one- to four-unit dwelling structures, and by 60 for all other developments.

A USGS report for the National Assessment of Shoreline Change entitled *Historical Shoreline Change along the New England and Mid-Atlantic Coasts* was released in 2011. The New England and Mid-Atlantic shores were subdivided into a total of 10 analysis regions for the purpose of reporting regional trends in shoreline change rates. The average rate of long-term shoreline change for the New England and Mid-Atlantic coasts was -0.5 meters per year.

There are no NJDEP-identified shoreline types in Essex County characterized as vulnerable to erosion. However, to estimate exposure to long-term coastal erosion for purposes of this risk assessment, the entire shoreline was analyzed. To generate the extent of the estimated coastal erosion hazard area (CEHA), an erosion rate of 0.5 meters per year was multiplied by 60 to include all structure types and developed/undeveloped areas (annual erosion rate of 0.5 meters x 60 years = 30 meters or approximately 98 feet). Therefore, population, buildings, and infrastructure within 98 feet of the shoreline are identified as vulnerable to long-term coastal erosion. Please note this methodology assumes that once lost to erosion, an area of land is not subsequently restored.

Figure 5.4.1-6 illustrates the coastal erosion hazard area in Essex County as estimated for this planning effort. The analysis presented below is based upon this defined hazard area.

Figure 5.4.1-6. Estimated Coastal Erosion Hazard Area (CEHA)



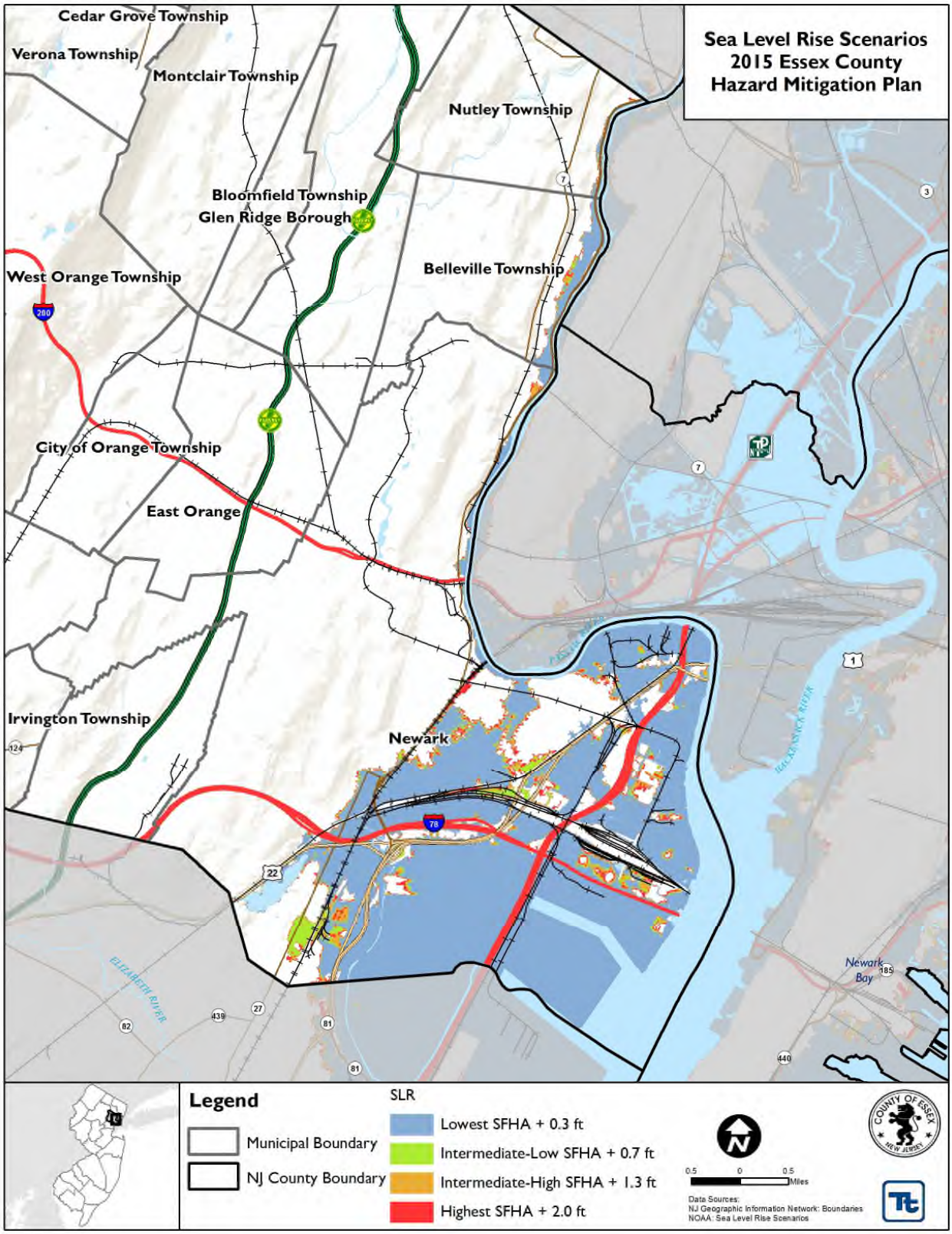
Source: NJDEP

To assess the County's vulnerability of population, buildings and critical facilities to sea level rise, a spatial analysis was conducted with the NOAA sea level rise scenario polygon data. To assess vulnerability to sea level rise, the lowest and the highest NOAA sea level rise scenarios were used to account for the full range of impacts.

- Lowest [Best Available Special Flood Hazard Area (SFHA) + 0.3 feet]
- Highest (Best Available SFHA + 2.0 feet)

Figure 5.4.1-7 illustrates the NOAA sea level rise scenarios boundaries used for this vulnerability assessment.

Figure 5.4.1-7. Sea Level Rise Scenarios for Essex County



Source: NOAA

Impact on Life, Health and Safety

Coastal erosion is not generally considered an imminent threat to public safety when the changes are gradual over many years. However, drastic changes to the shoreline may occur as a result of a single storm event which can threaten homes and public safety. The population exposed is also considered vulnerable to this hazard.

To estimate population vulnerable to the coastal erosion and sea level rise hazards, a spatial analysis using the centroid of the 2010 Census blocks located within 98 feet of the shoreline and the NOAA sea level rise scenarios extents was conducted. Table 5.4.1-5 summarizes these results by municipality. Please note the limitations of this analysis are recognized and the results should only be used as an estimate. The analysis showed that no population was exposed to coastal erosion. It is estimated that between 16,104 and 24,007 people are potentially vulnerable to sea level rise by the year 2050.

Table 5.4.1-5. Estimated Population Exposed to Projected Sea Level Rise

Municipality	U.S. Census 2010 Population	Estimated Population Exposed			
		Number in SFHA + 0.3 feet	% of Total Exposed	Number in SFHA + 2.0 feet	% of Total Exposed
Township of Belleville	35,926	903	2.5%	1,000	2.8%
Township of Bloomfield	47,315	0	0.0%	0	0.0%
Borough of Caldwell	7,822	0	0.0%	0	0.0%
Township of Cedar Grove	12,411	0	0.0%	0	0.0%
City of East Orange	64,270	0	0.0%	0	0.0%
Borough of Essex Fells	2,113	0	0.0%	0	0.0%
Township of Fairfield	7,466	0	0.0%	0	0.0%
Borough of Glen Ridge	7,527	0	0.0%	0	0.0%
Township of Irvington	53,926	0	0.0%	0	0.0%
Township of Livingston	29,366	0	0.0%	0	0.0%
Township of Maplewood	23,867	0	0.0%	0	0.0%
Township of Millburn	20,149	0	0.0%	0	0.0%
Township of Montclair	37,669	0	0.0%	0	0.0%
City of Newark	277,140	15,201	5.5%	23,007	8.3%
Borough of North Caldwell	6,183	0	0.0%	0	0.0%
Township of Nutley	28,370	0	0.0%	0	0.0%
City of Orange Township	30,134	0	0.0%	0	0.0%
Borough of Roseland	5,819	0	0.0%	0	0.0%
Township of South Orange Village	16,198	0	0.0%	0	0.0%
Township of Verona	13,332	0	0.0%	0	0.0%
Township of West Caldwell	10,759	0	0.0%	0	0.0%
Township of West Orange	46,207	0	0.0%	0	0.0%
Essex County (Total)	**783,969**	**16,104**	**2.1%**	**24,007**	**3.1%**

Source: U.S. Census 2010, NOAA 2013

Impact on General Building Stock

To estimate the general building stock exposed to coastal erosion and potential sea level rise, the updated building inventory was used. The buildings with their centroid in the estimated hazard areas were determined in GIS for each municipality. It is estimated that 23 buildings accounting for $1.9 million of improved value and estimated content value is exposed to the coastal erosion hazard area.

As presented in Table 5.4.1-6 below, the Township of Belleville, City of Newark, and Township of Nutley have buildings located in the potential sea level rise areas. The analysis indicates there are 2,646 buildings with improved value and estimated contents of $1.9 billion within the lowest sea level rise scenario and 3,862 buildings with improved value and estimated contents of $2.3 billion within the highest sea level rise scenario.

As mentioned above, please note the limitations of this analysis are recognized and the results should only be used as an estimate.

Table 5.4.1-6. Estimated Number of Buildings and Improved Value Exposed to Projected Sea Level Rise

Municipality	Number of Buildings	Improved Value and Estimated Contents	All Occupancies							
			Number of Buildings SFHA +0.3 feet	% of Total	IV in SFHA + 0.3 feet	% of Total	Number of Buildings SFHA +2 feet	% of Total	IV in SFHA + 2 feet	% of Total
Township of Belleville	9,154	$2,905,447,150	169	1.8%	$55,592,900	1.9%	273	3.0%	$73,498,800	2.5%
Township of Bloomfield	11,383	$3,827,312,350	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Borough of Caldwell	2,116	$753,639,775	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of Cedar Grove	3,815	$1,657,089,082	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
City of East Orange	9,310	$5,820,599,879	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Borough of Essex Fells	760	$567,106,700	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of Fairfield	3,169	$3,374,787,200	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Borough of Glen Ridge	2,214	$986,279,500	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of Irvington	9,312	$2,820,388,050	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of Livingston	9,510	$5,547,703,530	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of Maplewood	7,275	$2,733,369,500	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of Millburn	6,291	$8,045,533,450	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of Montclair	10,486	$5,890,125,479	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
City of Newark	38,329	$18,709,618,398	2,465	6.4%	$1,898,911,999	10.1%	3,555	9.3%	$2,243,929,599	12.0%
Borough of North Caldwell	1,951	$1,431,441,250	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of Nutley	8,884	$3,510,270,592	12	0.1%	$1,553,800	0.0%	34	0.4%	$4,769,000	0.1%
City of Orange Township	4,354	$1,867,401,350	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Borough of Roseland	1,616	$1,435,628,250	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of South Orange Village	4,508	$3,108,688,125	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of Verona	3,907	$1,598,018,325	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of West Caldwell	3,634	$2,040,951,278	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Township of West Orange	12,688	$5,503,784,816	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Essex County	**164,666**	**$84,135,184,028**	**2,646**	**1.6%**	**$1,956,058,699**	**2.3%**	**3,862**	**2.3%**	**$2,322,197,399**	**2.8%**

Source: NOAA 2013; Essex County Planning Department, 2014

Note: IV = Improved value and estimated contents; % = Percent

Impact on Critical Facilities

Coastal erosion and sea level rise can impact critical facilities. There are five critical facilities, including two ports and one bridge in the City of Newark located within the coastal erosion hazard area. There are several critical facilities in the City of Newark, Nutley Township, and Bellville Township that are exposed to sea level rise. Table 5.4.1-7 through Table 5.4.1-9 summarizes the critical facilities located within the coastal erosion hazard area and estimated sea level rise scenario areas.

Table 5.4.1-7. Critical Facilities in the Coastal Erosion Hazard Area

Municipality	Facility Type	
	Port	Highway Bridge
City of Newark	2	1
Essex County	**2**	**1**

Source: ECOEM 2014, NJDEP 2013

Note: Only the municipalities and facility types exposed to coastal erosion are listed.

Table 5.4.1-8. Critical Facilities in the Lowest Sea Level Rise Scenario (Special Flood Hazard Area + 0.3 feet)

Municipality	Facility Types															
	Airport	Bus	Chemical Storage	Commercial	Correctional Institution	Electric Power	Fire	Newark Housing Authority	Oil Facility	Police	Port	Safety	School	Train Station	Transportation	WWTP
Township of Belleville	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0
City of Newark	1	1	3	0	2	3	2	2	4	3	1	1	1	1	0	2
Essex County	**1**	**1**	**3**	**1**	**2**	**3**	**2**	**2**	**4**	**3**	**1**	**1**	**2**	**1**	**1**	**2**

Source: ECOEM 2014, NOAA 2013

Note: Only the municipalities and facility types exposed to sea level rise are listed.

Table 5.4.1-9. Critical Facilities in the Highest Sea Level Rise Scenario (Special Flood Hazard Area + 2 feet)

Municipality	Facility Types																
	Airport	Bus	Chemical Storage	Commercial	Correctional Institution	EMS	EPFAC	Fire	Newark Housing Authority	Oil Facility	Police	Port	Safety	School	Train Station	Transportation	WWTP
Township of Belleville	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0	1	0
City of Newark	1	2	3	0	2	1	3	3	3	4	3	1	1	4	1	0	2
Township of Nutley	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Essex County	**1**	**2**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**4**	**3**	**1**	**2**	**7**	**1**	**1**	**2**

Source: ECOEM 2014, NOAA 2013

Note: Only the municipalities and facility types exposed to sea level rise are listed.

Impact on Economy

Coastal erosion and sea level rise can also severely impact roads and infrastructure. As coastline evolution continues, evacuation and emergency routes need to be considered. Essex County includes significant westbound and northbound evacuation routes. Using the hurricane evacuation routes in the New Jersey spatial dataset, routes used to direct traffic inland in case of a hurricane threat are located in the coastal erosion hazard area and sea level rise area. These include portions of the New Jersey Turnpike, U.S. Route 280 and 78. The City of Newark has the largest port facility in the State and as indicated in the exposure analysis could be exposed to sea level rise in the future.

Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by the type, frequency and intensity of weather events. Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of events that exacerbate coastal erosion. While predicting changes of coastal erosion under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society, and the environment (U.S. Environmental Protection Agency [EPA], 2006).

Impacts of climate change can lead to shoreline erosion, coastal flooding, and water pollution, affecting man-made coastal infrastructure and coastal ecosystems. Coastal areas may be impacted by climate change in different ways. Coastal areas are sensitive to sea-level rise, changes in the frequency and intensity of storms, increase in precipitation, and warmer ocean temperatures. Additionally, oceans are absorbing more carbon dioxide from the rising atmospheric concentrations of the gas, resulting in oceans becoming more acidic. This could have significant impacts on coastal and marine ecosystems (U.S. EPA 2013). As previously stated, warmer temperatures may lead to an increase in frequency of storms, thus leading to more weather events that cause coastal erosion.

Change of Vulnerability

A vulnerability assessment was not conducted for coastal erosion and sea level rise in the 2008 HMP. Overall, this vulnerability assessment provides Essex County an estimated exposure assessment for these hazards of concern.

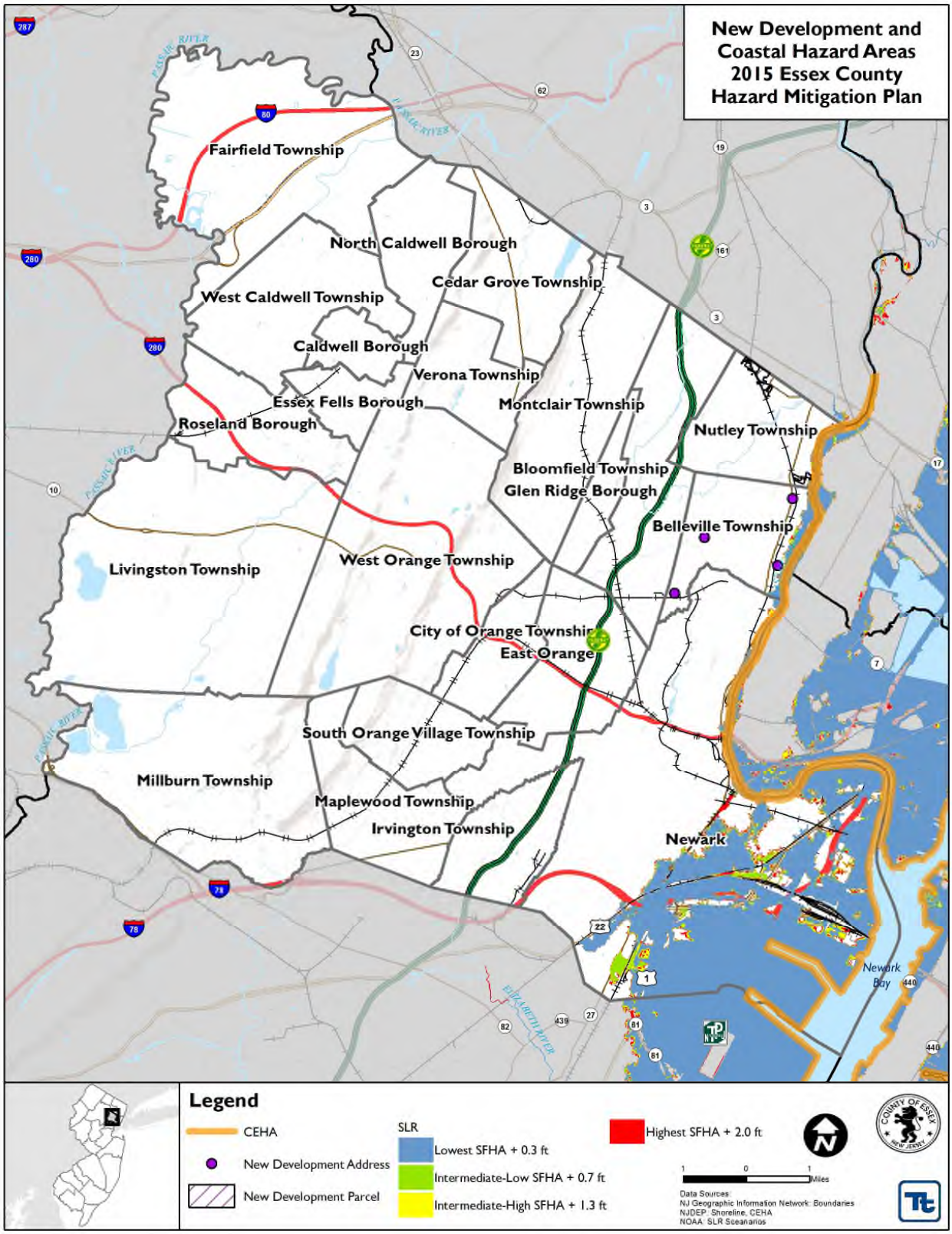
Future Growth and Development

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth located in the defined coastal risk areas could be potentially impacted by coastal erosion similar to those that currently exist within the County. Please refer to Figure 5.4.1-8 for the potential new development in the County and the coastal erosion and sea level rise areas.

Additional Data and Next Steps

As coastal erosion risk areas are updated and revised sea level rise projections are determined, this section of the plan will be updated. Additional data on historic costs incurred to reconstruct buildings and/or infrastructure due to coastal erosion impacts would assist in estimating future losses.

Figure 5.4.1-8. Potential New Development and Coastal Erosion Hazards and Coastal Risk Areas



Sources: NJDEP and NOAA

5.4.2 Coastal Storms

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the coastal storms hazard in Essex County.

2015 Plan Update Changes

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the coastal storm hazard is discussed.
- New and updated figures from federal and state agencies are incorporated.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- A vulnerability assessment was conducted for coastal storm. It now directly follows the hazard profile. An exposure analysis of the population, general building stock, and critical facilities was conducted using best available SLOSH data.

5.4.2.1 Profile

Hazard Description

A tropical cyclone is a rotating, organized system of clouds and thunderstorms that originates over tropical or sub-tropical waters and has a closed low-level circulation. Tropical depressions, tropical storms, and hurricanes are all considered tropical cyclones. These storms rotate counterclockwise in the northern hemisphere around the center and are accompanied by heavy rain and strong winds (National Oceanic and Atmospheric Administration [NOAA] 2013a). Almost all tropical storms and hurricanes in the Atlantic basin (which includes the Gulf of Mexico and Caribbean Sea) form between June 1 and November 30 (hurricane season). August and September are peak months for hurricane development. The average wind speeds for tropical storms and hurricanes are listed below:

- A tropical depression has a maximum sustained wind speeds of 38 miles per hour (mph) or less
- A tropical storm has maximum sustained wind speeds of 39 to 73 mph
- A hurricanes has maximum sustained wind speeds of 74 mph or higher. In the western North Pacific, hurricanes are called typhoons; similar storms in the Indian Ocean and South Pacific Ocean are called cyclones.
- A major hurricane has maximum sustained wind speeds of 111 mph or higher (NOAA 2013b).

Over a two-year period, the U.S. coastline is struck by an average of three hurricanes, one of which is classified as a major hurricane. Hurricanes, tropical storms and tropical depressions pose a threat to life and property. These storms bring heavy rain, storm surge and flooding (NOAA 2013a). The cooler waters off the coast of New Jersey can serve to diminish the energy of storms that have traveled up the eastern seaboard. However, historical data show that a number of hurricanes/tropical storms have impacted New Jersey, often as the remnants of a larger storm hitting the Gulf or Atlantic coast hundreds of miles south of New Jersey, but maintaining sufficient wind and precipitation to cause substantial damage to the State.

Tropical cyclones affect New Jersey the most during the month of September, though the State has experienced tropical cyclones throughout the hurricane season, excluding November. Because of peak warmth in water temperatures in September, storms usually affect New Jersey during this time (Bucholz and Savadove 1993).

Hurricanes and tropical storms often occur at the same time. Because of this, officials assign short, distinctive names to the storms to avoid confusion among weather stations, coastal bases, and ships at sea. Since 1953, Atlantic tropical storms have been named from lists originated by the National Hurricane Center (NHC). Currently, they are maintained and updated by the World Meteorological Organization. The list of names in the table below are used in rotation and recycled every six years. For example, the 2014 list will be used again in 2020. The only time there is a change in the list is if the named storm was so costly or deadly that the future use of it would be inappropriate. If that occurs, the World Meteorological Organization committee will select a new name to replace the one removed from the list. If all the names in a season's list have been used, later storms are named for Greek letters, in alphabetical order. A storm is given a name once its winds reach a speed of 40 mph. In addition to the Atlantic list of names, there are ten other lists corresponding to other storm-prone regions of the world (NOAA 2013c). Table 5.4.2-1 lists the tropical cyclone names for 2014 through 2019.

Table 5.4.2-1. Tropical Cyclone Names for the Atlantic

2014	2015	2016	2017	2018	2019
Arthur	Ana	Alex	Arlene	Alberto	Andrea
Bertha	Bill	Bonnie	Bret	Beryl	Barry
Cristobal	Claudette	Colin	Cindy	Chris	Chantal
Dolly	Danny	Danielle	Don	Debby	Dorian
Edouard	Erika	Earl	Emily	Ernesto	Erin
Fay	Fred	Fiona	Franklin	Florence	Fernand
Gonzalo	Grace	Gaston	Gert	Gordon	Gabrielle
Hanna	Henri	Hermine	Harvey	Helene	Humberto
Isaias	Ida	Ian	Irma	Isaac	Imelda
Josephine	Joaquin	Julia	Jose	Joyce	Jerry
Kyle	Kate	Karl	Katia	Kirk	Karen
Laura	Larry	Lisa	Lee	Leslie	Lorenzo
Marco	Mindy	Matthew	Maria	Michael	Melissa
Nana	Nicholas	Nicole	Nate	Nadine	Nestor
Omar	Odette	Otto	Ophelia	Oscar	Olga
Paulette	Peter	Paula	Philippe	Patty	Pablo
Rene	Rose	Richard	Rina	Rafael	Rebekah
Sally	Sam	Shary	Sean	Sara	Sebastien
Teddy	Teresa	Tobias	Tammy	Tony	Tanya
Vicky	Victor	Virginie	Vince	Valerie	Van
Wilfred	Wanda	Walter	Whitney	William	Wendy

Source: NOAA 2014

Hurricanes and Tropical Storm

A hurricane is a tropical storm that attains hurricane status when its wind speed reaches 74 or more miles an hour. Tropical systems may develop in the Atlantic between the Lesser Antilles and the African coast, or may develop in the warm tropical waters of the Caribbean and Gulf of Mexico. These storms may move up the Atlantic coast of the United States and impact the eastern seaboard, or move into the United States through the states along the Gulf Coast, bringing wind and rain as far north as New England before moving offshore and heading east.

Because of its northern location on the Atlantic coastline, direct hits by storms of hurricane strength have a relatively low probability of impacting New Jersey, compared to the Southern coastal and Gulf States. It is possible, though rare, for the entire State to be impacted by hurricanes. Wind and surge effects tend to be concentrated in coastal areas of New Jersey, as well as specific riverine regions that may experience storm surge backwater effects.

A hurricane is a storm system with sustained winds of greater than 74 mph. 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 2011).

A tropical storm system is characterized by a low-pressure center and numerous thunderstorms that produce strong winds and heavy rain (winds are at a lower speed than hurricane-force winds, thus gaining its status as tropical storm versus hurricane). Tropical storms strengthen when water evaporated from the ocean is released as the saturated air rises, resulting in condensation of water vapor contained in the moist air. They are fueled by a different heat mechanism than other cyclonic windstorms such as Nor'Easters and polar lows. The characteristic that separates tropical cyclones from other cyclonic systems is that at any height in the atmosphere, the center of a tropical cyclone will be warmer than its surroundings; a phenomenon called "warm core" storm systems (NOAA 1999).

The term "tropical" refers both to the geographical origin of these systems, which usually form in tropical regions of the globe, and to their formation in maritime tropical air masses. The term "cyclone" refers to such storms' cyclonic nature, with counterclockwise wind flow in the Northern Hemisphere, and clockwise wind flow in the Southern Hemisphere. The opposite direction of the wind flow is a result of the Coriolis force (National Weather Service [NWS] 2010).

According to NOAA, tropical storms and tropical depressions, while generally less dangerous than hurricanes, can be deadly. The winds of tropical depressions/storms are usually not the greatest threat; rather, the rains, flooding, and severe weather associated with the tropical storms are what customarily cause more significant problems. Serious power outages can also be associated with these types of events (NOAA 1999).

According to an article in Science Daily, while tropical storms can produce extremely powerful winds and torrential rain, they are also able to produce high waves, damaging storm surges, and tornadoes. They develop over large bodies of warm water, and lose their strength if they move over land because of increased surface friction and loss of the warm ocean as an energy source. This is why coastal regions can receive significant damage from a tropical cyclone, while inland regions are relatively safe from receiving strong winds. Heavy rains, however, can produce significant flooding inland, and storm surges can produce extensive coastal flooding up to 25 miles from the coastline.

As per the United States Naval Observatory, one measure of the size of a tropical cyclone is determined by measuring the distance from its center of circulation to its outermost closed isobar. If the radius is less than two degrees of latitude, or 138 miles, then the cyclone is "very small" or a "midget". A radius between three and six latitude degrees or 207 to 420 miles are considered "average-sized". "Very large" tropical cyclones have a radius of greater than eight degrees or 552 miles.

The National Weather Service (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. The following are the definitions of the watches and warnings:

- *Hurricane/Typhoon Warning* is issued when sustained winds of 74 mph or higher are expected somewhere within the specified area in association with a tropical, subtropical, or post-tropical cyclone. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the warning is issued 36 hours in advance of the anticipated onset of tropical storm force winds (24 hours in the western north Pacific). The warning can remain in effect when dangerously high

water or combination of dangerously high water and waves continue, even though winds may be less than hurricane force.

- *Hurricane Watch* is issued when sustained winds of 74 mph or higher are possible within the specified area in association with a tropical, subtropical, or post-tropical cyclone. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours prior to the anticipated onset of tropical storm force winds.
- *Tropical Storm Warning* is issued when sustained winds of 39 to 73 mph are expected somewhere within the specified area within 36 hours (24 hours for the western north Pacific) in association with a tropical, subtropical, or post-tropical storm.
- *Tropical Storm Watch* is issued when sustained winds of 39 to 73 mph are possible within the specified area within 48 hours in association with a tropical, sub-tropical, or post-tropical storm (NWS 2013).

Nor'Easter

A Nor'Easter is a cyclonic storm that moves along the East Coast of North America. It is called a Nor'Easter because the damaging winds over coastal areas blow from a northeasterly direction. Nor'Easters can occur any time of the year, but are most frequent and strongest between September and April. These storms usually develop between Georgia and New Jersey within 100 miles of the coastline and typically move from southwest to northeast along the Atlantic Coast of the United States (NOAA 2013d).

In order to be called a Nor'Easter, a storm must have the following conditions, as per the Northeast Regional Climate Center (NRCC):

- Must persist for at least a 12-hour period
- Have a closed circulation
- Be located within the quadrilateral bounded at 45°N by 65° and 70°W and at 30°N by 85°W and 75°W
- Show general movement from the south-southwest to the north-northeast
- Contain wind speeds greater than 23 miles per hour (mph)

A Nor'Easter event can cause storm surges, waves, heavy rain, heavy snow, wind, and coastal flooding. Nor'Easters have diameters that can span 1,200 miles, impacting large areas of coastline. The forward speed of a Nor'Easter is usually much slower than a hurricane, so with the slower speed, a Nor'Easter can linger for days and cause tremendous damage to those areas impacted. Approximately 20 to 40 Nor'Easters occur in the northeastern United States every year, with at least two considered severe (Storm Solution, 2013). The intensity of a Nor'Easter can rival that of a tropical cyclone in that, on occasion, it may flow or stall off the mid-Atlantic coast resulting in prolonged episodes of precipitation, coastal flooding, and high winds.

Nor'Easters are a common winter occurrence in New Jersey. New Jersey may be impacted by 10 to 20 Nor'Easters each year, with approximately five to 10 of those having significant impact to the State. These storms repeatedly result in flooding, wave and erosion damage to structures, and erosion of natural resources, such as beaches, dunes, and coastal bluffs. The erosion of coastal features commonly results in greater potential for damage to shoreline development from future storms.

Meteorologists can often predict the likelihood of a Nor'Easter event. The NWS monitors potential Nor'Easter events and provides forecasts and information between five and seven days in advance of the storm in order to help prepare for the incident.

Nor'Easters bring winds, high tides, beach erosion, flooding, freezing and heavy rain, or snow (NOAA 2013). Nor'Easters are common in winter in New Jersey and the greater Mid-Atlantic region. They repeatedly result in flooding, various degrees of wave and erosion damage to structures, and erosion of natural resources, such as beaches, dunes, and coastal bluffs. The erosion of coastal features commonly results in greater potential for damage to shoreline development from future storms.

Perhaps the greatest concern in New Jersey is coastal erosion from Nor'Easters. Several of the recent Nor'Easters have done tremendous damage to the New Jersey shore. An example of this was the 1991 Halloween Nor'Easter which caused extreme beach erosion in excess of 13.5 million cubic feet of sand loss. Coastal communities spend millions of dollars to mitigate coastal erosion resulting from Nor'Easters. Another issue of concern is the destruction of dune and other protection structures at beaches. In the case of the 2012 Nor'Easter, several coastal communities were evacuated because the dunes were destroyed during Superstorm Sandy.

Another secondary effect is the potential for extensive coastal and inland flooding due to strong winds and heavy precipitation. This secondary effect was evident during the April 2007 Nor'Easter when heavy flooding occurred throughout the State. Flooding may also cause environmental contamination issues when facilities producing or storing hazardous materials are flooded.

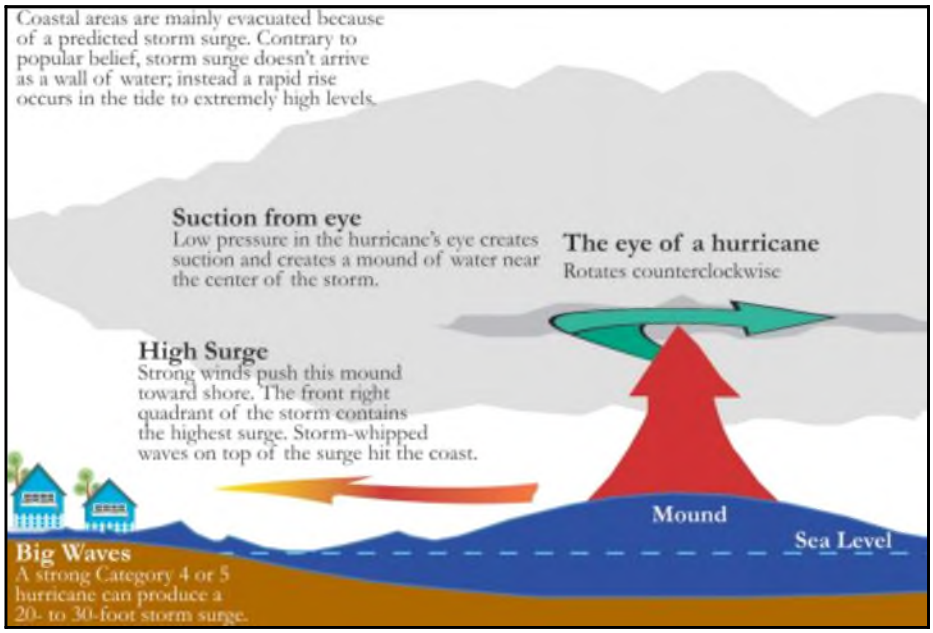
Widespread utility failure is another potential secondary effect of Nor'Easters. The high winds and often heavy wet snow associated with these storms have the potential to cause power outages and other service interruptions. Due to the size and intensity of Nor'Easters, power outages are often widespread and demand to restore power is great following cold-weather storms. In the event of extended service interruptions, another cascading event is the effect of extreme cold temperatures on vulnerable populations in the State and the potential for loss of life.

Storm Surge

Storm surges inundate coastal floodplains by dune overwash, tidal elevation rise in inland bays and harbors, and backwater flooding through coastal river mouths. Strong winds can increase in tide levels and water-surface elevations. Storm systems generate large waves that run up and flood coastal beaches. The combined effects create storm surges that affect the beach, dunes, and adjacent low-lying floodplains. Shallow, offshore depths can cause storm-driven waves and tides to pile up against the shoreline and inside bays.

Based on an area's topography, a storm surge may inundate only a small area (along sections of the northeast or southeast coasts) or storm surge may inundate coastal lands for a mile or more inland from the shoreline. Figure 5.4.2-1 depicts storm surge.

Figure 5.4.2-1. Storm Surge



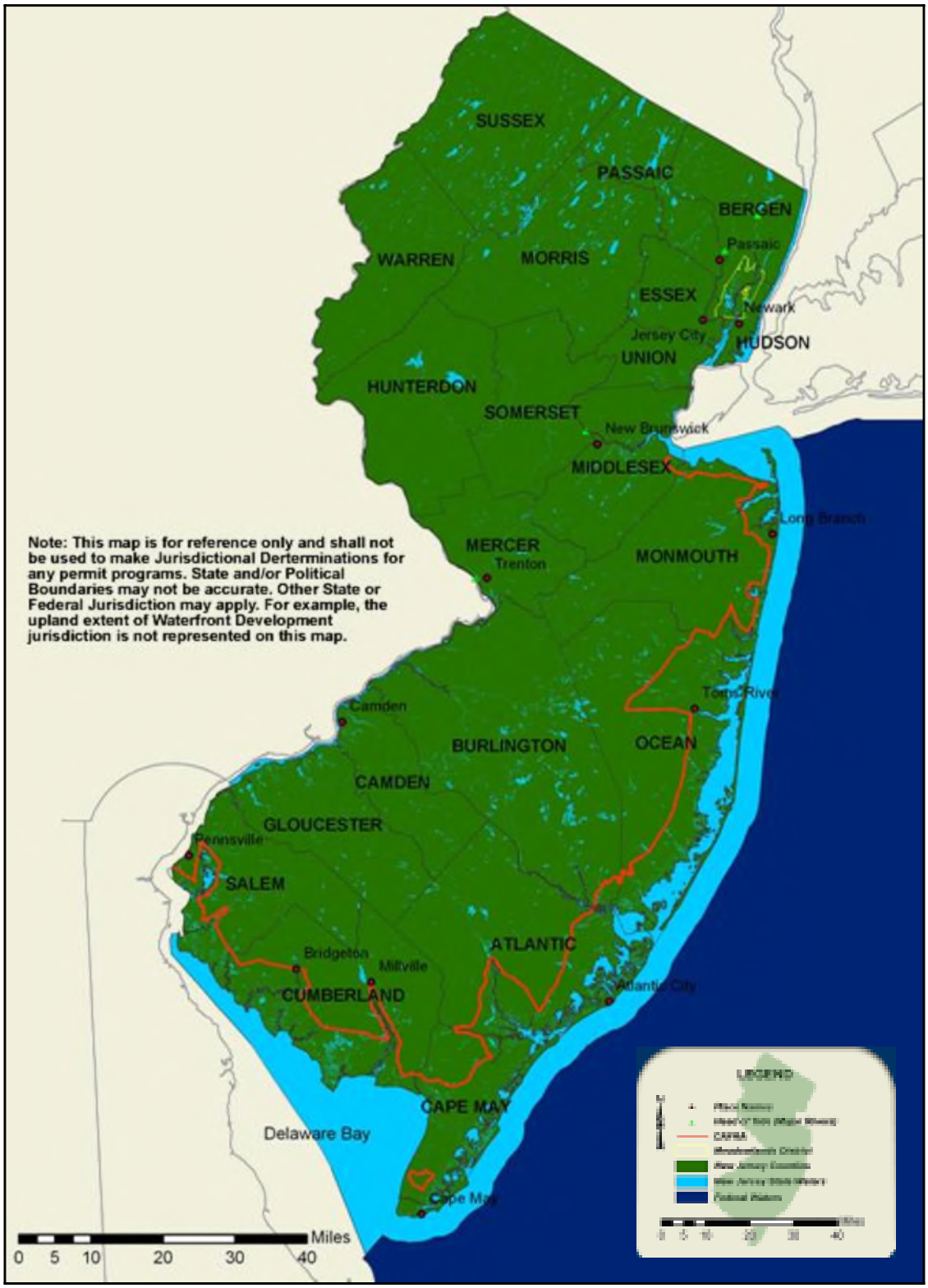
Source: FEMA 2010

Location

The entire State of New Jersey, not just the coastal areas, is vulnerable to coastal storms, depending on the storm's track. The coastal areas are more susceptible to damage caused by the combination of both high winds and tidal surge. Inland areas, especially those in floodplains, are also at risk for flooding because of heavy rain and winds. The majority of damage following coastal storms often results from residual wind damage and inland flooding, as was demonstrated during recent tropical storms.

New Jersey and its coastal communities are vulnerable to the damaging impacts of major storms along its 127 miles of coastline. As development and re-development increase, less-intense storms and sea-level rise will lead to costly storm damage. New Jersey's coastal zone includes portions of eight counties and 126 municipalities. The coastal boundary of New Jersey encompasses the Coastal Area Facility Review Act (CAFRA) area and the New Jersey Meadowlands District. Figure 5.4.2-2 shows New Jersey and the highlighted coastal zone area. Essex County is not located in either the CAFRA zone or Meadowlands; however, the County is considered a coastal area. The coastal area includes coastal waters to the limit of tidal influence including: the Atlantic Ocean (to the limit of New Jersey's seaward jurisdiction); Upper New York Bay, Newark Bay, Raritan Bay and the Arthur Kill; the Hudson, Raritan, Passaic, and Hackensack Rivers, and the tidal portions of the tributaries to these bays and rivers. The Delaware River and Bay and other tidal streams of the Coastal Plain are also in the coastal area, as is a narrow band of adjacent uplands in the Waterfront Development area beyond the CAFRA area (NJDEP 2014).

Figure 5.4.2-2. New Jersey Coastal Zone Area



Source: New Jersey Department of Environmental Protection (NJDEP) 2007

Essex County is located within the New York-New Jersey Harbor Estuary (Newark Bay) (see Figure 5.4.1-3 in Coastal Erosion for a map of the Estuary). Located in the New York & New Jersey Harbor Estuary, Newark Bay is the center of the most urbanized and industrialized parts of the country. Newark Bay is approximately six miles long and one mile wide and is located at the confluence of the Passaic and Hackensack Rivers, between the shores of Newark and Elizabeth to the west, Jersey City and Bayonne to the east, and Staten Island to the south. Newark Bay is linked to Upper and Lower New York Bay by the Kill van Kull and the Arthur Kill. Port Newark is located on the western shore of Newark Bay (Our Newark Bay 2014).

NOAA's Historical Hurricane Tracks tool is a public interactive mapping application that displays Atlantic Basin and East-Central Pacific Basin tropical cyclone data. This interactive tool catalogs tropical cyclones that have occurred from 1842 to 2012 (latest date available from data source). Between 1842 and 2012, 32 tropical cyclones tracked within 65 nautical miles of Essex County. Figure 5.4.2-3 displays tropical cyclone tracks for Essex County that tracked with 65 nautical miles between 2008 and 2012.

Figure 5.4.2-3. Historical Tropical Storm and Hurricane Tracks 2008 to 2012

Source; NOAA 2014

Storm Surge

Typically, storm surge is estimated by subtracting the regular/astrological tide level from the observed storm tide. Typical storm surge heights range from several feet to more than 25 feet. The exact height of the storm surge and which coastal areas will be flooded depends on many factors: strength, intensity, and speed of the hurricane or storm; the direction it is moving relative to the shoreline; how rapidly the sea floor is sloping along the shore; the shape of the shoreline; and the astronomical tide. Storm surge is the most damaging when it occurs along a shallow sloped shoreline, during high tide, in a highly populated, and developed area with little or no natural buffers (for example, barrier islands, coral reefs, and coastal vegetation).

The most common reference to a return period for storm surges has been the elevation of the coastal flood having a 1% chance of being equaled or exceeded in any given year, also known as the 100-year flood. Detailed hydraulic analyses include establishing the relationship of tide levels with wave heights and wave run-up. The storm surge inundation limits for the 1% annual chance coastal flood event are a function of the combined influence of the water surface elevation rise and accompanying wave heights and wave run-up along the coastline.

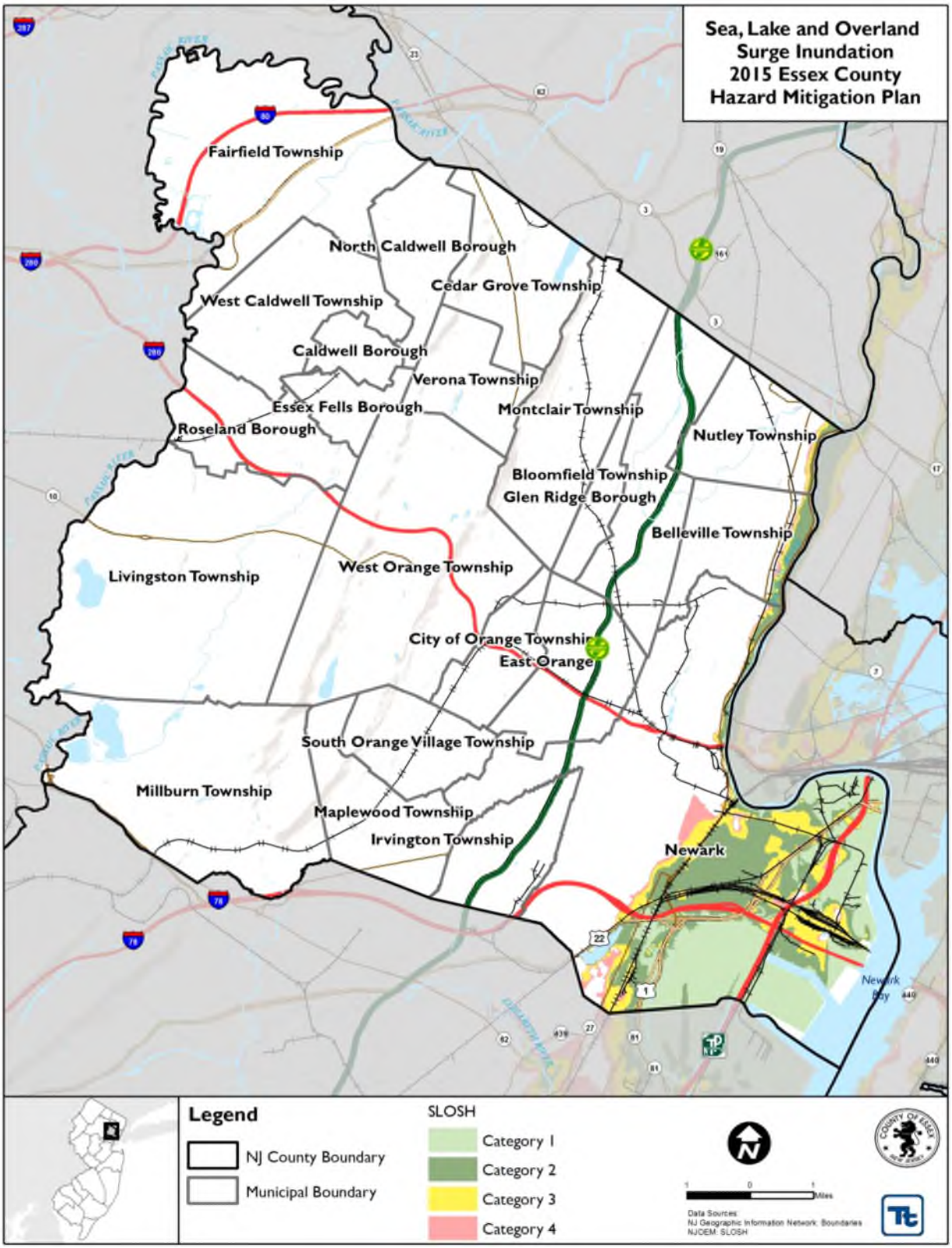
The risk of storm surge elevations higher than 7 feet exists along certain coastal segments of Oregon, Washington, and Alaska; and in every coastal state from Texas to New Jersey. A storm surge associated with storms of longer recurrence intervals may result in more storm surge flooding, higher water levels, larger waves, and an increased likelihood of dune overwash, wave damage, and possible breaching of barrier islands.

In addition to the coastal zone, the entire State, including Essex County, is vulnerable to hurricanes and tropical storms, depending on the storm's track. The coastal areas are more susceptible to damage caused by the combination of both high winds and tidal surge. Inland areas, especially those in floodplains, are also at risk for flooding because of heavy rain and winds. The majority of damage following hurricanes and tropical storms often results from residual wind damage and inland flooding, as was demonstrated during recent tropical storms.

As noted, inundation from storm surge has devastating impacts on the State's coastal communities. The U.S. Army Corps of Engineers (USACE), in cooperation with FEMA, initially prepared Sea, Lake and Overland Surge from Hurricanes (SLOSH) inundation maps. SLOSH maps represent potential flooding from worst-case combinations of hurricane direction, forward speed, landfall point, and high astronomical tide. It does not include riverine flooding caused by hurricane surge or inland freshwater flooding. The mapping was developed for the coastal communities in New Jersey using the computer model to forecast surges that occur from wind and pressure forces of hurricanes coastline topography. In New Jersey, hurricane category is the predominant factor in worst-case hurricane surges. The resulting inundation areas are grouped into Category 1 and 2 (dangerous), Category 3 (devastating), and Category 4 (catastrophic) classifications. The hurricane category refers to the Saffir/Simpson Hurricane Intensity Scale, summarized below.

FEMA Region IV Risk Analysis Team developed storm surge inundation grids for the State in a spatial format from the maximum of maximums outputs from the SLOSH model. These represent the worst-case storm surge scenarios for each hurricane category (1 through 4). To assess the Planning Area's exposure to the hurricane/tropical surge, a spatial analysis was conducted using the SLOSH model. The SLOSH boundaries do not account for any inland flash flooding. Figure 5.4.2-4 below illustrates these SLOSH zones.

Figure 5.4.2-4. FEMA Region IV SLOSH Model (Categories 1 through 4)



Source: NJOEM 2013

Extent

Hurricane and Tropical Storm

The extent of a hurricane is categorized in accordance with the Saffir-Simpson Hurricane Scale. The Saffir-Simpson Hurricane Wind Scale is a 1-to-5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous and require preventative measures (NOAA 2013b). Table 5.4.2-2 presents this scale, which is used to estimate the potential property damage and flooding expected when a hurricane makes landfall.

Table 5.4.2-2. The Saffir-Simpson Scale

Category	Wind Speed (mph)	Expected Damage
1	74-95 mph	Very dangerous winds will produce some damage: Homes with well-constructed frames could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph	Extremely dangerous winds will cause extensive damage: Homes with well-constructed frames could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph	Devastating damage will occur: Homes with well-built frames may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph	Catastrophic damage will occur: Homes with well-built frames can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	>157 mph	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: NOAA 2013b
Notes: mph = Miles per hour
> = Greater than

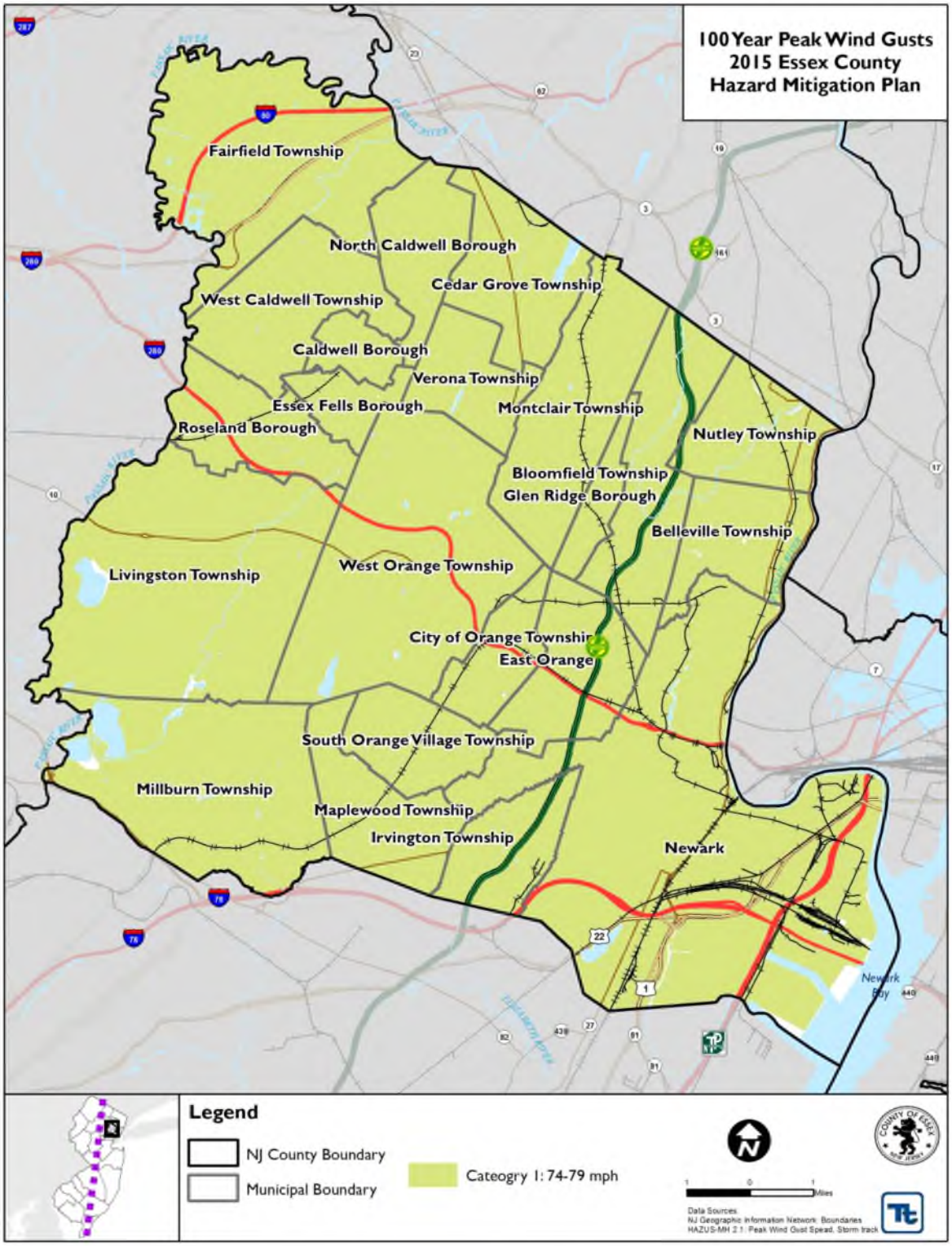
Mean Return Period

In evaluating the potential for hazard events of a given magnitude, a mean return period (MRP) is often used. The MRP provides an estimate of the magnitude of an event that may occur within any given year based on past recorded events. MRP is the average period of time, in years, between occurrences of a particular hazard event, equal to the inverse of the annual frequency of exceedance (Dinicola 2009).

Figure 5.4.2-5 and Figure 5.4.2-6 show the estimated maximum 3-second gust wind speeds that can be anticipated in the study area associated with the 100- and 500-year MRP events. These peak wind speed projections were generated using Hazards U.S. Multi-Hazard (HAZUS-MH) model runs. The estimated hurricane track used for the 100- and 500-year event is also shown. The maximum 3-second gust wind speeds for Essex County range from Tropical Storm to Category 1 hurricane speeds for the 100-year MRP event. The maximum 3-second gust wind speeds for Essex County range from Category 1 to Category 2 hurricane speeds

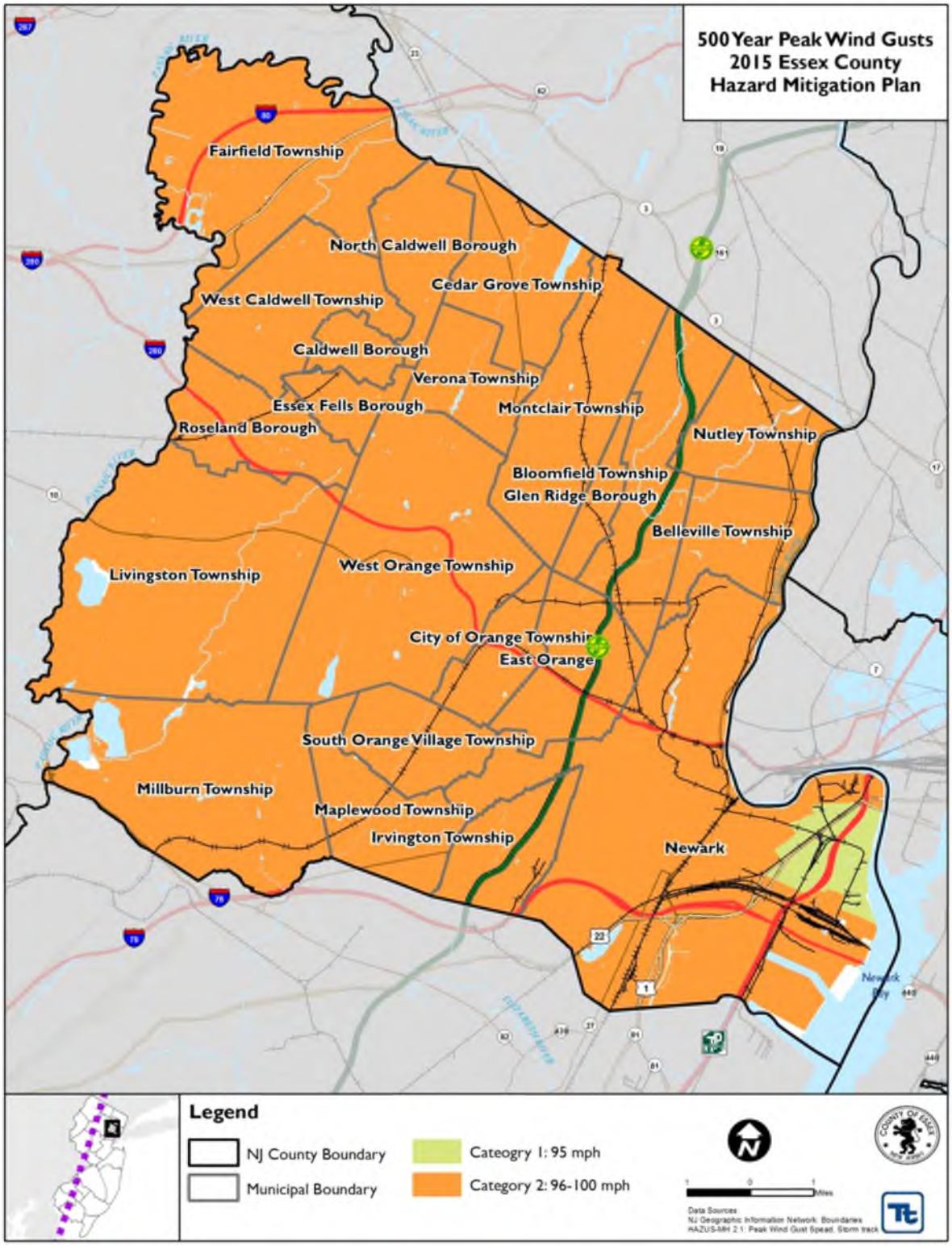
for the 500-year MRP event. The associated impacts and losses from these 100-year and 500-year MRP hurricane event model runs are reported in the Vulnerability Assessment.

Figure 5.4.2-5. Wind Speeds for the 100-Year Mean Return Period Event



Source: HAZUS-MH v.2.1

Figure 5.4.2-6. Wind Speeds for the 500-Year Mean Return Period Event



Source: HAZUS-MH v.2.1

Nor'Easter

The extent of a Nor'Easter can be classified by meteorological measurements and by evaluating its societal impacts. NOAA's National Climatic Data Center (NCDC) is currently producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two-thirds of the U.S. The RSI ranks snowstorm impacts on a scale from 1 to 5. It is based on the spatial extent of the storm, the amount of snowfall, and the interaction of the extent and snowfall totals with population (based on the 2000 Census). The NCDC has analyzed and assigned RSI values to over 500 storms since 1900 (NOAA-NCDC 2011). Table 5.4.2-3 presents the five categories.

Table 5.4.2-3. RSI Ranking Categories

Category	Description	RSI Value
1	Notable	1-3
2	Significant	3-6
3	Major	6-10
4	Crippling	10-18
5	Extreme	18.0+

Source: NOAA-NCDC 2011
RSI Regional Snowfall Index

Nor'Easters have the potential to impact society to a greater extent than hurricanes and tornadoes. These storms often have a diameter three to four times larger than a hurricane and therefore, impact much larger areas. More homes and properties become susceptible to damage as the size and strength of a Nor'Easter intensifies (Storm Solution, 2013). The severity of a Nor'Easter depends on several factors including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, time of occurrence during the day (e.g., weekday versus weekend), and time of season.

Storm Surge

Typically, storm surge is estimated by subtracting the regular/astrological tide level from the observed storm tide. Typical storm surge heights range from several feet to more than 25 feet. The exact height of the storm surge and which coastal areas will be flooded depends on many factors: strength, intensity, and speed of the hurricane or storm; the direction it is moving relative to the shoreline; how rapidly the sea floor is sloping along the shore; the shape of the shoreline; and the astronomical tide. Storm surge is the most damaging when it occurs along a shallow sloped shoreline, during high tide, in a highly populated, and developed area with little or no natural buffers (for example, barrier islands, coral reefs, and coastal vegetation).

The most common reference to a return period for storm surges has been the elevation of the coastal flood having a one-percent chance of being equaled or exceeded in any given year, also known as the 100-year flood. Detailed hydraulic analyses include establishing the relationship of tide levels with wave heights and wave run-up. The storm surge inundation limits for the one-percent annual chance coastal flood event are a function of the combined influence of the water surface elevation rise and accompanying wave heights and wave run-up along the coastline.

The risk of storm surge elevations higher than seven feet exists along certain coastal segments of Oregon, Washington, and Alaska; and in every coastal state from Texas to New Jersey. A storm surge associated with storms of longer recurrence intervals may result in more storm surge flooding, higher water levels, larger waves, and an increased likelihood of dune overwash, wave damage, and possible breaching of barrier islands.

Coastal Storm Frequency Caveats

Similar to flood and hurricanes, storms are often categorized by return frequencies (e.g. this was a 100-year storm, etc.). However, there are several shortcomings related to trying to categorize storms by return frequencies. First, the historical record of storms is relatively short to accurately assess the true long-term frequency of long period events. Most records only go back about 100 years. It is a little like sampling 20 ocean waves and making a conclusion of the full range of wave amplitudes in that part of the ocean. Second, when it comes to coastal flood impacts, it is not a level playing field. Sea level rise changes the vulnerability such that storms previously calculated at an average 100-year frequency will occur considerably more often. Determining how well that can be quantified is dependent on the accuracy of sea level rise predictions. Third, coastal flood impacts can vary significantly from one locality to another depending upon such factors as onshore wind component and incidence of wave activity to the coastline. Fourth, a storm may have been a 100-year storm for coastal flooding but a 10-year storm for wind, snowfall or rainfall. Also, the impact of a storm can be compounded if it has multiple severe dimensions (e.g. major coastal flooding in addition to very heavy snow and extreme winds) or if it impacts such a large area that mutual aid cannot be exercised. Fifth, development along the coastline or in other vulnerable areas can significantly increase the impact of a storm. Thus, the same storm in 1950 might not have generated the same amount of damage as now with the increased coastal development.

In addition, there is a great deal of misunderstanding surrounding the reference to a "100-year storm" or a return frequency of 100 years. Similar to the flood events, a 100-year storm event does not mean that one should expect such a storm (or a storm of greater intensity) once every 100 years. Instead, a 100-year storm, to use that frequency as an example, is best described as a 1% chance of a storm that magnitude occurring in any given year. There might be two or three such storms in one hundred year period and then no more for the next 200 or 300 years.

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with coastal storm 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.

Between 1954 and 2014, FEMA issued a disaster (DR) or emergency (EM) declaration for the State of New Jersey for 16 coastal storm-related events, classified as one or a combination of the following disaster types: hurricane, tropical storm, severe storm, flooding, Nor'Easter, tropical depression, coastal storm, high tides, and heavy rain. Of those events, Essex County has been included in eight coastal storm-related declarations (EM and DR) (FEMA 2014).

For this 2015 Plan Update, known coastal storm events that have impacted Essex County between 2007 and 2014 are identified in Table 5.4.2-4. With coastal storm documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.2-4 may not include all events that have occurred in the County. Please see Section 9 for detailed information regarding impacts and losses to each municipality.

Table 5.4.2-4. Coastal Storm Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
April 15-17, 2007	Severe Storm and Inland and Coastal Flooding (Nor'Easter)	DR-1694	Yes	A Nor'Easter brought heavy rain that caused widespread and significant river, stream, and urban flooding of low lying and poor drainage areas. Flooding resulted in two deaths and approximately $19 million damages. Rainfall totals ranged from 2.16 inches at Canoe Brook to 8.08 inches at Garret Mountain. In Essex County, rainfall totals ranged from 4.56 inches at the Orange Reservoir to 7.36 inches at Verona. Newark Airport had 6.63 inches of rain. Roads were closed throughout the County. There were widespread power outages and flooding of roadways and homes. There were evacuations in Fairfield Township due to flooded areas of the Township. In Belleville Township, a man was found next to his car on a flooded street. Overall, the County had approximately $4 million in damages from this event.
September 6-7, 2008	Tropical Storm Hanna	N/A	N/A	Tropical Storm Hanna impacted northeast New Jersey, making landfall near the Nassau/Suffolk County border on September 6th. Rainfall totals for this event ranged from 2.52 inches to 5.5 inches throughout New Jersey. The highest sustained wind speed of 39 mph and a peak gust of 45 mph was recorded at Newark Airport (Essex County). In Essex County, trees were reported down. Wind gusts ranged from 30 mph at Caldwell Airport to 45 mph at Newark International Airport. Rainfall totals in Essex County ranged from 3.75 inches at Newark Airport to 4.5 inches at the flood warning system gage in Canoe Brook. In the City of Newark, Meeker Avenue and Elizabeth Avenue were closed with cars floating due to flash flooding. McCarter Highway was closed due to flooding and Routes 1 and 9 were closed with cars stalled in flood waters. The Third River at Bloomfield exceeded its flood stage of 6 feet. The River crested at 7.37 feet and fell below flood stage on the 7th. The Peckman River at Verona exceeded its flood stage of 3.5 feet and crested at 4.10 feet. Water rescues were performed on Cortland Street in Belleville.
August 26 – September 5, 2011	Hurricane Irene	DR-4021	Yes	Hurricane Irene moved north along the Atlantic Coast, making landfall near Cape Lookout, North Carolina, on August 27th. The hurricane moved back over open water before making landfall for a second time at Little Egg Inlet in New Jersey on August 28th. This was the first time since 1903 that a hurricane made landfall in New Jersey. Rain fell for an 18-hour period, with totals ranging from six to eight inches across New Jersey. Higher amounts were

Table 5.4.2-4. Coastal Storm Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				observed in southwestern, central, and northeastern New Jersey. The heavy rain from the storm caused record-breaking floods on many streams throughout the State. Thirty-nine of the 94 USGS gages with greater than or equal to 20 years of record, had record high peaks. Thirty-three gages experienced peaks equal to or greater than the 100-year recurrence interval. NWS climate site at Newark recorded 8.92 inches of rain. In Essex County, in West Orange Township, nearly 15 homes were damaged from fallen trees. Emergency crews responded to 120 calls and closed several streets. Rainfall totals ranged from 7.32 inches in Essex Fells to 9.96 inches in Orange; with 7.69 inches falling at Newark Airport which was the highest one-day total for Newark Airport. Peak wind gusts of 40 mph and 61 mph were recorded at Caldwell and Newark Airports, respectively. In Belleville, downed trees were reported on Watchung Avenue. Overall, the municipalities experienced flooding, downed trees, power outages, flooding, evacuations, and over $1.8 million in clean-up and other costs to the municipalities. The Passaic River gage at the Passaic Valley Sewage Commission recorded a peak stage of 7.11 feet, 0.64 feet higher than the previous peak of record on March 13, 2010.
October 26 – November 8, 2012	Hurricane Sandy	DR-4048	Yes	As storm surge from Sandy was pushed into the New York and Raritan Bays, sea water piled up within the Hudson River and coastal waterways and wetlands of northeastern New Jersey, including Newark Bay, Passaic and Hackensack Rivers, Kill van Kull, and Arthur Kill. Mandatory evacuations of people living along the coasts and rivers in Union, Essex, and Hudson Counties. In Essex County, inundations of four to six feet were measured across Newark Bay in Elizabeth and the area around Newark Airport. Storm tide at Newark was 11.6 feet with an estimated inundation (maximum depth of water on land) of 3.5 feet. The City of Newark had 7.65 inches of rainfall. Peak wind gusts ranged from 70 mph at Caldwell Airport to 78 mph at Newark Airport. In Fairfield, peak wind gusts measured at 72 mph and Reef Road flooded to Howard Street.. Overall, the municipalities of Essex County experienced flooding, power outages, evacuations, opening of shelters, and evacuations. County residents were without power for six days. Other losses to the municipalities included damage to water mains and pressure regulators, damage to roofs of municipal buildings, water in basements of residential and

Table 5.4.2-4. Coastal Storm Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				commercial properties, tree damage, and wind damage. Two hundred properties in Essex County were damaged. The Passaic Valley Sewage Commission reported that the treatment plant in Newark was inundated with at five feet of water during the storm and 840 million gallons of untreated sewage flowed into the Newark Bay. Another three billion gallons of partially treated sewage was sent into the bay before secondary treatment was restored.
November 7-8, 2012	Nor'Easter	N/A	N/A	A strong Nor'Easter caused high winds along the coast of New Jersey, heavy snow in east-central New Jersey, 10 foot waves along the ocean front and minor tidal flooding along the ocean front. This storm caused setbacks with restoration efforts caused by Hurricane Sandy. Snowfall totals averaged one to five inches in most of the State. In Essex County, snowfall amounts totaled 6.2 inches, which broke the record of 5.7 inches on November 22-23, 1989 in the City of Newark. For the remainder of Essex County, snowfall totals ranged from 4.3 inches in Bloomfield to 6 inches in Millburn. Peak wind gusts reached 44 mph in Montclair.
December 26-27, 2012	Nor'Easter	N/A	N/A	A deep area of low pressure approached from the southeast and pass just south of Long Island. High winds from this Nor'Easter resulted in scatter damage throughout eastern Essex County, with property damages totaling $1,000. No injuries or fatalities were associated with this Nor'Easter. This storm brought heavy rain to parts of Essex County, with totals ranging from 1.44 inches at Caldwell Airport to 1.84 inches at Newark Airport. Peak wind gust of 44 mph was recorded at Newark Airport. In the City of Newark, wires were down on Morton Street.
February 13-14, 2014	Nor'Easter	N/A	N/A	In Essex County, snowfall totals ranged from 11.8 inches in Maplewood Township and 15.5 inches in West Orange Township. Heavy wet snow likely caused a roof collapse in Cedar Grove Township on Pompton Avenue.

Source: FEMA 2014; NCDC 2013; NWS 2014; SPC 2012; NJ HMP 2012; USGS 2011; NHC 2012; NOAA 2012

DR Disaster Declaration (FEMA)
FEMA Federal Emergency Management Agency
Mph miles per hour
N/A Not Applicable

Hurricane Sandy

Hurricane Sandy caused widespread damage after it came inland near Atlantic City on October 29, 2012. It was a Category 1 hurricane as it approached the New Jersey coastline and a post-tropical cyclone as it came ashore near Atlantic City. The storm brought hurricane-force wind gusts to coastal and inland sections, nearly a foot of rain in southern New Jersey, and a record storm surge along the coast and in adjacent waterbodies. Hurricane Sandy impacted roadways, rail and air transportation, and the power grid across the State.

In Essex County, freight movement at Port Authority facilities in Newark and County and regional facilities located in vulnerable areas, Essex County's municipalities, residents and businesses also suffered losses from wind and water damage. The most significant riverine flooding area in Essex County is related to the large Flood Hazard (A Zone) along the western Passaic River corridor in Fairfield, West Caldwell, Roseland, Livingston and Millburn. There was less direct exposure along the eastern Passaic River corridor except where the River becomes tidally influenced in parts of Nutley and Belleville along State Highway 21 and in portions of the downtown and Ironbound in Newark. Townships such as Montclair, Bloomfield and Nutley, located along Toney's Brook and the Third River, also experienced property losses due to flooding during Sandy and Irene. The Essex County Board of Taxation identified substantial ratable loses because of Hurricane Sandy. Table 5.4.2-5 outlines the amount of ratable loss due to the storm in Essex County.

Table 5.4.2-5. Hurricane Sandy Ratable Loss Identified in Essex County

Municipality	Ratable Loss
Belleville	$259,600
Bloomfield	$77,200
Essex Fells	$394,800
Irvington	$104,000
Livingston	$141,800
Millburn	$172,900
Montclair	$2,005,900
Nutley	$228,600
South Orange	$174,500
West Orange	$549,300
Total	**$4,108,600**

Source: Essex County Board of Taxation, 2013

Hurricane Sandy also brought economic impacts associated with the storm, including loss of wages. Rutgers University's School of Public Affairs and Administration in Newark recently completed the "The Impact of Superstorm Sandy on New Jersey Towns and Households" in October of 2013. This report provided and in-depth analysis of the lost wages. The report indicated that there was an approximate $59 million dollar loss in wages as a result of Hurricane Sandy in the County. The report also identified that there was an approximate average of six days of power loss in the County. The estimate was based on the average number of days the public schools were closed in the County.

Probability of Future Occurrences

It is estimated that Essex County will continue to experience direct and indirect impacts of coastal storms annually that may induce secondary hazards such as flooding, extreme wind, coastal erosion, storm surge in coastal areas, infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, and transportation delays, accidents and inconveniences.

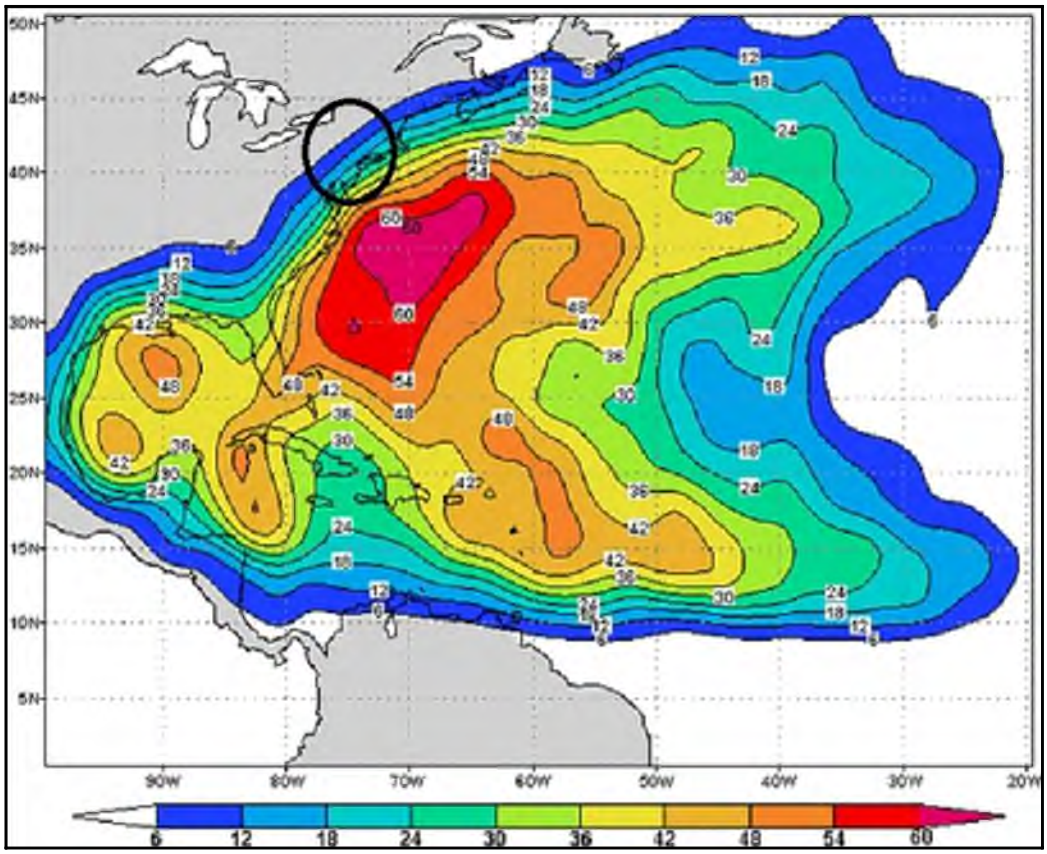
In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for drought in the County is considered 'occasional' (likely to occur within 100 years, as presented in Table 5.3-3).

The following provides probability of each type of coastal storm discussed in this section.

Hurricane and Tropical Storm

The NOAA Hurricane Research Division published a map (included as Figure 5.4.2-8) showing the chance that a tropical storm or hurricane (of any intensity) will affect a given area during the hurricane season (June to November). This analysis was based on historical data from 1944 to 1999. Based on this analysis, Essex County has a 12% to 18% chance of a tropical storm or hurricane affecting the area each year. The probability increases as you move from the northwest portion of the State to the southeast, with the highest probability along the coast in Cape May and Atlantic Counties.

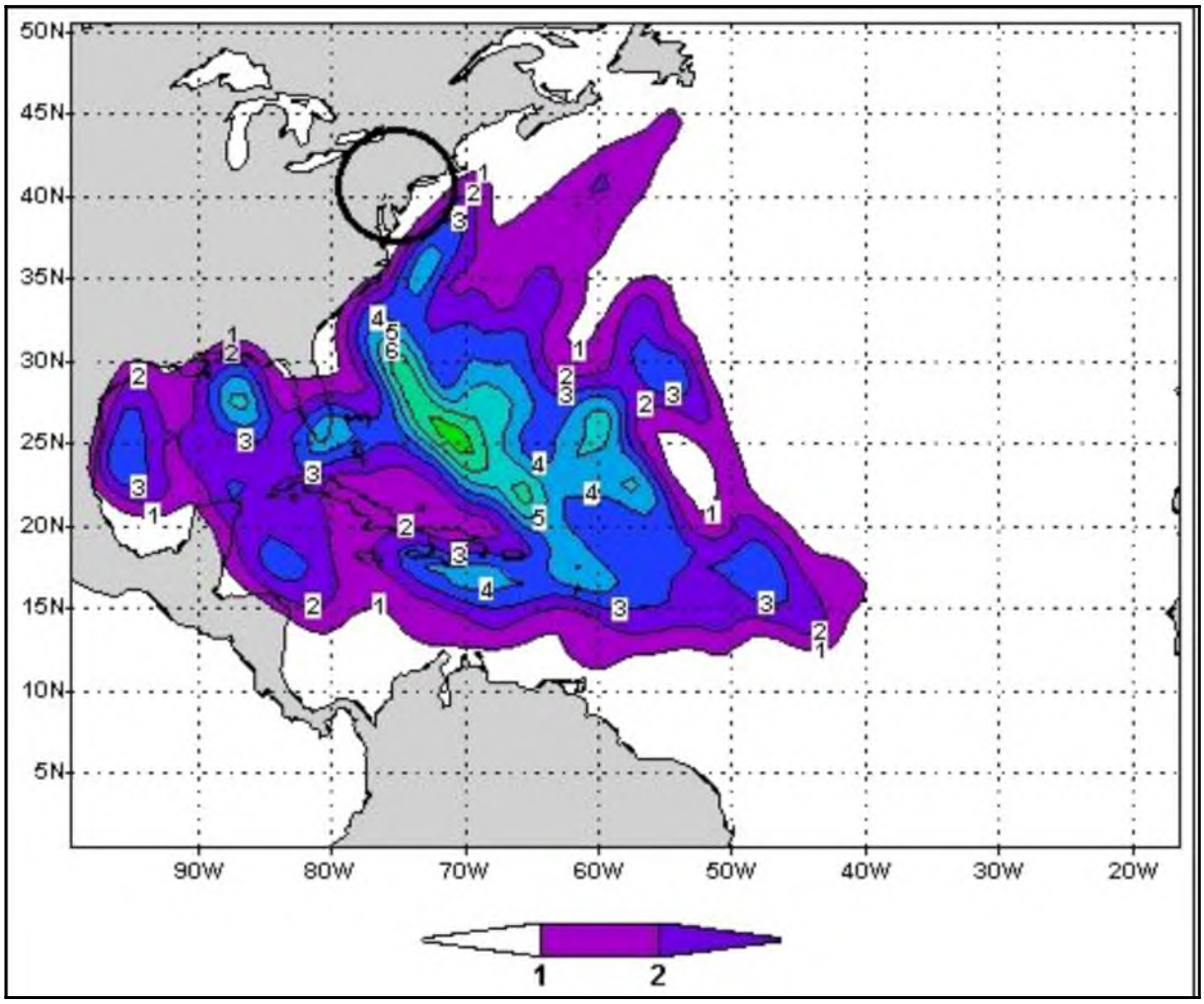
Figure 5.4.2-7. Atlantic Basin Tropical Cyclone Probabilities



Source: NOAA 2010
Note: The black circle was added to indicate the approximate location of the State of New Jersey

A similar analysis was conducted to determine the probability that a major hurricane (Category 3, 4, or 5) will directly affect the area during hurricane season (June through November). The analysis was based on historic data from 1944 to 1999 for hurricanes within approximately 30 miles of the identified area. This analysis indicates that Essex County has a less than 1% chance per year of a Category 3, 4, or 5 hurricane approaching the southern portion of the State (NOAA 2010). Major hurricanes are rare along the mid-Atlantic coast; therefore, determining and obtaining a realistic probability is extremely difficult.

Figure 5.4.2-8. Probability of a Category 3, 4, or 5 Hurricane



Source: NOAA 2010
Note: The black circle was added to indicate the approximate location of the State of New Jersey

Nor'Easter

As with any weather phenomenon, it is nearly impossible to assign probabilities to Nor'Easters, except over the long-term. High activity seasons are when storm activity exceeds the historical 75th percentile. This means that seasons with this number of storms are expected to occur during one out of four years. Lower activity seasons are defined as when storm activity falls below the historical 75th percentile; meaning this number of storms are expected to occur during three out of four years (East Coast Winter Storms, 2013).

Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

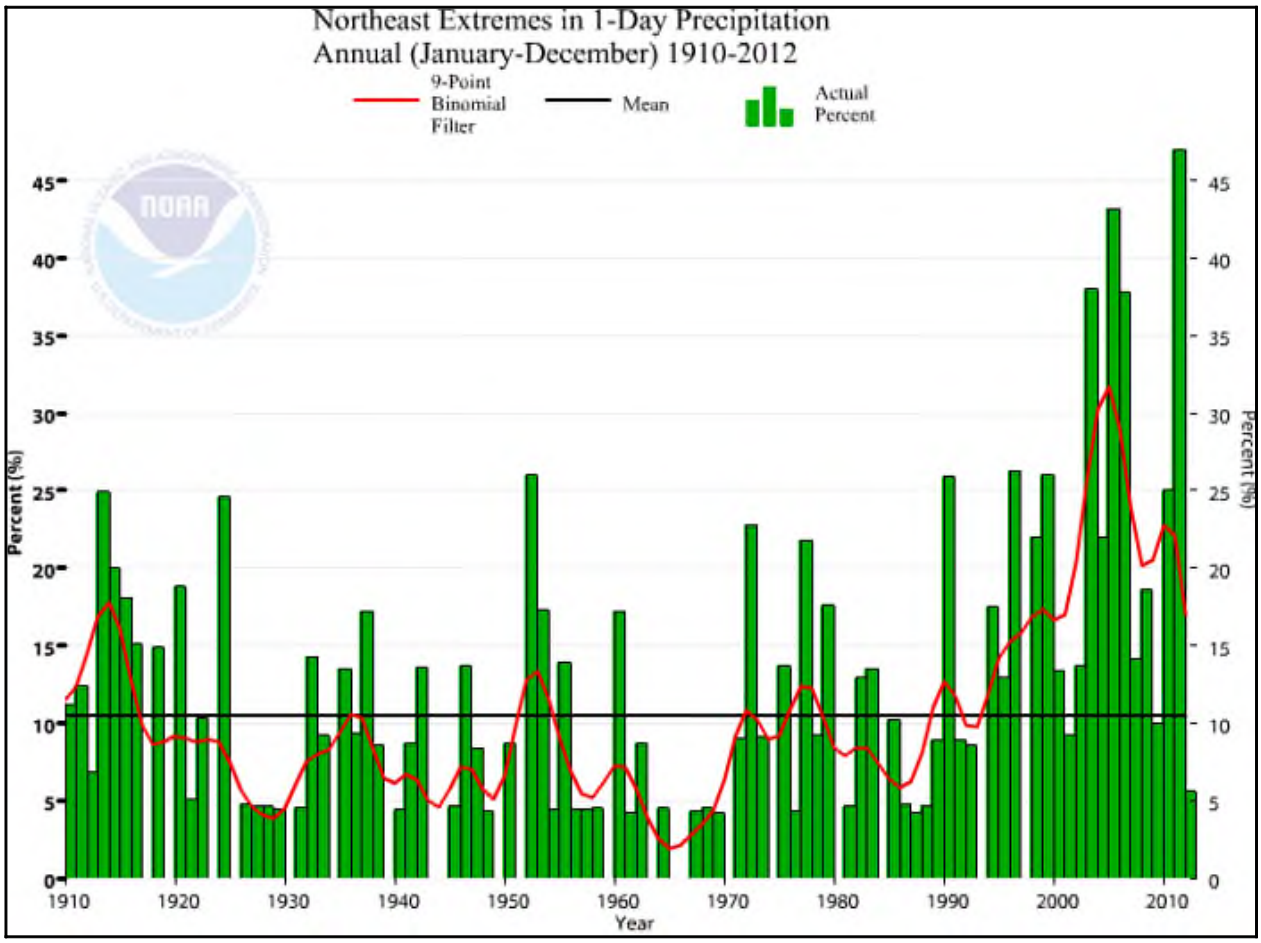
Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-

2010 (ONJSC, 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4 °F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).

Northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over 5" (12%) greater than the average from 1895-1970. Southern New Jersey became 2" (5%) wetter late in the 20th century (Office of New Jersey State Climatologist). Average annual precipitation is projected to increase in the region by 5% by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New York City Panel on Climate Change [NPCC] 2009).

Precipitation measurements indicate both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over five inches (12%) greater than the average from 1895-1970. Southern New Jersey became two inches (5%) wetter late in the 20th century (Office of New Jersey State Climatologist). Average annual precipitation is projected to increase in the region by 5% by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New York City Panel on Climate Change [NPCC] 2009). Figure 5.4.2-9 shows the frequency of heavy precipitation events in the northeastern United States.

Figure 5.4.2-9. Frequency of Heavy Precipitation Events in the Northeastern United States, 1910 to 2010



Source: Rutgers Climate Institute 2013

Some climatologists predict that climate change may play a role in the frequency and intensity of Nor'Easters. Two ingredients are needed to produce strong Nor'Easters and intense snowfall: (1) temperatures which are just below freezing, and (2) massive moisture coming from the Gulf of Mexico. When temperatures are far below freezing, snow is less likely. As temperatures increase in the winter months they will be closer to freezing rather than frigidly cold. Future climate change has been predicted to produce more moisture, thus increasing the likelihood that these two ingredients (temperatures just below freezing and intense moisture) will cause more intense snow events.

A 2013 report by Rutgers University indicates that sea level has been steadily rising with sea levels along the New Jersey coastline rising faster than the global average. Continued Seal Level Rise could indicate more frequent and more severe coastal flooding events (Rutgers 2013b). Flooding events associated with storm surge caused by hurricanes and tropical storms could therefore also increase. Section 5.4.1 (Coastal Erosion) contains a discussion of the State's efforts to address sea level rise.

5.4.2.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the coastal storm hazard, all of Essex County has been identified as exposed. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), are exposed and potentially vulnerable to coastal storms. The following text evaluates and estimates the potential impact of the coastal storm hazard on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

The high winds and air speeds of a hurricane often result in power outages, disruptions to transportation corridors and equipment, loss of workplace access, significant property damage, injuries and loss of life, and the need to shelter and care for individuals impacted by the events. A large amount of damage can be inflicted by trees, branches, and other objects that fall onto power lines, buildings, roads, vehicles, and, in some cases, people. Additionally, hurricanes can cause storm surge related damages along the coast.

Due to Essex County's location along the Newark Bay and the Passaic River, the loss associated with coastal storms is primarily associated with storm-related rains, storm surge and severe winds. The County has experienced flooding in association with hurricanes and tropical storms in the past. Please refer to Section 5.4.5 (Flood) for more information on the County's vulnerability to the flood hazard and the County's coastal vulnerability index that assesses the County's vulnerability to coastal hazards.

The entire inventory of the County is at risk of being damaged or lost due to impacts of coastal storms. Certain areas, infrastructure, and types of building are at greater risk than others due to proximity to coastal waters, falling hazards, their manner of construction. Potential losses associated with high winds were calculated for Essex County for the 100-year and 500-year MRP wind events. In addition, the coastal areas are vulnerable to hurricane storm surge. The impacts on population, existing structures and critical facilities are presented below, following a summary of the data and methodology used.

Data and Methodology

After reviewing historic data, the HAZUS-MH methodology and model were used to analyze the coastal storm hazard for Essex County. Data used to assess this hazard include data available in the HAZUS-MH 2.1 hurricane model, professional knowledge, information provided by the Planning Committee.

A probabilistic scenario was run for the County for annualized losses and the 100- and 500-year MRPs were examined for the wind hazard. These results are shown in Figures 5.4.2-6 and 5.4.2-7, earlier in this section, which show the HAZUS-MH maximum peak gust wind speeds that can be anticipated in the study area associated with the 100- and 500-year MRP events. The estimated hurricane storm track for the 100- and 500-year events is also shown.

HAZUS-MH contains data on historic hurricane events and wind speeds. It also includes surface roughness and vegetation (tree coverage) maps for the area. Surface roughness and vegetation data support the modeling of wind force across various types of land surfaces. Hurricane and inventory data available in HAZUS-MH were used to evaluate potential losses from the 100- and 500-year MRP events (severe wind impacts).

The "Sea – Lake Overland Surge from Hurricanes – SLOSH Model, which represents potential flooding from worst-case combinations of hurricane direction, forward speed, landfall point, and high astronomical tide was used to estimate exposure. Please note these inundation zones do not include riverine flooding caused by hurricane surge or inland freshwater flooding. The model, developed by the National Weather Service 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 analysis for the exposure of population, general building stock, and critical facilities are cumulative in nature. For example, if a facility is located within the category 1 SLOSH zone is also located within the category 2 SLOSH zone. The assumption is that if a facility is affected by a category 1 storm it would also be affected by a category 2 or 3 storm event. For this purposes of this assessment, the population/demographic data presented include only those Census blocks whose geometric centers fall within the identified hazard areas. Therefore, the assessment is likely to underestimate the population exposed.

Impacts to life, health, and safety and structures are discussed below using the methodology described above.

Impact on Life, Health and Safety

The impact of a hurricane on life, health and safety is dependent upon several factors including the severity of the event and whether or not adequate warning time was provided to residents. It is assumed that the entire County population is exposed to the hurricane hazard. Please refer to Section 4 (County Profile) for the total Essex County population vulnerable to this hazard.

To estimate the population in the hurricane inundation zones, the sum of the population in all Census Blocks with their centroid located in the SLOSH zone was calculated for each participating municipality Table 5.4.2-6 summarizes the approximate population located in the hurricane inundation zones based on 2010 Census data. This exposure analysis is limited by the Census Block and SLOSH zone configurations. If a Block's centroid is not located within the underlying SLOSH zone it will not produce a result. For example, a portion of Newark is located within the Category 1 and Category 2 SLOSH inundation zones, however the Census Block centroid is not located within the SLOSH, even though a portion of the Block is located within the SLOSH zone. This circumstance does not produce an exposure result. Refer to Section 5.4.5 (Flood) for the population located in the coastal flood zones (V-zones).

Table 5.4.2-6. Approximate Population in the Hurricane Inundation Zones

Municipality	Total Population (2010 Census)	Estimated Population in SLOSH Inundation Zones			
		Cat 1	Cat 2	Cat 3	Cat 4
Township of Belleville	35,926	0	1,488	2,369	2,523
Township of Bloomfield	47,315	0	0	0	0
Borough of Caldwell	7,822	0	0	0	0
Township of Cedar Grove	12,411	0	0	0	0
City of East Orange	64,270	0	0	0	0
Borough of Essex Fells	2,113	0	0	0	0

Municipality	Total Population (2010 Census)	Estimated Population in SLOSH Inundation Zones			
		Cat 1	Cat 2	Cat 3	Cat 4
Township of Fairfield	7,466	0	0	0	0
Borough of Glen Ridge	7,527	0	0	0	0
Township of Irvington	53,926	0	0	0	0
Township of Livingston	29,366	0	0	0	0
Township of Maplewood	23,867	0	0	0	0
Township of Millburn	20,149	0	0	0	0
Township of Montclair	37,669	0	0	0	0
City of Newark	277,140	5,038	40,919	60,909	65,367
Borough of North Caldwell	6,183	0	0	0	0
Township of Nutley	28,370	0	191	398	987
City of Orange Township	30,134	0	0	0	0
Borough of Roseland	5,819	0	0	0	0
Township of South Orange Village	16,198	0	0	0	0
Township of Verona	13,332	0	0	0	0
Township of West Caldwell	10,759	0	0	0	0
Township of West Orange	46,207	0	0	0	0
Essex County (Total)	**783,969**	**5,038**	**42,598**	**63,676**	**68,877**

Source: U.S. Census 2010 and NJOEM
Notes: Cat = Category Hurricane

Residents may be displaced or require temporary to long-term sheltering. In addition, downed trees, damaged buildings and debris carried by high winds can lead to injury or loss of life. Socially vulnerable populations are most susceptible, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. HAZUS-MH estimates there will be 0 displaced households and 0 people that may require temporary shelter due to a 100-year MRP event. For a 500-year MRP event, HAZUS-MH estimates 422 households will be displaced and 127 people will require short-term sheltering. Refer to Table 5.4.2-7 which summarizes the sheltering estimates for the 100- and 500-year MRP events by municipality. Please note these estimates are based on wind speed only and do not account for sheltering needs associated with flooding and storm surge that may accompany coastal storm events.

Table 5.4.2-7. Sheltering Needs for the 100- and 500-year MRP Hurricane Event

Municipality	100-Year MRP		500-Year MRP	
	Displaced Households	People Requiring Short-Term Shelter	Displaced Households	People Requiring Short-Term Shelter
Township of Belleville	0	0	22	5
Township of Bloomfield	0	0	28	6
Borough of Caldwell	0	0	7	2
Township of Cedar Grove	0	0	4	1
City of East Orange	0	0	57	20
Borough of Essex Fells	0	0	0	0
Township of Fairfield	0	0	1	0
Borough of Glen Ridge	0	0	2	0
Township of Irvington	0	0	51	17
Township of Livingston	0	0	3	0
Township of Maplewood	0	0	7	2
Township of Millburn	0	0	6	1
Township of Montclair	0	0	18	4
City of Newark	0	0	147	52
Borough of North Caldwell	0	0	1	0
Township of Nutley	0	0	12	2
City of Orange Township	0	0	29	9
Borough of Roseland	0	0	1	0
Township of South Orange Village	0	0	3	1
Township of Verona	0	0	5	0
Township of West Caldwell	0	0	1	0
Township of West Orange	0	0	17	5
Essex County (Total)	**0**	**0**	**422**	**127**

Source: HAZUS-MH v 2.1 (U.S. Census 2000)
Note: Sheltering estimates are based on the default 2000 U.S. Census data in HAZUS-MH. Therefore, these are conservative estimates given the increase in population as indicated by the 2010 U.S. Census data.

Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions based on the major economic impact to their family and may not have funds to evacuate. The population over the age of 65 is also more vulnerable and, physically, they may have more difficulty evacuating. 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 attention which may not be available due to isolation during a storm event. Please refer to Section 4 for the statistics of these populations.

Impact on General Building Stock

After considering the population exposed to the hurricane hazard, the value of general building stock exposed to and damaged by 100- and 500-year MRP hurricane wind event was considered. Potential damage is the modeled loss that could occur to the exposed inventory, including damage to structural and content value based on the wind-only impacts associated with a hurricane, followed by a consideration of wind and storm surge impacts (using the methodology described earlier).

Wind-Only Impacts

The entire study area is considered at risk to the hurricane wind hazard. Please refer to Section 4 (County Profile) which presents the total exposure value for general building stock by occupancy class for Essex County.

Expected building damage was evaluated by HAZUS across the following wind damage categories: no damage/very minor damage, minor damage, moderate damage, severe damage, and total destruction. Table 5.4.2-8 summarizes the definition of the damage categories.

Table 5.4.2-8. Description of Damage Categories

Qualitative Damage Description	Roof Cover Failure	Window Door Failures	Roof Deck	Missile Impacts on Walls	Roof Structure Failure	Wall Structure Failure
No Damage or Very Minor Damage Little or no visible damage from the outside. No broken windows, or failed roof deck. Minimal loss of roof over, with no or very Limited water penetration.	≤2%	No	No	No	No	No
Minor Damage Maximum of one broken window, door or garage door. Moderate roof cover loss that can be covered to prevent additional water entering the building. Marks or dents on walls requiring painting or patching for repair.	>2% and ≤15%	One window, door, or garage door failure	No	<5 impacts	No	No
Moderate Damage Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water.	>15% and ≤50%	> one and ≤ the larger of 20% & 3	1 to 3 panels	Typically 5 to 10 impacts	No	No
Severe Damage Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.	>50%	> the larger of 20% & 3 and ≤50%	>3 and ≤25%	Typically 10 to 20 impacts	No	No
Destruction Complete roof failure and/or, failure of wall frame. Loss of more than 50% of roof sheathing.	Typically >50%	>50%	>25%	Typically >20 impacts	Yes	Yes

Source: HAZUS-MH Hurricane Technical Manual

Table 5.4.2-9 summarizes the building value (structure only) damage estimated for the 100- and 500-year MRP hurricane wind-only events. Damage estimates are reported for the County's probabilistic HAZUS-MH model scenarios. The data shown indicates total losses associated with wind damage to building structure.

Table 5.4.2-9. Estimated Building Value (Structure Only) Damaged by the 100-Year and 500-Year MRP Hurricane-Related Winds

Municipality	Estimated Total Damages*			Percent of Total Building Improvement Value			Estimated Residential Damage		Estimated Commercial Damage	
	Annualized Loss	100-Year	500-Year	Annualized Loss	100-Year	500-Year	100-Year	500-Year	100-Year	500-Year
Township of Belleville	$224,499	$2,745,638	$14,129,477	0.013	0.15	0.79	$2,231,642	$12,668,220	$24,594	$585,452
Township of Bloomfield	$272,593	$3,675,465	$19,198,214	0.012	0.16	0.81	$3,073,470	$17,559,500	$35,444	$811,203
Borough of Caldwell	$38,887	$584,604	$3,902,237	0.008	0.12	0.82	$614,337	$3,796,290	$5,725	$131,668
Township of Cedar Grove	$94,049	$1,468,585	$8,578,358	0.009	0.14	0.83	$1,338,761	$7,980,950	$9,055	$205,422
City of East Orange	$285,990	$3,180,261	$21,411,224	0.009	0.10	0.65	$2,603,515	$17,209,531	$51,845	$782,207
Borough of Essex Fells	$31,493	$516,839	$3,036,523	0.008	0.14	0.81	$575,442	$3,022,220	$658	$11,842
Township of Fairfield	$109,182	$1,065,530	$10,654,877	0.006	0.06	0.58	$1,116,960	$5,986,940	$51,606	$1,083,730
Borough of Glen Ridge	$73,161	$1,087,381	$5,568,574	0.011	0.17	0.88	$976,181	$5,431,710	$3,184	$70,055
Township of Irvington	$199,703	$2,433,973	$15,276,653	0.012	0.14	0.89	$2,273,270	$13,530,042	$43,509	$625,480
Township of Livingston	$250,796	$3,228,158	$23,267,683	0.007	0.10	0.69	$4,202,832	$21,553,071	$132,718	$1,344,274
Township of Maplewood	$176,431	$2,535,267	$15,052,899	0.010	0.15	0.88	$2,592,383	$13,992,600	$40,255	$544,267
Township of Millburn	$390,705	$5,318,632	$38,481,544	0.008	0.11	0.77	$6,988,229	$35,894,521	$205,418	$2,310,727
Township of Montclair	$354,125	$5,210,069	$29,057,801	0.010	0.14	0.79	$4,682,601	$27,315,692	$37,408	$938,204
City of Newark	$1,071,554	$10,345,221	$58,847,765	0.010	0.10	0.57	$7,858,522	$42,651,315	$359,248	$4,443,318
Borough of North Caldwell	$69,593	$1,158,985	$6,762,057	0.008	0.13	0.74	$1,130,220	$6,479,920	$1,228	$23,328
Township of Nutley	$258,587	$3,282,860	$16,236,761	0.012	0.15	0.76	$2,659,718	$14,838,310	$47,317	$1,103,308
City of Orange Township	$115,767	$1,451,993	$10,018,790	0.010	0.13	0.88	$1,340,771	$8,953,284	$32,113	$460,454
Borough of Roseland	$45,941	$526,209	$4,361,507	0.006	0.06	0.54	$573,990	$3,404,020	$37,668	$715,688
Township of South Orange Village	$172,024	$2,450,633	$14,352,353	0.009	0.13	0.76	$2,339,351	$12,938,930	$23,524	$306,921
Township of Verona	$87,159	$1,335,306	$7,757,815	0.009	0.13	0.78	$1,264,081	$7,239,010	$11,498	$260,860
Township of West Caldwell	$81,045	$1,046,815	$8,003,704	0.007	0.09	0.67	$1,148,888	$6,163,630	$19,975	$418,826
Township of West Orange	$302,472	$4,369,898	$26,484,651	0.009	0.13	0.78	$4,396,956	$24,383,480	$83,521	$1,285,977
Essex County (Total)	**$4,705,755**	**$59,018,325**	**$360,441,467**	**0.009**	**0.12**	**0.72**	**$55,982,120**	**$312,993,184**	**$1,257,508**	**$18,463,210**

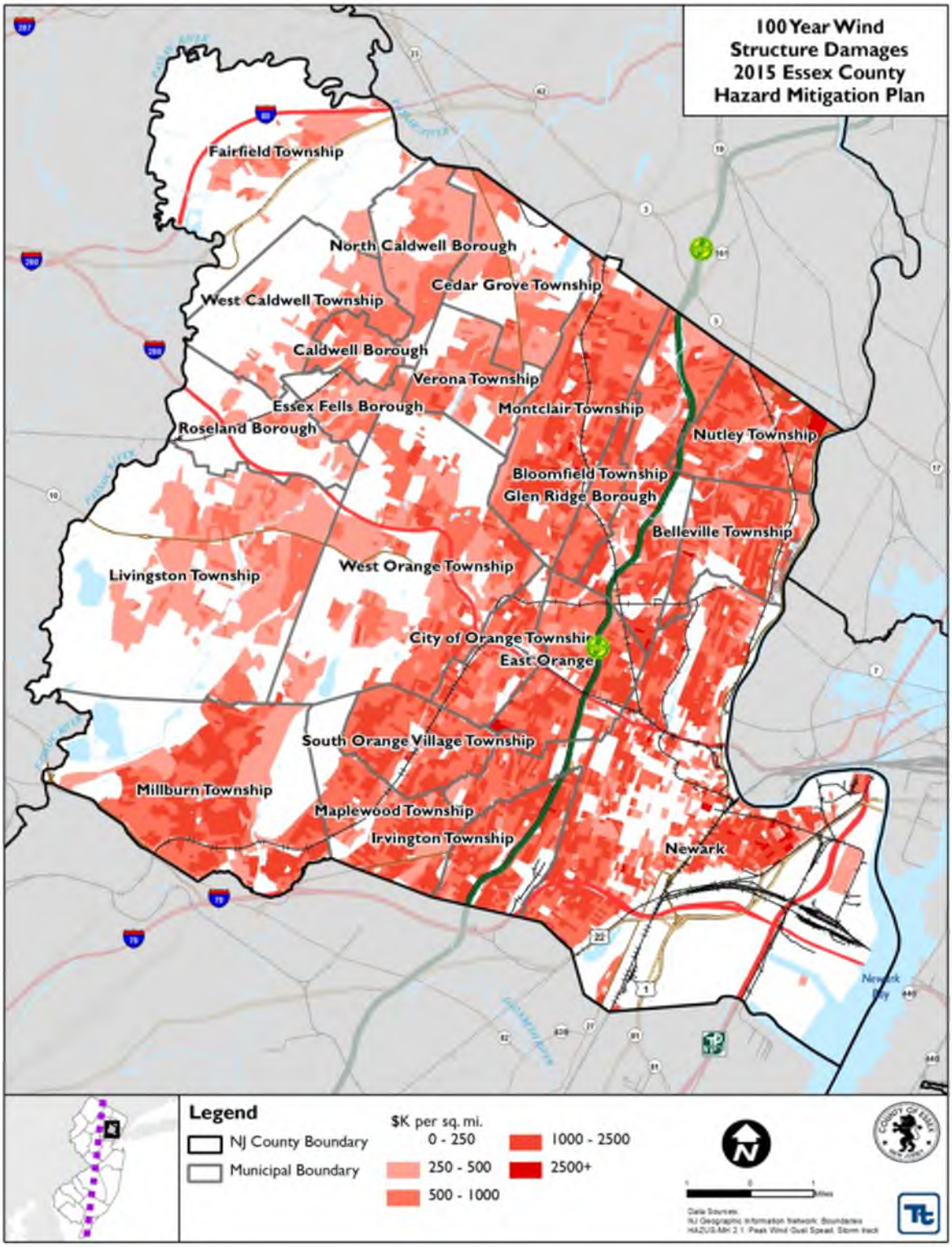
Source: HAZUS-MH 2.1; Essex County, 2014

**Total Damages is sum of damages for all occupancy classes (residential, commercial, industrial, agricultural, educational, religious and government) based on improvement value.*

The total damage to buildings (structure only) for all occupancy types across the County is estimated to be $59 million for the 100-year MRP wind-only event, and approximately $360 million for the 500-year MRP wind-only event. The majority of these losses are to the residential building category.

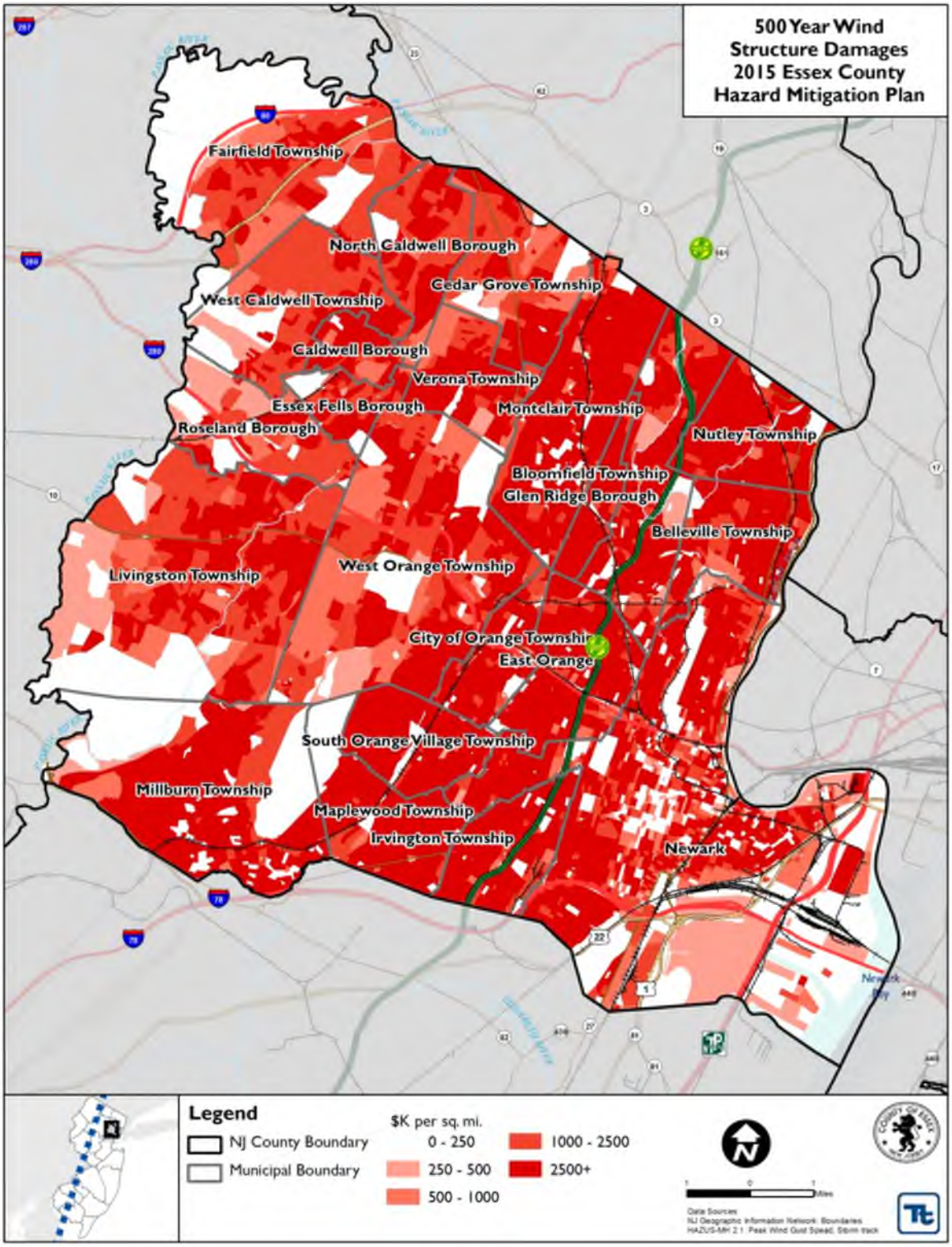
Because of differences in building construction, residential structures are generally more susceptible to wind damage than commercial and industrial structures. The damage counts include buildings damaged at all severity levels from minor damage to total destruction. Total dollar damage reflects the overall impact to buildings at an aggregate level.

Figure 5.4.2-10. Density of Losses for Structures (All Occupancies) for the County 100-Year MRP Hurricane (Wind-Only) Event



Source: HAZUS-MH 2.1

Figure 5.4.2-11. Density of Losses for Structures (All Occupancies) for the County 500-Year MRP Hurricane (Wind-Only) Event



Source: HAZUS-MH 2.1

Storm Surge Hurricane Impacts on Buildings

To estimate potential building exposure to storm surge, the SLOSH inundation zones were overlaid with updated building inventory. The structures with their centroid in the inundation zones were used to calculate the estimated exposure. Table 5.4.2-10 and Table 5.4.2-11 summarize the number of buildings and their estimated building replacement cost value exposed to hurricane storm surge by jurisdiction.

Table 5.4.2-10. Number of Buildings in the Hurricane Inundation Zones

Municipality	Total Number of Buildings	Number of Buildings in SLOSH Inundation Zones			
		Cat 1	Cat 2	Cat 3	Cat 4
Township of Belleville	9,154	0	371	583	624
Township of Bloomfield	11,383	0	0	0	0
Borough of Caldwell	2,116	0	0	0	0
Township of Cedar Grove	3,815	0	0	0	0
City of East Orange	9,310	0	0	0	0
Borough of Essex Fells	760	0	0	0	0
Township of Fairfield	3,169	0	0	0	0
Borough of Glen Ridge	2,214	0	0	0	0
Township of Irvington	9,312	0	0	0	0
Township of Livingston	9,510	0	0	0	0
Township of Maplewood	7,275	0	0	0	0
Township of Millburn	6,291	0	0	0	0
Township of Montclair	10,486	0	0	0	0
City of Newark	38,329	493	5,639	8,283	8,952
Borough of North Caldwell	1,951	0	0	0	0
Township of Nutley	8,884	0	174	442	621
City of Orange Township	4,354	0	0	0	0
Borough of Roseland	1,616	0	0	0	0
Township of South Orange Village	4,508	0	0	0	0
Township of Verona	3,907	0	0	0	0
Township of West Caldwell	3,634	0	0	0	0
Township of West Orange	12,688	0	0	0	0
Essex County	**164,666**	**493**	**6,184**	**9,308**	**10,197**

Source: ECOEM, 2014

Table 5.4.2-11. Building Improvement Value in the Hurricane Inundation Zones

Municipality	Total Improvement Value	Estimated Improvement Value in SLOSH Inundation Zones			
		Cat 1	Cat 2	Cat 3	Cat 4
Township of Belleville	$2,905,447,150	$0	$90,475,600	$141,072,600	$145,864,900
Township of Bloomfield	$3,827,312,350	$0	$0	$0	$0
Borough of Caldwell	$753,639,775	$0	$0	$0	$0
Township of Cedar Grove	$1,657,089,082	$0	$0	$0	$0
City of East Orange	$5,820,599,879	$0	$0	$0	$0
Borough of Essex Fells	$567,106,700	$0	$0	$0	$0
Township of Fairfield	$3,374,787,200	$0	$0	$0	$0
Borough of Glen Ridge	$986,279,500	$0	$0	$0	$0
Township of Irvington	$2,820,388,050	$0	$0	$0	$0
Township of Livingston	$5,547,703,530	$0	$0	$0	$0
Township of Maplewood	$2,733,369,500	$0	$0	$0	$0
Township of Millburn	$8,045,533,450	$0	$0	$0	$0
Township of Montclair	$5,890,125,479	$0	$0	$0	$0
City of Newark	$18,709,618,398	$1,428,179,599	$2,737,880,899	$3,438,831,599	$3,689,954,299
Borough of North Caldwell	$1,431,441,250	$0	$0	$0	$0
Township of Nutley	$3,510,270,592	$0	$38,358,400	$89,749,333	$120,574,633
City of Orange Township	$1,867,401,350	$0	$0	$0	$0
Borough of Roseland	$1,435,628,250	$0	$0	$0	$0
Township of South Orange Village	$3,108,688,125	$0	$0	$0	$0
Township of Verona	$1,598,018,325	$0	$0	$0	$0
Township of West Caldwell	$2,040,951,278	$0	$0	$0	$0
Township of West Orange	$5,503,784,816	$0	$0	$0	$0
Essex County	**$84,135,184,028**	**$1,428,179,599**	**$2,866,714,899**	**$3,669,653,532**	**$3,956,393,832**

Source: ECOEM; Essex County Planning Department, 2014

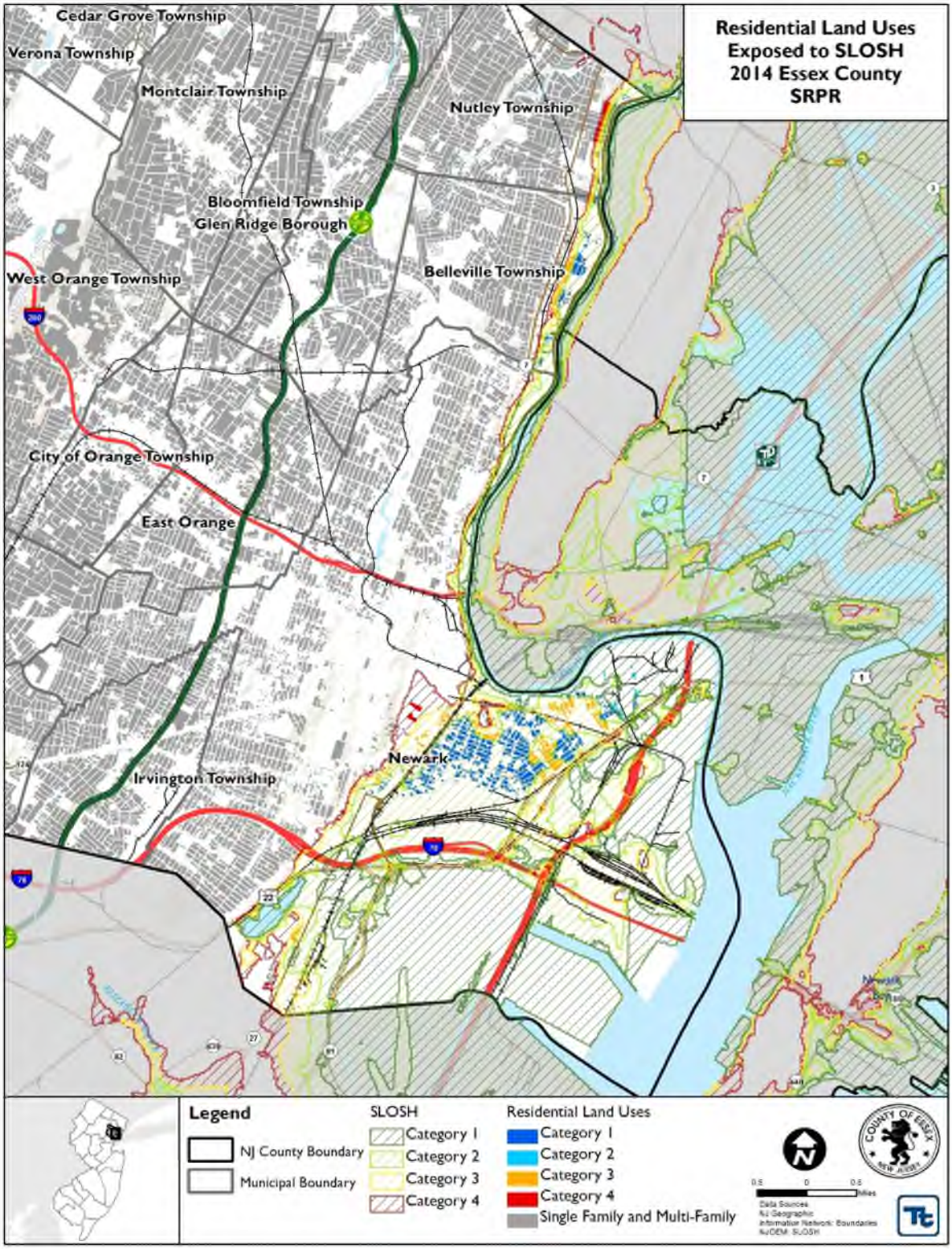
Impact on Land Uses

An exposure analysis was completed to assess the vulnerability of the residential and non-residential land uses within the County to Sea, Lake and Overland Surge from Hurricanes (SLOSH). To estimate the land use exposure to the Category 1 through Category 4 storm events, the SLOSH boundaries were overlaid upon the 2014 parcel data in GIS (2014 Essex County Planning) and used to calculate the estimated the number and area of residential and non-residential properties exposed to this hazard.

The analysis shows while most of the residential properties in the County are not vulnerable to storm surge caused by coastal storms, a substantial number of the residential properties in Newark are vulnerable. Neighborhoods within the Ironbound section of Newark comprise the majority of the residential land uses exposed to SLOSH. Approximately 0.4-percent of the total residential land use acreage and 0.6-percent of the residential properties are located in the Category 1 storm inundation extent. However, approximately 15-percent of the total residential land use area and 19-percent of the residential properties are located in the Category 4 storm inundation extent. It is clear that the Newark Ironbound section is highly exposed and vulnerable to storm surge.

The analysis shows a substantial number of the non-residential properties in the County are vulnerable to storm surge as well. Newark's large area of industrial and commercial land uses adjacent to the Passaic River and the Newark Bay account for the majority of the area exposed to this hazard. A substantial amount of the area is associated with Newark International Airport and the Port of Newark. Approximately 33-percent of the total non-residential land use acreage and 6-percent of the non-residential properties are located in the Category 1 storm inundation extent. However, approximately 65-percent of the total non-residential land use area and 36-percent of the non-residential properties are located in the Category 4 storm inundation extent. It is clear that the Newark's Ironbound section and the commercial and industrialized sections of the East Ward are highly exposed and vulnerable to storm surge.

Figure 5.4.2-12. Residential Properties Exposed to SLOSH Areas – Essex County



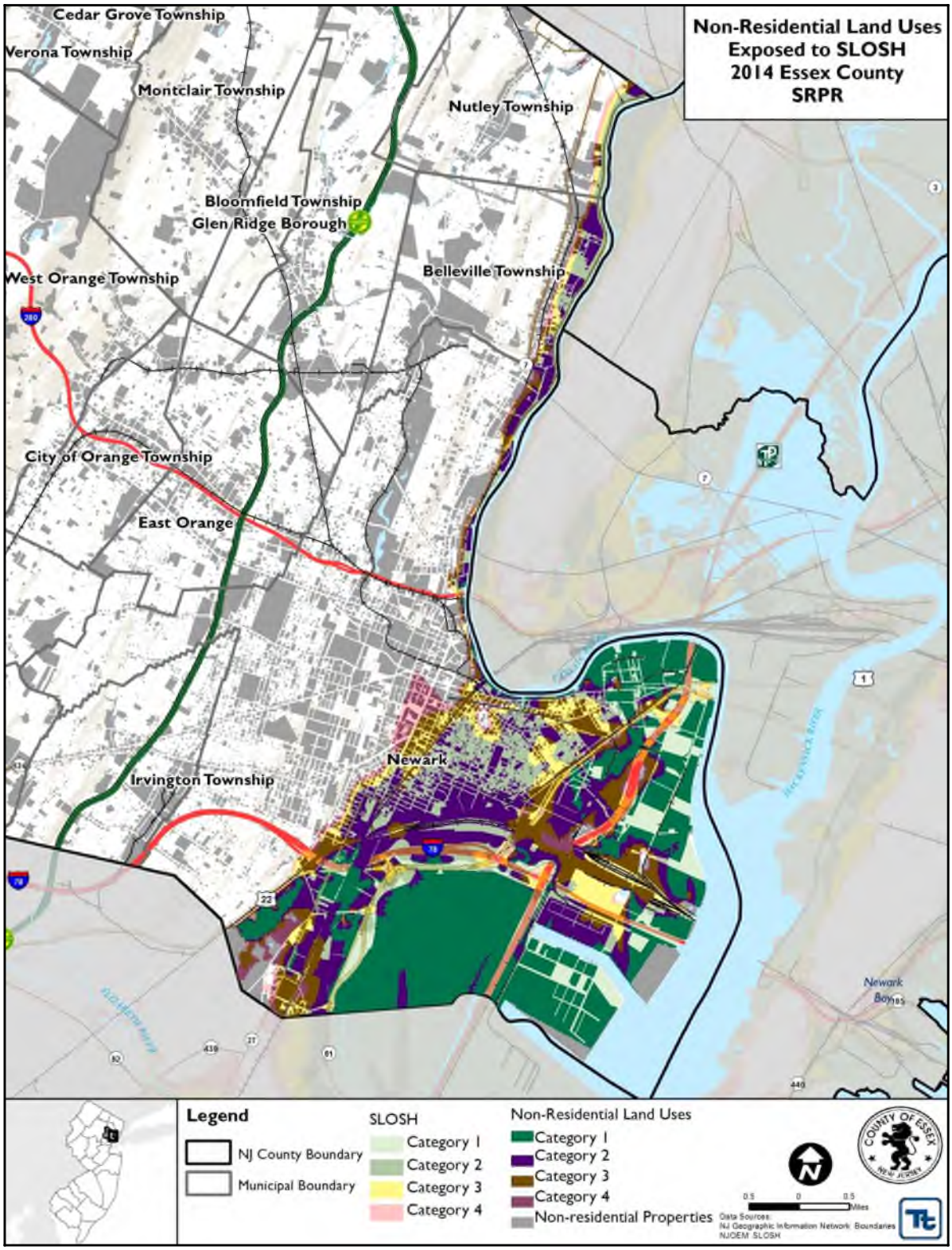
Source: Essex County SRPR. 2014, NJOEM

Table 5.4.2-12. Residential Land Use Exposure to SLOSH

Municipality	Total Residential Land Use Area (acres)	Total Number of Residential Properties	Number of Residential Properties in Category 1	% of Total	Residential Land Use Area Category 1 (acre s)	% of Total	Number of Residential Properties Category 2	% of Total	Residential Land Use Area in Category 2 (acres)	% of Total Residential Land Use Area	Number of Residential Properties Category 3	% of Total	Residential Land Use Area in Category 3 (acres)	% of Total Residential Land Use Area	Number of Residential Properties Category 4	% of Total	Residential Land Use Area in Category 4 (acres)	% of Total Residential Land Use Area
Township of Belleville	864	8,464	0	0%	0	0%	338	4.0%	26	3.0%	481	5.7%	46	5.3%	516	6.1%	49	5.7%
City of Newark	2,459	29,806	174	<1%	9	<1%	3,903	13.1%	232	9.4%	5,435	18.2%	340	13.8%	5,692	19.1%	362	14.7%
Township of Nutley	1,165	8,327	0	0%	0	0%	198	2.4%	6	<1%	473	5.7%	21	1.8%	646	7.8%	34	2.9%
Essex County (TOTAL)	**29,387**	**46,597**	**174**	**<1%**	**9**	**<1%**	**4,439**	**9.5%**	**264**	**<1%**	**6,389**	**13.7%**	**406**	**1.4%**	**6,854**	**14.7%**	**445**	**1.5%**

Source: NJOEM, 2013; Essex County Planning Department 2014

Figure 5.4.2-13. Residential Properties Exposed to SLOSH Areas – Essex County



Source: Essex County SRPR. 2014, NJOEM

Table 5.4.2-13. Non-Residential Land Use Exposure to SLOSH

Municipality	Total Non-Residential Land Use Area (acres)	Total Number of Non- Residential Properties	Number of Non-Residential Properties in Category 1	% of Total	Non-Residential Land Use Area Category 1 (acre s)	% of Total	Number of Non- Residential Properties Category 2	% of Total	Non-Residential Land Use Area in Category 2 (acres)	% of Total Non-Residential Land Use Area	Number of Non-Residential Properties Category 3	% of Total	Non-Residential Land Use Area in Category 3 (acres)	% of Total Non-Residential Land Use Area	Number of Non-Residential Properties Category 4	% of Total	Non-Residential Land Use Area in Category 4 (acres)	% of Total Non-Residential Land Use Area
Township of Belleville	740	1,146	0	0%	0	0%	139	12.1%	87	11.7%	205	17.9%	109	14.8%	241	21.0%	124	16.7%
City of Newark	8,337	13,003	752	5.8%	2,748	33.0%	2,871	22.1%	4,299	51.6%	4,085	31.4%	5,149	61.8%	4,656	35.8%	5,383	64.6%
Township of Nutley	476	762	0	4.9%	0	2.8%	12	1.6%	11	2.3%	20	2.6%	20	4.1%	27	3.5%	27	5.6%
Essex County (TOTAL)	**9,077**	**14,911**	**752**	**5.0%**	**2,748**	**30.3%**	**3,022**	**20.3%**	**4,397**	**48.4%**	**4,310**	**28.9%**	**5,278**	**58.2%**	**4,924**	**33.0%**	**5,533**	**60.9%**

Source: NJOEM, 2013; Essex County Planning Department 2014

Impact on Critical Facilities

Overall, all critical facilities are exposed to the wind hazard associated with coastal storms. HAZUS-MH estimates the probability that critical facilities (i.e., medical facilities, fire/EMS, police, EOC, schools, and user-defined facilities such as shelters and municipal buildings) may sustain damage as a result of 100-year and 500-year MRP wind-only events. Additionally, HAZUS-MH estimates the loss of use for each facility in number of days. Due to the sensitive nature of the critical facility dataset, individual facility estimated loss is not provided.

To estimate potential building exposure to storm surge, the SLOSH inundation zones were used. The critical facilities and utilities located in the Category 1 through 4 inundation zones are summarized by municipality in Table 5.4.2-14 through Table 5.4.2-17.

Table 5.4.2-14. Critical Facilities and Utilities Located in the Category 1 SLOSH Inundation Zones

Municipality*	Facility Types											
	Airport	Bus	Chemical Storage	Correctional Institution	Electric Power	HWY Bridge	Oil	Police	Port	Safety	Train Station	Waste Water
City of Newark	1	2	3	1	3	1	4	1	2	1	1	2
Essex County	**1**	**2**	**3**	**1**	**3**	**1**	**4**	**1**	**2**	**1**	**1**	**2**

Source: ECOEM
*Notes: *Only municipalities within the SLOSH inundation zones are tabulated.*

Table 5.4.2-15. Critical Facilities and Utilities Located in the Category 2 SLOSH Inundation Zones

Municipality*	Facility Types																			
	Airport	Bus	Chemical Storage	Commercial	Correctional Institution	EMS	Electric Power	Electric Substation	Fire	HWY Bridge	Light Rail	Newark Housing Authority	Oil	Police	Port	Safety	School	Train Station	Transportation	Waste Water
Township of Belleville				1				1									3		1	
City of Newark	1	3	3		2	1	4		3	1	1	3	4	2	2	1	8	1		2
Township of Nutley																1				
Essex County	**1**	**3**	**3**	**1**	**2**	**1**	**4**	**1**	**3**	**1**	**1**	**3**	**4**	**2**	**2**	**2**	**11**	**1**	**1**	**2**

Source: ECOEM

*Notes: *Only municipalities within the SLOSH inundation zones are tabulated.*

Table 5.4.2-16. Critical Facilities and Utilities Located in the Category 3 SLOSH Inundation Zones

Municipality*	Facility Types																					
	Airport	Bus	Chemical Storage	Commercial	Correctional Institution	EMS	Electric Power	Electric Substation	Fire	Government	Hospitals	HWY Bridge	Light Rail	Newark Housing Authority	Oil	Police	Port	Safety	School	Train Station	Transportation	Waste Water
Township of Belleville				1				1											3		1	
City of Newark	1	3	3		2	1	5		5	1	1	1	2	3	4	6	2	1	10	2		2
Township of Nutley																		1				
Essex County	**1**	**3**	**3**	**1**	**2**	**1**	**5**	**1**	**5**	**1**	**1**	**1**	**2**	**3**	**4**	**6**	**2**	**2**	**13**	**2**	**1**	**2**

Source: ECOEM

*Notes: *Only municipalities within the SLOSH inundation zones are tabulated.*

Table 5.4.2-17. Critical Facilities and Utilities Located in the Category 4 SLOSH Inundation Zones

Municipality*	Facility Types																					
	Airport	Bus	Chemical Storage	Commercial	Correctional Institution	EMS	Electric Power	Electric Substation	Fire	Government	Hospitals	HWY Bridge	Light Rail	Newark Housing Authority	Oil	Police	Port	Safety	School	Train Station	Transportation	Waste Water
Township of Belleville				1				1											3		1	
City of Newark	1	3	3		2	1	5		6	2	1	1	2	4	4	8	2	1	18	2		2
Township of Nutley																		1				
Essex County	**1**	**3**	**3**	**1**	**2**	**1**	**5**	**1**	**6**	**2**	**1**	**1**	**2**	**4**	**4**	**8**	**2**	**2**	**21**	**2**	**1**	**2**

Source: ECOEM

*Notes: *Only municipalities within the SLOSH inundation zones are tabulated.*

Impact on Economy

Hurricanes and tropical storms also impact the economy, including: 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. HAZUS-MH estimates the total economic loss associated with each storm scenario (direct building losses and business interruption losses). 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.

For the 100-year MRP wind event, HAZUS-MH estimates $371,000 in business interruption costs (income loss, relocation costs, rental costs and lost wages). For the 500-year MRP wind only event, HAZUS-MH estimates nearly $180 million in business interruption losses for the County which includes loss of income, relocation costs, rental costs and lost wages. Further HAZUS-MH estimates $8.5 million in loss of inventory.

HAZUS-MH 2.1 also estimates the amount of debris that may be produced a result of the 100- and 500-year MRP wind events. Table 5.4.2-18 estimates the debris produced. Because the estimated debris production does not include flooding, this is likely a conservative estimate and may be higher if multiple impacts occur.

According to the HAZUS-MH Hurricane User Manual: '*The Eligible Tree Debris columns provide estimates of the weight and volume of downed trees that would likely be collected and disposed at public expense. As discussed in Chapter 12 of the HAZUS-MH Hurricane Model Technical Manual, the eligible tree debris estimates produced by the Hurricane Model tend to underestimate reported volumes of debris brought to landfills for a number of events that have occurred over the past several years. This indicates that that there may be other sources of vegetative and non-vegetative debris that are not currently being modeled in HAZUS. For landfill estimation purposes, it is recommended that the HAZUS debris volume estimate be treated as an approximate lower bound. Based on actual reported debris volumes, it is recommended that the HAZUS results be multiplied by three to obtain an approximate upper bound estimate. It is also important to note that the Hurricane Model assumes a bulking factor of 10 cubic yards per ton of tree debris. If the debris is chipped prior to transport or disposal, a bulking factor of 4 is recommended. Thus, for chipped debris, the eligible tree debris volume should be multiplied by 0.4'.*

Table 5.4.2-18. Debris Production for 100- and 500-Year Mean Return Period Hurricane-Related Winds

Municipality	Brick and Wood (tons)		Concrete and Steel (tons)		Tree (tons)		Eligible Tree Volume (cubic yards)	
	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year
Township of Belleville	600	6,001	0	14	0	191	0	1,757
Township of Bloomfield	782	8,075	0	12	13	493	105	4,471
Borough of Caldwell	170	1,966	0	1	0	303	0	2,699
Township of Cedar Grove	151	1,962	0	5	0	1,252	0	9,580
City of East Orange	828	8,475	0	8	52	378	490	3,592
Borough of Essex Fells	20	234	0	0	0	497	0	3,727
Township of Fairfield	323	3,625	0	18	334	1,670	1,135	5,677
Borough of Glen Ridge	66	798	0	1	0	286	0	2,827
Township of Irvington	925	9,695	0	25	26	198	247	1,824
Township of Livingston	445	4,119	0	7	450	2,860	2,821	18,455
Township of Maplewood	426	4,442	0	8	109	951	844	6,799
Township of Millburn	343	3,494	0	5	316	2,610	1,963	15,343
Township of Montclair	658	7,485	0	5	29	1,515	283	13,867
City of Newark	6,071	54,137	0	99	67	615	515	4,814
Borough of North Caldwell	45	563	0	1	0	957	0	8,518
Township of Nutley	554	5,532	0	8	19	379	185	3,659
City of Orange Township	538	5,603	0	8	46	209	432	1,994
Borough of Roseland	70	809	0	2	116	694	544	3,262
Township of South Orange Village	299	3,028	0	4	91	633	865	6,009
Township of Verona	185	2,259	0	3	0	775	0	6,778
Township of West Caldwell	131	1,599	0	4	134	841	752	5,644
Township of West Orange	645	6,709	0	10	234	3,265	1,762	22,643
Essex County	**14,275**	**140,610**	**0**	**248**	**2,036**	**21,572**	**12,943**	**153,938**

Source: HAZUS-MH 2.1

Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by the type, frequency and intensity of weather events. Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of events like hurricanes. While predicting changes to the prevalence or intensity of hurricanes and the events affects under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society and the environment (U.S. Environmental Protection Agency [EPA], 2006).

Change of Vulnerability

Essex County and its municipalities continue to be vulnerable to the coastal storm hazard. However, there are several differences between the exposure and potential loss estimates between the 2015 HMP update and the results in the original 2008 HMP. Their differences are due to changes in the HAZUS model and the new and updated population (U.S. Census 2010) and building inventories available and used for this update.

Differences in exposure and potential losses estimated from the 2008 HMP can be attributed to the difference in building stock inventory and methodology used for the risk assessment. For example, the 2008 HMP building inventory used the default HAZUS-MH general building stock based on replacement cost value of the structures. For this plan update, the potential loss analysis was conducted using a custom County-wide building inventory using the most current tax record and parcel data provided by the County. For this risk assessment, the improvement value of the buildings was used. The SLOSH analysis was conducted at the structure-level allowing for more accurate exposure estimates.

For this plan update, the HAZUS-MH hurricane model was run for the entire County and reported at the municipal level. The HAZUS-MH version 2.1 was utilized for this plan update and the hurricane model has been enhanced since the 2008 HMP.

Overall, this vulnerability assessment using a more accurate and updated building inventory which provides more accurate estimated exposure and potential losses for Essex County.

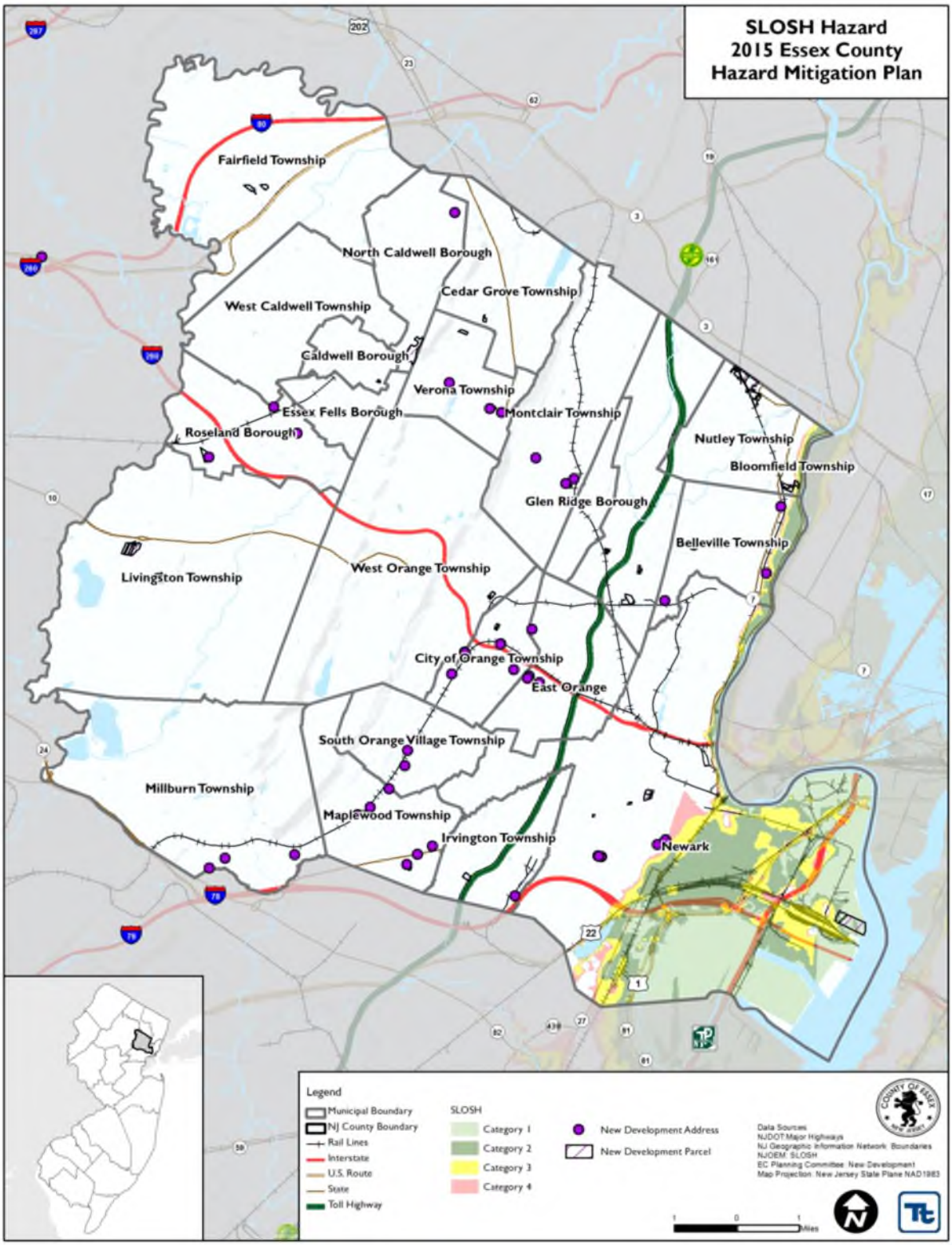
Future Growth and Development

As discussed and illustrated in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the hurricane and tropical storm hazard because the entire Planning Area is exposed and vulnerable to the wind and storm surge hazards associated with these events. Areas targeted for potential future growth and development in the next five (5) years have been identified across the County at the jurisdiction level. Refer to the jurisdictional annexes in Volume II of this HMP.

Additional Data and Next Steps

Over time, the County will obtain additional data to support the analysis of this hazard. Data that will support the analysis would include additional detail on past hazard events and impacts, building footprints and specific building information such as details on protective features (for example, hurricane straps).

Figure 5.4.2-14. Potential New Development in Essex County and SLOSH



Source: Planning Committee; NJOEM

5.4.3 Drought

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the drought hazard in Essex County.

2015 Plan Update Changes

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and climate change impacts.
- New and updated figures from federal and state agencies are incorporated.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- The vulnerability assessment section is new addition for the drought hazard. The vulnerability assessment directly follows the hazard profile.

5.4.3.1 Profile

Hazard Description

Drought is a temporary irregularity and differs from aridity since the latter is restricted to low rainfall regions and is a permanent feature of climate. Drought is a period characterized by long durations of below normal precipitation. Drought conditions occur in virtually all climatic zones yet its characteristics vary significantly from one region to another, since it is relative to the normal precipitation in that region. Drought can affect agriculture, water supply, aquatic ecology, wildlife, and plant life.

There are four different ways that drought can be defined or grouped:

- Meteorological drought is a measure of departure of precipitation from normal. It is defined solely on the relative degree of dryness. Due to climatic differences, what might be considered a drought in one location of the country may not be a drought in another location.
- Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced ground water or reservoir levels, and other parameters. It occurs when there is not enough water available for a particular crop to grow at a particular time. Agricultural drought is defined in terms of soil moisture deficiencies relative to water demands of plant life, primarily crops.
- Hydrological drought is associated with the effects of periods of precipitation shortfalls (including snowfall) on surface or subsurface water supply. It occurs when these water supplies are below normal. It is related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
- Socioeconomic drought is associated with the supply and demand of an economic good with elements of meteorological, hydrological, and agricultural drought. This differs from the aforementioned types of drought because its occurrence depends on the time and space processes of supply and demand to identify or classify droughts. The supply of many economic goods depends on weather (for example water, forage, food grains, fish, and hydroelectric power). Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply (National Drought Mitigation Center 2012).

Drought can produce a range of impacts that span many sectors of an economy and can reach beyond an area experiencing physical drought. This exists because water is integral to our ability to produce goods and provide services. Direct impacts of drought include reduced crop yield, increased fire hazard, reduced water levels, and damage to wildlife and fish habitat. The consequences of these impacts illustrate indirect impacts

that include: reduction in crop, rangeland, and forest productivity that may result in reduced income for farmers and agribusiness, increased prices for food and timber, unemployment, reduced tax revenues due to reduced expenditures, increased crime, foreclosures, migration, and disaster relief programs. The many impacts of drought can be listed as economic, environmental, or social.

Economic impacts occur in agriculture and related sectors because of the reliance of these sectors on surface and subsurface water supplies. Environmental impacts are the result of damage to plant and animal species, wildlife habitat, and air and water quality, forest and grass fires, degradation of landscape quality, loss of biodiversity, and soil erosion. Social impacts involve public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. A summary of potential impacts associated with drought are identified in Table 5.4.3-1. This table includes only some of the potential impacts of drought.

Table 5.4.3-1. Economic, Environmental, and Social Impacts of Drought

Economic	Environmental	Social
• Loss of national economic growth, slowing down of economic development	• Increased desertification - damage to animal species	• Food shortages
• Loss of national economic growth, slowing down of economic development	• Reduction and degradation of fish and wildlife habitat	• Loss of human life from food shortages, heat, suicides, violence
• Damage to crop quality, less food production	• Lack of feed and drinking water	• Mental and physical stress
• Increase in food prices	• Disease	• Water user conflicts
• Increased importation of food (higher costs)	• Increased vulnerability to predation	• Political conflicts
• Insect infestation	• Loss of wildlife in some areas and too many in others	• Social unrest
• Plant disease	• Increased stress to endangered species	• Public dissatisfaction with government regarding drought response
• Loss from dairy and livestock production	• Damage to plant species, loss of biodiversity	
• Unavailability of water and feed for livestock which leads to high livestock mortality rates	• Increased number and severity of fires	• Inequity in the distribution of drought relief
• Disruption of reproduction cycles (breeding delays or unfilled pregnancies)	• Wind and water erosion of soils	• Loss of cultural sites
• Increased predation	• Loss of wetlands	• Reduced quality of life which leads to changes in lifestyle
• Increased fire hazard - range fires and wildland fires	• Increased groundwater depletion	• Increased poverty
• Damage to fish habitat, loss from fishery production	• Water quality effects	• Population migrations
• Income loss for farmers and others affected	• Increased number and severity of fires	
• Unemployment from production declines	• Air quality effects	
• Loss to recreational and tourism		

Economic	Environmental	Social
industry		
• Loss of hydroelectric power		
• Loss of navigability of rivers and canals		

Droughts are climatic patterns that occur over long periods of time. Only generalized warning can take place due to the numerous variables that scientists have not pieced together well enough to make accurate and precise predictions (NDMC Date Unknown).

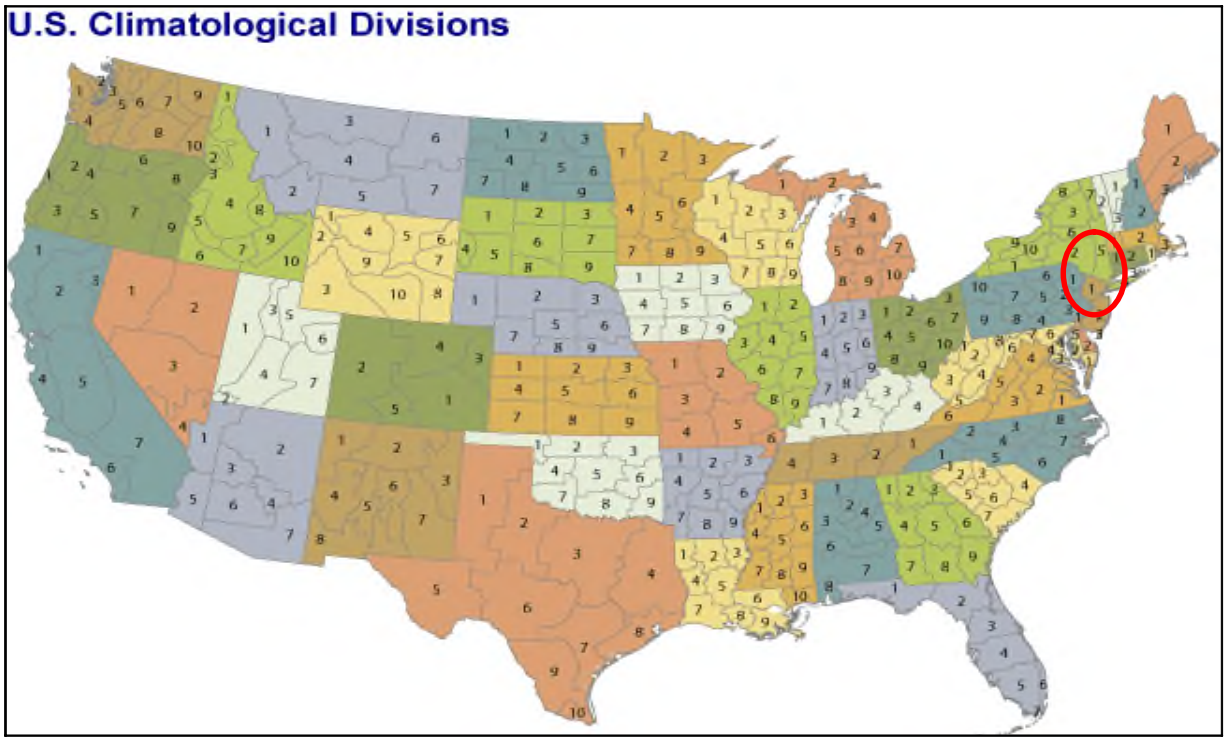
Empirical studies conducted over the past century have shown that meteorological drought is never the result of a single cause. It is the result of many causes, often synergistic in nature; these include global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast with warm, dry air resulting in less precipitation (NDMC Date Unknown).

Scientists at this time do not know how to predict drought more than one month in advance for most locations. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depends on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on the global scale (NDMC Date Unknown).

Location

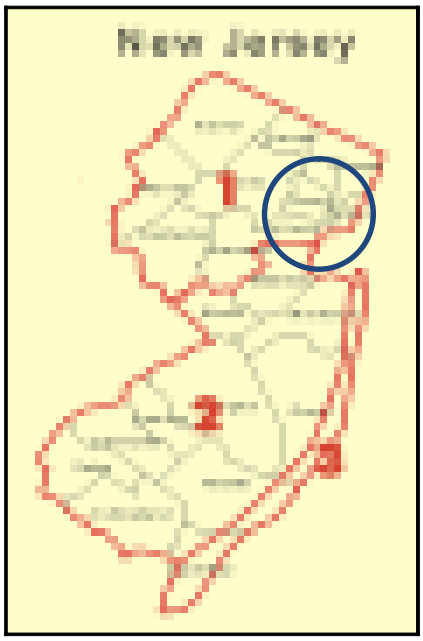
Climate divisions are regions within a state that are climatically homogenous. The National Oceanic and Atmospheric Administration (NOAA) has divided the U.S. into 359 climate divisions. The boundaries of these divisions typically coincide with the county boundaries, except in the western U.S., where they are based largely on drainage basins (U.S. Energy Information Administration, Date Unknown). According to NOAA, New Jersey is made up of three climate divisions: Northern, Southern, and Coastal (NOAA, 2012). Figure 5.4.3-1 shows the climate divisions throughout the U.S. and Figure 5.4.3-2 shows the climate divisions of New Jersey. Essex County is located in the Northern Climate Division.

Figure 5.4.3-1. Climate Divisions of the US



Source: NOAA 2012
Note: The red circle indicates the approximate location of New Jersey. New Jersey is divided into three climate divisions.

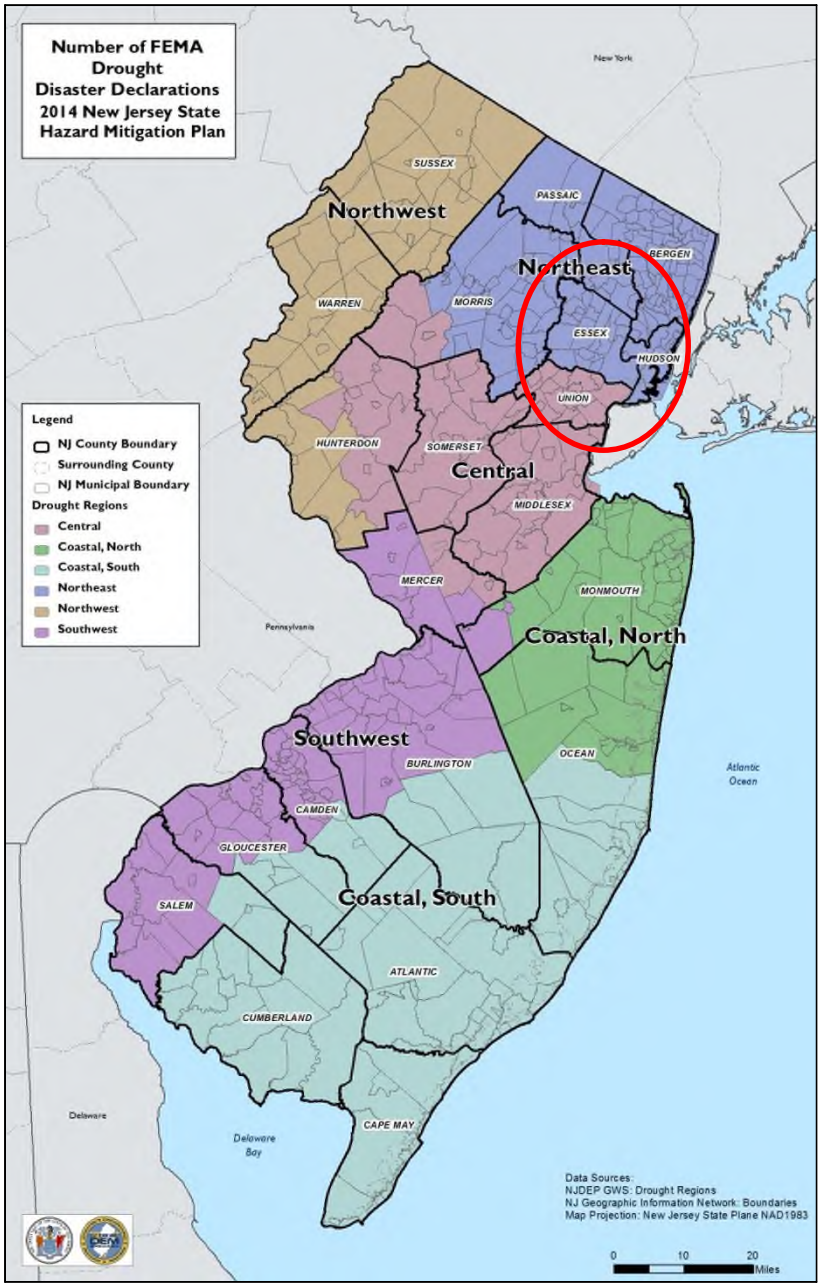
Figure 5.4.3-2. Climate Divisions of New Jersey



Source: National Weather Service (NWS) Climate Prediction Center (CPC) 2005
Notes: The blue circle indicates the location of Essex County. The County is located in the Northern Climate Division of New Jersey
1 Northern
2 Southern
3 Coastal

Drought regions allow New Jersey to respond to changing conditions without imposing restrictions on areas not experiencing water supply shortages. New Jersey is divided into six drought regions that are based on regional similarities in water supply sources and rainfall patterns (Hoffman and Domber, 2003). These regions were developed based upon hydro-geologic conditions, watershed boundaries, municipal boundaries, and water supply characteristics. Drought region boundaries are contiguous with municipal boundaries because during a water emergency, the primary enforcement mechanism for restrictions is municipal police forces. Figure 5.4.3-3 shows the drought regions of New Jersey. Essex County is located in the Northeast Drought Region.

Figure 5.4.3-3. Drought Regions of New Jersey



Source: New Jersey Department of Environmental Protection (NJDEP) GWS 2004
Note: The red circle indicates the location of Essex County. The County is located in the Northeast Region of New Jersey

Extent

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts (NOAA Date Unknown). Droughts are not usually associated with direct impacts on people or property, but they can have significant impacts on agriculture, which can impact people indirectly. When measuring the severity of droughts, analysts typically look at economic impacts on a planning area.

Unlike most disasters, droughts normally occur slowly but last a long time. On average, the nationwide annual impacts of drought are greater than the impacts of any other natural hazard. They are estimated to be between $6 billion and $8 billion annually in the U.S. and affect primarily the agriculture, transportation, recreation and tourism, forestry, and energy sectors. Social and environmental impacts are also significant, although it is difficult to put a dollar value on these impacts.

Drought affects groundwater sources, but generally not as quickly as surface water supplies. Groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater affects streams also. Much of the flow in streams comes from groundwater, especially during the summer when there is less precipitation and after snowmelt ends. Reduced groundwater levels mean that even less water will enter streams when steam flows are lowest.

A drought directly or indirectly impacts all people in affected areas. A drought can result in farmers not being able to plant crops or the failure of already planted crops. This results in loss of work for farm workers and those in related food processing jobs. Other water-dependent industries are commonly forced to shut down all or a portion of their facilities, resulting in further layoffs. A drought can harm recreational companies that use water (e.g., swimming pools, water parks, and river rafting companies) as well as landscape and nursery businesses because people will not invest in new plants if water is not available to sustain them.

Drought Indices

A number of drought indices are available from U.S. Geological Survey (USGS) and the New Jersey Department of Environmental Protection (NJDEP) to assess the various impacts of dry conditions. However, the USGS indicators are not used by NJDEP to a significant extent. The State uses a multi-index system that takes advantage of some of these indices to determine the severity of a drought or extended period of dry conditions.

New Jersey Drought Indices

During the New Jersey droughts that occurred during 1998 and 1999, the NJDEP had difficulty comparing the severity of drought throughout the state. To improve monitoring and measurement of drought severity from region to region, NJDEP devised a unique set of indices specifically designed for the particular characteristics and needs of the State. These were implemented in January 2001. This new set of statewide indicators supplements the Palmer Drought Severity Index (PDSI) with the measurement of regional precipitation, stream-flow, reservoir levels, and groundwater levels. New Jersey currently measures the status of each indicator as near or above normal, moderately dry, severely dry, or extremely dry. The status is based on a statistical analysis of historical values with generally the driest 10% being classified as extremely dry, from 10% to 30% as severely dry, and 30% to 50% as moderately dry.

When there is less precipitation than normal, New Jersey experiences drought. However, a few dry days or even a month of dry weather does not create a water supply drought. It can take months of less than average

rainfall to do this. The difference between the actual amount of precipitation measured during a month and the historical average for that month is either a negative or positive number, indicating a deficit or surplus. The monthly surplus or deficit can vary significantly from month-to-month and is not a good indicator of a water supply drought. A better method to use is a running 3-month total. This number is the surplus or deficit in a given month added to the values of the two previous months. To use the indicator on a daily basis, precipitation during the previous 90-day period is compared to the average in past years. This data comes from ONJSC and the NWS's Middle Atlantic River Forecast Center (Hoffman and Domber, 2003). Precipitation data is collected from NWS Cooperative Observing Program (COOP) Stations. COOP is a weather and climate observing network that is made up of more than 11,000 volunteers that take observations. Data collected support the NWS climate program and field observations. A COOP station is a site where observations are taken. Observers typically record temperature and precipitation daily and send those reports electronically to the NWS and NCDC (NWS 2013). Approximately 30 of the stations are augmented by observations from Rutgers's New Jersey Weather and Climate Network and New Jersey Community Collaborative Rain, Hail, and Snow Network (Robinson 2013).

The Groundwater Level Index is based on the number of consecutive months that groundwater levels are below normal (lowest 25% of period of record for the respective months). The U.S. Geological Survey (USGS) monitors groundwater levels in a network of monitoring wells throughout New Jersey. Groundwater condition maps showing areas of above normal, normal, and below normal (monthly conditions compared to monthly normals) are provided by the USGS on a monthly basis.

The Stream Flow Index is based on the number of consecutive months that stream flow levels are below normal (lowest 25% of period of record for the respective months). The USGS monitors stream flow in a network of 111 gages throughout New Jersey. Stream flow conditions maps showing areas of above normal, normal and below normal (monthly conditions compared to monthly normals) are provided by the USGS on a monthly basis. In addition, USGS provides a table that describes the cumulative monthly stream flow condition as normal, above normal, or below normal (USGS 2013).

New Jersey maintains a real-time groundwater level monitoring system consisting of seven observation wells throughout the state. The network, a cooperative between the USGS and NJDEP, uses satellite telemetry to provide observations in four-hour increments. Observations are available on the USGS website at http://water.usgs.gov/nj/nwis/current/?type=gw. The primary purpose of the network is to provide information regarding the status of wells throughout the state and to anticipate potential shortages (NJDEP 2002).

The Reservoir Index is based on the water levels of small, medium, and large index reservoirs across the state. The reservoir level relative to normal conditions will be considered. The NJDEP maintains a listing of current reservoir levels across the State and the Northeast. The current reservoir levels are available at http://www.njdrought.org/reservoir.html.

New Jersey also maintains a real time Regional Drought Indicator Status, showing the level of 90-day precipitation, 90-day stream flow, reservoir levels, the Delaware River Basin Commission reservoir levels, and the unconfined groundwater levels in terms of dryness indices. These indicators determine the Declared Drought Status for each drought region. The observations and status are available at http://www.njdrought.org/status.html.

National Drought Indices

Several indices developed by Wayne Palmer, the PDSI and Crop Moisture Index (CMI), as well as the Standardized Precipitation Index (SPI), are useful for describing the many scales of drought. Other indices include accumulated departure from normal stream flows, low-flow frequency estimates, and changes in water storage, groundwater levels and rates of decline, and lake levels. Most commonly used indices that are used to

measure or identify the severity and classification of past and present droughts primarily include, but not limited to, the following:

The PDSI was developed in 1965 and indicates prolonged and abnormal moisture deficiency or excess. The PDSI is an important climatological tool for evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather. It can be used to help delineate disaster areas and indicate the availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water, and potential intensity of forest fires.

The PDSI has become the semi-official drought index. It is the most effective in determining long-term droughts; it is not good with short-term forecasts. Table 5.4.3-2 lists the Palmer Classifications. A Palmer Classification of 0 is used as normal and drought is shown in terms of negative numbers. For example, -2 is moderate drought, -3 is severe drought, and -4 is extreme drought. The PDSI also reflects excess precipitation using positive numbers.

Table 5.4.3-2. PDSI Classifications

Palmer Classifications	Description
4.0 or more	extremely wet
3.0 to 3.99	very wet
2.0 to 2.99	moderately wet
1.0 to 1.99	slightly wet
0.5 to 0.99	incipient wet spell
0.49 to -0.49	near normal
-0.5 to -0.99	incipient dry spell
-1.0 to -1.99	mild drought
-2.0 to -2.99	moderate drought
-3.0 to -3.99	severe drought
-4.0 or less	extreme drought

Source: National Drought Mitigation Center (NDMC) 2013
PDSI Palmer Drought Severity Index

The CMI, developed by Wayne Palmer in 1968, can be used to measure the status of dryness or wetness affecting warm season crops and field activities. It gives the short-term or current status of purely agricultural drought or moisture surplus and can change rapidly from week to week (National Weather Service Climate Prediction Center, 2005). The CMI responds more rapidly than the PDSI so it is more effective in calculating short-term abnormal dryness or wetness affecting agriculture. CMI is designed to indicate normal conditions at the beginning and end of the growing season; it uses the same levels as the Palmer Drought Severity Index (NOAA Date Unknown).

The SPI is a probability index that considers only precipitation. It is based on the probability of recording a given amount of precipitation. The probabilities are standardized so that an index of zero indicates the median precipitation amount (half of the historical precipitation amounts are below the median, and half are above the median). The index is negative for drought, and positive for wet conditions. The SPI is computed by National Climatic Data Center (NCDC) for several time scales, ranging from one month to 24 months, to capture the various scales of both short-term and long-term drought.

The Keetch-Byram Drought Index (KBDI) is a drought index designed for fire potential assessment. 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 0 (no moisture deficit) to 800 (maximum drought possible). The range of the index is determined by assuming that there is eight inches of moisture that is readily available to the vegetation in saturated soil. 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. The Precipitation Index is a comparison of measured precipitation amounts (in inches) to historic normal precipitation. Cumulative amounts for 3-, 6- and 12-month periods are factored into the drought determination. Data is available on the New Jersey Forest Fire Service website at http://www.nj.gov/dep/parksandforests/fire/firedanger-restrictions.html.

Watches, Warnings and Emergencies

During periods of drought, the NJDEP may issue drought watches, drought warnings, or a water emergency. A drought watch is an administrative designation made by the NJDEP when drought or other factors begin to adversely affect water supply conditions. A watch indicates that conditions are dry but not significantly. During a drought watch, the NJDEP closely monitors drought indicators and consults with affected water suppliers. The watch designation is used to alert the public about deteriorating conditions, while reminding water supply professionals to keep watch on conditions and update contingency plans (NJDEP 2011).

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, the NJDEP commissioner 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 (NJDEP 2011).

A water emergency (or drought emergency) can only be declared by the governor. 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 (NJDEP 2011).

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with drought events throughout the State of New Jersey. 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.

Agriculture-related drought disasters are quite common. One-half to two-thirds of the counties in the U.S. have been designated as disaster areas in each of the past several years. The USDA Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in counties that are contiguous to a designated county. Between 2012 and 2014, New Jersey has been included in six USDA declarations. Of those six declarations, Essex County has not been included in any of the declarations.

Between 1954 and 2014, the State of New Jersey experienced two FEMA declared drought-related disasters (DR) or emergencies (EM) classified as a water shortage. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Of those two declarations, Essex County has been included in both declarations (FEMA 2014).

For this 2015 Plan Update, known drought events that have impacted Essex County between 2007 and 2014 are identified in Table 5.4.3-3. With drought documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.3-3 may not include all events that have occurred in the County.

Table 5.4.3-3. Drought Incidents in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
2010	Drought	N/A	N/A	During the summer and fall, New Jersey experienced its hottest and 10th driest summer since 1895. The drought watch originally was declared for Bergen, Essex, Hudson, Morris, and Passaic Counties, then was expanded statewide. It was the first time since 2005 that a statewide drought watch had been declared. The drought continued through the summer and into the fall until a wet October led to the cancellation of the drought watch on October 26, 2010. The drought was taxing for New Jersey farmers and the U.S. Secretary of Agriculture Thomas Vilsack declared all counties in southern, central and northwest New Jersey to be natural disaster areas. The declaration made farm operators eligible for assistance from the Farm Service Agency. The assistance included low interest loans which could cover up to 100% of the dollar value of the crop losses.

Source: NOAA-NCDC 2014; FEMA 2014

Probability of Future Occurrences

Based upon risk factors for and past occurrences, it is likely that droughts will occur across New Jersey and Essex County in the future. In addition, as temperatures increase (see climate change impacts), the probability for future droughts will likely increase as well. Therefore, it is likely that droughts will occur in New Jersey of varied severity in the future.

It is estimated that Essex County will continue to experience direct and indirect impacts of drought and its impacts on occasion, with the secondary effects causing potential disruption or damage to agricultural activities and creating shortages in water supply within communities.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for drought in the County is considered 'occasional' (likely to occur within 100 years, as presented in Table 5.3-3).

Climate Change Impacts

The New Jersey Climate Adaptation Alliance is a network of policymakers, public and private-sector practitioners, academics, non-governmental organizations (NGO), and business leaders aligned to build climate change preparedness in the state of New Jersey. The Alliance is facilitated by Rutgers University, which provides science and technical support, facilitates the Alliance's operations and advances its recommendations. A document titled Change in New Jersey: Trends and Projections was developed to identify recommendations for State and local public policy that will be designed to enhance climate change preparedness and resilience in New Jersey (Rutgers 2013).

Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC, 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4 °F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).

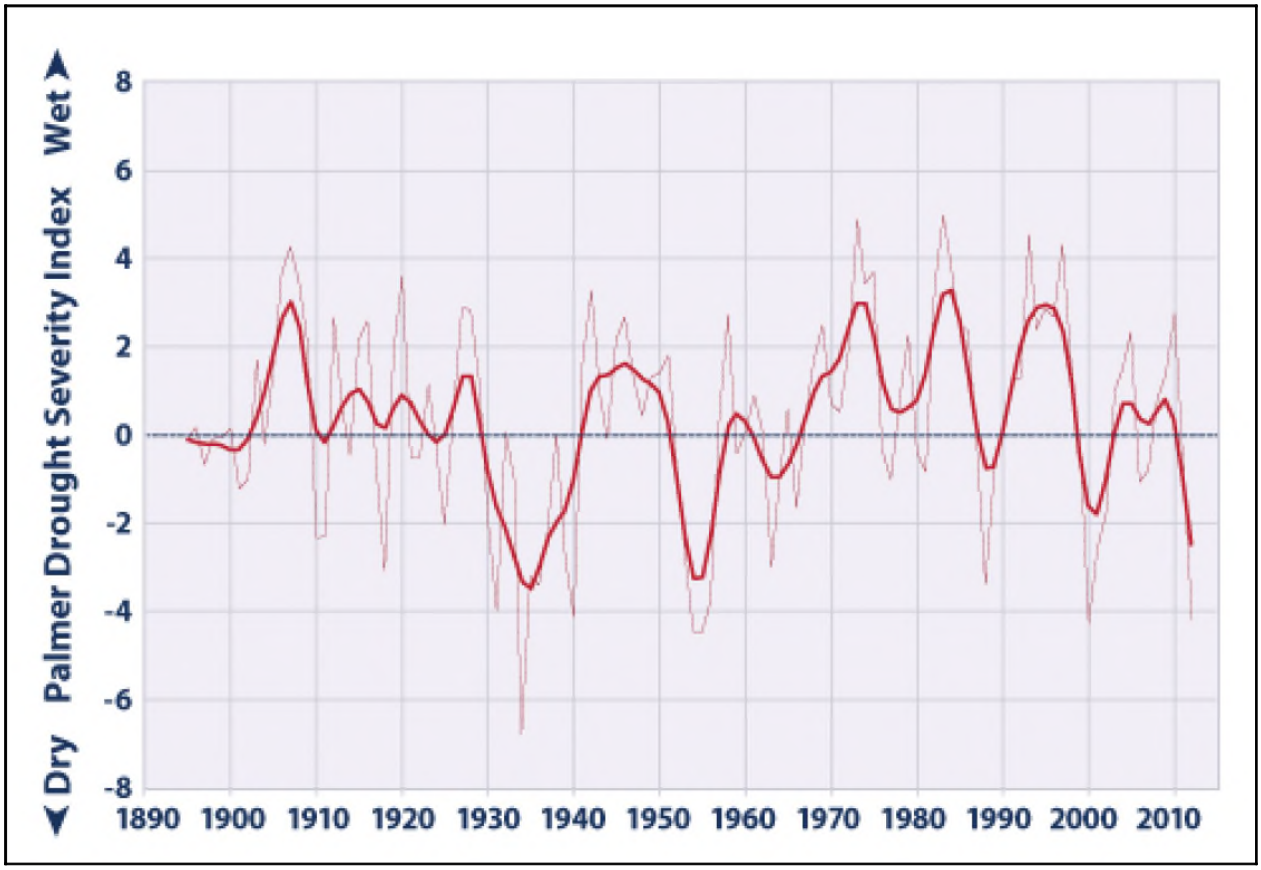
Nearly every region in the country is facing some increased risk of seasonal drought. Climate change can significantly affect the sustainability of water supplies in the future. As parts of the United States get drier, the amount and quality of water available will likely decrease, impacting people's health and food supplies. With climate change, the entire country will likely face some level of drought. A report by the Natural Resources Defense Council (NRDC) found that 1,100 counties (one-third of all counties in the contiguous 48 states) face higher risks of water shortages by mid-century as a result of climate change. More than 400 of these counties will face extremely high risks of water shortages.

The NRDC states that global warming is projected to alter precipitation patterns, increase the frequency and intensity of major storm events, and increase the flood risk throughout the United States, particularly the midwest and the northeast. Between 2000 and 2009, approximately 30% to 60% of the United States experienced drought conditions at any one time. However, both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over five inches (12%) greater than the average from 1895-1970. Southern New Jersey became 2" (5%) wetter late in the 20th century (Office of New Jersey State Climatologist). Average annual precipitation is projected to

increase in the region by 5% by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New York City Panel on Climate Change [NPCC] 2009).

Drought conditions across the country have varied since records began in 1895. The 1930s and 1950s saw the most widespread droughts, while the last 50 years have generally been wetter than average (Figure 5.4.3-4).

Figure 5.4.3-4. Average Drought Conditions in the Contiguous 48 States, 1895 to 2012

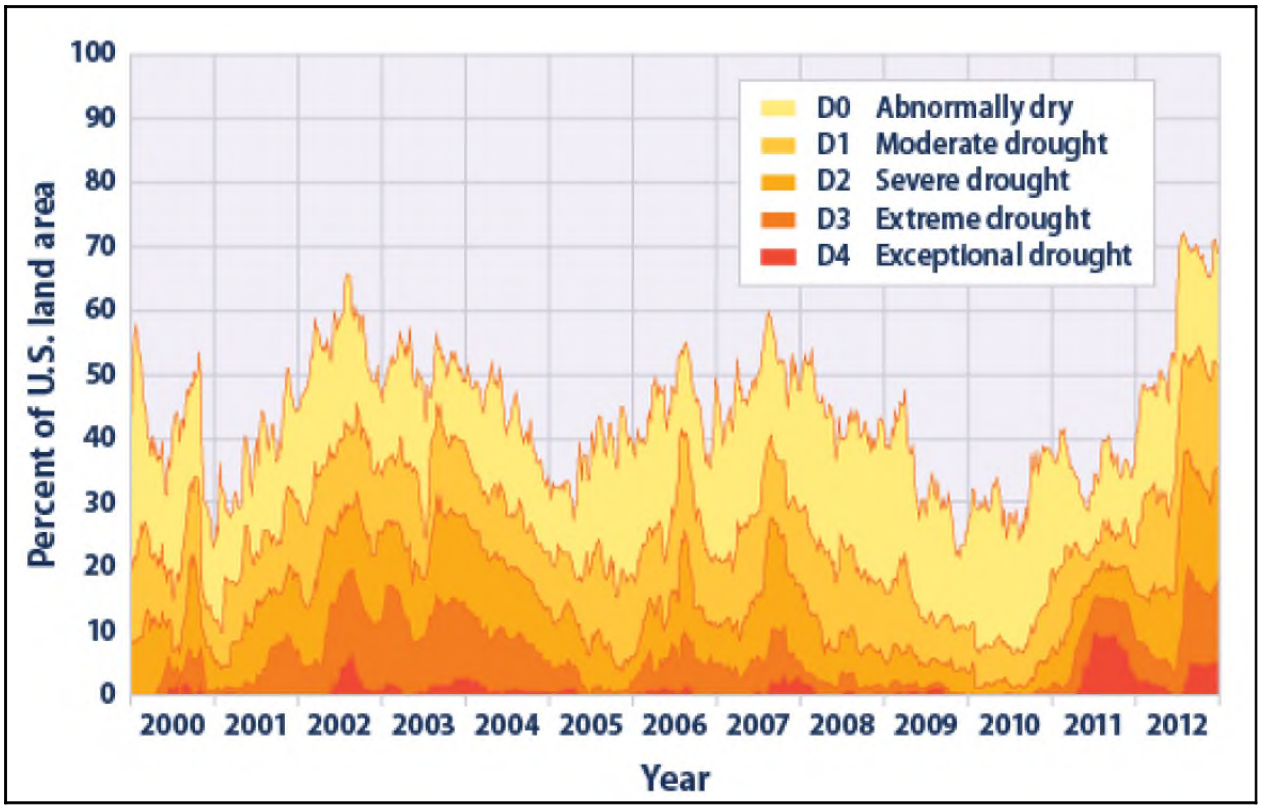


Source: *U.S. Environmental Protection Agency (EPA) 2013*

Note: *This figure shows annual values of the Palmer Drought Severity Index, averaged over the entire area of the contiguous U.S. Positive values represent wetter-than-average conditions, while negative values represent drier-than-average conditions. A value between -2 and -3 indicates a moderate drought, -3 to -4 is severe drought, and -4 or below is extreme drought. The thicker line is a nine-year weighted average.*

Over the period from 2000 through 2012, roughly 30% to 70% of the U.S. experienced conditions that were at least abnormally dry at any given time. High drought years occurred in 2002, 2003, 2007, and 2012, while 2001, 2005, 2009, and 2010 were relatively low drought years. Both drought figures indicate that in 2012, the U.S. experienced the driest conditions in more than a decade. During the latter half of 2012, more than half of the U.S. was covered by moderate or greater drought (Figure 5.4.3-5). In several states, 2012 was among the driest years on record.

Figure 5.4.3-5. Percentage of U.S. Under Drought Conditions, 2000 to 2012



Source: *EPA 2013*

Note: *This figure shows the percentage of U.S. under drought conditions from 2000 through 2012. This figure uses the U.S. Drought Monitor classification system, which is described above. This figure includes all 50 states and Puerto Rico.*

5.4.3.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the drought hazard, all of Essex County has been identified as exposed. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), are exposed and potentially vulnerable to a drought. The following text evaluates and estimates the potential impact of the drought hazard on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

The entire County is vulnerable to drought. However, areas at particular risk are areas used for agricultural purposes (farms and cropland), open/forested land vulnerable to the wildfire hazard, densely-populated areas where communities rely on surface water supplies (above ground reservoirs) for industrial, commercial, and domestic purposes, and certain areas where elderly, impoverished or otherwise vulnerable populations are located. Vulnerable populations could be particularly susceptible to the drought hazard and cascading impacts due to age, health conditions, and limited ability to mobilize to shelter, cooling and medical resources.

Droughts conditions can cause a shortage of water for human consumption and reduce local fire-fighting capabilities. According to the New Jersey HMP, counties most often affected by a drought are densely populated areas that rely on above-ground reservoirs for their water supply; this includes Essex County. Areas more resistant to drought conditions are less densely populated and rely on groundwater or surface water sources (NJ HMP, 2011). Essex County is located within the Northeast Drought Region of New Jersey. According to the NJDEP, water supply sources available to this region include rivers and New Jersey reservoirs, both major supply sources, and unconfined groundwater (minor supply source).

Data and Methodology

Data was collected from HAZUS-MH, USDA, NOAA-NCDC, Essex County, and the Planning Committee. Insufficient data was available to model the long-term potential impacts of a drought on the County. Over time, additional data will be collected to allow better analysis for this hazard. Available information and a preliminary assessment are provided below.

Impact on Life, Health and Safety

Drought conditions can affect people's health and safety including health problems related to low water flows and poor water quality; and health problems related to dust. Droughts also have the potential to lead to loss of human life (NDMC 2014). Other possible impacts to health due to drought include increased recreational risks; effects on air quality; diminished living conditions related to energy, air quality, and sanitation and hygiene; compromised food and nutrition; and increased incidence of illness and disease. Health implications of drought are numerous. Some drought-related health effects are short-term while others can be long-term (CDC 2012). The following table provides the drinking water suppliers for Essex County.

Table 5.4.3-4. Drinking Water Suppliers in Essex County

Name	Population Served	Source Type
Belleville Water Dept.	35,129	Purchased surface water
Bloomfield Water Dept.	45,061	Purchased surface water
Caldwell Water Dept.	7,584	Purchased ground water
Cedar Grove Water Dept.	12,3000	Purchased surface water
East Orange Water Commission	75,000	Purchased surface water
Essex Fells Water Dept.	2,200	Groundwater
Fairfield Water Dept.	8,000	Purchased surface water
Glen Ridge Water Dept.	8,000	Purchased surface water
Livingston Township Division of Water	27,391	Groundwater
Montclair Water Bureau	38,977	Purchased surface water
Newark Water Department	273,000	Surface water
NJ American Water Company	217,230	Surface water
North Caldwell – Hilltop	40	Surface water
North Caldwell Water Dept.	6,000	Purchased surface water
Nutley Water Dept.	27,362	Purchased surface water
Orange Water Dept.	33,000	Groundwater
Roseland Water Dept.	5,298	Purchased ground water
South Orange Water Dept.	16,924	Groundwater
Verona Water Dept.	13,61	Purchased surface water
West Caldwell Water Dept.	10,485	Purchased surface water

Source: U.S. EPA 2014

The City of Newark Water System is a public community water system that consists of one surface water intake and one purchased groundwater source. The system's source water comes from the Charlottesburg Reservoir and purchases water from the Elizabethtown WC and the North Jersey District Water Supply Commission (City of Newark 2010).

As previously stated, drought conditions can cause shortages in water for human consumption. Droughts can also lead to reduced local firefighting capabilities. The drought hazard is a concern for Essex County because the County's water is supplied by both surface water and groundwater. Surface water supplies are affected more quickly during droughts than groundwater sources.

Impact on General Building Stock

No structures are anticipated to be directly affected by a drought event. However, droughts contribute to conditions conducive to wildfires and reduce fire-fighting capabilities. Risk to life and property is greatest in those areas where forested areas adjoin urbanized areas (high density residential, commercial and industrial) also known as the wildfire urban interface (WUI). Therefore, all assets in and adjacent to, the WUI zone, including population, structures, critical facilities, lifelines, and businesses are considered vulnerable to wildfire. Refer Section 5.4.9 for the Wildfire risk assessment.

Impact on Critical Facilities

Water supply facilities may be affected by short supplies of water. As mentioned, drought events generally do not impact buildings; however, droughts have the potential to impact agriculture-related facilities and critical facilities that are associated with potable water supplies. Also, those critical facilities in and adjacent to the WUI zone are considered vulnerable to wildfire.

Impact on the Economy

When a drought occurs, the agricultural industry is most at risk in terms of economic impact and damage. During droughts, crops do not mature leading to a lessened crop yield, wildlife and livestock are undernourished, land values decrease, and ultimately there is financial loss to the farmer (FEMA, 1997).

Based on the 2007 Census of Agriculture, there were 13 farms in Essex County, with 184 acres of total land in farms. The average farm size was 14 acres. Essex County farms had a total market value of products sold of $710,000 $701,000 in crop sales and $10,000 in livestock sales), averaging $24,631 per farm. The Census indicated that six of farm operators reported farming as their primary occupation (USDA 2007). Table 5.4.3-5 shows the acreage of agricultural land exposed to the drought hazard.

Table 5.4.3-5. Agricultural Land in Essex County in 2007

Number of Farms	Land in Farms (acres)	Total Cropland (acres)	Harvested Cropland (acres)	Irrigated Land (acres)
13	184	43	(D)	21

Source: USDA 2007
(D) Withheld to avoid disclosing data for individual farms

The 2007 Census of Agriculture for Essex County does not specific the top agricultural products sold. However, the County ranks 19th in the State for horses, ponies, mules, burros, and donkeys; and fruits, tree nuts, and berries sold. The County also ranks 20th in the State for vegetables, melons, potatoes, and sweet potatoes sold and nursery, greenhouse, floriculture, and sod sold (USDA 2007).

A prolonged drought can have a serious economic impact on a community. Increased demand for water and electricity may result in shortages and a higher cost for these resources (FEMA, 2005). Industries that rely on water for business may be impacted the hardest (e.g., landscaping businesses). Even though most businesses will still be operational, they may be impacted aesthetically. These aesthetic impacts are most significant to the recreation and tourism industry. In addition, droughts in another area could impact the food supply/price of food for residents in the County.

Future Growth and Development

As discussed in Section 4, areas targeted for future growth and development have been identified across Essex County. Future growth could impact the amount of potable water available due to a drain on the available water resources. Other areas that could be impacted include agriculture and recreational facilities such as golf courses, farms, and nurseries. Areas targeted for potential future growth and development in the next five (5) years have been identified across the County at the municipal level. Refer to the jurisdictional annexes in Volume II of this HMP.

Effect of Climate Change on Vulnerability

Nearly every region in the country is facing some increased risk of seasonal drought. Climate change can significantly affect the sustainability of water supplies in the future. As parts of the United States get drier, the amount and quality of water available will likely decrease, impacting people's health and food supplies.

Western United States have already been experiencing water shortages due to severe dry-spells. With climate change, the entire country will likely face some level of drought. A report by the National Resources Defense Council (NRDC) found that 1,100 counties (one-third of all counties in the contiguous 48 states) face higher risks of water shortages by mid-century as a result of climate change. More than 400 of these counties will face extremely high risks of water shortages.

Change of Vulnerability

When examining the change in the County's vulnerability to drought events from the 2008 original HMP to this update, it is important to look at each entity that is exposed and vulnerable. The total population across the County has minimally changed as shown by the 2000 to 2010 U.S. Census.

In terms of the agricultural industry for Essex County, from 2002 to 2007, there was a 13% decrease in number of farms (15 farms to 13 farms, respectively); however, the County had a 20% increase in land in farms (153 acres to 184 acres) and a 40% increase in average size of farms (10 acres to 14 acres). Also, the County experienced a 4% decrease in market value of products sold, from $737,000 in 2002 to $710,000 in 2007. Due to the small number of farms and the market value of products sold, the County's potential crop loss due to drought may remain the same.

Additional Data and Next Steps

For the Plan Update, any additional information regarding localized concerns and past impacts will be collected and analyzed. This data will be developed to support future revisions to the plan. Mitigation efforts could include building on existing New Jersey, Essex County, and local efforts.

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5.4.4 Earthquake

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the earthquake hazard in Essex County.

2015 Plan Update Changes

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the earthquake hazard are discussed.
- The *NJGS Geological Component of the Earthquake Loss Estimation Study for Essex County* (2001) was referenced and used.
- New and updated figures from other federal and state agencies are incorporated.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- A vulnerability assessment section is conducted for the earthquake hazard. A probabilistic assessment was conducted for Essex County for the 100-, 500-, and 2,500-year MRPs through a Level 2 analysis HAZUS-MH 2.1 to analyze the earthquake hazard and provide a range of loss estimates for the County. An exposure assessment was conducted for population and buildings on liquefaction using the NJGS susceptibility spatial layer.

5.4.4.1 Profile

Hazard Description

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 (Federal Emergency Management Agency [FEMA] 2001; Shedlock and Pakiser 1997). Most earthquakes occur at the boundaries where the Earth's tectonic plates meet (faults); less than 10% of earthquakes occur within plate interiors. New Jersey is in an area where the rarer plate interior-related earthquakes occur. 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 (Shedlock and Pakiser 1997).

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 (Shedlock and Pakiser 1997). Earthquakes usually occur without warning and their effects can impact areas of great distance from the epicenter (FEMA 2001).

According to the U.S. Geological Survey (USGS) Earthquake Hazards Program, an earthquake hazard is any disruption associated with an earthquake that may affect residents' normal activities. This includes surface faulting, ground shaking, landslides, liquefaction, tectonic deformation, tsunamis, and seiches; each of these terms is defined below:

- *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 at the 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 (USGS 2012a).

Ground shaking is the primary cause of earthquake damage to man-made structures. Damage can be increased when soft soils amplify ground shaking. 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 (Stanford 2003).

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, as noted in Table 5.4.4-1, 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.

Table 5.4.4-1. NEHRP Soil Classifications

Soil Classification	Description
A	Hard Rock
B	Rock
C	Very dense soil and soft rock
D	Stiff soils
E	Soft soils

Source: FEMA 2013

There is currently no reliable way to predict the day or month that an earthquake will occur at any given location. An Earthquake Early Warning System is being developed by the USGS for the west coast of the United States. This system uses existing seismic networks to detect moderate to large earthquakes very rapidly so that a warning can be sent before destructive seismic waves arrive to locations outside the area where the earthquake begins. These warnings will allow people to take protective action and can also trigger automatic responses to safeguard critical infrastructure. Under the Disaster Relief Act of 1974, the USGS has the federal responsibility to issue alerts for earthquakes, enhance public safety, and reduce losses through effective forecasts and warnings. USGS currently issues rapid, automatic earthquake information via the Internet, e-mail messages, text messages, and social media (USGS 2012b).

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. 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. Landslides are further discussed in Section 5.4.7 (Geologic Hazards) of this Plan update.

Earthquakes can also cause dam failures. The most common mode of earthquake-induced dam failure is slumping or settlement of earth-fill dams where the fill has not been property compacted. If the slumping occurs when the dam is full, then overtopping of the dam, with rapid erosion leading to dam failure is possible. Dam failure is also possible if strong ground motions heavily damage concrete dams. Earthquake-induced landslides into reservoirs have also caused dam failures.

Another secondary effect of earthquakes that is often observed in low-lying areas near water bodies is ground liquefaction. Liquefaction is the conversion of water-saturated soil into a fluid-like mass. This can occur when loosely packed, waterlogged sediments lose their strength in response to strong shaking. Liquefaction effects may occur along the shorelines of the ocean, rivers, and lakes and they can also happen in low-lying areas away from water bodies in locations where the ground water is near the earth's surface.

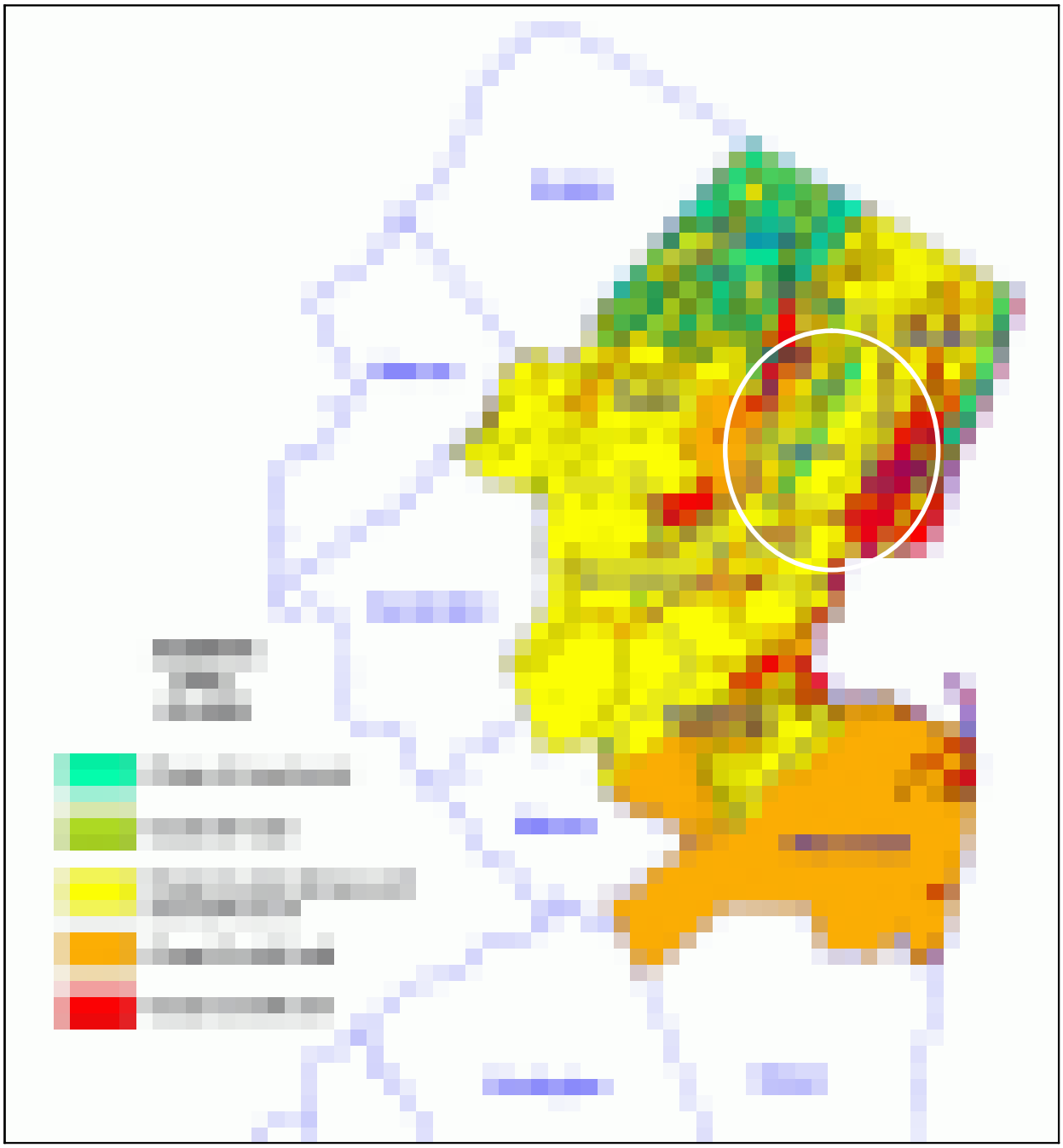
Tsunamis are formed as a result of earthquakes, volcanic eruptions, or landslides that occur under the ocean. When these events occur, huge amounts of energy are released as a result of quick, upward bottom movement. A wave is formed when huge volumes of ocean water are pushed upward. A large earthquake can lift large portions of the seafloor, which will cause the formation of huge waves (U.S. Search and Rescue Task Force Date Unknown).

Location

Earthquakes are most likely to occur in the northern parts of New Jersey, where significant faults are concentrated; however, low-magnitude events can and do occur in many other areas of the State. Figure 5.4.4-1 illustrates the NEHRP soils located in the northeast quadrant the State. The data was available from the New Jersey Geologic and Water Survey. The available NEHRP soils information is incorporated into the HAZUS-MH earthquake model for the risk assessment (discussed in further detail later in this section). According to this figure, Essex County is predominately underlain by Class C soils, with bands of Class A in the central portion of the County and areas of Class D in the western and southwestern areas.

Damage from earthquakes depends on the location, depth, and magnitude of the earthquake; the thickness and composition of soil and bedrock beneath the area in question; and the types of building structures. Soils influence damage in two ways. Soft soils amplify the motion of earthquake waves, producing greater ground shaking and increasing the stresses on structures. Loose, wet, sandy soils may lose strength and flow as a fluid when shaken (this is known as liquefaction). This causes foundations and underground structures to shift and break. Liquefaction susceptibility is determined by the geological history, depositional setting, and topographic position of the soil (Stanford 2003).

Figure 5.4.4-1. Seismic Soils in Northeastern New Jersey

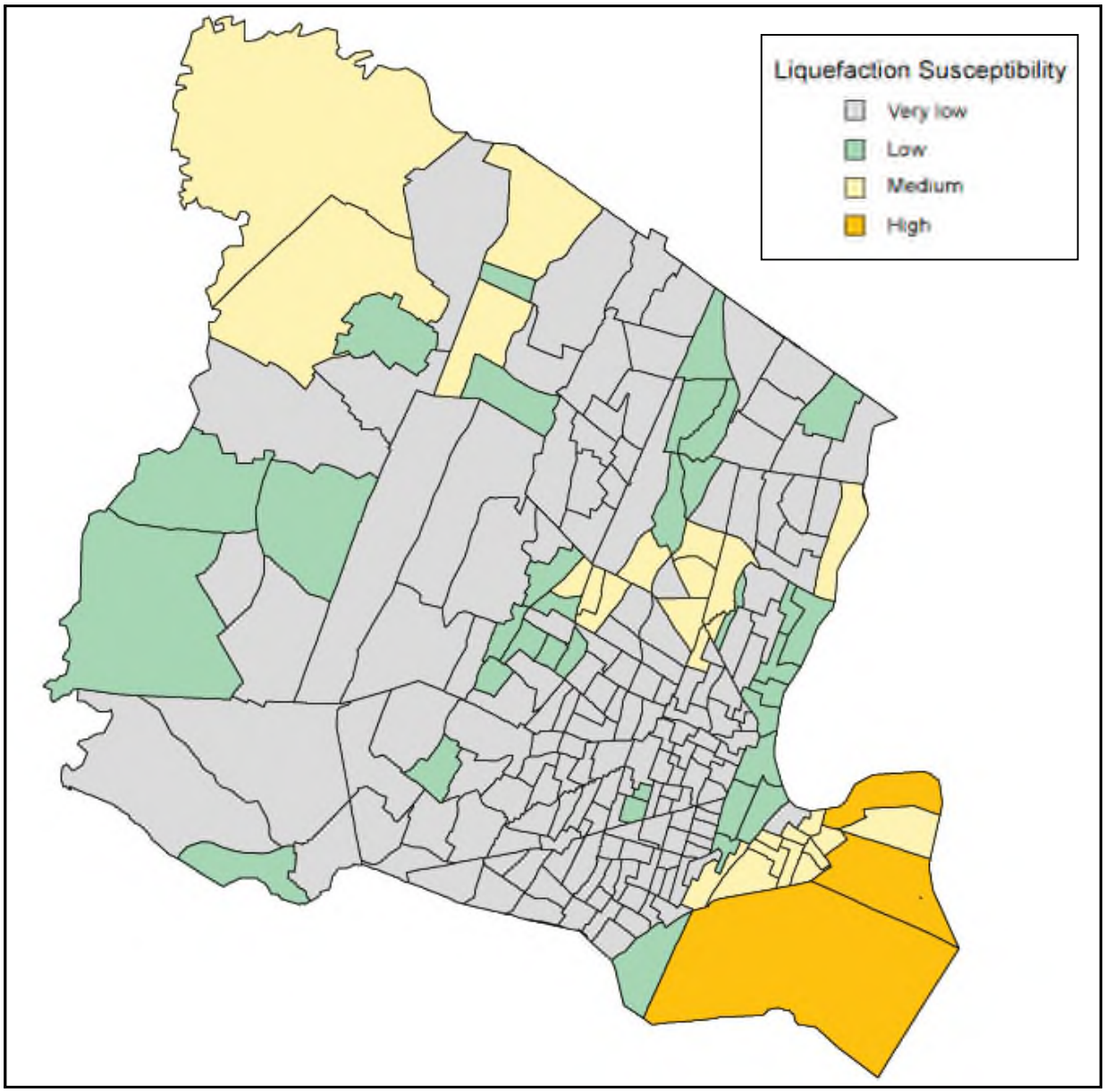


Source: New Jersey Geological and Water Survey (NJGWS) and New Jersey Department of Environmental Protection (NJDEP) 2011

Note: The white circle indicates the location of Essex County. The County contains mainly Class C soils, with areas of Class A, B, D, and E.

In terms of liquefaction susceptibility, the northwestern corner and some parts in central and western Essex County have a medium susceptibility, and southeastern Essex County (City of Newark) has a high liquefaction susceptibility (see Figure 5.4.4-2).

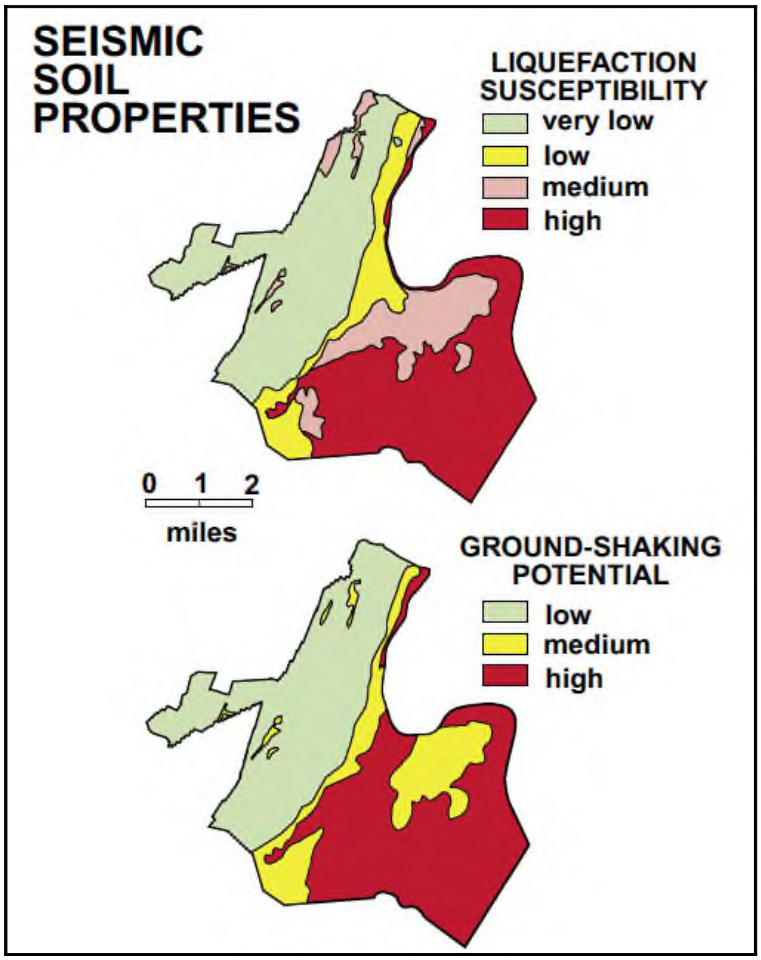
Figure 5.4.4-2. Liquefaction Susceptibility in Essex County



Source: NJGWS 2001

The City of Newark is built on glacial and postglacial deposits that overlie sandstone bedrock. The glacial deposits include till, a compact sediment deposited beneath the glacier, sand and gravel deposited in glacial lakes and river plains, and silt and clay deposited in glacial lakes. The glacial deposits are as much as 250 feet thick. In places they are overlain by postglacial sediments laid down in floodplains, swamps, salt marshes, and river terraces. The postglacial sediments are less than 20 feet thick. Till underlies the western half of Newark and has low liquefaction and ground shaking potential. Peat, deposited in wetlands, and silt, clay, and fine sand deposited in floodplains and glacial lakes, are often soft, saturated soils that are highly susceptible to shaking and liquefaction. These underlie most of the eastern half of the City. Figure 5.4.4-3 illustrates the liquefaction susceptibility and ground shaking potential for the City of Newark.

Figure 5.4.4-3. Seismic Soil Properties for the City of Newark

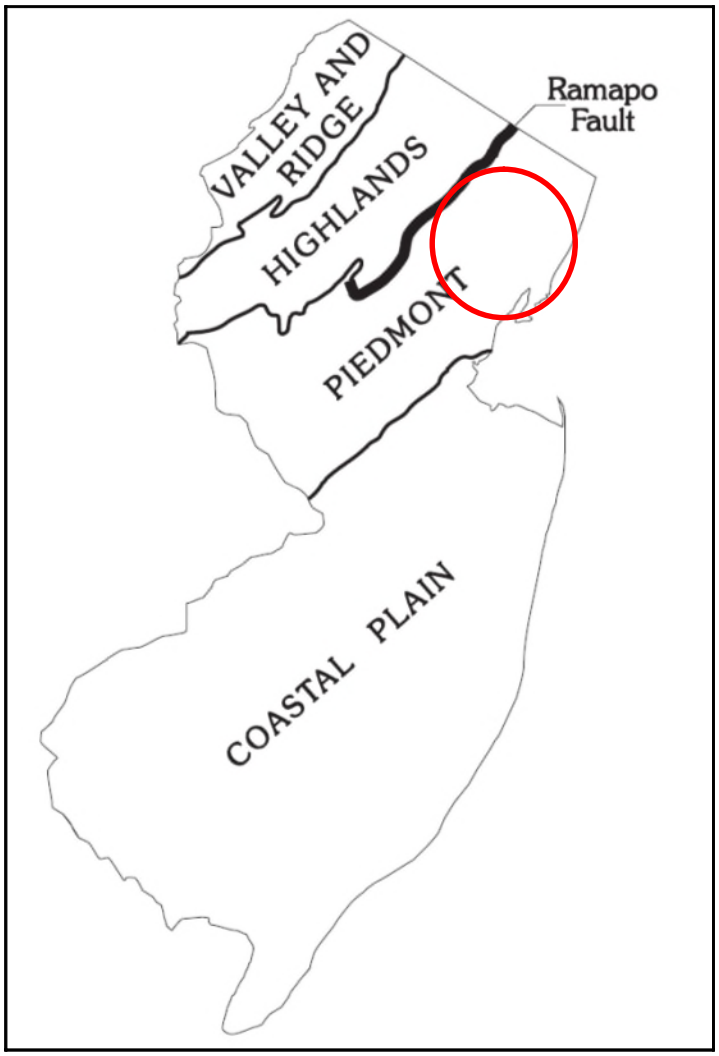


Source: Stanford (NJGWS) 2003

Faults are observed and mapped at the surface. There is no known surface ground displacement along faults in the eastern U.S. from historic earthquakes. Earthquake epicenters in eastern North America and the New Jersey area, in general, do not now occur on known faults. The faults in these parts are from tectonic activity more than 200 million years ago (Muessig, 2013).

There are many faults in New Jersey; however, the Ramapo Fault, which separates the Piedmont and Highlands Physiographic Provinces, is best known. Numerous minor earthquakes have been recorded in the Ramapo Fault zone, a 10- to 20-mile-wide area lying adjacent to, and west, of the actual fault (Dombroski 1973 [revised 2005]). Figure 5.4.4-4 illustrates the relationship of the Ramapo fault line with the physiologic provinces of New Jersey. Essex County is located in the Piedmont Province and within the vicinity of the Ramapo Fault line.

Figure 5.4.4-4. Physiographic Provinces of New Jersey and the Ramapo Fault Line

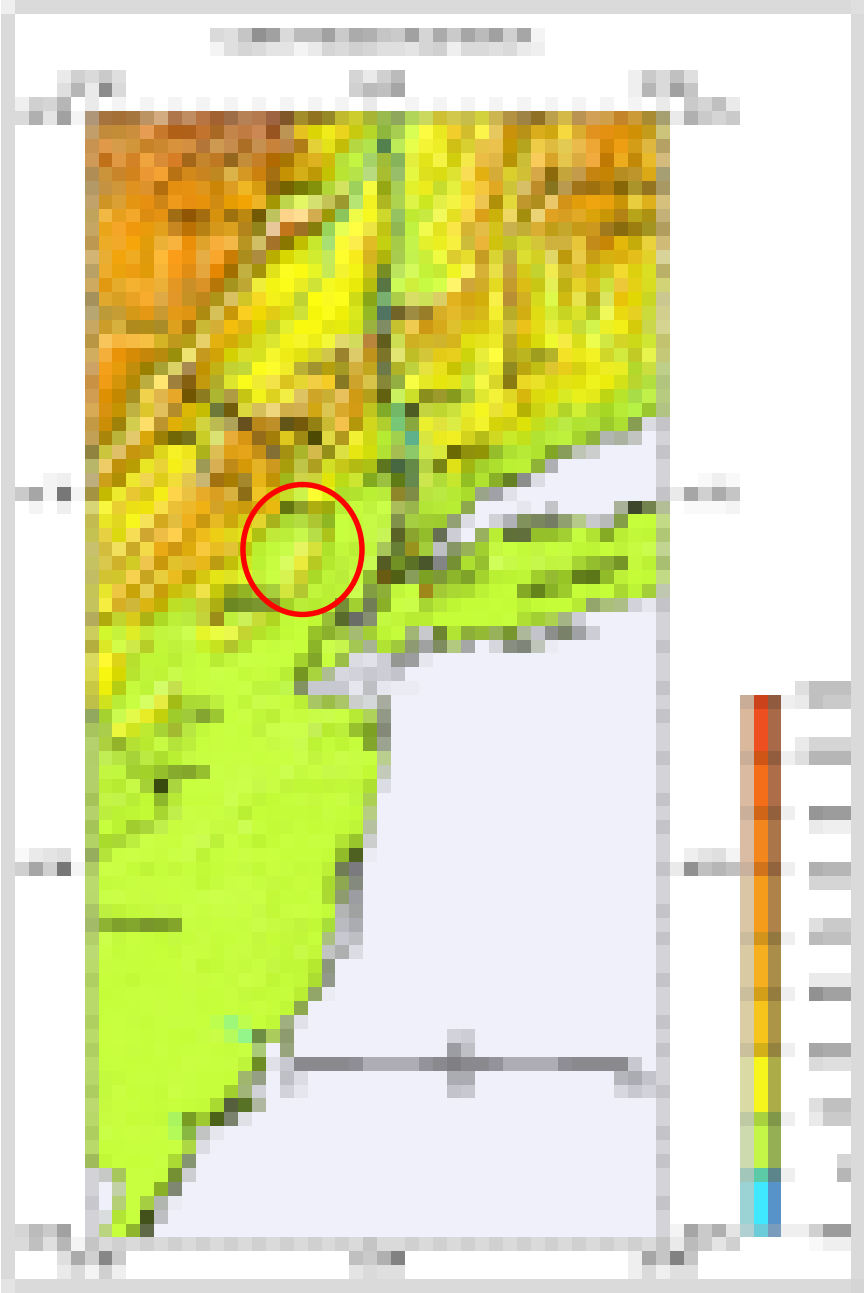


Source: Dombroski 1973 (revised 2005)

Note: The red circle indicates the approximate location of Essex County. The County is part of Piedmont Province.

The Lamont-Doherty Cooperative Seismographic Network (LCSN) monitors earthquakes that occur primarily in the northeastern United States. The goal of the project is to compile a complete earthquake catalog for this region, to assess the earthquake hazards, and to study the causes of the earthquakes in the region. The LCSN operates 40 seismographic stations in the following seven states: Connecticut, Delaware, Maryland, New Jersey, New York, Pennsylvania, and Vermont. In New Jersey, there are several Lamont-Doherty Seismic Stations as part of the Palisades Sub-Network, as shown in Figure 5.4.4-5. The network is composed of broadband and short-period seismographic stations (LCSN 2012a).

Figure 5.4.4-5. New Jersey Lamont-Doherty Seismic Stations Locations



Source: LCSN 2006
Note: The red circle indicates the approximate location of Essex County.

In addition to the Lamont-Doherty Seismic Stations, the USGS operates a global network of seismic stations to monitor seismic activity. While no seismic stations are located in New Jersey, nearby stations are positioned in State College, Pennsylvania and Harvard University in Massachusetts. Figure 5.4.4-6 shows locations of USGS seismic stations near New Jersey.

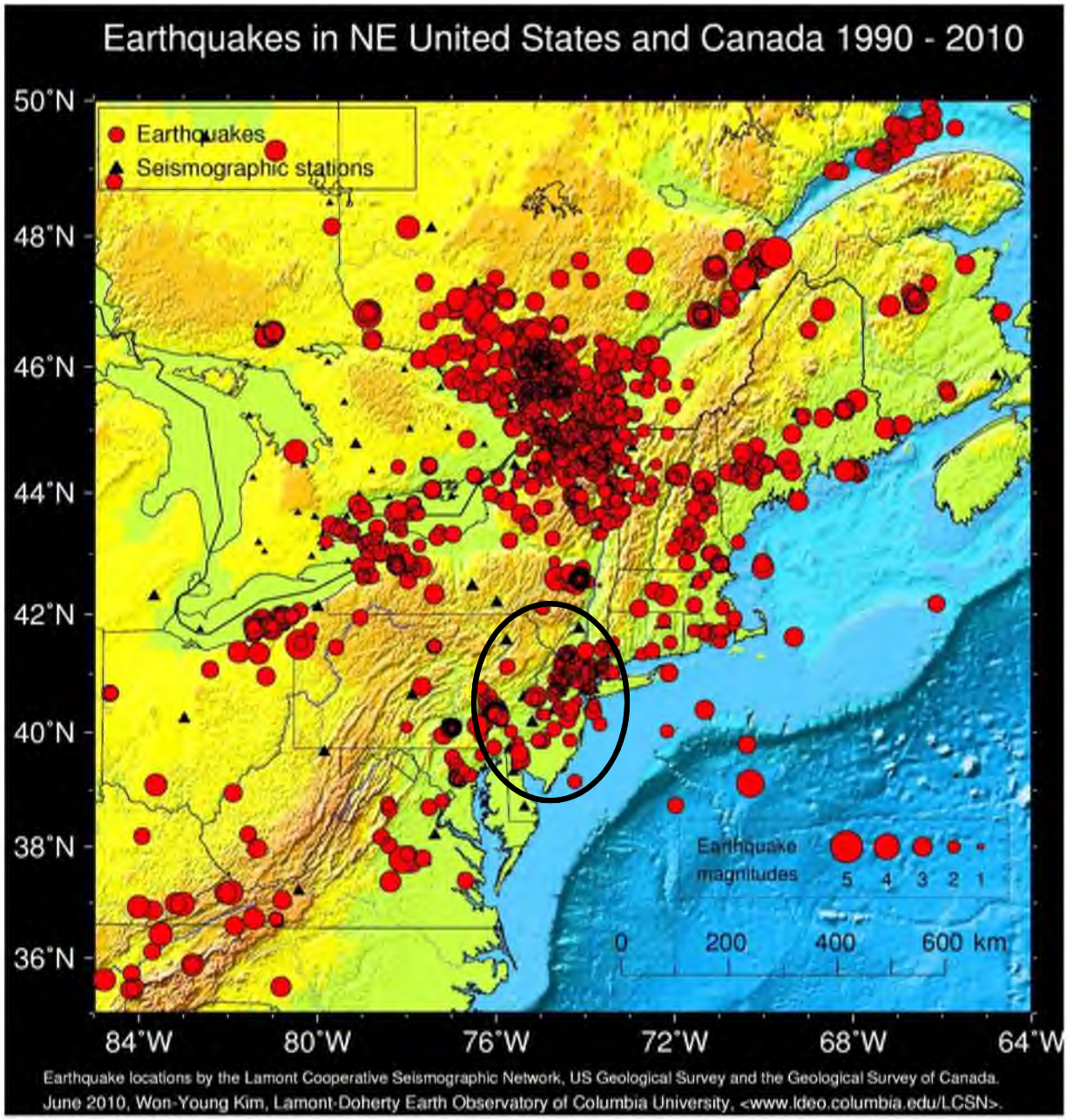
Figure 5.4.4-6. USGS Seismic Stations near New Jersey

Source: USGS 2012c

Note: The red circle indicates the approximate location of Essex County.

Earthquakes above a magnitude 5.0 have the potential for causing damage near their epicenters, and larger-magnitude earthquakes have the potential for causing damage over larger, wider areas. In New Jersey history, the earthquake with the highest magnitude occurred in 1783 with an epicenter west of New York City. This earthquake had a magnitude of 5.3. Earthquakes seem to occur with regularity across New Jersey. As mentioned earlier, earthquakes are concentrated along the Ramapo Fault System; however, earthquakes have occurred as far south as Salem County. A full discussion of past occurrences of earthquakes in New Jersey is presented in the following section. Figure 5.4.4-7 illustrates earthquake activity in the northeastern United States from 1990 – 2010, with New Jersey circled in black.

Figure 5.4.4-7. Earthquake Epicenters in the Northeast 1990 – 2010



Source: LCSN 2010

Note: The black circle indicates the location of New Jersey. The figure indicates that numerous earthquakes have been epicentered in Essex County and its surrounding area.

Extent

The level of seismic hazard—the frequency and severity of earthquakes—is substantially lower in New Jersey than in more seismically active states such as California or Alaska. The level of seismic risk - the threat to buildings, infrastructure, and people—is significant in New Jersey, especially in the northern portion of the State. The level of seismic risk in New Jersey is higher than might be expected because the majority of buildings and infrastructure has been built with minimal or no consideration of earthquakes, making them

more vulnerable to earthquake damage. Because of this low frequency of occurrence and the relatively low levels of ground shaking that would be experienced, the entire State of New Jersey can be expected to have a low-to-moderate risk to earthquake damage as compared to other areas of the country. The relatively small difference in the level of impact from one area of the State to another does not justify differentiating risk levels from one portion of the State to another (New Jersey State HMP 2014).

Seismic waves are the vibrations from earthquakes that travel through the Earth and are recorded on instruments called seismographs. The magnitude or extent of an earthquake is a measured value of the earthquake size, or amplitude of the seismic waves, using a seismograph. The Richter magnitude scale (Richter scale) was developed in 1932 as a mathematical device to compare the sizes of earthquakes. The Richter scale is the most widely known scale that measures the magnitude of earthquakes. It has no upper limit and is not used to express damage. An earthquake in a densely populated area, which results in many deaths and considerable damage, may have the same magnitude and shock in a remote area that did not experience any damage. Table 5.4.4-2 presents the Richter scale magnitudes and corresponding earthquake effects.

Table 5.4.4-2. Richter Magnitude Scale

Richter Magnitude	Earthquake Effects
2.5 or less	Usually not felt, but can be recorded by seismograph
2.5 to 5.4	Often felt, but causes only minor damage
5.5 to 6.0	Slight damage to buildings and other structures
6.1 to 6.9	May cause a lot of damage in very populated areas
7.0 to 7.9	Major earthquake; serious damage
8.0 or greater	Great earthquake; can totally destroy communities near the epicenter

Source: Michigan Tech University Date Unknown

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 scale expresses intensity of an earthquake; the scale is a subjective measure that describes how strong a shock was felt at a particular location. The Modified Mercalli scale expresses the intensity of an earthquake's effects in a given locality in values ranging from I to XII. Table 5.4.4-3 summarizes earthquake intensity as expressed by the Modified Mercalli scale. Table 5.4.4-4 displays the Modified Mercalli scale and peak ground acceleration equivalent.

Table 5.4.4-3. Modified Mercalli Intensity Scale

Mercalli Intensity	Description
I	Felt by very few people; barely noticeable.
II	Felt by few people, especially on upper floors.
III	Noticeable indoors, especially on upper floors, but may not be recognized as an earthquake.
IV	Felt by many indoors, few outdoors. May feel like passing truck.
V	Felt by almost everyone, some people awakened. Small objects move; trees and poles may shake.
VI	Felt by everyone; people have trouble standing. Heavy furniture can move; plaster can fall off walls. Chimneys may be slightly damaged.
VII	People have difficulty standing. Drivers feel their cars shaking. Some furniture breaks. Loose bricks fall from buildings. Damage is slight to moderate in well-built buildings; considerable in poorly built buildings.
VIII	Well-built buildings suffer slight damage. Poorly built structures suffer severe damage. Some walls collapse.

Mercalli Intensity	Description
IX	Considerable damage to specially built structures; buildings shift off their foundations. The ground cracks. Landslides may occur.
X	Most buildings and their foundations are destroyed. Some bridges are destroyed. Dams are seriously damaged. Large landslides occur. Water is thrown on the banks of canals, rivers, and lakes. The ground cracks in large areas.
XI	Most buildings collapse. Some bridges are destroyed. Large cracks appear in the ground. Underground pipelines are destroyed.
XII	Almost everything is destroyed. Objects are thrown into the air. The ground moves in waves or ripples. Large amounts of rock may move.

Source: Michigan Tech University Date Unknown

Table 5.4.4-4. Modified Mercalli Intensity and PGA Equivalents

Modified Mercalli Intensity	Acceleration (%g) (PGA)	Perceived Shaking	Potential Damage
I	< .17	Not Felt	None
II	.17 – 1.4	Weak	None
III	.17 – 1.4	Weak	None
IV	1.4 – 3.9	Light	None
V	3.9 – 9.2	Moderate	Very Light
VI	9.2 – 18	Strong	Light
VII	18 – 34	Very Strong	Moderate
VIII	34 – 65	Severe	Moderate to Heavy

Source: Freeman et al. 2004
Note: PGA Peak Ground Acceleration

Modern intensity scales use terms that can be physically measured with seismometers, such as the acceleration, velocity, or displacements (movement) of the ground. The most common physical measure is peak ground acceleration (PGA). 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 2011). Damage levels experienced in an earthquake vary with the intensity of ground shaking and with the seismic capacity of structures, as noted in Table 5.4.4-5.

Table 5.4.4-5. Damage Levels Experienced in Earthquakes

Ground Motion Percentage	Explanation of Damages
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

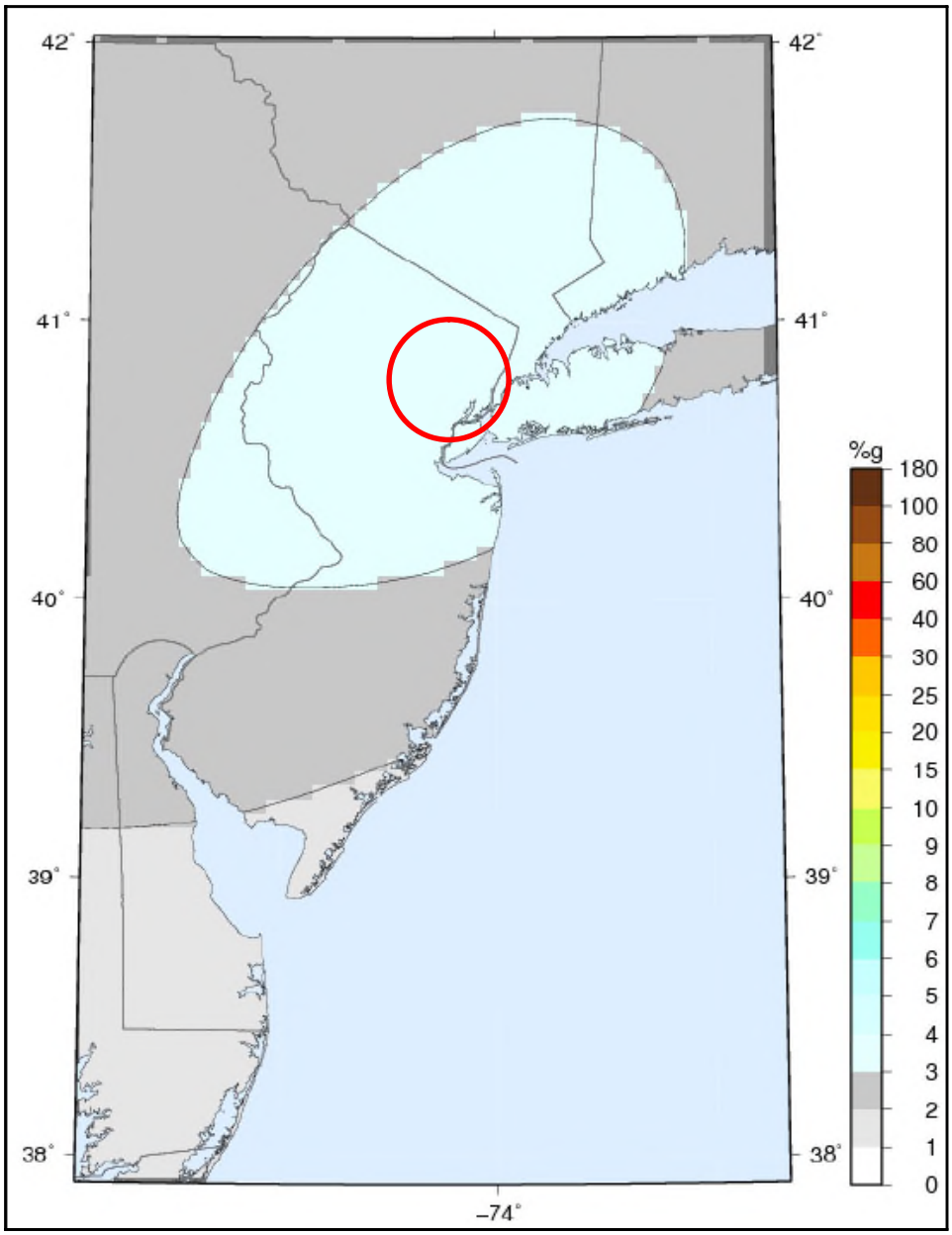
Ground Motion Percentage	Explanation of Damages
	collapse) in poorly designed buildings.
≥50%g	May causes higher levels of damage in many buildings, even those designed to resist seismic forces.

Source: NJOEM 2011
Note: %g Peak Ground Acceleration

According to USGS Earthquake Hazards Program, PGA maps (also known as earthquake hazard maps) are used as planning tools when designing buildings, bridges, highways, and utilities so that they can withstand shaking associated with earthquake events. These maps are also used as planning tools for the development of building codes that establish construction requirements appropriate to preserve public safety.

The USGS updated the National Seismic Hazard Maps in 2008, which supersede the 2002 maps. New seismic, geologic, and geodetic information on earthquake rates and associated ground shaking were incorporated into these revised maps. The 2008 map, presented as Figure 5.4.4-8, represents the best-available data as determined by the USGS (USGS 2008).

Figure 5.4.4-8. 2008 Seismic Hazard Map, PGA with 10% Probability of Exceedance in 50 Years



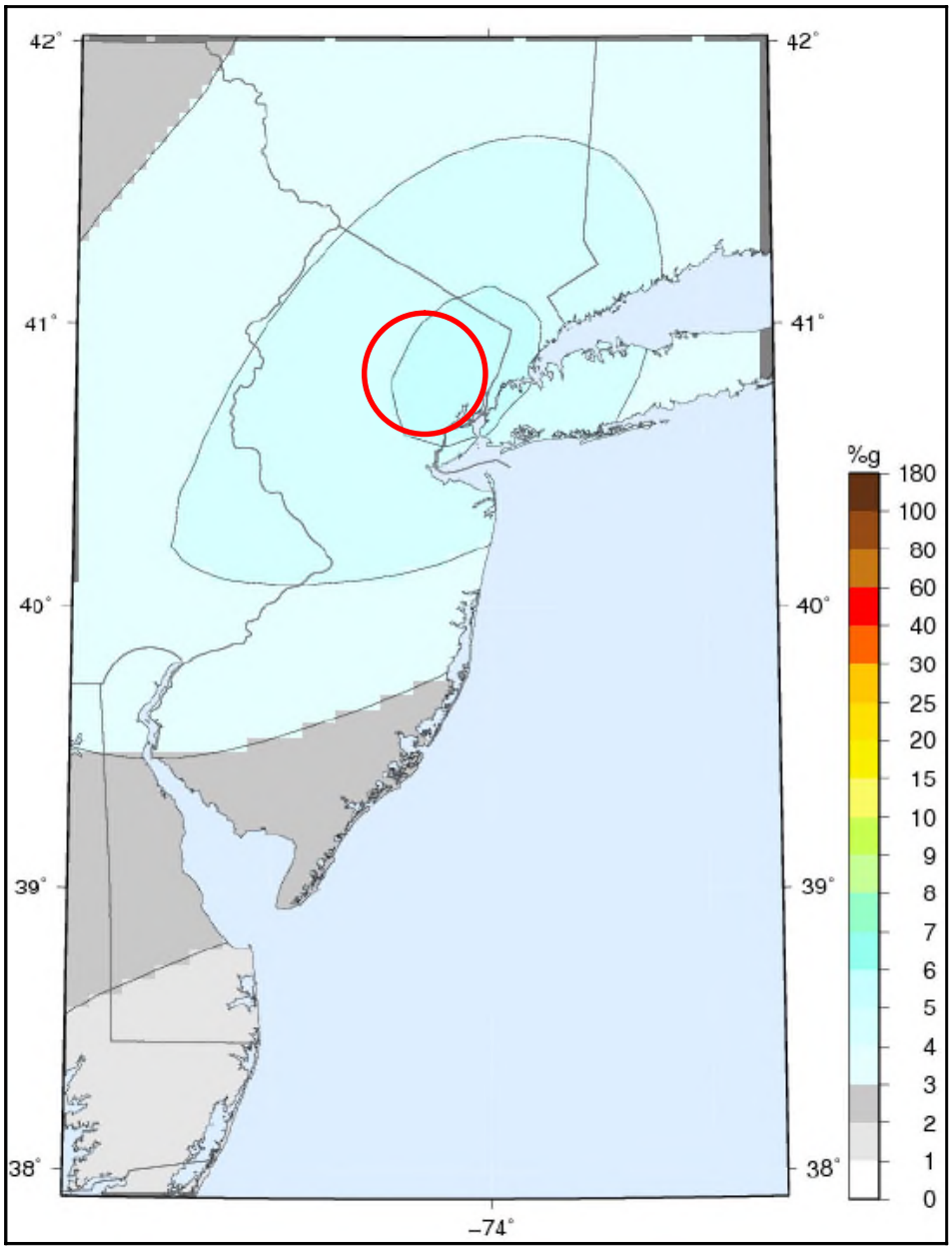
Source: USGS 2008

Note: The red circle indicates the approximate location of Essex County. The County's PGA is between 3 and 4%g.

%g Percent acceleration force of gravity

PGA Peak ground acceleration

Figure 5.4.4-9. 2002 Seismic Hazard Map, PGA with 10% Probability of Exceedance in 50 Years



Source: USGS 2002
Note: The red circle indicates the approximate location of Essex County. The County's PGA is between 4 and 5%g.
g% Percent acceleration force of gravity
PGA Peak ground acceleration

The 2002 Seismic Hazard Map shows that Essex County has a PGA between 5%g and 6%g (Figure 5.4.4-9). The 2008 Seismic Hazard Map shows that New Jersey has a PGA between 3%g and 4%g (Figure 5.4.4-8). These maps are based on peak ground acceleration (%g) with 10% probability of exceedance in 50 years.

A probabilistic assessment was conducted for the 100-, 500- and 2,500-year mean return periods (MRP) in HAZUS-MH 2.1 to analyze the earthquake hazard for Essex County. The HAZUS analysis evaluates the statistical likelihood that a specific event will occur and what consequences will occur. Figure 5.4.4-10

through Figure 5.4.4-12 illustrates the geographic distribution of PGA (*g*) across the County or 100-, 500- and 2,500-year MRP events by Census-tract.

Figure 5.4.4-10. Peak Ground Acceleration 100-Year Mean Return Period for Essex County

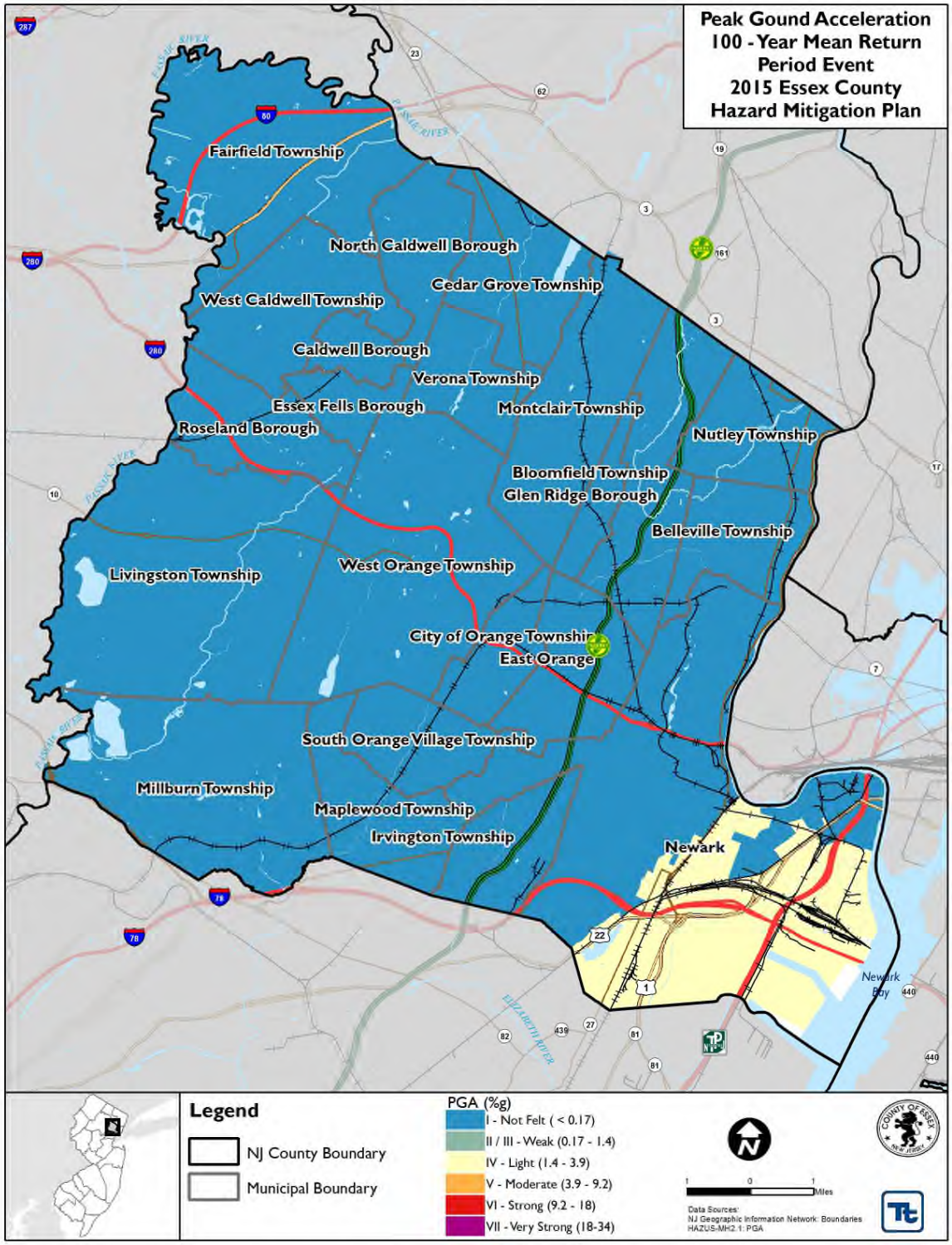


Figure 5.4.4-11. Peak Ground Acceleration 500-Year Mean Return Period for Essex County

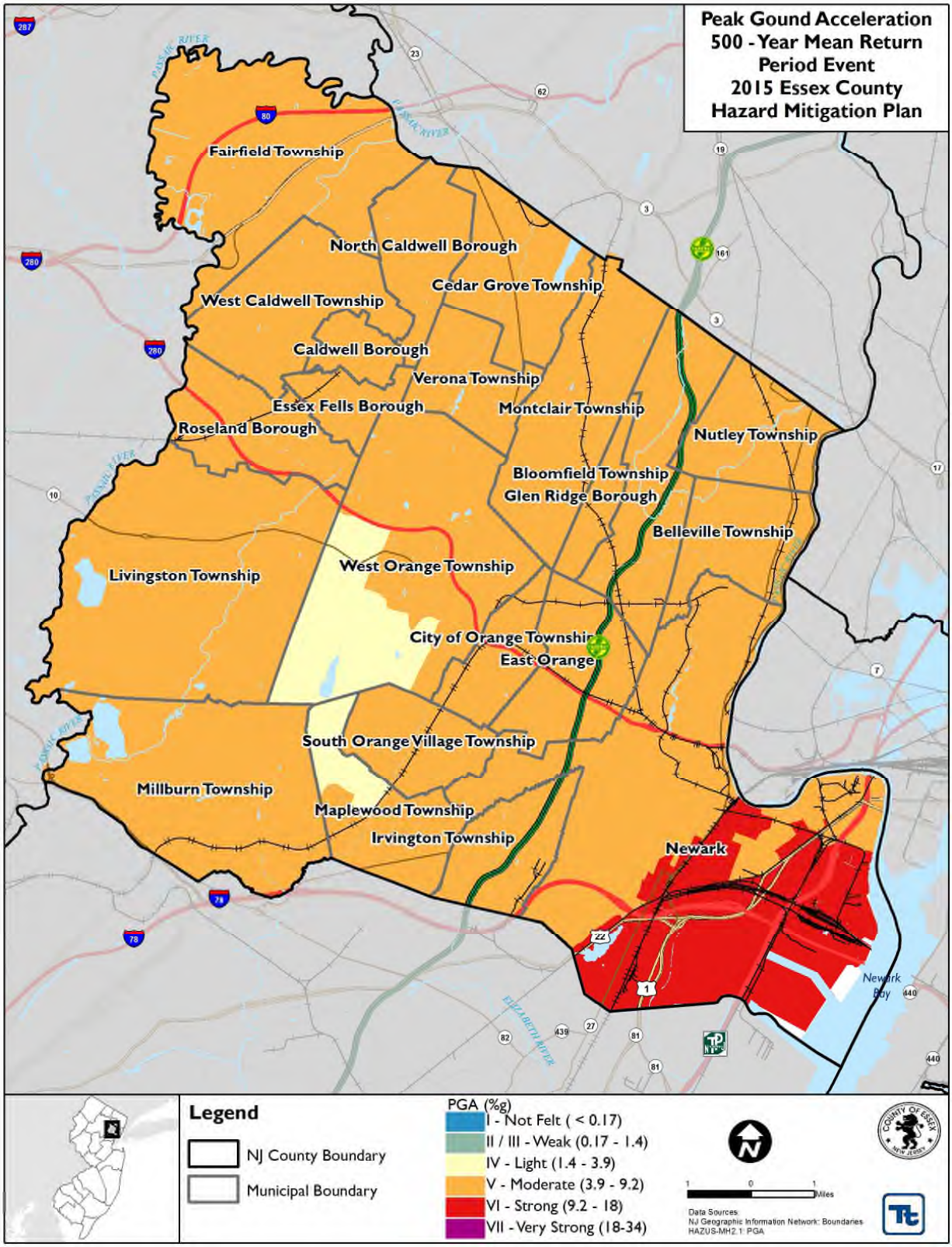
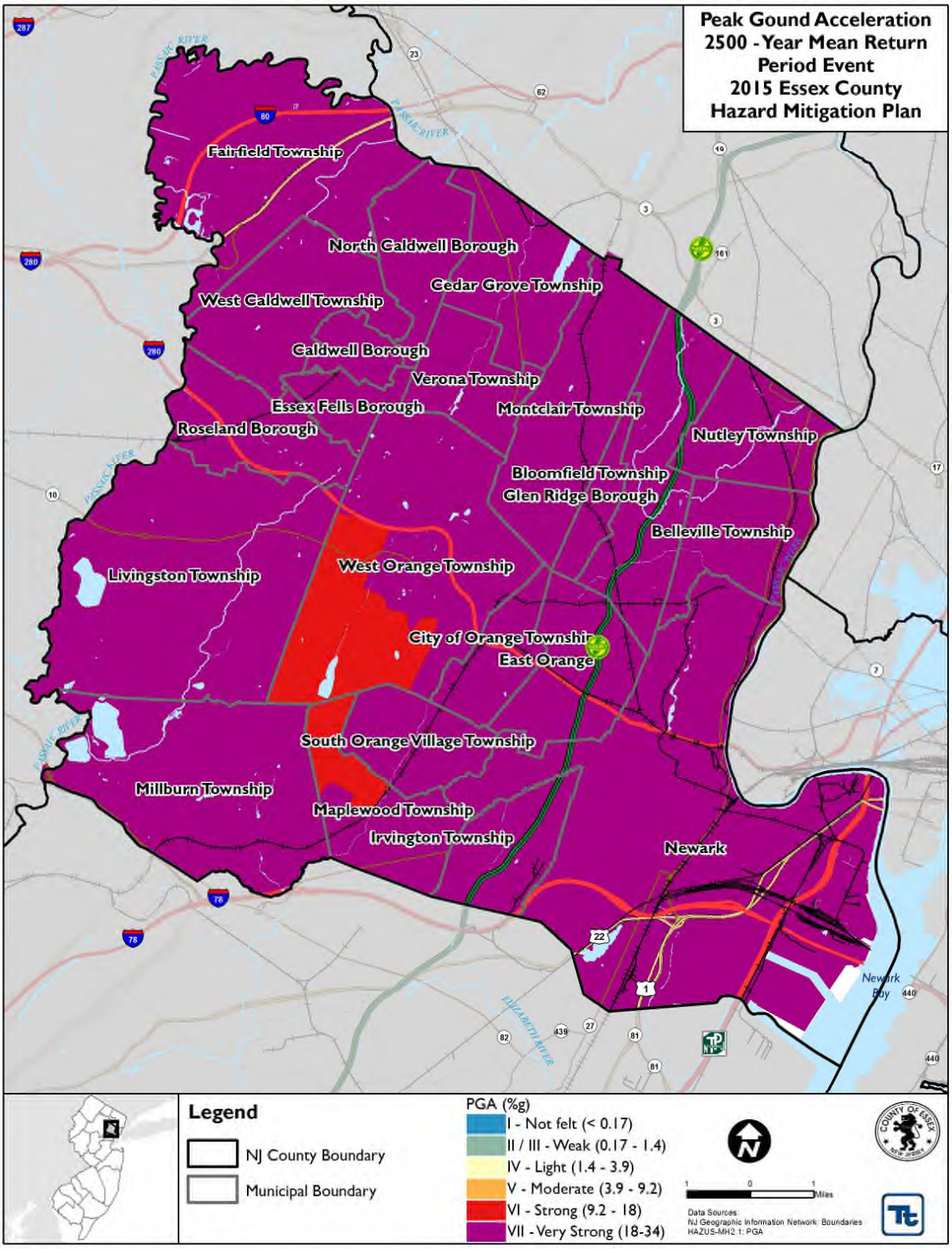


Figure 5.4.4-12. Peak Ground Acceleration 2,500-Year Mean Return Period for Essex County



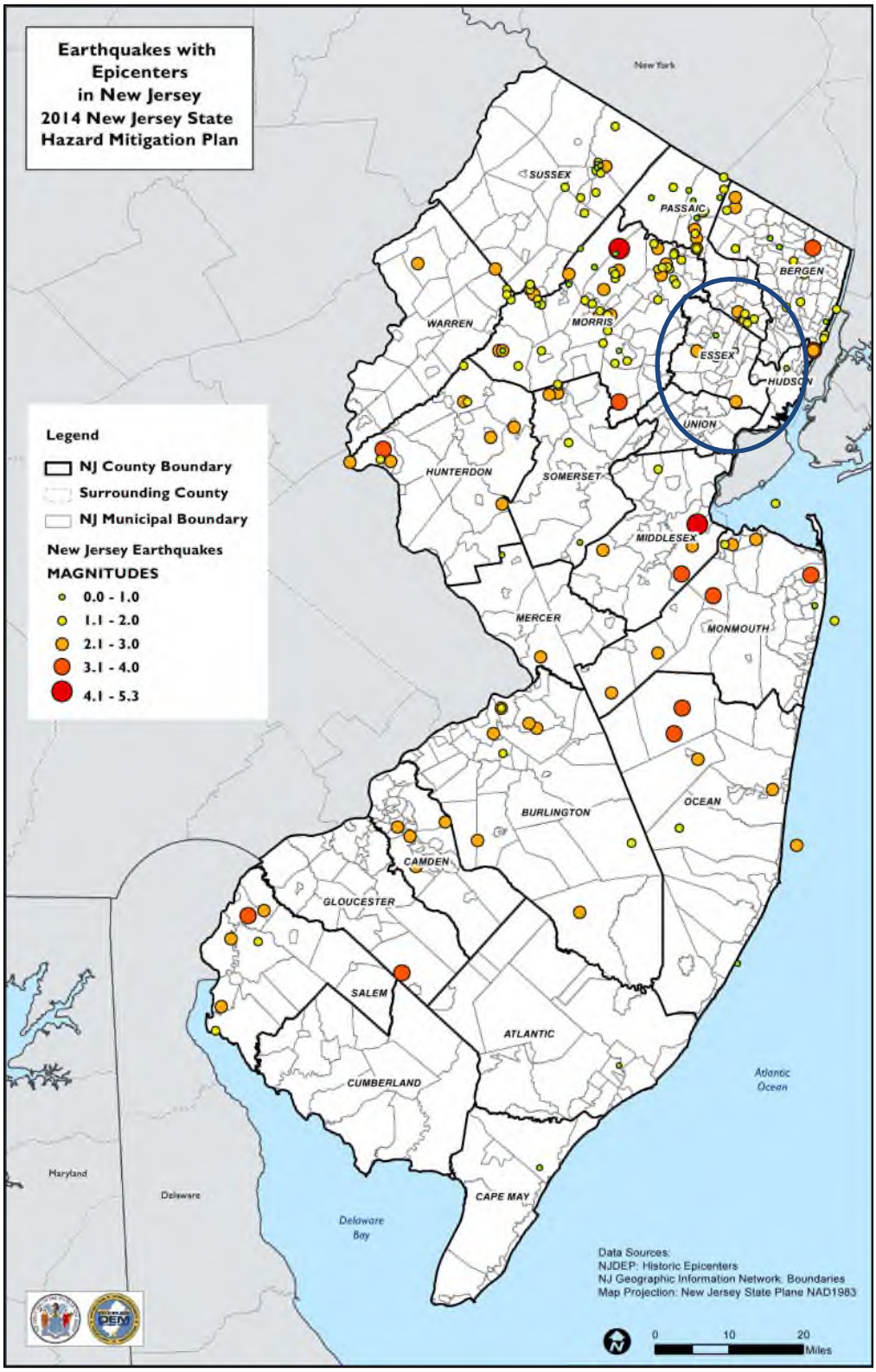
Previous Occurrences and Losses

New Jersey has a fairly extensive history of earthquakes, mostly because of the factors discussed previously in the location section. Small earthquakes occur several times a year and generally do not cause significant damage. The largest earthquake to impact New Jersey occurred in 1783. That earthquake, a magnitude 5.3 quake, occurred west of New York City and was felt from New Hampshire to Pennsylvania (Stover and Coffman 1993).

Many sources provided historical information regarding previous occurrences and losses associated with earthquake events throughout the State of 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 available information identified during research for this HMP update. Figure 5.4.4-13 illustrates earthquake events where the epicenters were located in New Jersey. The figure shows that 178 earthquakes had epicenters in New Jersey. Of those 178 events, four of those events occurred in Essex County.

For this 2015 Plan Update, known earthquake events that have impacted Essex County between 2007 and 2014 are identified in Table 5.4.4-6. With earthquake documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.4-6 may not include all events that have occurred in the County. The State of New Jersey has not been included in any FEMA disaster (DR) or emergency (EM) declarations for earthquake events.

Figure 5.4.4-13. Earthquakes with Epicenters in New Jersey, 1783 to 2012



Source: *NJDEP 2012*

Note: *The blue circle indicates the location of Essex County. The figure shows that several earthquakes have been epicentered in Essex County.*

Table 5.4.4-6. Earthquake Events in New Jersey, 2007 to 2014

Date(s) of Event	Magnitude	Location	Losses/Impacts
06/28/2007	2.1	7 km East of Fairfield, NJ	No reference and/or no damage reported.
02/03/2009	3.0	3.5km South-Southwest of Rockaway, NJ	There were reports of people having felt this earthquake throughout New Jersey.
02/14/2009	2.4	5 km North-Northeast of Boonton, NJ	There were reports of people having felt this earthquake throughout New Jersey.
2/18/2009	1.1	3 km South-Southwest of Kinnelon, NJ	No reference and/or no damage reported.
2/16/2009	1.4	1 km East-Southeast of Oradell, NJ	No reference and/or no damage reported.
2/16/2009	2.3	2 km South-Southeast of Dover, NJ	No reference and/or no damage reported.
07/01/2009	2.8	2.25km East-Southeast of Pennsville, NJ	There were reports of people having felt this earthquake throughout New Jersey.
12/21/2009	2.3	13 km South of Phillipsburg, NJ	No reference and/or no damage reported.
12/26/2009	2.0	8 km Northwest of Morris Plains, NJ	No reference and/or no damage reported.
02/05/2010	1.5	3 km Northwest of Far Hills, NJ	No reference and/or no damage reported.
02/07/2010	1.2	3 km Northwest of far Hills, NJ	No reference and/or no damage reported.
02/10/2010	2.2	1 km West of Wanaque	No reference and/or no damage reported.
02/21/2010	2.6	Gladstone, NJ	This earthquake hit just before 9 a.m. and prompted numerous phone calls to police. No damages were reported. Many people in New Jersey reported having felt this earthquake.
02/21/2010	2.3	Gladstone, NJ	This event was most likely an aftershock from the morning's earthquake. Numerous people in New Jersey reported having felt this earthquake.
06/06/2010	2.3	6 km Southeast of Sayreville, NJ	People reported having felt this earthquake throughout New Jersey.
12/25/2010	2.1	1 km West of Clifton, NJ	No reference and/or no damage reported.
05/08/2011	1.2	1 km Southwest of Clifton, NJ	No reference and/or no damage reported.
05/10/2011	1.9	2 km North of Mount Holly, NJ	No reference and/or no damage reported.
05/29/2011	1.3	3 km South of Fort Lee, NJ	No reference and/or no damage reported.
05/29/2011	1.9	24 km South-Southwest of Lakehurst, NJ	No reference and/or no damage reported.
06/09/2011	1.6	2 km Southeast of S. Plainfield, NJ	No reference and/or no damage reported.
08/23/2011	5.8	Central Virginia	A moderate earthquake occurred in central Virginia and was felt throughout most of the east, from Georgia to southern Canada and from Indiana to coastal Maine. It was followed by four aftershocks. In New Jersey, the intensity ranged from 1 to 4 (weak to light). Areas underlain by thick silt and clay felt a stronger ground motion than did those where rock was very close to the surface. The quake was felt in South Brunswick and residents were calling 911 wanting to

Table 5.4.4-6. Earthquake Events in New Jersey, 2007 to 2014

Date(s) of Event	Magnitude	Location	Losses/Impacts
			know what happened; some thought it was an explosion. It was also felt in the offices of Alcatel-Lucent in Murray Hill (Union County). Ceiling tiles fell out at a Sears store in Middletown. In Plainfield (Union County), employees in the Park Madison building were evacuated after the tremor. Union County's administration building in Elizabeth reported continuous shaking. In New Brunswick (Middlesex County), employees were evacuated from the County administration building. Atlantic City (Atlantic County) went into emergency mode with evacuations of high rises, hospitals, schools, casinos, and hotels. The County OEM received reports of a crack in a wall in a house and broken water pipe in a building. There were minor scattered power outages reported throughout the state.
07/17/2012	1.1	16 km Northwest of Morristown, NJ	No reference and/or no damage reported.
07/18/2012	1.1	18 km Northwest of Morristown, NJ	No reference and/or no damage reported.
08/23/2012	1.2	1.4 km East of Ringwood, NJ	No reference and/or no damage reported.
11/05/2012	2.0	3 km Southwest of Mahwah, NJ	People reported having felt this earthquake in various parts of New Jersey.
11/23/2012	2.2	Greater Philadelphia Area/New Jersey	Numerous reports of people having felt the earthquake in southwestern New Jersey.

Source: NJGWS 2013; USGS 2012d; Won-Young Kim, Lamont-Doherty Earth Observatory of Columbia University 1999
** Location very poorly determined; may be uncertain by 50 miles.*
Note: Events highlighted in green were epicentered in Essex County
km Kilometers
N/A Not Applicable/Not Available
NJ New Jersey
NYC New York City
OEM Office of Emergency Management

Probability of Future Occurrences

Earthquakes cannot be predicted and may occur any time of the day or year. The probability of damaging earthquakes affecting New Jersey and Essex County is low. However, there is a definite threat of major earthquakes that could cause widespread damage and casualties in New Jersey. Major earthquakes are infrequent in the State and may occur only once every few hundred years or longer, but the consequences of major earthquakes would be very high.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for earthquake events in the County is considered 'rare' (not likely to occur within 100 years).

Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes. The potential impacts of global climate change on earthquake probability are unknown. Some scientists feel that melting glaciers could induce tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the Earth's crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity according to research into prehistoric earthquakes and volcanic activity. National Aeronautics and Space Administration (NASA) and USGS scientists found that retreating glaciers in southern Alaska might be opening the way for future earthquakes (New Jersey State HMP 2014).

Secondary impacts of earthquakes could be magnified by future climate change. Soils saturated by repetitive storms 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 (New Jersey State HMP 2014).

5.4.4.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the earthquake hazard, the entire County has been identified as exposed to the hazard. Therefore, all assets in Essex County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), are exposed and potentially vulnerable. The following section includes an evaluation and estimation of the potential impact of the earthquake hazard on Essex County including the following:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Earthquakes usually occur without warning and can impact areas a great distance from their point of origin. The extent of damage depends on the density of population and building and infrastructure construction in the area shaken by the quake. Some areas may be more vulnerable than others based on soil type, the age of the buildings and building codes in place. Compounding the potential for damage – historically, Building Officials Code Administration (BOCA) used in the Northeast were developed to address local concerns including heavy snow loads and wind; seismic requirements for design criteria are not as stringent compared to the west coast's reliance on the more seismically-focused Uniform Building Code). As such, a smaller earthquake in the Northeast can cause more structural damage than if it occurred out west.

The entire population and general building stock inventory of the County is at risk of being damaged or experiencing losses due to impacts of an earthquake. Potential losses associated with the earth shaking were calculated for Essex County for three probabilistic earthquake events, the 100-year, 500- and 2,500-year mean return periods (MRP). The impacts on population, existing structures, critical facilities and the economy within Essex County are presented below, following a summary of the data and methodology used.

Data and Methodology

A probabilistic assessment was conducted for Essex County for the 100-, 500- and 2,500-year MRPs through a Level 2 analysis in HAZUS-MH 2.1 to analyze the earthquake hazard and provide a range of loss estimates for Essex County. The probabilistic method uses information from historic earthquakes and inferred faults, locations and magnitudes, and computes the probable ground shaking levels that may be experienced during a recurrence period by Census tract.

As noted in the HAZUS-MH Earthquake User Manual '*Uncertainties are inherent in any loss estimation methodology. They arise in part from incomplete scientific knowledge concerning earthquakes and their effects upon buildings and facilities. They also result from the approximations and simplifications that are necessary for comprehensive analyses. Incomplete or inaccurate inventories of the built environment, demographics and economic parameters add to the uncertainty. These factors can result in a range of uncertainly in loss estimates produced by the HAZUS Earthquake Model, possibly at best a factor of two or more*.' However, HAZUS' potential loss estimates are acceptable for the purposes of this HMP.

The occupancy classes available in HAZUS-MH 2.1 were condensed into the following categories (residential, commercial, industrial, agricultural, religious, government, and educational) to facilitate the analysis and the

presentation of results. Residential loss estimates address both multi-family and single family dwellings. Impacts to critical facilities and utilities were also evaluated.

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). The 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.

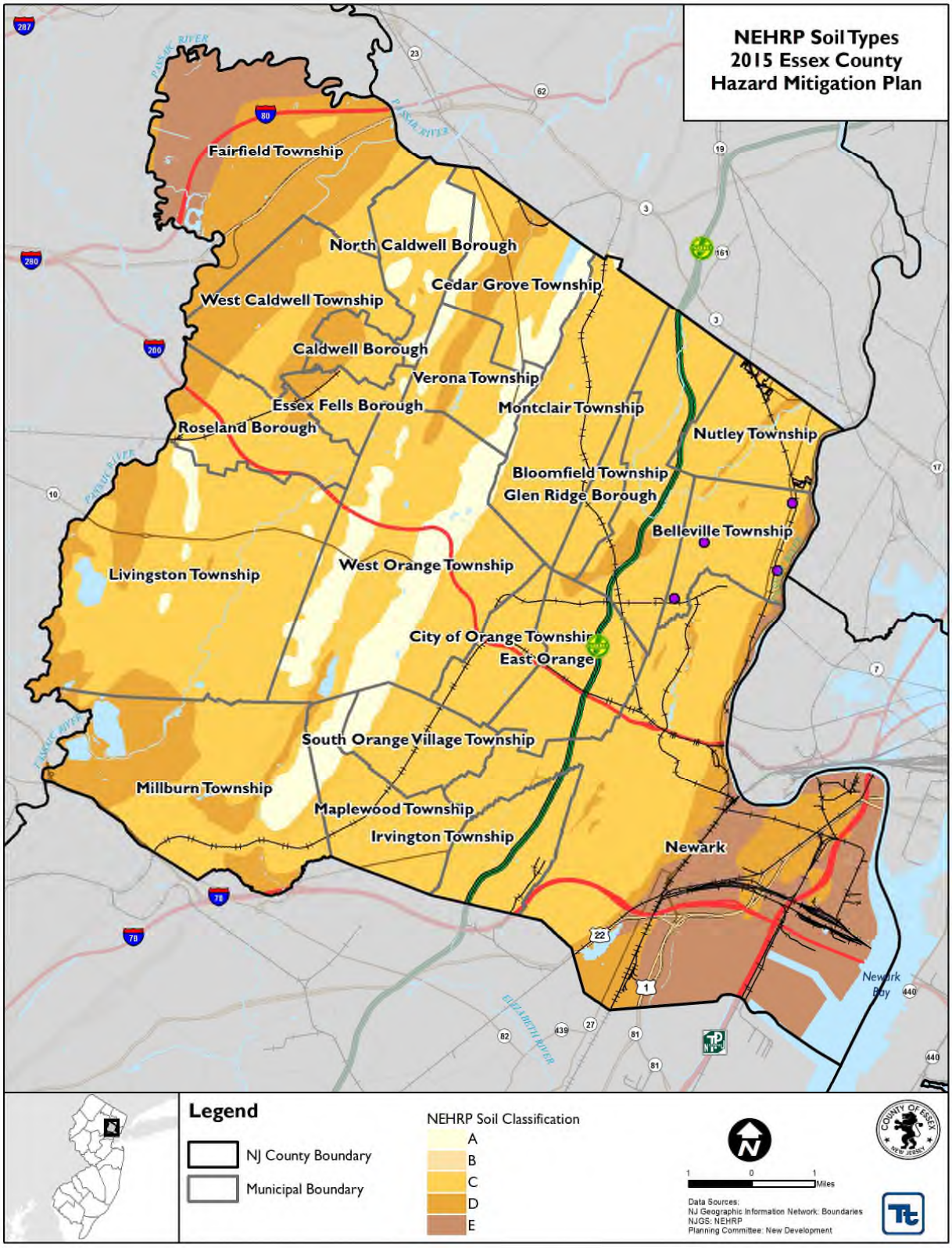
Figure 5.4.4-14 shows the geographic distribution of the NEHRP soil types in the County. When unchanged, HAZUS-MH default soil types are class "D". However, for this analysis HAZUS-MH was updated with the specific NEHRP soil types for Essex County as provided by the New Jersey Geological and Water Survey. As stated earlier, soft soils (NEHRP soil classed D and E) can amplify ground shaking to damaging levels even in a moderate earthquake (NYCEM, 2003). Therefore, buildings located on NEHRP soil classes D and E have an increased risk of damages from an earthquake.

As Figure 5.4.4-14 illustrates, Essex County consists of all NEHRP soil types. The City of Newark and portions of Fairfield along the Passaic River are located on Class 'E' soils and therefore have an increased risk of damage from an earthquake.

As illustrated in Figure 5.4.4-15, portions of Essex County are susceptible to liquefaction (City of Newark). In other words, there are areas in the County where natural soils are susceptible to losing strength and may act as a liquid when shaken during earthquakes (areas in a category 4). Susceptibility was mapped based on grain-size, compaction, and degree of saturation of soils as determined from published and unpublished geologic-map and well-log data on file at the NJ Geological Survey. This coverage shows the liquefaction susceptibility of natural soils. Man-made fill overlies these soils (particularly those in category 4) in some areas. While most fill has a low liquefaction susceptibility, uncompacted sand and silt fills may liquefy. The behavior of fill during seismic shaking should be assessed on a site-specific basis. For the purposes of this risk assessment, an exposure assessment was conducted for population and buildings and liquefaction.

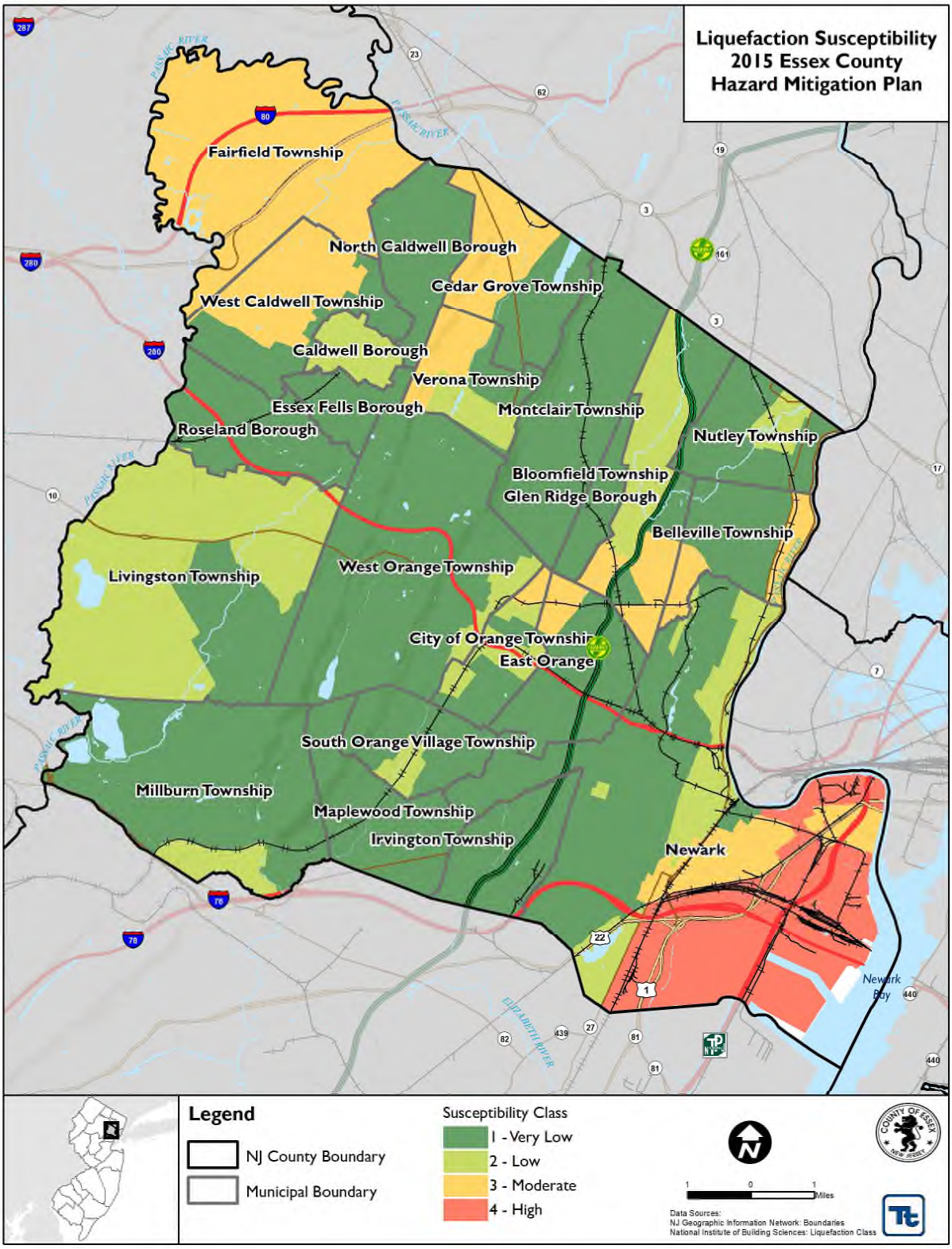
Data used to assess this hazard include data available in the HAZUS-MH 2.1 earthquake model, USGS data, data provided by NJOEM, professional knowledge, and information provided by the County's Planning Committee.

Figure 5.4.4-14. NEHRP Soils Types in Essex County



Source: NJGS 2013

Figure 5.4.4-15. Liquefaction Susceptibility in Essex County



Source: National Institute of Building Sciences

Impact on Life, Health and Safety

Overall, the entire population of Essex County is exposed to the earthquake hazard event. The impact of earthquakes on life, health and safety is dependent upon the severity of the event. Risk to public safety and loss of life from an earthquake in Essex County is minimal with higher risk occurring in buildings as a result of damage to the structure, or people walking below building ornamentation and chimneys that may be shaken loose and fall as a result of the quake.

Populations considered most vulnerable are those located in/near the built environment, particularly near unreinforced masonry construction. In addition, the vulnerable population includes the elderly (persons over the age of 65) and individuals living below the Census poverty threshold. These socially vulnerable populations are most susceptible, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Refer to Section 4 (County Profile) for the vulnerable population statistics in Essex County.

An exposure analysis was performed using the NEHRP soils data, the liquefaction susceptibility data and the 2010 Census data. The sum of the population by Census Block within the NEHRP class "D" and "E" soil types and located within areas with a liquefaction class of 4 were calculated and summarized in Table 5.4.4-7 below. Overall, the greater than 14-percent of the County's population is located on NEHRP class "D" and "E" soils. In addition, the City of Newark is the only municipality with population, buildings and infrastructure highly susceptible to liquefaction.

Table 5.4.4-7. Approximate Population within NEHRP and Liquefaction Areas

Municipality	Total Population (2010 Census)	Population NEHRP Class "D" and "E" Soils		Population Liquefaction Class 4	
		Number	%	Number	%
Township of Belleville	35,926	2,664	7.4%	0	0.00%
Township of Bloomfield	47,315	5,254	11.1%	0	0.00%
Borough of Caldwell	7,822	4,755	60.8%	0	0.00%
Township of Cedar Grove	12,411	2,756	22.2%	0	0.00%
City of East Orange	64,270	1,181	1.8%	0	0.00%
Borough of Essex Fells	2,113	110	5.2%	0	0.00%
Township of Fairfield	7,466	5,447	73.0%	0	0.00%
Borough of Glen Ridge	7,527	195	2.6%	0	0.00%
Township of Irvington	53,926	72	0.1%	0	0.00%
Township of Livingston	29,366	1,079	3.7%	0	0.00%
Township of Maplewood	23,867	0	0.0%	0	0.00%
Township of Millburn	20,149	5,274	26.2%	0	0.00%
Township of Montclair	37,669	0	0.0%	0	0.00%
City of Newark	277,140	74,021	26.7%	14,331	5.17%
Borough of North Caldwell	6,183	0	0.0%	0	0.00%
Township of Nutley	28,370	1,645	5.8%	0	0.00%
City of Orange Township	30,134	0	0.0%	0	0.00%
Borough of Roseland	5,819	880	15.1%	0	0.00%
Township of South Orange Village	16,198	0	0.0%	0	0.00%

Municipality	Total Population (2010 Census)	Population NEHRP Class "D" and "E" Soils		Population Liquefaction Class 4	
		Number	%	Number	%
Township of Verona	13,332	2,785	20.9%	0	0.00%
Township of West Caldwell	10,759	3,879	36.1%	0	0.00%
Township of West Orange	46,207	100	0.2%	0	0.00%
Essex County (Total)	**783,969**	**112,097**	**14.3%**	**14,331**	**1.83%**

Sources: National Institute of Building Sciences, NJGS, 2014, U.S. Census 2010

Residents may be displaced or require temporary to long-term sheltering due to an earthquake event. 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. Table 5.4.4-8 summarizes the households HAZUS-MH 2.1 estimates will be displaced and population that may require short-term sheltering as a result of the 100-, 500- and 2,500-year MRP earthquake events.

Table 5.4.4-8. Summary of Estimated Sheltering Needs for Essex County

Scenario	Displaced Households	Persons Seeking Short-Term Shelter
100-Year Earthquake	0	0
500-Year Earthquake	126	110
2,500-Year Earthquake	2,854	2,492

Source: HAZUS-MH 2.1

According to the 1999-2003 NYCEM Summary Report (*Earthquake Risks and Mitigation in the New York / New Jersey / Connecticut Region*), there is a strong correlation between structural building damage and the number of injuries and casualties 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., and peak commute time is 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 keep 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.

There are no injuries or casualties estimated for the 100-year or 500-year events. Table 5.4.4-9 summarizes the County-wide injuries and casualties estimated for 2,500-year MRP earthquake event.

Table 5.4.4-9. Estimated Number of Injuries and Casualties from the 2,500-Year MRP Earthquake Event

Level of Severity	Time of Day		
	2:00 AM	2:00 PM	5:00 PM
Injuries	4	2	3
Hospitalization	1	0	0
Casualties	0	0	0

Source: HAZUS-MH 2.1

Impact on General Building Stock

After considering the population vulnerable to the earthquake hazard, the value of general building stock exposed to and damaged by 100-, 500- and 2,500-year MRP earthquake events was evaluated. In addition, annualized losses were calculated using HAZUS-MH 2.1. The entire County's general building stock is considered at risk and exposed to this hazard.

As stated earlier, soft soils (NEHRP soil classed D and E) can amplify ground shaking to damaging levels even in a moderate earthquake (NYCEM, 2003). Therefore, buildings located on NEHRP soil classes D and E have an increased risk of damages from an earthquake. In addition, the areas with an identified class 4 susceptibility of liquefaction have the potential to further increase the effects of an earthquake. Table 5.4.4-10 summarizes the number and value of buildings in Essex County on the approximately located NEHRP soils classed D and E and the areas with a class 4 liquefaction susceptibility.

Table 5.4.4-10. Number and Improvement Value of Buildings within NEHRP and Liquefaction Areas

Municipality	Total Number of Buildings	Total RCV (Structure and Contents)	Buildings NEHRP Class "D" and "E" Soils			Buildings Liquefaction Class 4		
			Number	RCV	% of Total RCV	Number	RCV	% of Total RCV
Township of Belleville	9,154	$2,905,447,150	612	$149,982,800	5.2%	0	$0	0.0%
Township of Bloomfield	11,383	$3,827,312,350	1,073	$279,369,400	7.3%	0	$0	0.0%
Borough of Caldwell	2,116	$753,639,775	1,176	$270,966,750	36.0%	0	$0	0.0%
Township of Cedar Grove	3,815	$1,657,089,082	675	$183,584,200	11.1%	0	$0	0.0%
City of East Orange	9,310	$5,820,599,879	243	$40,433,000	0.7%	0	$0	0.0%
Borough of Essex Fells	760	$567,106,700	60	$17,366,300	3.1%	0	$0	0.0%
Township of Fairfield	3,169	$3,374,787,200	2,563	$1,555,041,100	46.1%	0	$0	0.0%
Borough of Glen Ridge	2,214	$986,279,500	64	$9,119,000	0.9%	0	$0	0.0%
Township of Irvington	9,312	$2,820,388,050	44	$8,946,000	0.3%	0	$0	0.0%
Township of Livingston	9,510	$5,547,703,530	265	$244,230,600	4.4%	0	$0	0.0%
Township of Maplewood	7,275	$2,733,369,500	0	$0	0.0%	0	$0	0.0%
Township of Millburn	6,291	$8,045,533,450	1,635	$1,943,599,900	24.2%	0	$0	0.0%
Township of Montclair	10,486	$5,890,125,479	0	$0	0.0%	0	$0	0.0%
City of Newark	38,329	$18,709,618,398	10,566	$4,871,668,399	26.0%	1,368	$1,890,039,599	10.1%
Borough of North Caldwell	1,951	$1,431,441,250	4	$2,135,800	0.1%	0	$0	0.0%
Township of Nutley	8,884	$3,510,270,592	417	$114,577,935	3.3%	0	$0	0.0%
City of Orange Township	4,354	$1,867,401,350	0	$0	0.0%	0	$0	0.0%
Borough of Roseland	1,616	$1,435,628,250	244	$62,901,900	4.4%	0	$0	0.0%
Township of South Orange Village	4,508	$3,108,688,125	0	$0	0.0%	0	$0	0.0%
Township of Verona	3,907	$1,598,018,325	881	$218,279,800	13.7%	0	$0	0.0%
Township of West Caldwell	3,634	$2,040,951,278	1,220	$431,690,000	21.2%	0	$0	0.0%

Table 5.4.4-10. Number and Improvement Value of Buildings within NEHRP and Liquefaction Areas

Municipality	Total Number of Buildings	Total RCV (Structure and Contents)	Buildings NEHRP Class "D" and "E" Soils			Buildings Liquefaction Class 4		
			Number	RCV	% of Total RCV	Number	RCV	% of Total RCV
Township of West Orange	12,688	$5,503,784,816	124	$24,325,200	0.4%	0	$0	0.0%
Essex County	**164,666**	**$84,135,184,028**	**21,866**	**$10,428,218,084**	**12.4%**	**1,368**	**$1,890,039,599**	**2.2%**

Sources: National Institute of Building Sciences, NJGS, 2014, U.S. Census 2010
Note: RCV is the estimated replacement cost value of both structure and contents.

According to NYCEM, where earthquake risks and mitigation were evaluated in the New York, New Jersey and Connecticut region, most damage and loss caused by an earthquake is directly or indirectly the result of ground shaking (NYCEM, 2003). NYCEM indicates there is a strong correlation between PGA and the damage a building might experience. The HAZUS-MH model is based on the best available earthquake science and aligns with these statements. HAZUS-MH 2.1 methodology and model were used to analyze the earthquake hazard for the general building stock for Essex County. See Figure 5.4.4-10 through Figure 5.4.4-12 earlier in this profile which illustrates the geographic distribution of PGA (g) across the County for 100-, 500- and 2,500-year MRP events at the Census-tract level.

In addition, according to NYCEM, a building's construction determines how well it can withstand the force of an earthquake. The NYCEM report indicates that un-reinforced 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 contribute to a building's capability to withstand an earthquake's force include its age, number of stories and quality of construction. HAZUS-MH considers building construction and the age of buildings as part of the analysis.

Potential building damage was evaluated by HAZUS-MH 2.1 across the following damage categories (none, slight, moderate, extensive and complete). Table 5.4.4-11 provides definitions of these five categories of damage for a light wood-framed building; definitions for other building types are included in HAZUS-MH technical manual documentation. General building stock damage for these damage categories by occupancy class and building type on a County-wide basis is summarized below for the 100-, 500- and 2,500-year events.

Table 5.4.4-11. Example of Structural Damage State Definitions for a Light Wood-Framed 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; partial collapse of room-over-garage or other soft-story configurations.
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: HAZUS-MH Technical Manual

HAZUS-MH 2.1 estimates $259,251 in damage to Essex County's general building stock as a result of a 100-year MRP event. Table 5.4.4-12 summarizes the damage estimated for the 100-, 500- and 2,500-year MRP earthquake events. Damage loss estimates include structural and non-structural damage to the building and loss of contents.

Table 5.4.4-12. Estimated Value (Building and Contents) Damaged by the 100-, 500- and 2,500-Year MRP Earthquake Events

Municipality	Estimated Total Damages*			Percent of Total Building and Contents **		
	100-Year	500-Year	2,500-Year	100-Year	500-Year	2,500-Year
Township of Belleville	$0	$2,286,079	$46,845,114	0	0.08	1.61
Township of Bloomfield	$0	$2,620,846	$57,077,233	0	0.07	1.49
Borough of Caldwell	$0	$1,047,692	$17,553,808	0	0.14	2.33
Township of Cedar Grove	$0	$1,041,206	$23,529,867	0	0.06	1.42
City of East Orange	$0	$3,506,254	$77,330,706	0	0.06	1.33
Borough of Essex Fells	$0	$333,917	$7,654,994	0	0.06	1.35
Township of Fairfield	$0	$5,194,775	$84,041,089	0	0.15	2.49
Borough of Glen Ridge	$0	$601,219	$13,972,913	0	0.06	1.42
Township of Irvington	$0	$1,777,653	$40,636,952	0	0.06	1.44
Township of Livingston	$0	$3,364,630	$75,061,414	0	0.06	1.35
Township of Maplewood	$0	$1,469,380	$33,916,762	0	0.05	1.24
Township of Millburn	$0	$8,092,032	$148,770,599	0	0.10	1.85
Township of Montclair	$0	$3,669,112	$83,350,000	0	0.06	1.42
City of Newark	$259,251	$35,119,663	$496,802,974	<1	0.19	2.66
Borough of North Caldwell	$0	$819,537	$17,865,017	0	0.06	1.25
Township of Nutley	$0	$2,240,045	$50,907,888	0	0.06	1.45
City of Orange Township	$0	$1,165,594	$26,572,651	0	0.06	1.42
Borough of Roseland	$0	$930,976	$20,194,012	0	0.06	1.41
Township of South Orange Village	$0	$2,260,413	$52,656,109	0	0.07	1.69
Township of Verona	$0	$1,002,944	$22,167,503	0	0.06	1.39
Township of West Caldwell	$0	$2,365,287	$40,332,819	0	0.12	1.98
Township of West Orange	$0	$2,710,857	$61,868,132	0	0.05	1.12
Essex County (Total)	**$259,251**	**$83,620,111**	**$1,499,108,556**	**<1**	**<1**	**1.78**

Source: HAZUS-MH 2.1
**Total Damages is sum of damages for all occupancy classes (residential, commercial, industrial, agricultural, educational, religious and government).*
Improved value was used

It is estimated that there would be nearly $84 million in damages to buildings in the County during a 500-year earthquake event. This includes structural damage, non-structural damage and loss of contents, representing less than one-percent of the total replacement value for general building stock in Essex County. For a 2,500-year MRP earthquake event, HAZUS-MH estimates nearly $1.5 billion, approximately 2-percent of the total general building stock replacement value. Residential and commercial buildings account for most of the damage for earthquake events.

Earthquakes can cause secondary hazard events such as fires. No fires are anticipated as a result of the 100-year MRP event. Two fires are estimated as a result of the 500-year event that will displace approximately 12 people. HAZUS-MH estimates there will be 36 ignitions as a result of the 2,500-year event that will displace an estimated nearly 10,000 people and cause an estimated $322 million in building damages.

Impact on Critical Facilities

After considering the general building stock exposed to, and damaged by, 100-, 500- and 2,500-year MRP earthquake events, critical facilities were evaluated. All critical facilities (essential facilities, transportation systems, lifeline utility systems, high-potential loss facilities and user-defined facilities) in Essex County are considered exposed and potentially vulnerable to the earthquake hazard. Refer to subsection "Critical Facilities" in Section 4 (County Profile) of this Plan for a complete inventory of critical facilities in the County.

To estimate critical facility exposure to the potential impacts of an earthquake an exposure analysis was performed using the NEHRP soils data and the liquefaction susceptibility data to determine the critical facility's location in relation to these areas. The critical facilities and utilities in the areas were calculated and summarized in Table 5.4.4-13 and Table 5.4.4-14 below. The analysis indicates that the City of Newark has the greatest number of critical facilities on NEHRP soil types "D" and "E" and is the only municipality with critical facilities located in the high susceptibility liquefaction area.

Table 5.4.4-13. Number of Critical Facilities Located in the NEHRP Soil Class D and E

Municipality	Facility Types																																		
	Airport	Bus	Chemical Storage	College	Communication	Commercial	Correctional Institution	County Building	DAM	EMS	Energy / Utility	EOC	Electric Power	Electric Substation	Finance	Fire	Government	Health Care	Hospitals	HWY Bridge	LTRail	Newark Housing Authority	Nursing Homes	Oil	Park	Police	Port	Public Health Department	Potable Water Treatment	Safety	School	Train Station	Transportation	Waste Water Pump	Waste Water Treatment
Township of Belleville						1								1																	4		1		
Township of Bloomfield				1						3		1				1	1						1			1		1				1			
Borough of Caldwell																															1				
Township of Cedar Grove																			1				2												
City of East Orange																															1				
Borough of Essex Fells																																			
Township of Fairfield	1											1				2	1	1								1			4		6		8		
Borough of Glen Ridge																																			
Township of Irvington																																			
Township of Livingston										1																					1				1
Township of Maplewood																																			
Township of Millburn									4		1				1	1	1								1	1			4		3			4	
Township of Montclair																																			
City of Newark	1	3	3	1	2	1	2			1			5		4	6	2		2	1	7	10		4		8	4			1	23	2			2
Borough of North Caldwell																																			
Township of Nutley												1				1	3									1			1		1				
City of Orange Township																																			
Borough of Roseland								1																											
Township of South Orange Village																																			
Township of Verona									1																	1					3				
Township of West Caldwell						1				1																					3			1	

Municipality	Facility Types																																		
	Airport	Bus	Chemical Storage	College	Communication	Commercial	Correctional Institution	County Building	DAM	EMS	Energy / Utility	EOC	Electric Power	Electric Substation	Finance	Fire	Government	Health Care	Hospitals	HWY Bridge	LTRail	Newark Housing Authority	Nursing Homes	Oil	Park	Police	Port	Public Health Department	Potable Water Treatment	Safety	School	Train Station	Transportation	Waste Water Pump	Waste Water Treatment
Township of West Orange								1	1														2						2					1	
Essex County	**2**	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**6**	**6**	**1**	**3**	**5**	**1**	**5**	**11**	**8**	**1**	**3**	**1**	**7**	**10**	**5**	**4**	**1**	**13**	**4**	**1**	**11**	**1**	**46**	**3**	**9**	**6**	**3**

Source: ECOEM

Table 5.4.4-14. Number of Critical Facilities Located in the Liquefaction Susceptibility Class 4

Municipality	Facility Types												
	Airport	Bus	Chemical Storage	Correctional Institution	Electric Power	Fire	Oil	Police	Port	Safety	School	Train Station	Waste Water Treatment
City of Newark	1	2	3	2	5	1	1	3	1	1	1	1	2
Essex County	**1**	**2**	**3**	**2**	**5**	**1**	**1**	**3**	**1**	**1**	**1**	**1**	**2**

Source: ECOEM

HAZUS-MH 2.1 estimates the probability that critical facilities may sustain damage as a result of 100-, 500- and 2,500-year MRP earthquake events. Additionally, HAZUS-MH estimates percent functionality for each facility days after the event. Due to the sensitivity of the critical facility inventory in Essex County, facility-specific losses are not provided.

Impact on Economy

The risk of a damaging earthquake, in combination with the density of value of buildings in New Jersey, place the State 10th among all states for potential economic loss from earthquakes (Stanford 2003).

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. A Level 2 HAZUS-MH analysis estimates the total economic loss associated with each earthquake scenario, which includes building- and lifeline-related losses (transportation and utility losses) based on the available inventory (facility [or GIS point] data only). 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" subsection discussed earlier in this section. Lifeline-related losses include the direct repair cost to transportation and utility systems and are reported in terms of the probability of reaching or exceeding a specified level of damage when subjected to a given level of ground motion. Additionally, economic loss includes business interruption losses associated with the inability to operate a business due to the damage sustained during the earthquake as well as temporary living expenses for those displaced. These losses are discussed below.

It is significant to note that for the 500-year event, HAZUS-MH 2.1 estimates the County will incur nearly $110 million in income losses (wage, rental, relocation and capital-related losses) in addition to the 500 –year event structural, non-structural, content and inventory losses ($203 million).

For the 2,500-year event, HAZUS-MH 2.1 estimates the County will incur approximately $1.6 billion in income losses, mainly to the residential and commercial occupancy classes associated with wage, rental, relocation and capital-related losses. In addition, the 2,500-year event structural, non-structural, content and inventory losses equate to greater than an estimated $1.6 billion.

Roadway segments and railroad tracks may experience damage due to ground failure and regional transportation and distribution of these materials will be interrupted as a result of an earthquake event. Losses to the community that result from damages to lifelines can be much greater than the cost of repair (HAZUS-MH 2.1 Earthquake User Manual, 2012).

Earthquake events can significantly impact road bridges. These are important because they often provide the only access to certain neighborhoods. Since softer soils can generally follow floodplain boundaries, bridges that cross watercourses should be considered vulnerable. A key factor in the degree of vulnerability will be the age of the facility or infrastructure, which will help indicate to which standards the facility was built. HAZUS-MH estimates the long-term economic impacts to the County for 15-years after the earthquake event. In terms of the transportation infrastructure, HAZUS-MH estimates $413 million in direct repair costs to bridges as a result of a 2,500-year event. There are no losses computed by HAZUS for business interruption due to transportation or utility lifeline losses.

HAZUS-MH 2.1 also 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 (HAZUS-MH Earthquake User's Manual).

For the 100-year MRP event, HAZUS-MH 2.1 estimates more than 2,000 tons of debris will be generated in the City of Newark, with approximately 75-percent of the debris comprised of brick/wood. For the 500-year MRP event, HAZUS-MH 2.1 estimates more than 20,000 tons of debris will be generated. For the 2,500-year MRP event, HAZUS-MH 2.1 estimates nearly 3 million tons of debris will be generated. Of the total amount, brick/wood comprises approximately 50% of the total with the remainder being reinforced concrete/steel.

Table 5.4.4-15. Estimated Debris Generated by the 500- and 2,500-year MRP Earthquake Events

Municipality	500-Year		2,500-Year	
	Brick/Wood (tons)	Concrete/Steel (tons)	Brick/Wood (tons)	Concrete/Steel (tons)
Township of Belleville	4,857	2,224	51,594	50,283
Township of Bloomfield	5,450	2,215	58,215	48,327
Borough of Caldwell	2,603	1,259	26,955	29,829
Township of Cedar Grove	1,077	425	11,506	9,130
City of East Orange	5,162	2,069	56,665	46,202
Borough of Essex Fells	109	35	1,167	769
Township of Fairfield	5,236	2,777	54,755	66,225
Borough of Glen Ridge	338	111	3,622	2,389
Township of Irvington	5,604	2,323	61,733	52,000
Township of Livingston	2,225	849	23,919	18,435
Township of Maplewood	2,179	863	23,871	19,061
Township of Millburn	1,940	750	20,739	16,515
Township of Montclair	4,840	1,929	51,819	41,730
City of Newark	80,207	46,196	820,805	980,660
Borough of North Caldwell	219	67	2,305	1,396
Township of Nutley	3,576	1,441	38,623	31,300
City of Orange Township	3,535	1,472	38,706	32,746
Borough of Roseland	507	202	5,495	4,441
Township of South Orange Village	1,862	715	20,309	16,003
Township of Verona	1,369	541	14,426	11,525
Township of West Caldwell	1,397	666	14,663	15,712
Township of West Orange	3,253	1,261	34,727	26,869
Essex County (Total)	**137,545**	**70,392**	**1,436,617**	**1,521,549**

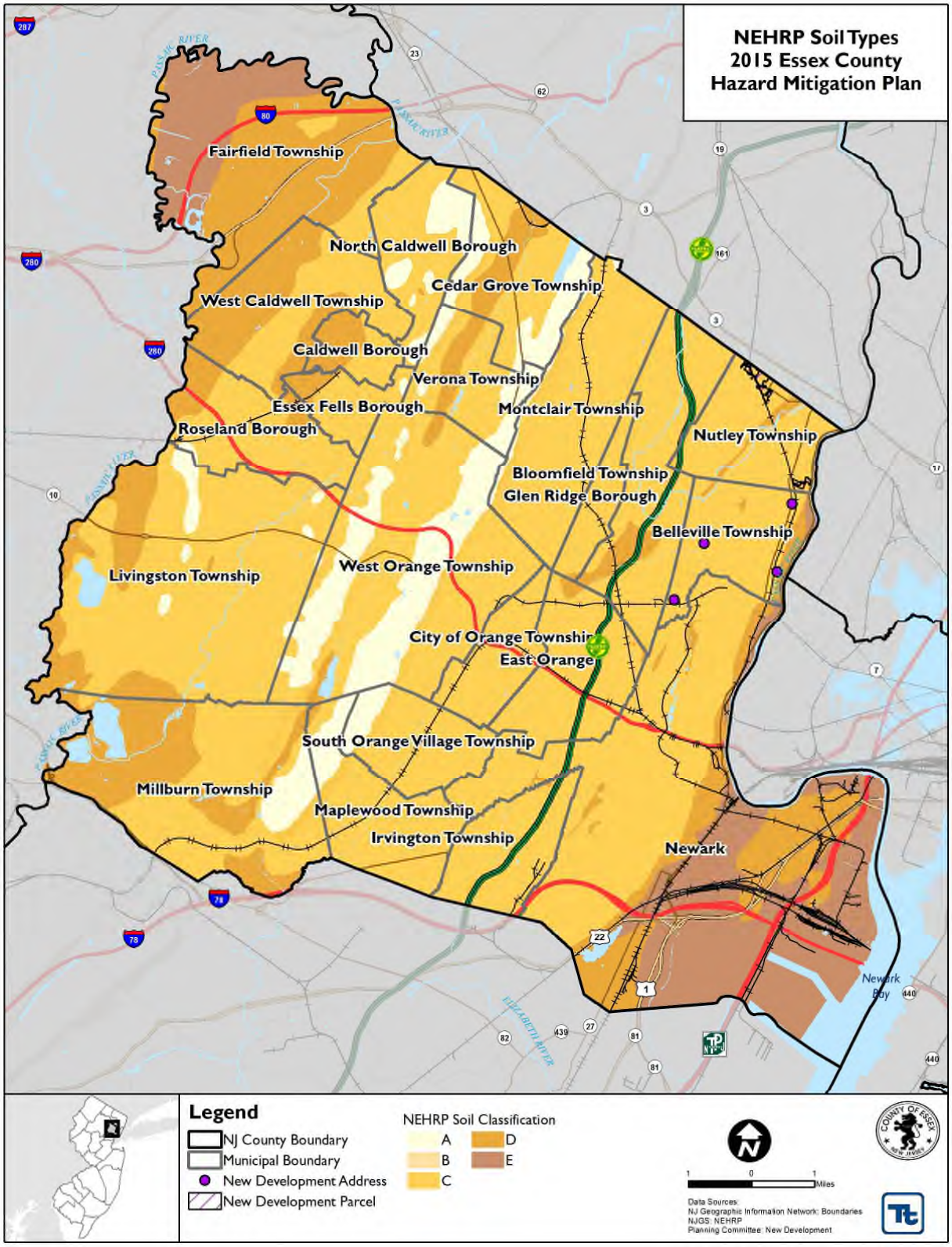
Source: HAZUS-MH 2.1

Future Growth and Development

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. It is anticipated that the human exposure and vulnerability to earthquake impacts in newly developed areas will be similar to those that currently exist within the County. Current building codes require seismic provisions that should render new construction less vulnerable to seismic impacts than older, existing construction that may have been built to lower construction standards.

New development located in areas with softer NEHRP soil classes may be more vulnerable to the earthquake hazard. Refer to Section 4, and Volume II Section 9 for potential new development and approximate NEHRP soil class areas in Essex County.

Figure 5.4.4-16. Potential New Development in Essex County and NEHRP Soil Types



Source: NJGS

Change of Vulnerability

Essex County and all plan participants continue to be vulnerable to the earthquake hazard. Differences in exposure and potential losses estimated from the 2008 HMP can be attributed to the difference in building stock inventory and methodology used for the risk assessment. For example, the 2008 HMP building inventory used the default HAZUS-MH general building stock based on replacement cost value of the structures. For this plan update, the potential loss analysis was conducted using a custom County-wide building inventory using the most current tax record and parcel data provided by the County.

Effect of Climate Change on Vulnerability

Providing projections of future climate change for a specific region is challenging. Some scientists feel that melting glaciers could induce tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the Earth's crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity according to research into prehistoric earthquakes and volcanic activity. National Aeronautics and Space Administration (NASA) and USGS scientists found that retreating glaciers in southern Alaska might be opening the way for future earthquakes.

Secondary impacts of earthquakes could be magnified by future climate change. Soils saturated by repetitive storms 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.

Additional Data and Next Steps

A Level 2 HAZUS-MH earthquake analysis was conducted for Essex County using the default model data, with the exception of the updated building and critical facility inventories which included user-defined data, and NEHRP soil data. Additional data needed to further refine the County's vulnerability assessment include: (1) updated demographic data to update the default data in HAZUS-MH; and (2) soil liquefaction data. Additionally, the County can identify un-reinforced masonry critical facilities and privately-owned buildings (i.e., residences) using local knowledge and/or pictometry/orthophotos. These buildings may not withstand earthquakes of certain magnitudes and plans to provide emergency response/recovery efforts for these properties can be set in place. Further mitigation actions include training of County and municipal personnel to provide post-hazard event rapid visual damage assessments, increase of County and local debris management and logistic capabilities, and revised regulations to prevent additional construction of non-reinforced masonry buildings.

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5.4.5 Extreme Temperatures

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the extreme temperature hazard in Essex County.

2015 Plan Update Changes

- For the 2015 Update, the extreme temperature profile includes both extreme heat and extreme cold. In the previous County HMP, extreme heat and extreme cold were discussed individually.
- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and climate change impacts.
- New and updated figures from other federal and state agencies are incorporated.
- New and updated figures and studies from the Office of the New Jersey State Climatologist are incorporated.
- Previous occurrences are updated with events that occurred between 2007 and 2014.
- A vulnerability assessment section is completed for the extreme temperature hazard. Available information and a preliminary assessment are used to complete this section. The vulnerability assessment directly follows the hazard profile.

5.4.5.1 Profile

Hazard Description

Extreme temperature includes both heat and cold events, which can have significant impact to human health, commercial/agricultural businesses, and primary and secondary effects on infrastructure (e.g., burst pipes and power failures). What constitutes as extreme cold or extreme heat can vary across different areas of the U.S., based on what the population is accustomed to.

New Jersey has four well-defined seasons. The seasons have several defining factors, with temperature one of the most significant. Extreme temperatures can be defined as those that are far outside the normal ranges for the season. Figure 5.4.5-1 illustrates long-term average temperatures in the northern region of the State, which includes Essex County. The values were calculated from a spatially weighted average of numerous weather stations throughout the State and measured in degrees Fahrenheit (°F). Between 1895 and 1970, the northern New Jersey mean temperature was 50.6°F. The mean increased to 50.9°F between 1971 and 2000. It increased again to 52.9°F between 2001 and 2013 (ONJSC Rutgers University 2013).

The average annual temperature in Essex County is 54°F. In January, the average low is 24°F. In July, the average high is 86°F (Essex County 2014). The following provides information regarding extreme cold and extreme warm temperatures in Essex County.

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 (Centers of Disease Control and Prevention [CDC] 2005).

Exposure to cold temperatures, whether indoors or outside, can lead to serious or life-threatening health problems such as hypothermia, cold stress, frostbite or freezing of the exposed extremities such as fingers, toes, nose, and ear lobes. Hypothermia occurs when the core body temperature is <95ºF. If persons exposed to excessive cold are unable to generate enough heat (e.g., through shivering) to maintain a normal core body temperature of 98.6ºF, their organs (e.g., brain, heart, or kidneys) can malfunction. When brain function

deteriorates, persons with hypothermia are less likely to perceive the need to seek shelter. Signs and symptoms of hypothermia (e.g., lethargy, weakness, loss of coordination, confusion, or uncontrollable shivering) can increase in severity as the body's core temperature drops (CDC 2005).

Extremely cold temperatures often accompany a winter storm, which can cause power failures and icy roads. Although staying indoors as much as possible can help reduce the risk of car crashes and falls on the ice, individuals may also face indoor hazards. Many homes will be too cold—either due to a power failure or because the heating system is not adequate for the weather. The use of space heaters and fireplaces to keep warm increases the risk of household fires and carbon monoxide poisoning (CDC 2007).

The following are the lowest temperatures recorded at the three weather stations in Essex County for the period from 1899 to 2014:

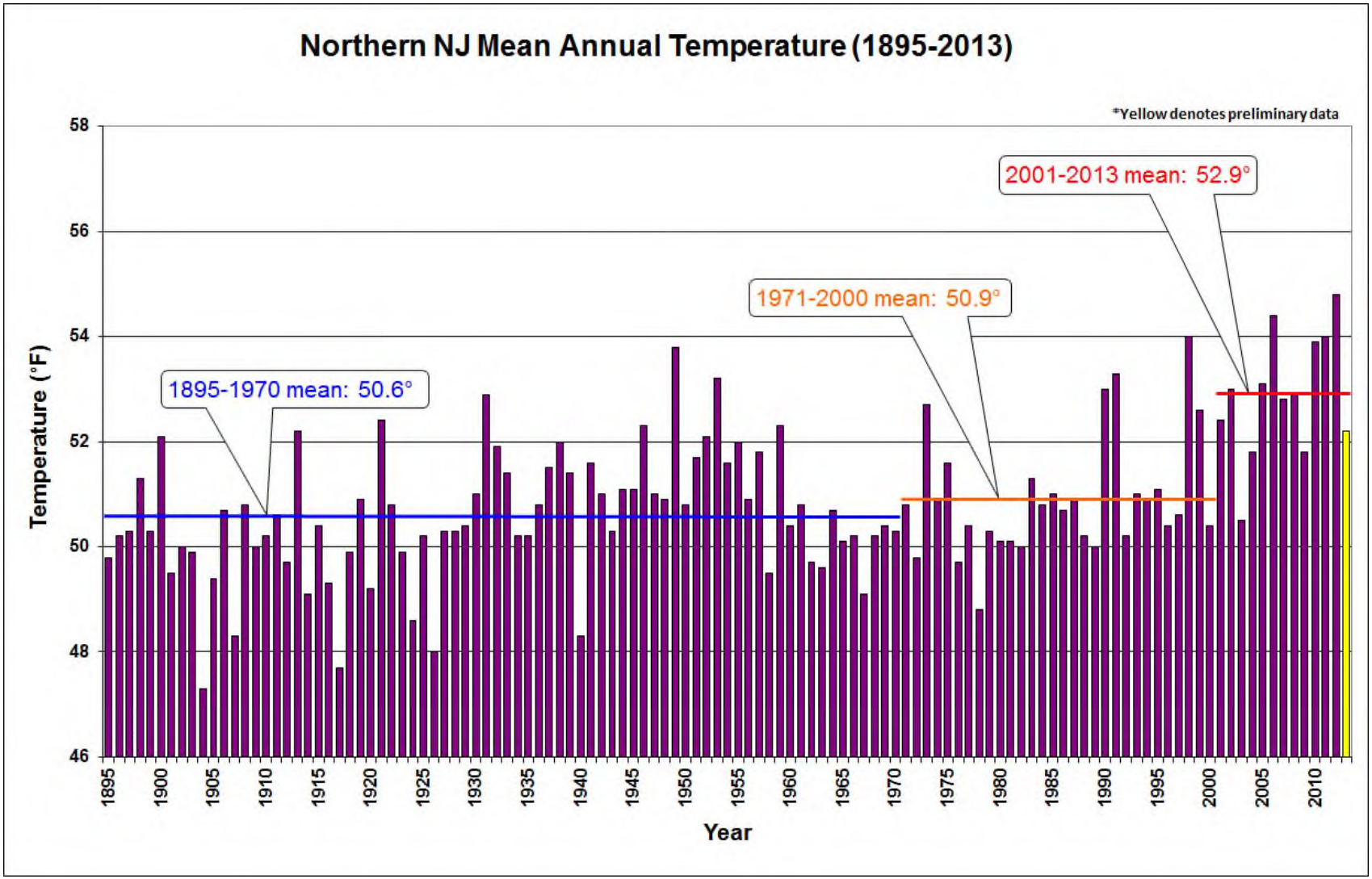
- Caldwell/Essex County Airport: -0.9°F (January 2004)
- Canoe Brook: -26°F (February 1934)
- Newark International Airport: -9°F (February 1899) (Utah Climate Center 2014)

Conditions of extreme heat are defined as summertime temperatures that are substantially hotter and/or more humid than average for a location at that time of year (CDC 2009). An extended period of extreme heat of three or more consecutive days is typically called a heat wave and is often accompanied by high humidity (NWS 2005). 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). A basic definition of a heat wave implies that it is an extended period of unusually high atmosphere-related heat stress, which causes temporary modifications in lifestyle and which may have adverse health consequences for the affected population (Robinson, 2000). In Essex County, a heat wave is defined as three consecutive days with temperatures ≥90°F.

The following are the highest temperatures recorded at the three weather stations in Essex County for the period from 1899 to 2014:

- Caldwell/Essex County Airport: 102.9°F (July 2011)
- Canoe Brook: 107.1°F (July 2010)
- Newark International Airport: 108°F (July 2011) (Utah Climate Center 2014)

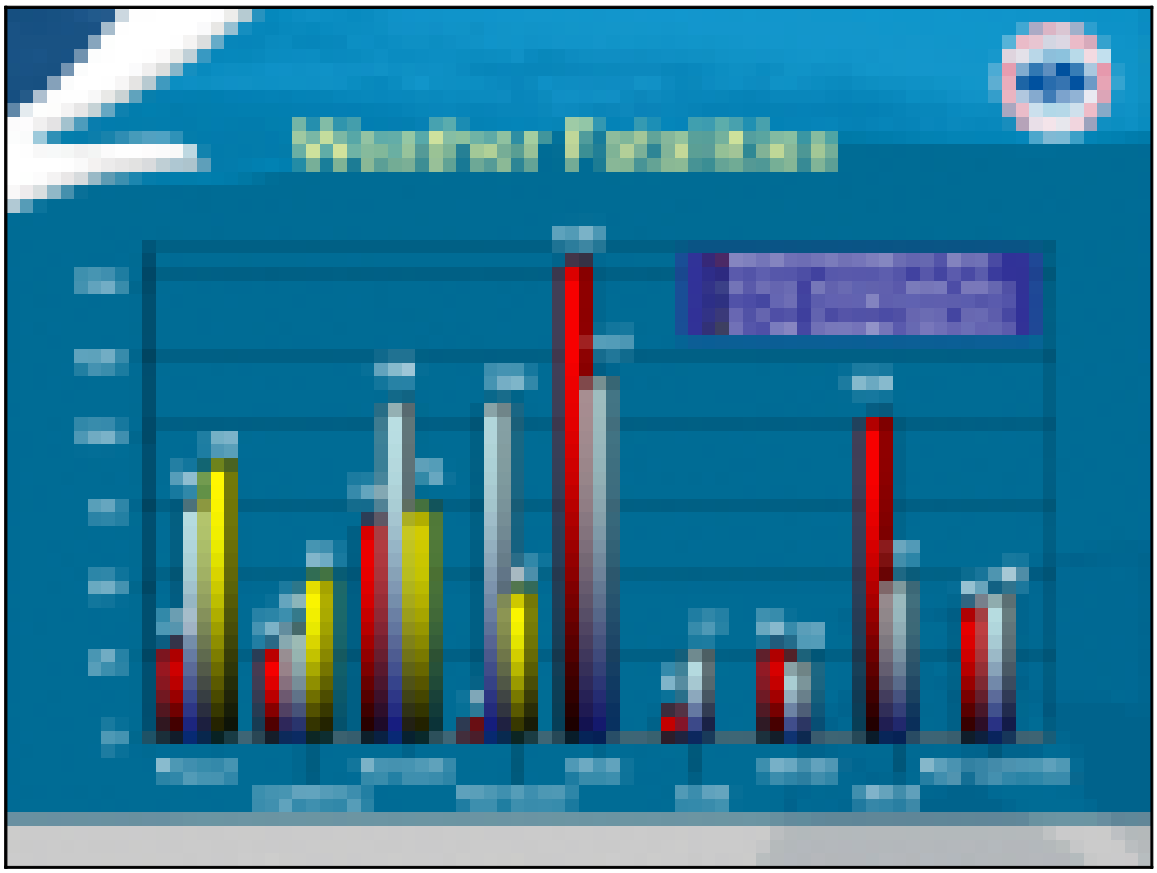
Figure 5.4.5-1. Historical Mean Annual Temperatures for Northern New Jersey



Source *ONJSC Rutgers University 2013b*
°F *degrees Fahrenheit*

Extreme heat is the number one weather-related cause of death in the U.S. On average, excessive heat claims more lives each year than floods, lightning, tornadoes, and hurricanes combined (NOAA Date Unknown). In 2012, New Jersey reported one heat-related fatality (NOAA 2012). As seen in Figure 5.4.5-2, heat had the highest average of weather related fatalities nationally in 2012 (155 fatalities), with one of those fatalities occurring in New Jersey.

Figure 5.4.5-2. Weather Fatalities for 2012 in the U.S.



Source: NWS 2013

Urbanized areas and urbanization creates 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:

- 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 discontiguous areas with qualifying densities (U.S. Census 2003).

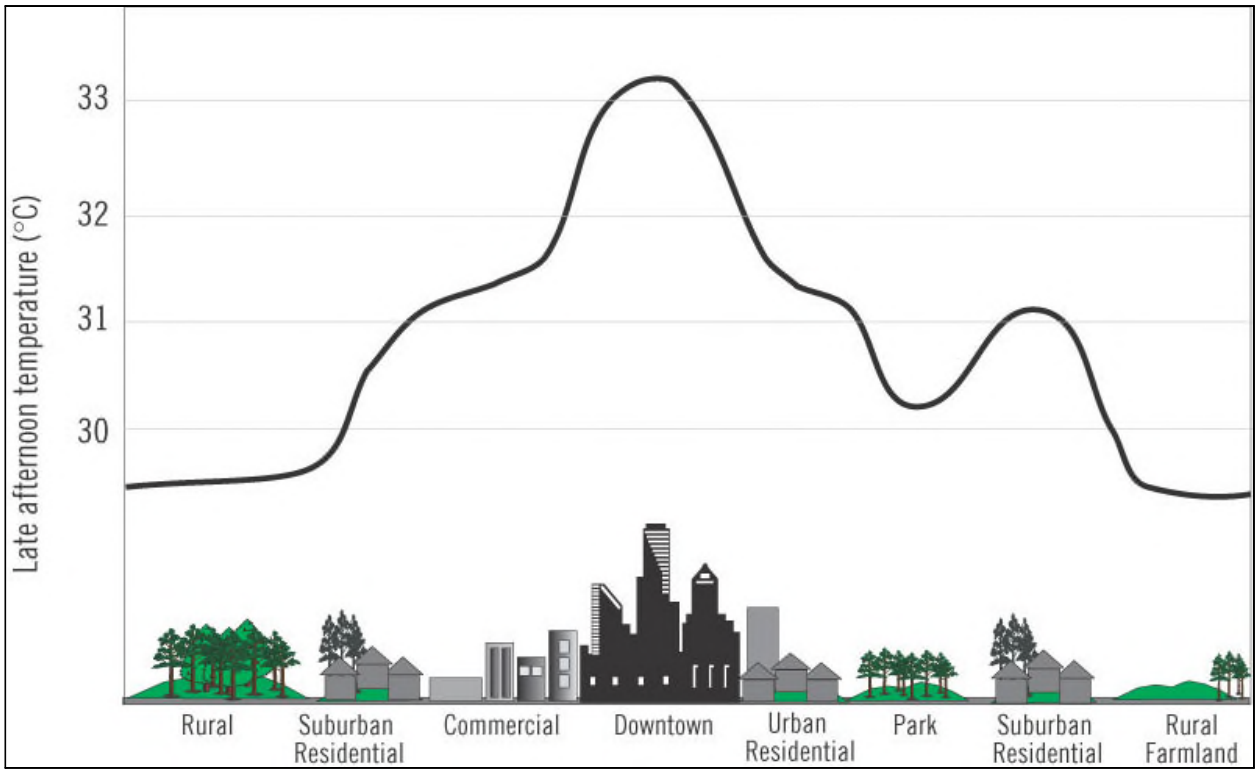
As these urban areas develop and change, so does the landscape. Buildings, roads, and other infrastructure replace open land and vegetation. Surfaces that were once permeable and moist are now impermeable and dry. These changes cause urban areas to become warmer than the surrounding areas. This forms an 'island' of higher temperatures (U.S. Environmental Protection Agency [EPA] 2009).

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 (EPA 2010 and 2011). Detailed information regarding the effects of heat islands is described below.

- Elevated summer temperatures increase the energy demand for cooling. Research has shown that for every 1ºF, electricity demand increases between 1.5% and 2%, starting when temperatures reach between 68ºF and 77ºF. Urban heat islands increase overall electricity demand, as well as peak demand. This generally occurs during hot, summer afternoons when homes and offices are running cooling systems, electricity, and appliances. During extreme heat events, the demand for cooling can overload systems and require utility companies to institute controlled brownouts or blackouts to prevent power outages (EPA 2011).
- Urban heat islands raise the demand for electricity during the summer. Companies that provide the electricity generally rely on fossil fuel power plants to meet the demand. This can lead to an increase in air pollution and greenhouse gas emissions. The primary pollutants include sulfur dioxide (SO_2), nitrogen oxides (NOx), particulate matter (PM), carbon monoxide (CO), and carbon dioxide (CO_2). These can all contribute to global climate change. Elevated temperatures can also directly increase the rate of ground-level ozone formation. Ground-level ozone is formed when NOx and volatile organic compounds (VOC) react to the presence of sunlight and hot weather (EPA 2011).
- Increased temperatures and higher air pollution levels can affect human health by causing discomfort, respiratory difficulties, heat cramps and exhaustion, heat stroke, and mortality. Heat islands can also intensify the impact of heat waves. High risk populations are at particular risk from extreme heat events (EPA 2011).
- Urban areas often have many buildings and paved areas. During the hot summer months, high pavement and rooftop surface temperatures can heat stormwater runoff. Pavements that are 100ºF can elevate initial rainwater temperature from approximately 70ºF to over 95ºF. The heated stormwater usually becomes runoff and drains into storm sewers and raises water temperatures of streams, rivers, ponds, and lakes. Water temperature affects aquatic life. Rapid temperature changes in aquatic ecosystems from stormwater runoff can be stressful and sometimes fatal to aquatic habitats (EPA 2011).

Figure 5.4.5-3 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 (EPA 2008).

Figure 5.4.5-3. Urban Heat Island Profile



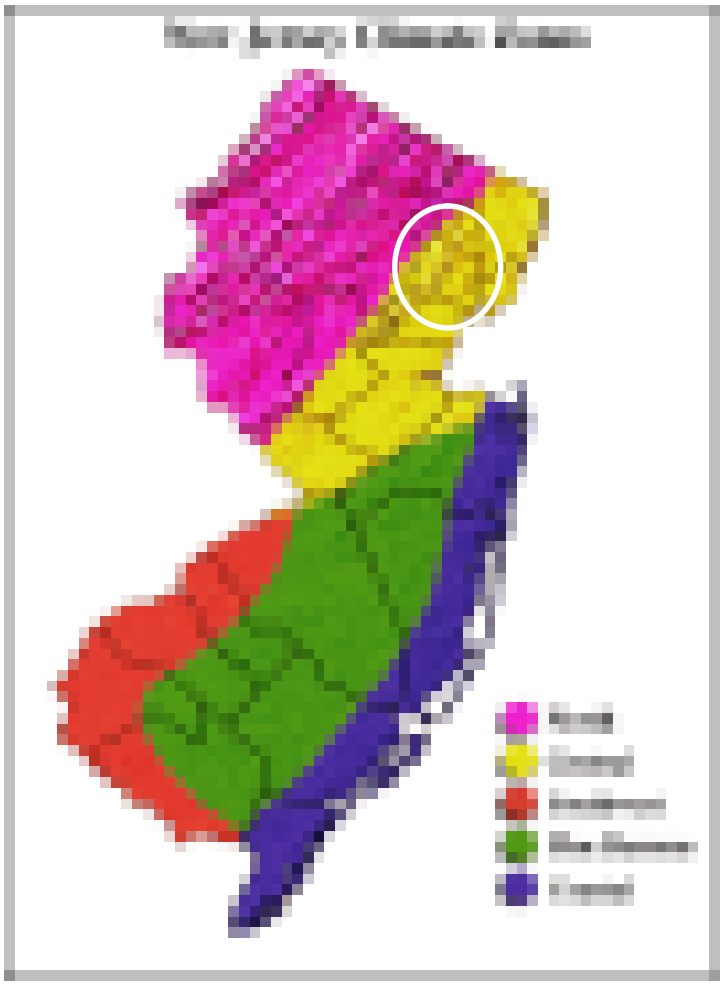
Source: EPA 2008
ºC degrees Celsius

Location

According to the ONJSC, New Jersey has five distinct climate regions. Elevations, latitude, distance from the Atlantic Ocean, and landscape (e.g. urban, sandy soil) produce distinct variations in the daily weather between each of the regions. The five regions include: Northern, Central, Pine Barrens, Southwest, and Coastal (ONJSC Rutgers University, Date Unknown). Figure 5.4.5-4 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.

The Central Region has a northeast to southeast 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 traffic and industrial establishments. The concentration of buildings and impervious surfaces tend to retain more heat; thereby, affecting the local temperatures. The observed nighttime temperatures in heavily developed areas of this 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 2014).

Figure 5.4.5-4. Climate Regions of New Jersey

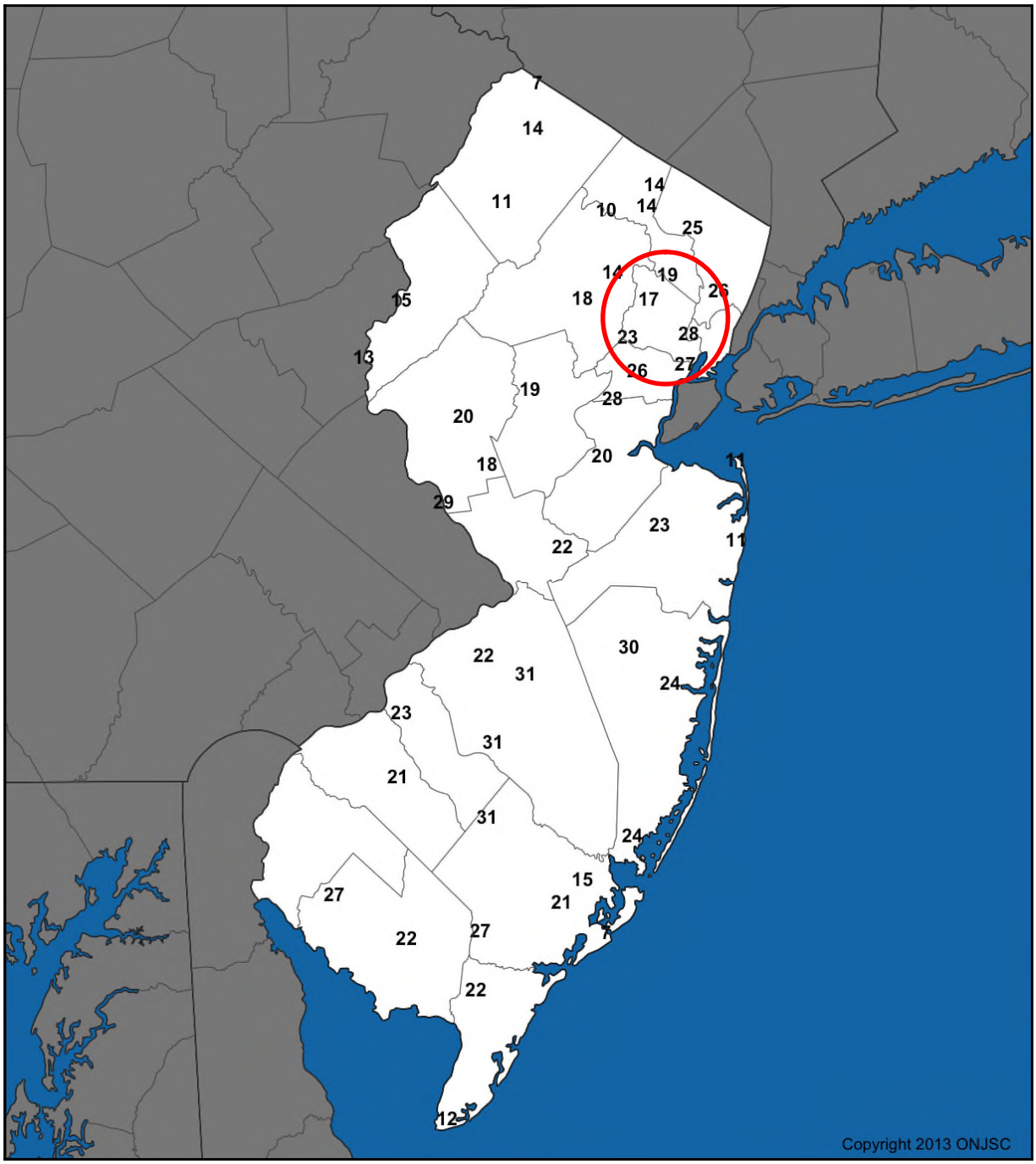


Source: ONJSC Rutgers University, Date Unknown

Note: The white circle indicates the location of Essex County. The County is located in the Central Climate Zone of New Jersey.

Temperature extremes can occur throughout the entire State. In New Jersey, average days per year where temperatures reach 90°F or higher range from five days to over 30 days, depending on location. Figure 5.4.5-5 through Figure 5.4.5-7 shows the average number of days per year, from 1981 to 2010, when temperatures were in excess of 90°F, 95°F, and 100°F. The figure indicates that Essex County has an average of 25 days of temperatures in excess of 90°F; 7.5 days of temperatures in excess of 95°F; and 1.1 days of temperatures in excess of 100°F

Figure 5.4.5-5. Average Number of Days per Year in Excess of 90°F (1981 to 2010)

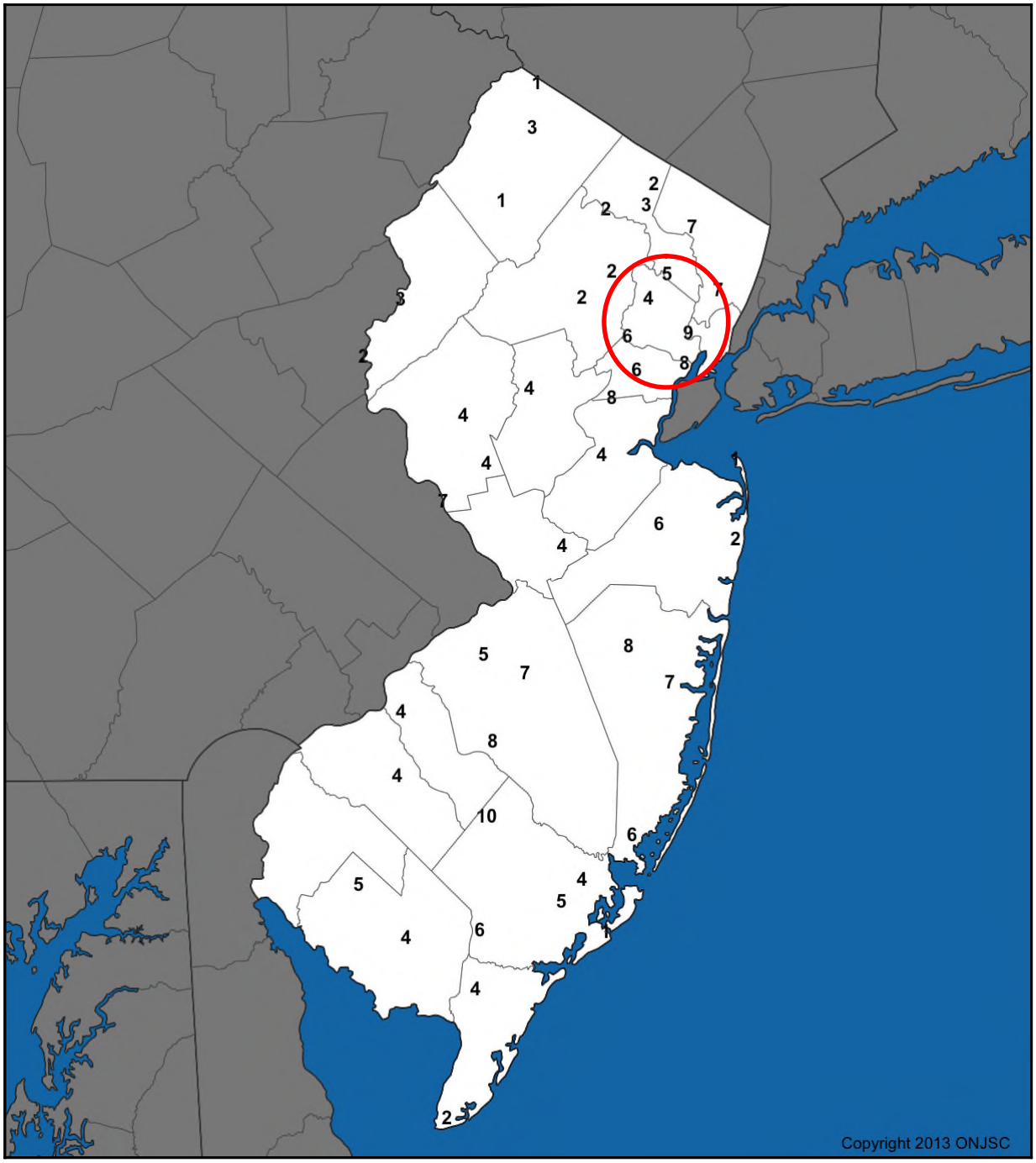


Source: *ONJSC Rutgers University 2013a*

Note: *The red circle indicates the location of Essex County. The County experiences between 17 and 28 days, annually, over 90°F*

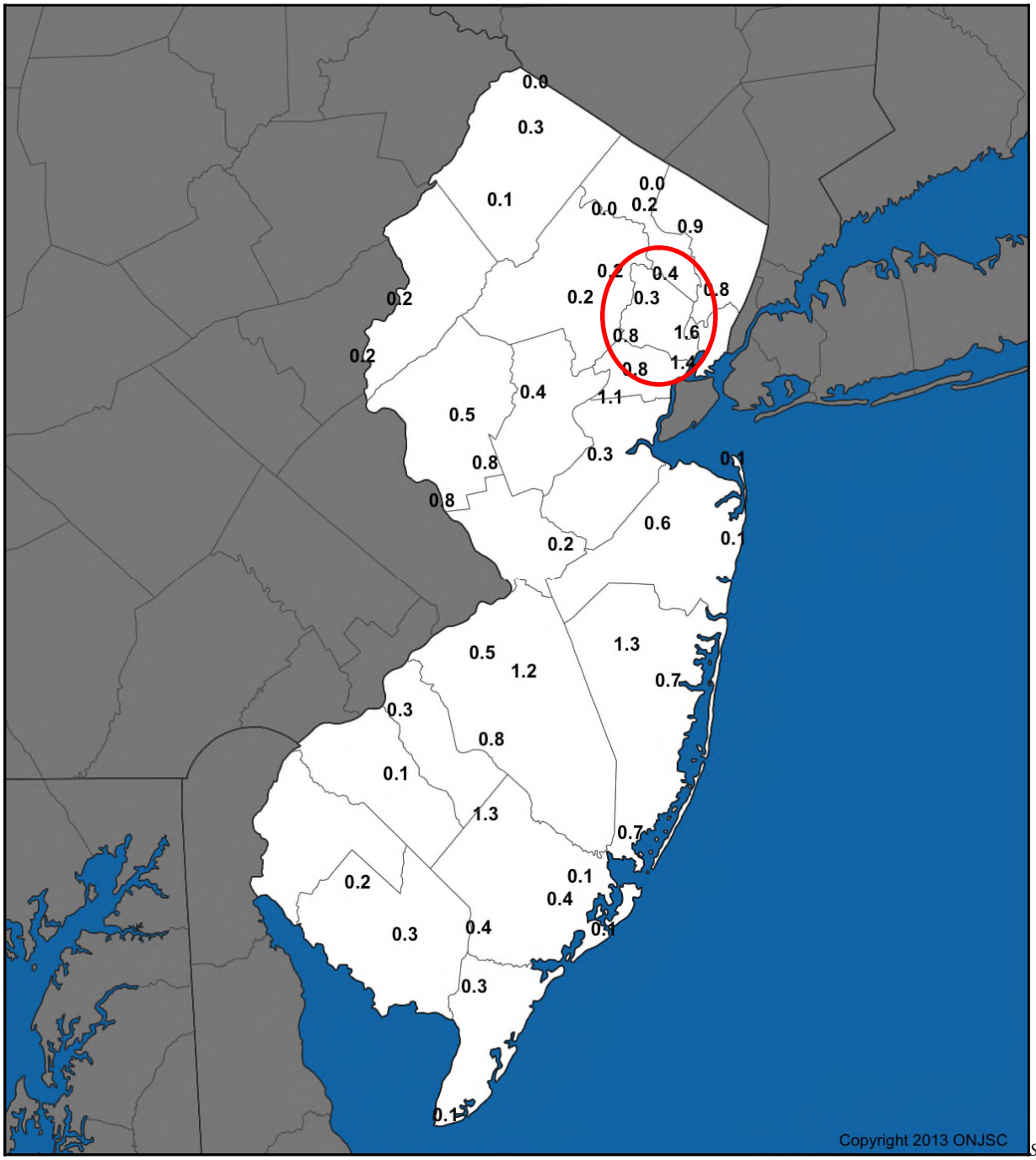
°F *degrees Fahrenheit*

Figure 5.4.5-6. Average Number of Days per Year in Excess of 95°F (1981 to 2010)



Source: ONJSC Rutgers University 2013a
Note: The red circle indicates the location of Essex County. The County experiences between 4 and 9 days, annually, over 95°F
°F degrees Fahrenheit

Figure 5.4.5-7. Average Number of Days per Year in Excess of 100°F (1981 to 2010)



Source: ONJSC Rutgers University 2013a

Note: The red circle indicates the location of Essex County. The County experiences between 0.3 and 1.6 days, annually, over 100°F

°F degrees Fahrenheit

Locations that are more prone to heat include inland urban areas. Cities are the most susceptible to the stresses of heat waves. Urban areas tend to have the largest populations and therefore, amplify the effects of heat. ONJSC conducted a study from 1997 to 2010 on summer heat at the NWS observing station located at Newark Liberty International Airport. The frequency of hot days, those with a maximum air temperature of 90°F or greater, or a heat index of that magnitude, was recorded during the study. Conditions were observed and recorded daily and hourly. and also included information for 100°F. During the 14-year study, there was an average of 26 days each year with maximum temperatures ≥90°F. This ranged from 13 days in 2004, to 54 days in 2010. On average, the heat index was ≥90°F for 30 days each year. The temperature was ≥90°F for 124 hours in an average year, with a maximum of 319 hours in 2010. The average was 197 hours per year for the heat index. On ≥90°F days, the temperature remained at that level for an average of 4.4 hours and the heat index for 6.7 hours. Heat waves were also scrutinized during the ONJSC study. The maximum number of consecutive days of ≥90°F was 14 from July 16 to 29, 2010 (ONJSC Rutgers University, 2010).

The NWS Automated Surface Observing Station (ASOS) was installed in 1996 in a grassy field between the outermost runway and the New Jersey Turnpike, roughly opposite of Terminal A of Newark Airport. The terrain in the area is flat and marshy, and there is a drainage canal between the station and the Turnpike. Less than a mile to the east is the Newark Bay and just beyond that is the New York Harbor. The majority of the land within a mile of the airport is covered with pavement or rooftops. Downtown Newark is located several miles to the north, and the City of Elizabeth is located to the south of the ASOS. To the northwest are ridges oriented roughly in a south-southwest to north-northwest direction. They rise to an elevation of approximately 200 feet at 4.5 to 5 miles and to 500 to 600 feet at 7 to 8 miles. The land up to the ridges is heavily developed urban/suburban (ONJSC Rutgers University, 2010).

The ASOS weather station records temperature approximately five feet above the grassy surface. While Newark Airport observations date back to the early 1930s, the most recent 14 years were evaluated due to the change in landscape, relocation of the weather station, and the determination that the thermistor at Newark was faulty and read a degree or more too high from June 1992 through November 1994 (ONJSC Rutgers University, 2010).

The results from the study provided the following:

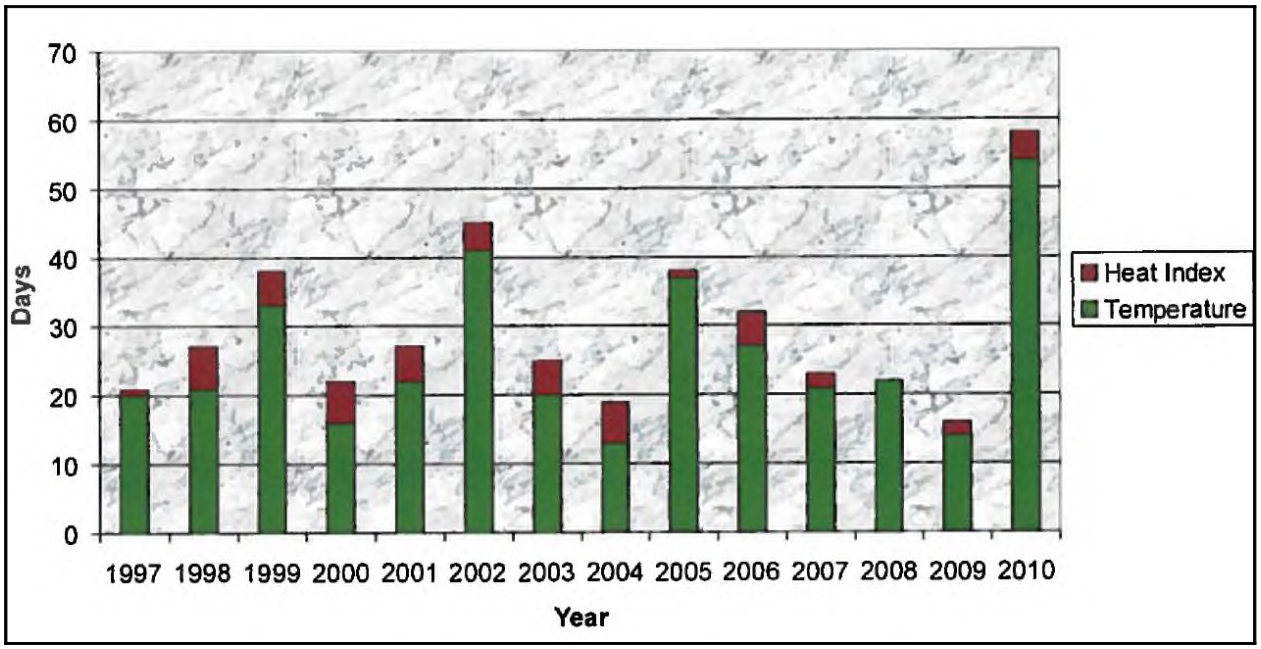
- Maximum temperature ≥90°F – on average, there were 124 hours ≥90°F annually, with a maximum of 319 hours in 2010 and a minimum of 30 hours in 2004. On average, ≥90°F was reached 26 days each year, with a maximum of 54 days ≥90°F in 2010 and a minimum of 13 days ≥90°F in 2004.

- On days where the temperature was ≥90°F, the average maximum temperature for the day was 93°F, with a maximum of 105°F on August 9, 2001. On days where the temperature was ≥90°F, the average maximum heat index for the day was 95°F, with a maximum temperature of 112°F on July 5, 1999.

- Days where the temperature was ≥90°F, the temperature stayed at ≥90°F for an average of 4.4 hours. The annual maximum was 5.6 hours/day in 1999 and the daily maximum was 15 hours on July 5-6, 1999 and July 5-6, 2010. On days where the temperature was ≥90°F, the heat index was ≥90°F for 2.3 hours longer than the temperature was at or above this mark. The daily maximum was 21 hours on July 5, 1999, August 1, 2006, and August 2, 2006.

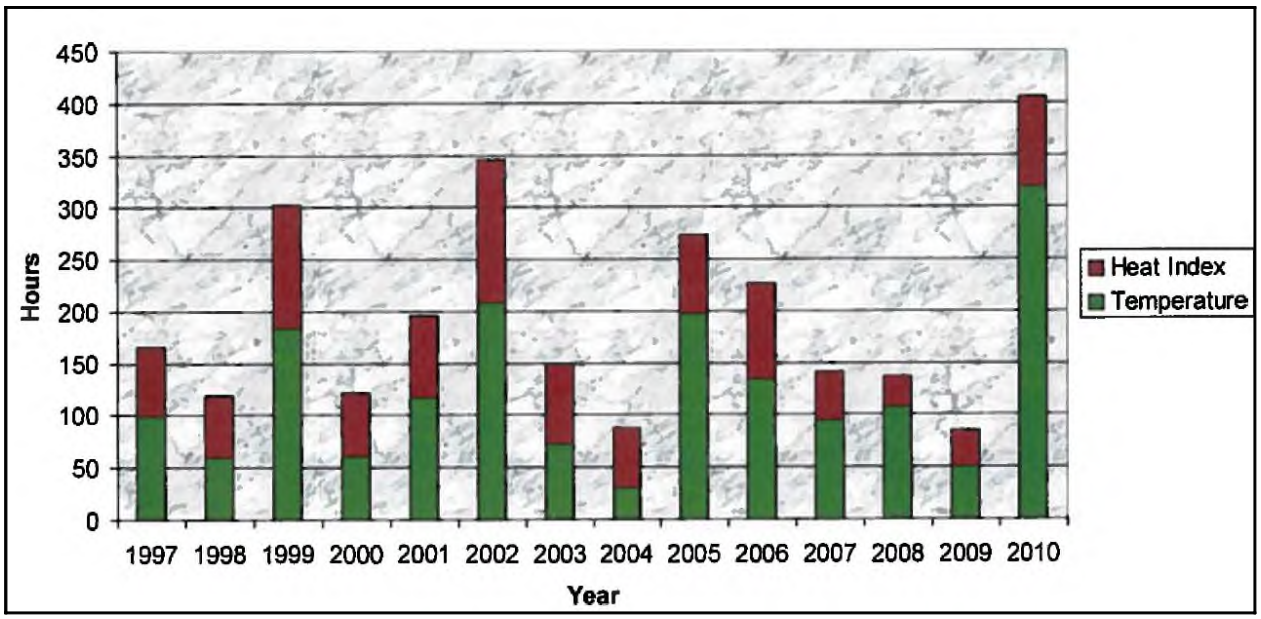
Figure 5.4.5-8 through Figure 5.4.5-10 illustrates these observations.

Figure 5.4.5-8. ≥90°F Days Per Year, 1997 through 2010



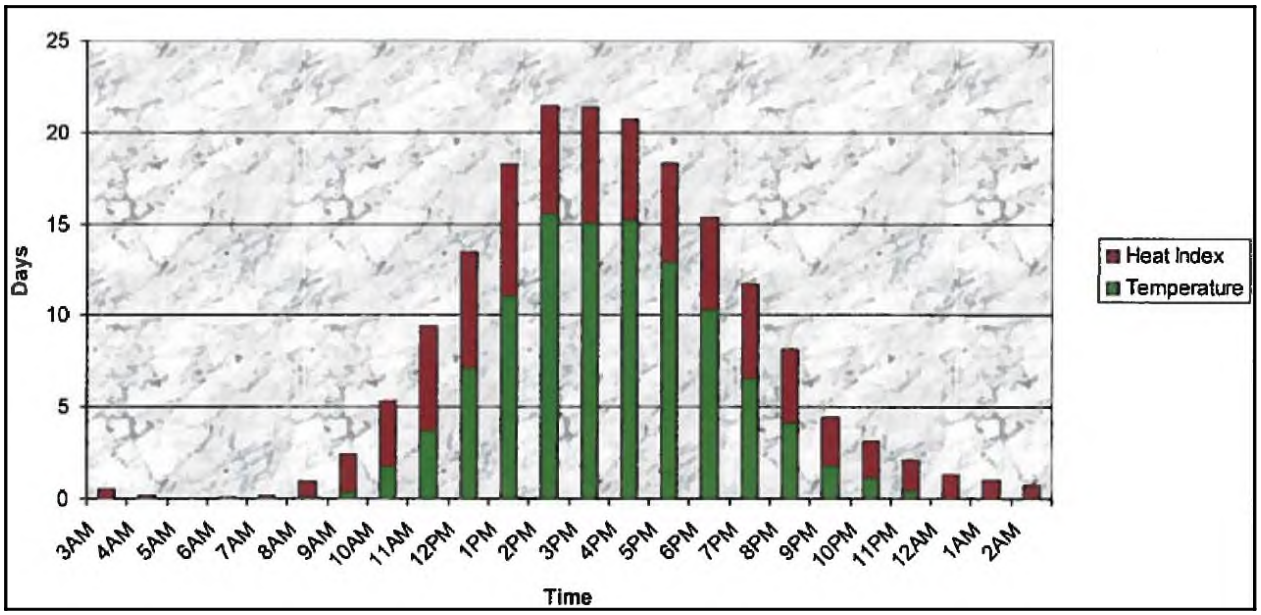
Source: ONJSC Rutgers University, 2010
°F degrees Fahrenheit

Figure 5.4.5-9. ≥90°F Hourly Observations Per Year, 1997 through 2010



Source: ONJSC Rutgers University, 2010
°F degrees Fahrenheit

Figure 5.4.5-10. Average Days Per Year ≥90°F by Hour, 1997 through 2009



Source: ONJSC Rutgers University, 2010
Note: 2010 observations were not included in this calculation
°F degrees Fahrenheit

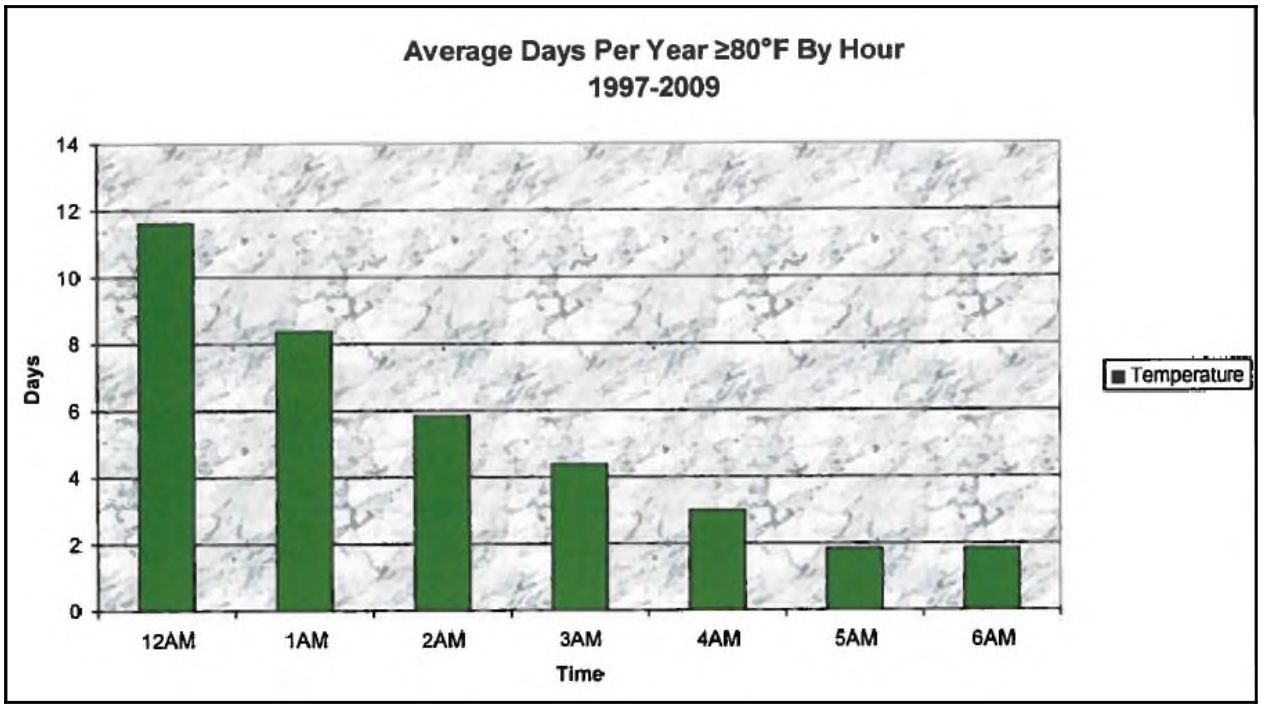
Additional results from the study provided the following:

- **Heat Waves** – on average, heat waves lasted five days, with a maximum of 14 from July 16 to 29, 2010. On average, there were four heat waves per year, with a maximum of seven in 1999 and 2010 and a minimum of zero in 2004. The average duration of heat waves was 93 hours (from the first hourly reading ≥90°F until the last one), with a maximum of 317 hours during the July 2010, heat wave. From the start to the end of heat waves, approximately 26% of hours were spent below 80°F, with a minimum of 4% from August 11 to 14, 2005.
- **Heat Index ≥90°F** – on average, approximately 197 hours were spent with the heat index ≥90°F annually, with a maximum of 406 hours in 2010 and a minimum of 85 hours in 2009. On average, a heat index of ≥90°F was reached on 30 days annually, with a maximum of 58 in 2010 and a minimum of 16 in 2009. On days where the heat index was ≥90°F, the average maximum heat index for the day was 95°F, with a maximum of 112°F on July 5, 1999.
- **Temperatures ≥100°F** – on average, 2.4 hours were spent at ≥100°F annually. The following table summarizes the number of days each year that had temperatures ≥100°F.

Additional results from the study provided the following:

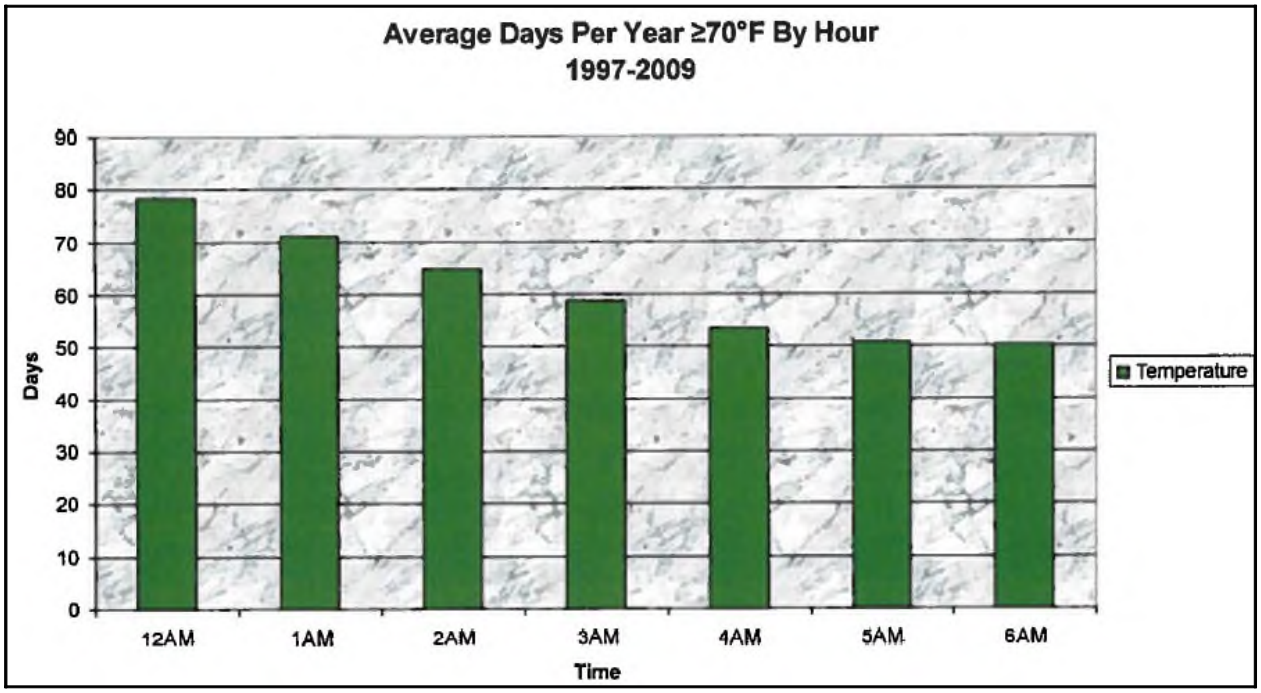
- **Warm nighttime temperatures** – On average, two days per year had 5am and 6am temperatures ≥80°F and average of 50 days per year had 5am and 6am temperatures ≥70°F (Figure 5.4.5-11 and Figure 5.4.5-12).

Figure 5.4.5-11. Average Days Per Year ≥80°F by Hour



Source: ONJSC Rutgers University, 2010
°F degrees Fahrenheit

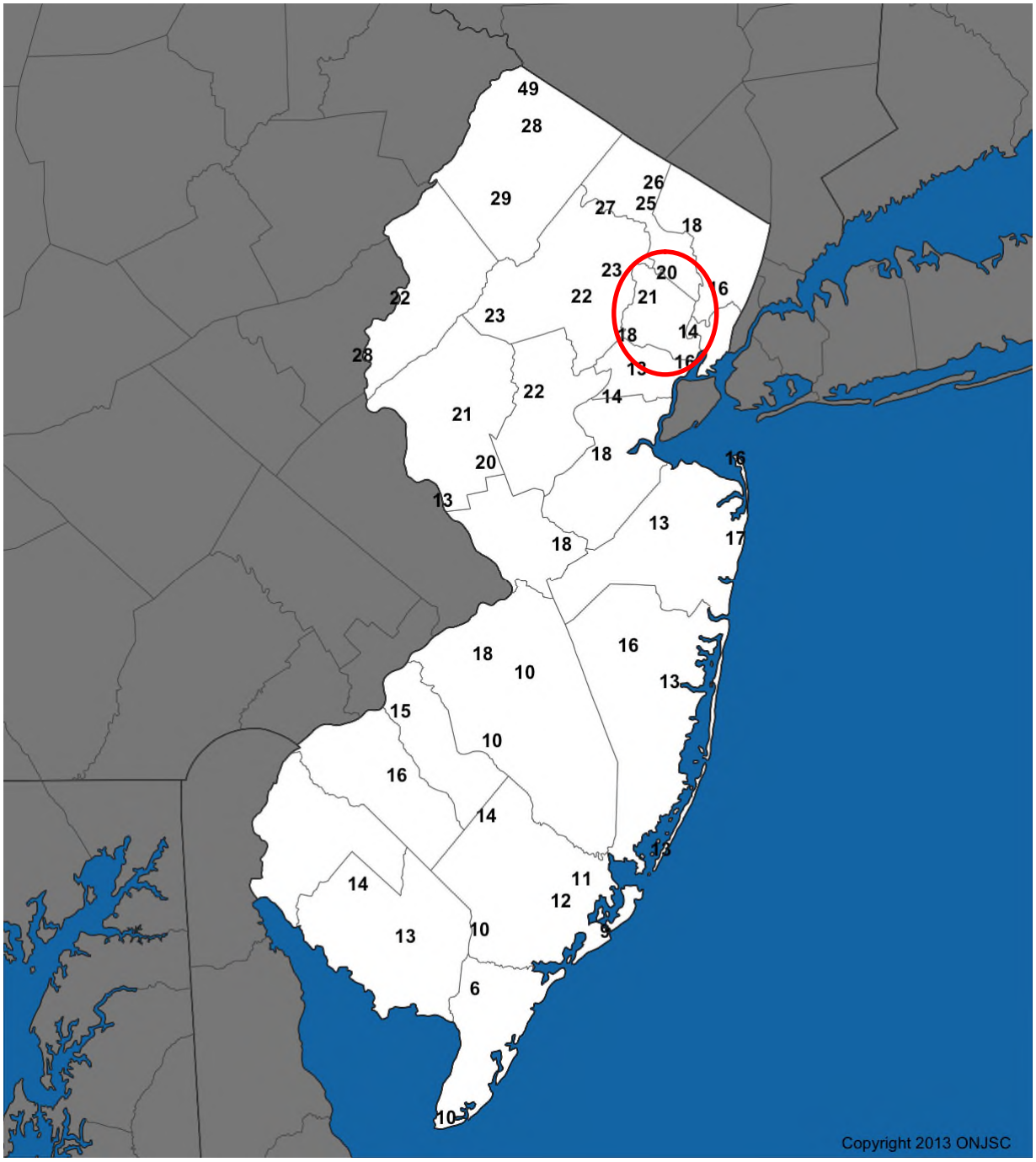
Figure 5.4.5-12. Average Days Per Year ≥70°F by Hour, 1997 to 2009



Source: ONJSC Rutgers University, 2010
°F degrees Fahrenheit

In New Jersey, average days per year when temperatures reached less than 32°F range from six days in southern New Jersey to over 45 days in northern New Jersey. Figure 5.4.5-13 and shows the average number of days per year, from 1981 to 2010, when temperatures were below 32°F and 0°F. The figure indicates that Essex County has an average of 17.2 days of temperatures below 32°F ; 34.3 days below 20°F; and 1.2 days of temperatures below 0°F.

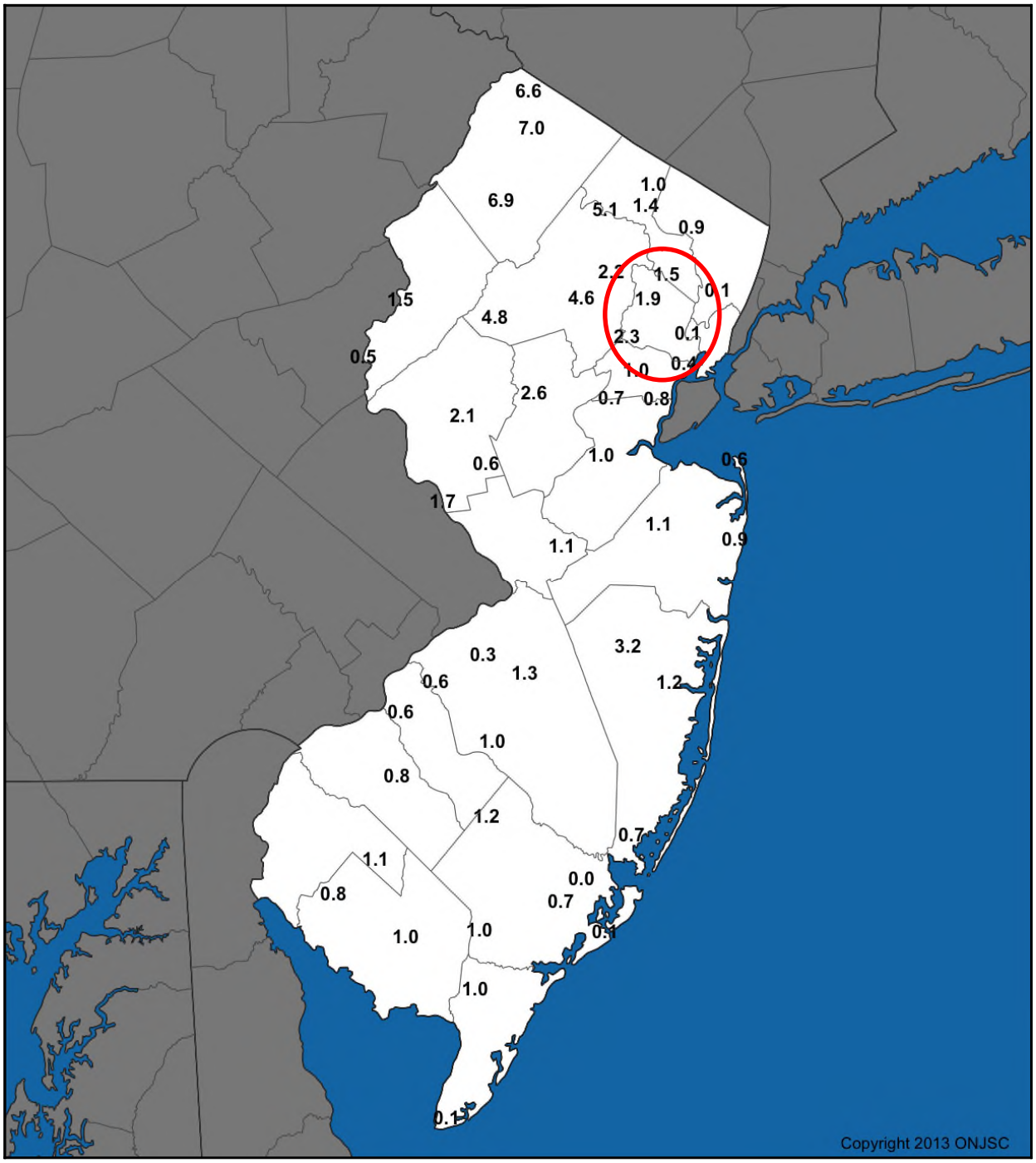
Figure 5.4.5-13. Average Number of Days Less than 32°F (1981 to 2010)



Source: ONJSC Rutgers University 2013a

Note: The red circle indicates the location of Essex County. The County experiences an average 14 and 21 days of less than 32°F
°F degrees Fahrenheit

Figure 5.4.5-14. Average Number of Days Less than 0°F (1981 to 2010)



Source: *ONJSC Rutgers University 2013a*

Note: *The red circle indicates the location of Essex County. The County experiences an average 0.1 and 2.3 days of less than 0°F*

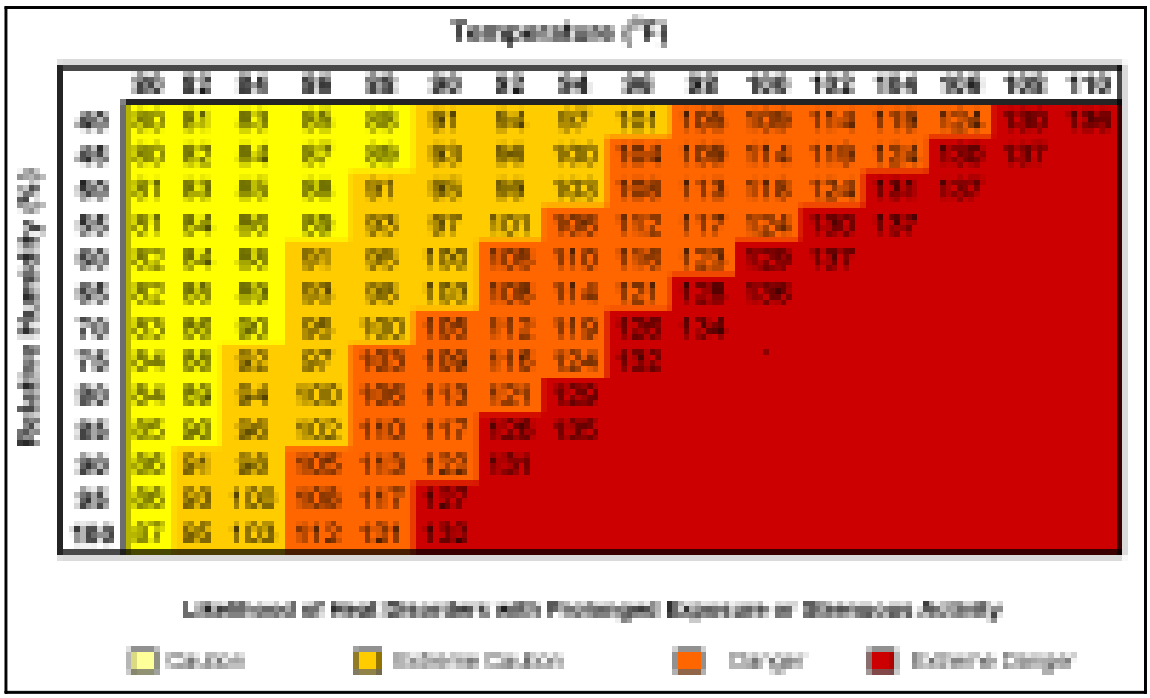
°F *degrees Fahrenheit*

Extent

Extreme Heat

NOAA's heat alert procedures are based mainly on Heat Index values. The Heat Index is given in degrees Fahrenheit. The Heat Index is a measure of how hot it really feels when relative humidity is factored in with the actual air temperature. To find the Heat Index temperature, the temperature and relative humidity need to be known. Once both values are known, the Heat Index will be the corresponding number with both values (Figure 5.4.5-15). The Heat Index indicated the temperature the body feels. It is important to know that the Heat Index values are devised for shady, light wind conditions. Exposure to full sunshine can increase heat index values by up to 15°F. Strong winds, particularly with very hot dry air, can also be extremely hazardous (NWS 2013).

Figure 5.4.5-15. NWS Heat Index Chart



Source: NWS 2013
°F degrees Fahrenheit
% percent

Figure 5.4.5-16. Adverse Effects of Prolonged Exposures to Heat on Individuals

Category	Heat Index	Health Hazards
Extreme Danger	130 °F – Higher	Heat Stroke / Sunstroke is likely with continued exposure.
Danger	105 °F – 129 °F	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Extreme Caution	90 °F – 105 °F	Sunstroke, muscle cramps, and/or heat exhaustions possible with prolonged exposure and/or physical activity.
Caution	80 °F – 90 °F	Fatigue possible with prolonged exposure and/or physical activity.

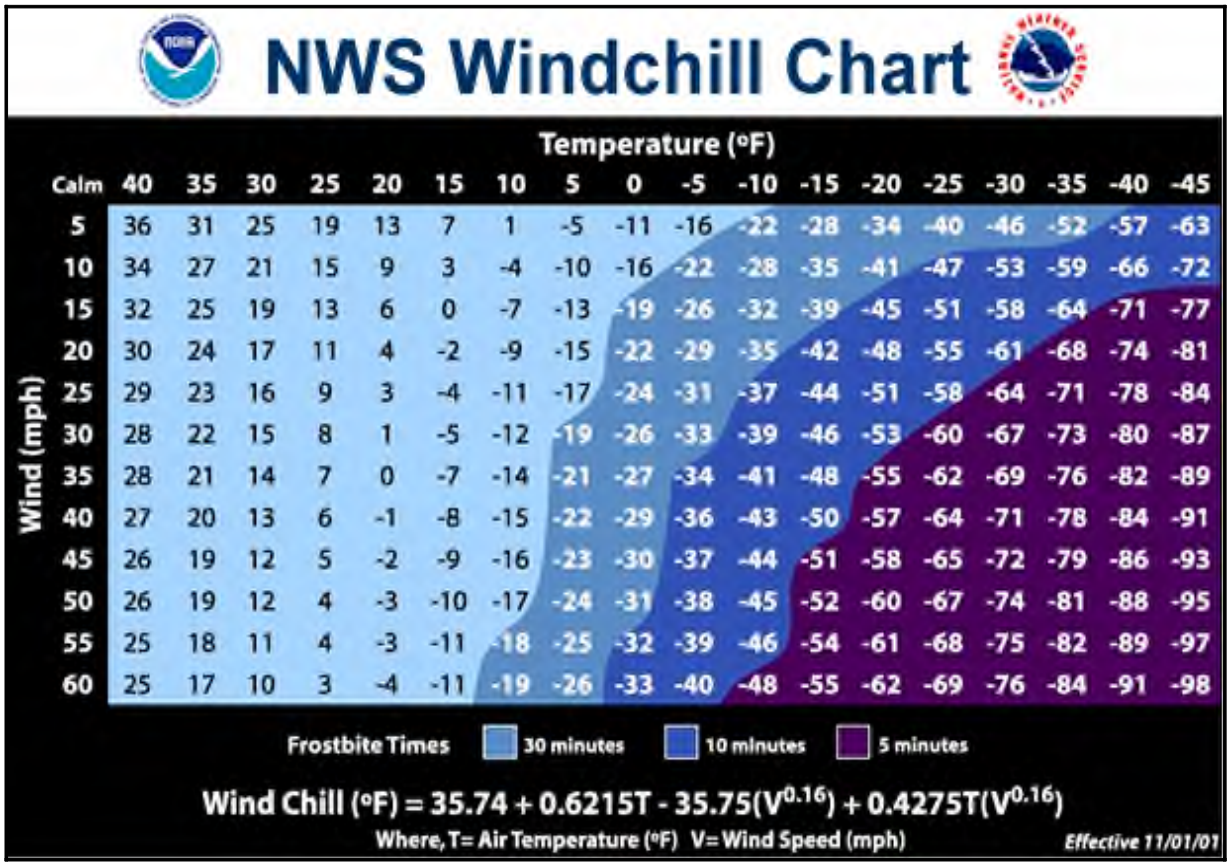
Source: NWS 2009
°F degrees Fahrenheit

Extreme Cold

The extent (severity or magnitude) of extreme cold temperatures are 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 Date Unknown).

On November 1, 2001, the NWS implemented a new WCT Index. It was designed to more accurately calculate how cold air feels on human skin. The table below shows the new WCT Index. The WCT Index includes a frostbite indicator, showing points where temperature, wind speed, and exposure time will produce frostbite to humans. Figure 5.4.5-17 shows three shaded areas of frostbite danger. Each shaded area shows how long a person can be exposed before frostbite develops (NWS Date Unknown).

Figure 5.4.5-17. NWS Wind Chill Index



NWS Windchill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Source: NWS 2009b
°F degrees Fahrenheit
mph miles per hour

Warning Time

Meteorologists can accurately forecast extreme temperature event development and the severity of the associated conditions with several days lead time. These forecasts provide an opportunity for public health and other officials to notify vulnerable populations. For heat events, the NWS issues excessive heat outlooks when the potential exists for an excessive heat event in the next three to seven days. Watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. Excessive heat

warning/advisories are issued when an excessive heat event is expected in the next 36 hours (NWS 2013). Winter temperatures may fall to extreme cold readings with no wind occurring. Currently, the only way to headline very cold temperatures is with the use of the NWS-designated Wind Chill Advisory or Warning products. When actual temperatures reach Wind Chill Warning criteria with little to no wind, extreme cold warnings may be issued (NOAA 2013).

Previous Occurrences and Losses

New Jersey has been experiencing an increase in extreme temperatures across the State. Historically, there has been an increase in temperature during the warmest months in New Jersey, with the majority of the extreme heat months occurring after 1990. Conversely, the months which set records for extreme cold temperatures tended to occur prior to 1930.

Many sources provided historical information regarding previous occurrences and losses associated with extreme temperature events throughout the State 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 NWS Forecast Office operates an online annual temperature extremes database, known as "NOWData". The data set contains annual maximum and minimum temperature records for stations in the U.S. Each station has a cooperative observer system identification number (coop number). In the New York City Cooperative Area, there are over 25 stations, including one station in the City of Newark. There may be some potential problems with the data collected at the stations. The values of the all-time records for stations with brief histories are limited in accuracy and could vary from nearby stations with longer records. Although the data sets have been through quality control, there is still a need for more resources to quality control extremes. The record sets are for single stations in the cooperative observer network and are limited to the time of operation of each station under one coop number. The records for a place may need to be constructed from several individual station histories. Some of the data may vary from NWS records due to NWS using multiple stations and additional sources like record books (MRCC, Date Unknown).

Based on the NWS data, Table 5.4.5-1 presents the extreme cold (minimum) and hot (maximum) temperature records for the three weather stations located in Essex County.

Table 5.4.5-1. MRCC Temperature Extremes

Station Name	Average Maximum (°F)	Average Minimum (°F)	Mean (°F)	Highest Max (°F)	Date	Lowest Minimum (°F)	Date
CANOE BROOK	63	40	51.4	107	2010-07-07	-26	1934-02-09
ESSEX FELLS SERV BLDG	62	40	51	105	2001-08-10	-14	1985-01-21
NEWARK INTL AP	63	46	54.4	108	2011-07-22	-14	1934-02-09

Source: MRCC 2014

For this 2015 Plan Update, known extreme temperature events that have impacted Essex County between 2007 and 2014 are identified in Table 5.4.5-2. With extreme temperature documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.5-2 may not include all events that have occurred in the County. Please see Section 9 for detailed information regarding impacts and losses to each municipality.

Table 5.4.5-2. Extreme Temperature Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
July 4 to 7, 2010	Extreme Heat	N/A	N/A	Temperatures ranged from 90°F to 105°F. One fatality was reported from this event. In Newark, four straight days of temperatures ≥100°F (101°F, 102°F, 103°F, and 101°F respectively). This led to 65 consecutive hours of temperatures of ≥80°F. The low temperature on July 6 was 84°F. At the Canoe Brook weather station, the highest temperature on record was recorded on July 7th. The maximum temperature at this station reached 107°F.
July 21 to 24, 2011	Heat Wave	N/A	N/A	One of the most oppressive heat waves since July 1995. It caused two deaths and hundreds of heat-related injuries. Many locations had high temperatures that were in excess of 100°F. July 22 was the hottest, with heat index values of 110°F to 120°F. Many counties and municipalities opened cooling centers for its residents. In Essex County, at Newark Airport on July 22nd, the temperature reached 108°F which broke the all-time record and the daily record. The minimum temperature for that day was 86°F. Another record was set on July 23rd at the airport, with temperatures reaching 102°F and the minimum temperature was only 86°F.
Winter 2013/2014	Cold	N/A	N/A	Enduring wind chill resulted in a December through March average statewide temperature of 31.9°F. This was the 20th coldest period on record

Source: NOAA-NCDC 2013; ONJSC Rutgers University 2013a; MRCC 2014; NWS 2014
°F degrees Fahrenheit

Probability of Future Occurrences

Extreme temperatures are expected to occur more frequently as part of regular seasons. Specifically, extreme heat will continue to impact New Jersey and its counties and, based upon data presented, will increase in the next several decades. As previously stated, several extreme temperature events occur each year in Essex County. It is estimated that the County will continue to experience these events annually.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for extreme temperature events in the County is considered 'frequent' (likely to occur within 25 years).

Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC, 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4°F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).

Annual average temperatures have been rising in the northeastern United States since 1900, with the regional warming trend greater in the Northeast than in the United States as a whole. Data collected by ONJSC shows a statistically significant rise in average statewide temperature over the last 113 years. Since 1970, the average annual temperature in the Northeast has increased by 2°F. Average winter temperatures have increased by 4°F (Rutgers 2013). Over the next 100 years, temperatures across the Northeast are projected to increase, with larger increases under higher emissions scenarios to lower emissions scenarios, and greater increases in summer as compared to winter temperatures by the end of the century. In the Northeast, increases in annual average temperature above the baseline are expected to range from 1.5°F to 3°F by the 2020s, 3°F to 6°F by the 2050s, and from 3.5°F to 10°F by the 2080s, reflecting a range of emissions scenarios from low to high (Rutgers 2013).

The increase in the number of extreme heat days will lead to more heat related illness. Also, with an increase in severe storms there will be an increase in stormwater runoff which may be polluted and sicken individuals (Kaplan and Herb 2012). The effect on public health will likely increase the need for vulnerable population planning and may place heavier burdens on the healthcare system.

5.4.5.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For extreme temperatures, the entirety of Essex County has been identified as exposed to this hazard. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County profile, are exposed and potentially vulnerable. The following text evaluates and estimates the potential impact of extreme temperature on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Extreme temperatures generally occur for a short period of time but can cause a range of impacts, particularly to vulnerable populations that may not have access to adequate cooling or heating. This natural hazard can also cause impacts to agriculture (crops and animals), infrastructure (e.g., through pipe bursts associated with freezing, power failure) and the economy.

Data and Methodology

At the time of this Plan, insufficient data is available to model the long-term potential impacts of extreme temperature on Essex County. Over time, additional data will be collected to allow better analysis for this hazard. Available information and a preliminary assessment are provided below.

Impact on Life, Health and Safety

For the purposes of this HMP, the entire population in Essex County is exposed to extreme temperature events. Refer to Section 4 for a summary of population statistics for the County.

Extreme temperature events have potential health impacts including injury and death. According to the Centers for Disease Control and Prevention, populations most at risk to extreme cold and heat events include the following: 1) the elderly, who are less able to withstand temperatures extremes due to their age, health conditions and limited mobility to access shelters; 2) infants and children up to four years of age; 3) individuals who are physically ill (e.g., heart disease or high blood pressure), 4) low-income persons that cannot afford proper heating and cooling; and 5) the general public who may overexert during work or exercise during extreme heat events or experience hypothermia during extreme cold events (CDC, 2006).

Meteorologists can accurately forecast extreme heat event development and the severity of the associated conditions with several days of lead time. These forecasts provide an opportunity for public health and other officials to notify vulnerable populations, implement short-term emergency response actions and focus on surveillance and relief efforts on those at greatest risk. Adhering to extreme temperature warnings can significantly reduce the risk of temperature-related deaths.

Impact on General Building Stock

All of the building stock in the County is exposed to the extreme temperature hazard. Refer to Section 4 which summarizes the building inventory in Essex County. Extreme heat generally does not impact buildings. Losses may 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. Additionally, manufactured homes (mobile homes) and antiquated or poorly constructed facilities may have inadequate capabilities to withstand extreme temperatures.

Impact on Critical Facilities

All critical facilities in the County are exposed to the extreme temperature hazard. Impacts to critical facilities are the same as described for general building stock. Additionally, it is essential that critical facilities remain operational during natural hazard events. Extreme heat events can sometimes cause short periods of utility failures, commonly referred to as "brown-outs", due to increased usage from air conditioners, appliances, etc. Similarly, heavy snowfall and ice storms, associated with extreme cold temperature events, can cause power interruption as well. Backup power is recommended for critical facilities and infrastructure.

Impact on Economy

Extreme temperature events also have impacts on the economy, including loss of business function and damage/loss of inventory. Business-owners may 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).

The agricultural industry is most at risk in terms of economic impact and damage due to extreme temperature events. Extreme heat events can result in drought and dry conditions and directly impact livestock and crop production.

Future Growth and Development

As discussed in Sections 4 and 9, areas targeted for future growth and development have been identified across Essex County. Any areas of growth could be potentially impacted by the extreme temperature hazard because the entire County is exposed and vulnerable. Please refer to the specific areas of development indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.

Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by the type, frequency and intensity of weather events. Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of extremes such as extreme temperature events. While predicting changes of extreme temperature events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society and the environment (U.S. Environmental Protection Agency [EPA], 2006).

Climate Change in New Jersey: Trends and Projections describes changes in temperature, precipitation, and sea level rise. Each section of the report summarizes observed recent changes in climate in New Jersey. Observations are based on recorded climate data collected by the ONJSC and other institutions, and on other reports summarizing climate change in the northeastern United States. Each section also presents a synthesis of the most current projections for future climate changes based on climate science modeling and techniques.

The projections reflect potential average climate over a span of future years (2020, 2050, and 2080). The projections in the report illustrate the potential climate changes that could impact the northeastern United States based on future emissions scenarios (A2, A1B, and B1 – high, medium, and low scenarios). Each emissions scenario would result in a range of potential climate outcomes in the State (Rutgers 2013).

In the coming years, most studies project that the State of New Jersey can expect an increase in average annual temperature, and steady or increasing amounts of precipitation with more rain in the winter. More frequent extreme events are likely, including heat waves, short-term droughts, and extreme precipitation events with subsequent flooding. Sea level rise in New Jersey is already occurring faster than the global average rate because of land subsidence and ground water withdrawal, and a continued rate of rise is expected to lead to more frequent and more severe coastal flooding events, including those associated with hurricane and tropical storms (Rutgers 2013).

Change of Vulnerability

Overall, the County's vulnerability has not changed and the entire County will continue to be exposed and vulnerable to the extreme temperature events.

Additional Data and Next Steps

For future plan updates, the County can track data on extreme temperature events, obtain additional information on past and future events, particularly in terms of any injuries, deaths, shelter needs, pipe freeze, agricultural losses and other impacts. This will help to identify any concerns or trends for which mitigation measures should be developed or refined. In time, quantitative modeling of estimated extreme heat and cold events may be feasible as data is gathered and improved.

5.4.6 Flood

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the flood hazard in Essex County.

2015 Plan Update Changes

- For the 2015 Update, the flood profile includes only riverine and dam failure flooding and storm surge/coastal flooding is discussed in the coastal storm profile. In the previous County HMP, coastal flooding was including in the flood profile.
- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences (updated with events that occurred between 2007 and 2014), probability of future occurrence, and potential climate change impacts using best available data.
- A vulnerability assessment section is completed for the flood hazard. It directly follows the hazard profile. The HAZUS-MH flood model was used to estimate potential losses to the general building stock and critical facilities. The 1-percent annual chance flood event was used to evaluate the County's risk and vulnerability to floods. The July 2013 FEMA preliminary work maps and 2007 FEMA DFIRM were used to evaluate the County's exposure to flood.

5.4.6.1 Profile

Hazard Description

Floods are one of the most common natural hazards in the U.S. They can develop slowly over a period of days or develop quickly, with disastrous effects that can be local (impacting a neighborhood or community) or regional (affecting entire river basins, coastlines and multiple counties or states) (FEMA 2008). Most communities in the U.S. have experienced some kind of flooding after spring rains, heavy thunderstorms, coastal storms, or winter snow thaws (George Washington University 2001). Floods are frequent and costly natural hazards in New Jersey in terms of human hardship and economic loss, particularly to communities that lie within flood-prone areas or floodplains of a major water source.

The flood-related hazards most likely to impact Essex County are riverine (inland) flooding, and flooding as a result of a dam failure. Each is described below, along with the subcategories associated with each hazard type.

Riverine (Inland) Flooding

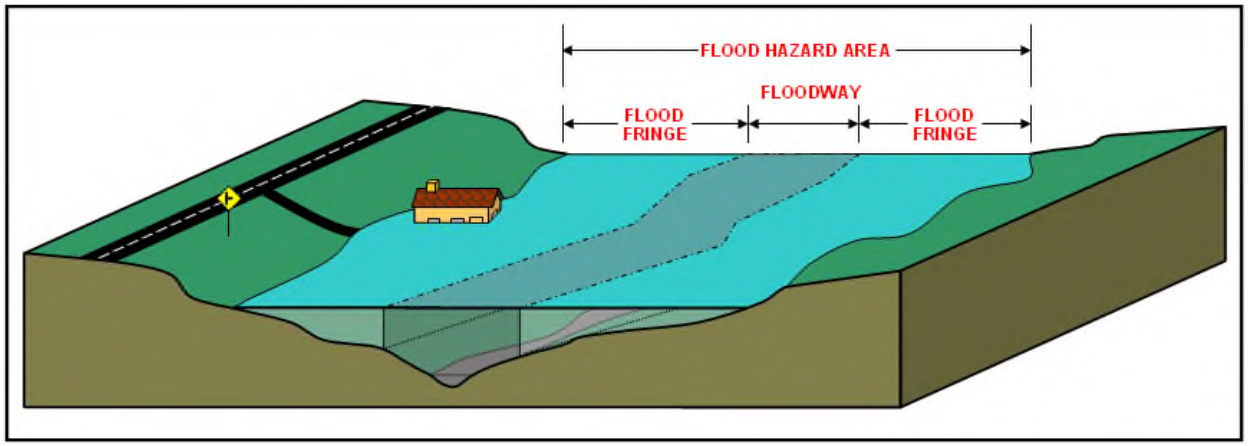
Riverine floods are the most common flood type. They occur along a channel and include overbank and flash flooding. Channels are defined, ground features that carry water through and out of a watershed. They may be called rivers, creeks, streams, or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas (FEMA 2008; The Illinois Association for Floodplain and Stormwater Management 2006).

Flash floods are "a rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within six hours of the causative event (e.g., intense rainfall, dam failure, ice jam). However, the actual time threshold may vary in different parts of the country. Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters" (National Weather Service [NWS] 2009).

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. Most often floodplains are referred to as 100-

year floodplains. A 100-year floodplain is not a flood that will occur once every 100 years, rather it is a flood that has a 1% 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. Due to this misleading term, FEMA has properly defined it as the 1% annual chance flood. This 1% annual chance flood is now the standard used by most federal and state agencies and by the NFIP (FEMA 2002). Figure 5.4.6-1 depicts the flood hazard area, the flood fringe, and the floodway areas of a floodplain.

Figure 5.4.6-1. Floodplain



Source: New Jersey Department of Environmental Protection (NJDEP) Date Unknown

Dam Failure

A dam is an artificial barrier that has the ability to store water, wastewater, or liquid-borne materials for many reasons (flood control, human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, or pollution control. Many dams fulfill a combination of the stated functions (Association of State Dam Safety Officials 2013). They are an important resource in the United States.

Man-made dams can be classified according to the type of construction material used, the methods used in construction, the slope or cross-section of the dam, the way the dam resists the forces of the water pressure behind it, the means used for controlling seepage, and, occasionally, according to the purpose of the dam. The materials used for construction of dams include earth, rock, tailings from mining or milling, concrete, masonry, steel, timber, miscellaneous materials (plastic or rubber), and any combination of these materials (Association of State Dam Safety Officials 2013).

More than a third of the country's dams are 50 or more years old. Approximately 14,000 of those dams pose a significant hazard to life and property if failure occurs. There are also about 2,000 unsafe dams in the United States, located in almost every state.

Dam failures typically occur when spillway capacity is inadequate and excess flow overtops the dam, or when internal erosion (piping) through the dam or foundation occurs. Complete failure occurs if internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-filled waters that rush downstream damaging and/or destroying anything in its path (FEMA 1996).

Dam failures can result from one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam
- Deliberate acts of sabotage
- 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 maintenance and upkeep (FEMA 2013a)

Federal Flood Programs

National Flood Insurance Program

The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. For most participating communities, FEMA has prepared a detailed Flood Insurance Study (FIS). The study presents water surface elevations for floods of various magnitudes, including the 1% annual chance flood and the 0.2% annual chance flood (the 500-year flood). Base flood elevations and the boundaries of the 100- floodplains are shown on Flood Insurance Rate Maps (FIRMs), which are the principle tool for identifying the extent and location of the flood hazard.

The FIRMs depict SFHAs - those areas subject to inundation from the 1% annual chance flood (also known as the Base Flood or the 100-Year Flood). Those areas are defined as follows:

- Zones A1-30 and AE: SFHAs that are subject to inundation by the base flood, determined using detailed hydraulic analysis. Base Flood Elevations are shown within these zones.
- Zone A (Also known as Unnumbered A-zones): SFHAs where no Base Flood Elevations or depths are shown because detailed hydraulic analyses have not been performed.
- Zone AO: SFHAs subject to inundation by types of shallow flooding where average depths are between 1 and 3 feet. These are normally areas prone to shallow sheet flow flooding on sloping terrain.
- Zone VE, V1-30: SFHAs along coasts that are subject to inundation by the base flood with additional hazards due to waves with heights of 3 feet or greater. Base Flood Elevations derived from detailed hydraulic analysis are shown within these zones.
- Zone B and X (shaded): Zones where the land elevation as been determined to be above the Base Flood Elevation, but below the 500-year flood elevation. These zones are not SFHAs.
- Zones C and X (unshaded): Zones where the land elevation has been determined to be above both the Base Flood Elevation and the 500-year flood elevation. These zones are not SFHAs.

There are approximately 4,925 NFIP policies in Essex County. Of those policies, 499 are considered repetitive loss (RL) and 73 are considered severe repetitive loss (SRL). To be eligible for the NFIP, certain criteria must be met and claim payments must have occurred within 10 years of each other. If there are multiple losses at the same location within 10 days of each other, these claims are counted within one loss.

Flood Insurance Studies (FIS)

In addition to FIRM and Digital Flood Insurance Rate Maps (DFIRM), FEMA also provides FISs for entire counties and individual jurisdictions. These studies aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. They are narrative reports of countywide flood hazards, including descriptions of the flood areas studied, the engineered methods used, principal flood problems, flood protection measures, and graphic profiles of the flood sources. A preliminary countywide FIS for Essex County has been completed and is dated May 30, 2014. See the Location section of this profile for information regarding floodprone areas in Essex County.

Risk Mapping, Assessment, and Planning (Risk MAP)

Risk MAP is a FEMA program that provides communities with flood information and tools to enhance their mitigation plans and take action to protect their citizens. It builds on flood hazard data and maps produced during the Flood Map Modernization (Map Mod) program. Through more precise flood mapping products, risk assessment tools, and planning and outreach support, Risk MAP strengthens local ability to make informed decisions about reducing risk. It combines quality engineering with state-of-the-art flood hazard data to assist communities in planning and preventing risk using the most current information.

Risk MAP collaborates with state, tribal, and local governments and delivers quality data that increases public awareness and leads to action that reduces risk to property and life. Risk MAP focuses on products and services beyond the traditional FIRMs and works with officials to help put flood risk data and assessment tools to use. Risk MAP also helps effectively communicate risk to citizens and enable communities to enhance their mitigation plans and actions (FEMA 2012).

The goals of Risk MAP are as follows:

- Flood Hazard Data – addresses gaps in flood hazard data to form a solid foundation for risk assessment, floodplain management, and actuarial soundness of the NFIP.
- Public Awareness/Outreach – ensures that a measurable increase of the public's awareness and understanding of risk results in a measurable reduction of current and future vulnerability.
- Hazard Mitigation Planning – leads and supports states, local, and tribal communities to effectively engage in risk-based mitigation planning resulting in sustainable actions that reduce or eliminate risks to life and property from natural hazards.
- Enhanced Digital Platform – provides an enhanced digital platform that improves management of Risk MAP, conserves information produced by Risk MAP, and improves communication and sharing of risk data and related products to all levels of government and the public.
- Alignment and Synergies – aligns risk analysis programs and develops synergies to enhance decision-making capabilities through effective risk communication and management.

FEMA headquarters and regional offices lead a team of contractors and stakeholders to deliver its Risk MAP program. The team is made up of the following:

- FEMA Headquarters – responsible for overall program implementation
- FEMA Regions – manage regional flood map production and help implement the Risk MAP outreach strategy
- State, Local, and Tribal entities – help ensure that updated mapping information is used to make informed decisions regarding risk
- Program Management Contractor – provide general oversight for Risk MAP including integration of activities, development and implementation of a national outreach strategy, and stakeholder relations
- Production and Technical Services Contractors – update flood hazard data and maps
- Customer and Data Services Contractor – provide the digital platform for sharing flood mapping products and information

Risk MAP will provide state and community officials with three Flood Risk Products (Flood Risk Report, Flood Risk Map, and Flood Risk Database) to help them gain a better understanding of flood risk and its potential impact on communities and individuals. These products will also enable communities to take proper mitigation actions to reduce flood risk. The products will summarize information captured through the Flood Risk Datasets during a Flood Risk study (FEMA 2012a). These datasets include:

- Changes since last FIRM
- Flood depth and analysis grids
- Flood risk assessment data
- Areas of mitigation interest (FEMA 2012a)

The Flood Risk Report provides stakeholders with a comprehensive understanding of flood hazard and risk exposure within their community, watershed, or other geographic area. The report parallels the Flood Insurance Study (FIS) by providing a narrative of the flood risk assessment methodology and results. The report provides risk assessment information at the project level, placing emphasis on risk reduction activities that may have impacts beyond the specific stream or community. The report also provides risk assessment information that can be incorporated into mitigation plans (FEMA 2012a).

The Flood Risk Map depicts select flood risk data for jurisdictions within the project area, emphasizing that risk reduction activities have an impact beyond the site. The Flood Risk Database will be the primary source to access information collected and developed during the flood risk assessment process. The Database parallels the FIRM database. It is a project-level database that includes flood risk assessment data collected, created, and analyzed during the flood risk project. FEMA will publish and maintain the database in a standardized form to support national, state, regional, and local distribution. Viewing tools are currently under development, to provide users without access to GIS software, the ability to visualize and understand the multiple flood risk datasets contained within the database (FEMA 2012a).

The NJDEP executed a Cooperating Technical Partners (CTP) partnership agreement with FEMA on May 16, 2006. Since that time, NJDEP has become a full CTP partner with FEMA. Under the CTP agreement, the NJDEP works as a contractor to FEMA Region II on the production of both regulatory and non-regulatory Flood Risk MAP products for the State of New Jersey. Risk MAP is discussed further below and in Section 5.6 (Flood). Under the CTP program, NJDEP has a dedicated full-time and part-time production team with specialized capabilities in water resource engineering, hydrology, hydraulics, flood risk hazard mapping, geographic information systems (GIS) and land surveying.

Within the last few years, the NJDEP has been working on the update of hydrology, hydraulics and flood risk hazard mapping for over 120-stream miles within the Passaic-Hackensack watershed basin. Additionally, the NJDEP has been working on updated Flood Insurance Study (FIS) and Digital Flood Insurance Rate Map (DFIRM) regulatory products for the Counties of Bergen, Salem, Cumberland, Gloucester and Camden. Non-regulatory flood Risk MAP products including Changes Since Last FIRM (CSLF), Flood Depth and Water Surface Elevation Change Grids, Flood Risk Assessments, Areas of Mitigation Interest, Primary Frontal Dune (PFD) Erosion Areas, Coastal Increased Inundation Areas, Flood Risk Database, Flood Risk Report and Flood Risk Map are being produced for selected areas of the Passaic-Hackensack watershed basin, Atlantic Coastal Counties and Delaware Bay Coastal Counties. The NJDEP has also collected building footprint information in GIS for selected areas of the Passaic-Hackensack watershed basin, Atlantic Coastal Counties and Delaware Bay Coastal Counties.

FEMA and NJDEP are providing communities with these additional tools or non-regulatory Flood Risk MAP products that can be used in planning efforts to mitigate flood risk, communicate with the public, and create a dialogue with neighboring communities about ways to reduce future flood risk. These tools include GIS datasets and maps, as well as supporting reports. The tools are not directly tied to regulatory development and insurance requirements of the NFIP, but are important resources to support community planning efforts (FEMA 2014b).

The Richard Stockton College of New Jersey Coastal Research Center (CRC), Stevens Institute of Technology, Sea Grant, Monmouth University, and Jacques Cousteau National Estuarine Research Reserve of

Rutgers University have partnered with FEMA and the NJDEP Bureau of Dam Safety and Flood Control to become Academic Cooperating Technical Partners. As CTPs they provides technical support, web-based outreach products, and meeting facilitation to increase public awareness of flood risks within New Jersey's coastal counties.

The flood risk tools are in the process of being released on a rolling basis by county. Draft versions of certain tools will be initially released at the time of Flood Risk Review and Flood Resilience meetings for each community. The Flood Risk Review Meeting occurs after the release of preliminary work maps and before the release of the preliminary FIRM and FIS report. It is a technically- focused meeting organized by FEMA and its partners that gives community officials the opportunity to review the draft Risk MAP products, including the preliminary work maps and certain draft flood risk datasets. Opportunities for incorporating Risk MAP products into local mitigation planning efforts are also presented during this meeting (FEMA Region II 2014b).

The Resilience Meeting occurs after the issuance of the preliminary FIRM and FIS report. During this meeting organized by FEMA and its partners, community officials will have the first opportunity to review the preliminary FIRM and FIS report and additional draft flood risk datasets and products. Ways the community can incorporate the Risk MAP products into ongoing risk assessment and planning efforts are also discussed during this meeting (FEMA Region II 2014b).

Final versions of the tools will be released at the time of the Consultation Coordination Officer (CCO) meeting. The CCO meeting is held by FEMA and its partners for communities after the issuance of the preliminary FIRM and the Resilience Meeting. The purpose of the CCO Meeting and associated public open house is to present the preliminary FIRM and data to community officials and the general public. During this meeting, differences between the new and the effective FIRM will be presented, along with an overview of the appeals and map adoption process (FEMA Region II 2014b).

The flood risk tools consist of flood risk datasets and flood risk products which provide a summary of the datasets and results (FEMA Region II 2014c). The tools are currently being developed and will be available through county-specific links as they are released. Draft versions of certain flood risk tools are available for Atlantic, Bergen, Cape May, Cumberland, Essex, Hudson, Ocean, Middlesex, Monmouth, and Salem Counties.

The Risk MAP products provide a more accurate, comprehensive picture of a community's watershed's flood risk. The tools and information provided below can offer a framework for planning for and addressing other natural hazards that communities face.

Flood risk datasets include the following:

- *Coastal Flood Risk Assessment* – "Risk assessment" is a process to identify potential hazards and to analyze what could happen if the hazard occurs. The coastal flood risk assessment dataset provides estimates of potential flood damage based on the new coastal flood study results using FEMA's HAZUS software. The data can help guide community mitigation efforts by highlighting areas where risk reduction actions are needed and will have the biggest impact (FEMA Region II 2014c).

  Using this dataset, planners and officials can identify where risk reduction efforts may produce the highest return on investment. This can inform policy decisions about mitigation actions are pursued and how they are prioritized. It may also provide a baseline against which to evaluate loss reduction upon future updates.

If the community uses this information, and determines the need to adopt a more stringent flood protection standard for critical facilities, the community may receive CRS points if they followed through on the adoption.

Flood risk data can be used to quantify potential losses from floods on the built environment, which would assist with the prioritization of mitigation areas, and may also be incorporated into a focused sustainability effort. By focusing on areas facing the greatest vulnerability, sustainability efforts can help a community reduce its short- and long-term risk from floods.

The refined HAZUS analysis with annualized loss estimates makes the risk more tangible to the planners and property owners. Providing potential flood event scenarios with dollar damages for their properties create more understandable situations, which can be presented to the public. In addition to these benefits, elected officials, planners, and engineers can use these datasets to help address the concerns or criticisms expressed by local stakeholders associated with changing flood risk.

- *Changes Since Last Firm (CSLF)* - The CSLF dataset compares information shown on the preliminary FIRM with that of the effective FIRM. Specifically, this includes a comparison of the floodplain boundaries and zones, Base Flood Elevation changes, and where applicable, the regulatory floodway. The dataset also includes information about why changes are happening in particular areas and indicates where no changes are occurring as well. It can be used to help explain map changes to residents and to identify areas newly mapped in high risk flood zones where outreach efforts may need to be focused. It can also be used to inform planning decisions and to prioritize mitigation measures. For draft versions of the CSLF dataset, preliminary work map data will be compared with the effective FIRM. For final versions, the preliminary FIRM will be compared with the effective FIRM (FEMA Region II 2014c).
- *Flood Depth Grids and Water Surface Elevation Change Grids*
    - Flood Depth Grids - A flood depth grid is a data set of grid cells which show the depth of the 1% annual chance flood for any given location within the study area. Depth grids can be used by communities to identify high risk areas and to help prioritize and evaluate the cost effectiveness of mitigation measures. Flood depth is often easier for people to understand than Base Flood Elevations shown on the FIRMs. Thus, depth grids can also be effective outreach tools for communicating with the public about local flood risk. For draft versions of the flood depth grids, preliminary work map data will be used. For final versions, the preliminary FIRM data will be used instead (FEMA Region II 2014c).
    - Water Surface Elevation Change Grids - Similar to the flood depth grid is the Water Surface Elevation Change Grid which shows the change in the one-percent annual chance water surface elevation between the existing and revised mapped floodplain (FEMA Region II 2014c).
- *Areas of Mitigation Interest* - This dataset shows areas where local conditions/factors may have an impact (positive or negative) on the identified flood risk. Areas with a history of flood claims, structures that contribute to flooding problems (e.g., undersized culverts or bridges), and areas experiencing land use change or development can be included in this dataset. By identifying these factors, this dataset can assist communities in identifying and prioritizing potential mitigation opportunities. It also allows communities to see factors present in neighboring communities which may impact them, fostering collaboration on mitigation projects (FEMA Region II 2014c).
- *Primary Frontal Dune (PFD) Erosion Areas* – PFD is a mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach which is subject to erosion and overtopping from high tides and waves during major storms. The PFD, where present, is used to delineate the limit of the coastal high hazard area (also known as the 'V zone') shown on the FIRM. This dataset shows the erosion areas associated with the PFD which can be used for community mitigation planning and communication efforts (FEMA Region II 2014c).

- *Coastal Increased Inundation Areas* - This dataset shows hypothetical increases of one, two, and three feet in the total water levels along the coast using the inland extent of one-percent annual chance flooding shown on the flood depth grid. The inundation areas are showing yellow, orange, and red. Flood levels exceeding the BFE (blue) are shown at one-foot increments depicting additional areas at risk for flooding. The increased flood hazard scenarios depict possible increases in flooding due to stronger storms, sea level rise, or land subsidence. This information can contribute to a better local understanding of characteristics of land in your community, which can lead to more informed decisions to allow suitable and appropriate development in higher risk areas (FEMA Region II 2014c).

  The local floodplain manager could use the 'coastal increased inundation areas' for advising the local elected officials to consider adopting more freeboard in the local floodplain ordinance. This step could also be used for CRS points and this information could be used to advise elected officials and property owners that they should consider purchasing a Preferred Risk Flood Insurance policy due to their proximity of the SFHA.

Flood risk products include the following:

- *Flood Risk Database* - The Flood Risk Database contains all of the flood risk datasets listed above. The database files are accessed using specialized GIS software that many communities use for planning, permitting, and other purposes. The Flood Risk Database can be used to develop customized maps to communicate with the public about flood risk and to overlay with other datasets the community may have for planning efforts and/or further flood risk analysis. The Flood Risk Database parallels, but is separate from, the regulatory FIRM database (FEMA Region II 2014c).
- *Flood Risk Report* - The Flood Risk Report summarizes the flood risk datasets listed above and provides readers with an understanding of local flood risk exposure. The risk assessment information included in the report can be used to develop and prioritize mitigation strategies and can be incorporated into local hazard mitigation plans. The information in this report can also be used to help communicate with the general public about local flood risk. The Flood Risk Report parallels, but is separate from, the FIS report which accompanies the FIRM (FEMA Region II 2014c).
- *Flood Risk Map* - The Flood Risk Map shows flood risk in the study area using the flood risk datasets listed above. The Flood Risk Map is intended to provide a high level overview of the study area to help community officials identify flood risk "hot spots" and to promote coordination with neighboring communities. The Flood Risk Map parallels, but is separate from, the community FIRM (FEMA Region II 2014c).

Resources available to local, regional, state and Federal agencies that may assist with the specific mitigation strategies identified include:

- FEMA grants available to communities that participate in the NFIP
- Other Federal grants available from the U.S. Department of Housing and Urban Development (HUD) and others
- Resources from the NFIP, CRS (when applicable), and floodplain management
- FEMA technical resources available online, such as design guides for hazard resistant construction and structure retrofits
- Technical assistance by other Federal agencies and professional associations such as ASFPM, NAFSMA, state floodplain management associations, and others

Coastal Outreach Advisory Teams (COATs) are intended to increase local awareness and understanding of, and engagement in the flood study process, as well as awareness and understanding of the risk from flooding and other natural hazards. COAT members actively participate in periodic meetings to discuss outreach and communication opportunities, identifying potential issues, and providing input on strategies and tactics for

communicating about flood risk and other natural hazards. COAT members include local partners, community officials, federal agency partners, representatives from non-profit organizations, academic institutions, and the private sector (FEMA Region II 2014d).

There are two COATs currently active in FEMA Region II. The New Jersey and New York COAT focuses on the coastal flood study underway and general flood risk for the region. The Puerto Rico COAT focuses on the unique flooding and natural hazards associated with Puerto Rico (FEMA Region II 2014d). The New Jersey and New York COAT supports the New Jersey and New York Coastal Flooding Outreach and Education Programs. It advocates risk awareness and engagement in the coastal flood mapping process among public officials, citizens, and other key stakeholders. COAT members actively participate through identifying, prioritizing, and discussing outreach and education opportunities, recognizing potential issues, and providing meaningful input on strategies and tactics for communicating coastal flood risk. Members serve as word-of-mouth ambassadors among fellow stakeholders to convey the importance of reducing flood risk through increased community resilience (RAMPP 2012).

Homeowner Flood Insurance Affordability Act of 2014

In July 2012, the U.S. Congress passed the Biggert-Water Flood Insurance Reform Act of 2012 (BW-12) which called on FEMA and other agencies to make a number of changes to the way the NFIP is run. Key provisions of the legislation will require the NFIP to raise rates to reflect true flood risk, make the program more financially stable, and change how FIRM updates impact policyholders. BW-12 also eliminated the Repetitive Flood Claims and Severe Repetitive Loss programs and made significant changes to the Flood Mitigation Assistance (FMA) program.

On March 21, 2014, President Obama signed the Homeowner Flood Insurance Affordability Act (HFIAA) of 2014 into law. HFIAA of 2014 repeals certain provisions of the BW-12 that eliminated eligibility for Pre-Flood Insurance Rate Map (FIRM) subsidies for buildings newly purchased or newly insured on or after July 6, 2012, as well as reinstatements of lapsed policies effective on or after October 4, 2012. FEMA's initial priority is to restore Pre-FIRM subsidies for policyholders covered by section 3 of the HFIAA (FEMA 2014a).

While FEMA actively works to implement the new law, policyholders are encouraged to maintain and keep current flood insurance policies. FEMA will continue working with Congress, the private Write Your Own Insurance Companies, and other stakeholders to implement these Congressionally-mandated reforms and to working toward our 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. FEMA will continue to identify and publish special flood hazards and flood risk zones as authorized and required by Congress (FEMA 2014b). The following provides information regarding this new 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 has actively begun analyzing and prioritizing implementation of the new law. We will be working with the private Write Your Own insurance companies in the next few weeks to seek their input and expertise prior to issuing business practice bulletins.
- It is not possible for changes to happen immediately. While the new law does require some changes to be made retroactively, applying to certain policies written after July 6, 2012, other changes require establishment of new programs, processes and procedures.
- FEMA's initial priority is assessing potential changes to the NFIP's business processes to stop policy increases for certain subsidized policyholders as outlined in the Act.

- FEMA also plans to issue guidance in the months ahead for the Write Your Own insurance companies to begin issuing refunds as outlined in the law for some policyholders who were previously impacted by subsidy phase outs.
- More information on the new law and its impacts on the NFIP will be forthcoming (FEMA 2014b).

Refunds

For certain flood insurance policies affected by the Pre-Flood Insurance Rate Map (Pre-FIRM) subsidy elimination required by BW-12, the new law mandates refunds of the excess premiums that those policyholders were charged pursuant to the requirements of BW-12. Refunds will not affect all subsidized policyholders who received rate increases as directed by Congress in BW-12, only policyholders for whom the rate increases under BW-12 were revoked by the new law. Refunds will affect only a small percentage of the overall NFIP policy base (FEMA 2014b).

Prior to restoring and refunding premiums, FEMA is required by the Homeowner Flood Insurance Affordability Act to consult with its partner insurers (Write-Your-Own insurance companies or WYOs) to develop guidance and rate tables. In accordance with the new law, FEMA will work to develop and finalize its guidance and rate tables within eight months. The law provides WYO insurance companies between six and eight months to implement the changes and update systems to implement the guidance (FEMA 2014b).

FEMA is working closely with the WYO insurance companies to develop a timetable for processing refunds expediently. Refunds apply to policyholders in high-risk areas who were required to pay their full-risk rate after purchasing a new flood insurance policy on or after July 6, 2012. Refunds may apply to policyholders who renewed their policy after HFIAA was enacted on March 21, 2014 and whose premium increased more than 18% (FEMA 2014b). Refunds do not apply to the following:

- Policyholders paying the 25 percent annual rate increases, as required by Congress in BW12, for a Pre-FIRM subsidized non-primary residence, business, Severe Repetitive Loss property, or building that was substantially damaged or improved (FEMA 2014b).
- Policyholders whose full-risk premium is less than the Pre-FIRM subsidized premium, or who were not overcharged according to any retroactive revisions to the Pre-FIRM subsidized rates required by the new law (FEMA 2014b).

Policyholders who saw usual, annual rate increases in 2013 or 2014, or policyholders who paid the 5 percent fee, as required by BW-12, for the NFIP Reserve Fund, will only see a refund if their premium renewal was after March 21, 2014 and their total premium, including the reserve fund, exceeded 18% (FEMA 2014b).

Premium Rates for Subsidized Policies

The new law requires gradual rate increases to properties now receiving artificially low (or subsidized) rates instead of immediate increases to full-risk rates required in certain cases under BW-12. FEMA is required to increase premiums for most subsidized properties by no less than 5% annually until the class premium reaches its full-risk rate. It is important to note that close to 80% of NFIP policyholders paid a full-risk rate prior to either BW-12 or HFIAA, and are minimally impacted by either law (FEMA 2014b).

With limited exceptions flood insurance premiums cannot increase more than 18 percent annually. There are some exceptions to these general rules and limitations. The most important of these exceptions is that policies for the following properties will continue to see up to 25% annual increases as required by BW-12 until they reach their full-risk rate (FEMA 2014b). Other exceptions include:

- Older business properties insured with subsidized rates

- Older non-primary residences insured with subsidized rates
- Severe Repetitive Loss Properties insured with subsidized rates; and
- Buildings that have been substantially damaged or improved built before the local adoption of a Flood Insurance Rate Map (known as Pre-FIRM properties) (FEMA 2014b).

In order to enable new purchasers of property to retain Pre-FIRM rates while FEMA is developing its guidelines, a new purchaser will be allowed to assume the prior owner's flood insurance policy and retain the same rates until the guidance is finalized. Also, lapsed policies receiving Pre-FIRM subsidized rates may be reinstated with Pre-FIRM subsidized rates pending FEMA's implementation of the rate increases required by HFIAA (FEMA 2014b).

New Surcharge on All Policies

A new surcharge will be added to all policies to offset the subsidized policies and achieve the financial sustainability goals of BW-12. A policy for a primary residence will include a $25 surcharge. All other policies will include a $250 surcharge. The fee will be included on all policies, including full-risk rated policies, until all Pre-FIRM subsidies are eliminated (FEMA 2014b).

Grandfathering

The new law repeals a provision of BW-12 that required FEMA, upon the effective date of a new or updated FIRM, to phase in premium increases over five years by 20%a year to reflect the current risk of flood to a property, effectively eliminating FEMA's ability to grandfather properties into lower risk classes (FEMA 2014b).

Also for newly mapped in properties, the new law sets first year premiums at the same rate offered to properties located outside the Special Flood Hazard Area (preferred risk policy rates). With limited exceptions, flood insurance premiums cannot increase more than 18% annually (FEMA 2014b).

Flood Insurance Advocate

The new law requires FEMA to designate a Flood Insurance Advocate to advocate for the fair treatment of NFIP policy holders (FEMA 2014b). The Advocate will:

- Educate property owners and policyholders on individual flood risks; flood mitigation; measures to reduce flood insurance rates through effective mitigation; the flood insurance rate map review and amendment process; and any changes in the flood insurance program as a result of any newly enacted laws;
- Assist policy holders and property owners to understand the procedural requirements related to appealing preliminary flood insurance rate maps and implementing measures to mitigate evolving flood risks;
- Assist in the development of regional capacity to respond to individual constituent concerns about flood insurance rate map amendments and revisions;
- Coordinate outreach and education with local officials and community leaders in areas impacted by proposed flood insurance rate map amendments and revisions; and Aid potential policy holders in obtaining and verifying accurate and reliable flood insurance rate information when purchasing or renewing a flood insurance policy (FEMA 2014b).

Other Provisions

The new law permits FEMA to account for property specific flood mitigation that is not part of the insured structure in determining a full-risk rate. The law requires that residential basement floodproofing be

considered when developing full-risk rates after a map changes increasing the Base Flood Elevation in an area where residential basement floodproofing is permitted (FEMA 2014b).

The law mandates that FEMA develop an installment plan for non-escrowed flood insurance premiums, which will require changes to regulations and the Standard Flood Insurance Policy contract. The law increases maximum deductibles. The law encourages FEMA to minimize the number of policies where premiums exceed 1-percent of the coverage amount, and requires FEMA to report such premiums to Congress (FEMA 2014b).

Draft Affordability Framework

The new law requires FEMA to prepare a draft affordability framework, which is due to Congress 18 months after completion of the affordability study required by BW-12. The Affordability Study required by BW-12 is underway and is being conducted by the National Academies of Sciences, as specified in the BW-12 law (FEMA 2014b). In developing the affordability framework, FEMA must consider:

- Accurate communication to customers of the flood risk,
- Targeted assistance based on financial ability to pay,
- Individual and community actions to mitigate flood risk or lower cost of flood insurance,
- The impact of increases in premium rates on participation in NFIP, and
- The impact of mapping update on affordability of flood insurance (FEMA 2014b).

The affordability framework will include proposals and proposed regulations for ensuring flood insurance affordability among low-income populations (FEMA 2014b).

Mapping

The HFIAA requires the Technical Mapping Advisory Council (TMAC) to review the new national flood mapping program authorized under the 2012 and 2014 flood insurance reform laws. The law requires the Administrator to certify in writing to Congress that FEMA is utilizing “technically credible” data and mapping approaches. The law also requires FEMA to submit the TMAC review report to Congress (FEMA 2014b).

FEMA will be looking to the TMAC for recommendations on how best to meet the legislatively mandated mapping requirements for the new mapping program including the identification of residual risk areas, coastal flooding information, land subsidence, erosion, expected changes in flood hazards with time, and others (FEMA 2014b).

As the new national flood mapping program is being established, FEMA expects there will be opportunities to make incremental improvements to current procedures as it provides flood hazard data and information under the NFIP. FEMA will make those improvements where necessary to ensure all ongoing changes to flood hazards continue to be effectively communicated, mitigated, and properly insured against (FEMA 2014b).

The law lifts the $250,000 limit on the amount that FEMA can spend to reimburse homeowners for successful map appeals based on a scientific or technical error. Federal rulemaking is required in order to implement this provision (FEMA 2014b).

FEMA is authorized to account for reconstruction or improvements of flood protection, not just new construction. It authorizes FEMA to consider the existing present value of a levee when assessing adequate progress for the reconstruction of an existing flood protection system. The law extends certain provisions related to NFIP requirements in areas restoring disaccredited flood protection systems to coastal levees and clarifies that the levee needs to be considered without regard to the level of federal funding for the original construction or the restoration (FEMA 2014b).

The law exempts mapping fees for flood map changes due to habitat restoration projects, dam removal, culvert re-design or installation, or the installation of fish passages. It also requires FEMA to consider the effects of non-structural flood control features, such as dunes, and beach and wetland restoration when it maps the special flood hazard area (FEMA 2014b).

The law requires FEMA to enhance coordination with communities before and during mapping activities and requires FEMA to report certain information to members of Congress for each State and congressional district affected by preliminary maps (FEMA 2014b).

Implementation of Section 3 - Repeal of Certain Rate Increases

As part of the implementation of HFIAA and provide relief to qualifying policyholders who received rate increases under earlier legislative program changes, on April 15, 2014, FEMA issued a National Flood Insurance Program bulletin to its private sector, Write Your Own insurance company partners on how to adjust rates for certain Pre-Flood Insurance Rate Map properties as described by Section 3 of the Act. This action begins to implement FEMA's first priority to stop policy increases for certain subsidized policyholders as outlined in the Act (FEMA 2014a).

Beginning May 1, 2014, for all new applications for flood insurance and renewal of flood insurance policies for properties covered by Section 3, FEMA will require its Direct Servicing Agent and Write Your Own companies to use the October 1, 2013 Pre-FIRM subsidized rates when more favorable for properties covered by Section 3 (FEMA 2014a).

Implementation of Section 5 – October 1, 2014 Program Rate Changes

On March 29, 2014, FEMA issued a NFIP bulletin (linked below) to its private sector, Write Your Own insurance company partners, which included the October 1, 2014 program rate changes that revise premium rate tables to comply with Section 5 of the HFIAA of 2014. Section (5) of the Act prohibits FEMA from increasing premiums more than 15 percent a year within a single risk class and not more than 18 percent for an individual policy. In every case, these rates are the same or lower than the October 1, 2013 premium rates. The HFIAA Section 5 premium rates are to be used for all new and renewal policies effective on or after October 1, 2014 (FEMA 2014a).

FEMA will also use these rate tables to calculate premium refunds required under Section (3) of HFIAA. Additionally, to the extent a policyholder was charged a premium in excess of the premium increase caps mandated under Section 5 of HFIAA, FEMA will use these rate tables to calculate the refund. FEMA will continue consulting with WYO companies to finalize refund guidance for facilitating refunds under Sections 3 and 5 of HFIAA. FEMA anticipates finalizing its guidance by July 2014 with refunds beginning in fall 2014 (FEMA 2014a).

Community Rating System (CRS) Program

The CRS is a voluntary program within the NFIP encouraging floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk to meet the CRS goals of reducing flood losses, facilitating accurate insurance rating, and promoting awareness of flood insurance in the community.

For participating communities, flood insurance premium rates are discounted in increments of 5%. For example, a Class 1 community receives a 45% premium discount, and a Class 9 community receives a 5% discount. Class 10 communities do not participate in the CRS and therefore do not receive a discount. The CRS classes for local communities are based on 18 creditable activities in the following categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Flood preparedness

CRS activities (discussed below) can help save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation's flood risk; over 66% of the NFIP's policy base is located in these communities. Small and large communities participate in and receive premium discounts through the CRS. These communities represent a mixture of flood risks, including both coastal and riverine flood risks. The Insurance Services Office (ISO) administers the CRS program under contract to FEMA.

As of October 2013, there were 82 communities within the State of New Jersey participating in the CRS program, with two of those communities located in Essex County. The participating communities in Essex County are shown in Table 5.4.6-1. The CRS classifications in New Jersey range from a high of Class 10 (no discount) to a low of Class 5 (25% discount). The New Jersey Dam Safety program, state stormwater management requirements, and the development of all hazard mitigation plans are some of the efforts at the state level that provide CRS credits for all New Jersey municipalities. Communities are encouraged to adopt freeboard elevation requirements, which also provide CRS credits. Many municipalities in New Jersey are small and lack the professional support to fill out a CRS application, or do not have the flood insurance policy base to make it worthwhile. However, Community Assistance Visits (CAV), Community Assistance Contacts (CAC), technical assistance contacts, and workshops help to promote the CRS program in these small towns.

As of October 2013, Essex County has two communities in CRS, Fairfield Township and Montclair Township. However, Montclair had their CRS classification rescinded due to failure to meet annual participation requirements and the Township does not receive CRS discounts.

Table 5.4.6-1. Participating CRS Communities in Essex County, New Jersey

Community #	Community	CRS Entry Date	Current Effective Date	Current Class	% Discount for SFHA	% Discount for Non-SFHA	Status
345295	Fairfield, Township of	5/1/2013	5/1/2013	6	20	10	C
340188	Montclair, Township of	10/1/1994	10/1/1995	10	0	0	R

Source: *FEMA 2012a*

Note: *For the purpose of determining CRS discounts, all AR and A99 Zones are treated as non-SFHAs*
Zone A99 is the flood insurance rate zone that corresponds to areas of the 1% chance floodplains that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. Mandatory flood insurance purchase requirements apply.
Zone AR is the flood insurance rate zone used to depict areas protected from flood hazards by flood control structures, such as a levee, that are being restored. Mandatory purchase requirements for flood insurance will apply in Zone AR, but the rate will not exceed the rate for unnumbered A zones if the structure is built in compliance with Zone AR floodplain management regulations.
The CRS uses a class rating system that has ratings from 10 to 1. Each CRS Class improvement produces a 5% greater discount on flood insurance premiums for properties in the SFHA, with a Class 1 community receiving the maximum 45% premium reduction.

% *percent*
C *Current*
CRS *Community rating system*
R *Rescinded*
SFHA *Special Flood Hazard Area*

U.S. Army Corps of Engineers

Rahway River Basin Flood Risk Management Study

In response to locals concerns regarding flooding, Congress funded the Corps to conduct a reconnaissance study of the Rahway River Basin. In July 1999, the Corps issued a favorable reconnaissance report

recommending that a feasibility study be conducted to develop flood risk management alternatives in the Rahway River Basin. The State of New Jersey Department of Environmental Protection concurred with the Corps reconnaissance study recommendations and signed a Feasibility Cost Sharing Agreement (FCSA) on March 14, 2002 to cost share the feasibility study. While an entire basin study was authorized, an initial screening conducted in 2006 determined that Cranford, New Jersey and City of Rahway (Robinson's Branch) apparently have the greatest potential for Federal Interest. The study focus has been mostly in the Cranford area and completed work includes surveys, existing conditions hydrology and hydraulics (H&H), environmental and cultural. The seven alternatives for the Cranford area include structural (levee, floodwalls, channel improvement, and detention basin) and non-structures (dry and wet flood proofing, elevation and buyouts) plans including a dry detention basin in the South Mountain Reservation suggested by the Mayors' Council on Rahway River. The benefit to cost analysis was completed late last year and provided to the non-Federal sponsor, NJDEP, for their review. For the Robinson's Branch area, the existing conditions analyses has been completed, and team is currently working on formulation of alternatives. The Rahway River Study is not funded for fiscal year (FY) 2014 and is not in FY15 President's Budget. The Corps team will work with non-Federal sponsor, NJDEP, to revised study schedule and use FY13 carryover funds to the point that seven alternatives are narrowed down. Eventually, work will be suspended once the funds run out. The carryover funds will also be utilized for public information sessions to take place in May and June (USACE 2014a).

The study area encompasses the Rahway River Basin located in northeastern New Jersey. The Rahway River Basin is 81.9 square miles and lies within the metropolitan area of Greater New York. Flooding within the Rahway River Basin is caused principally by the rapid development of the area, which has resulted in a large increase of storm water runoff. Floods have caused damage to houses, businesses, municipal facilities and public infrastructure. Portions of the Rahway River Basin have also suffered environmental degradation and opportunities exist for restoration (USACE 2014a)

The most damaging floods of record within the Rahway River Basin resulted from the storms of July 1938, May 1968, August 1971, August 1973, July 1975, June 1992, October 1996, July 1997, Tropical Storm Floyd in September 1999 , April 2007 Nor'easter, and Hurricane Irene in August 2011. During the April 2007 storm, 70 to 100 homes suffered major damage to first floor and foundations. Union County and the Township of Cranford were declared federal disaster areas as a result of the April 2007 storm. As a result of Hurricane Irene, residents and business owners along Rahway River have suffered extensive financial losses and personal hardship than in most severe prior storms (USACE 2014a).

Passaic River Basin General Re-Evaluation Study – Army Corps

Flooding has long been a problem in the Passaic River Basin. Since colonial times, floods have claimed lives and damaged property. The growth of residential and industrial development in recent years has multiplied the threat of serious damages and loss of life from flooding. More than 2.5 million people live in the basin (2000 census), and about 20,000 homes and places of business lie in the Passaic River floodplain. Since 1900, at least 26 lives have been lost in floods and the total loses are over $5.5 billion dollars. In addition to the flood damages that occur in over thirty-five municipalities in the basin, environmental damage from flooding has also occurred. Significant interruption to businesses and transportation has also resulted in hardship in the basin and region after each flood event (USACE 2014b).

As a result of the April 2007 storm event, the New Jersey Department of Environmental Protection (NJDEP), as the non-Federal sponsor, requested that the United States Army Corps of Engineers (USACE) initiate the process for conducting a reevaluation of the Passaic River Basin and previously identified alternatives to manage the risk associated with the flooding within the Passaic River Basin. In June 2012, USACE initiated the alternative reevaluation in accordance with Engineering Regulation 1105-2-100 (ER 1105-2-100) in the form of a General Reevaluation Report (GRR). The GRR is being conducted in two phases, the Preliminary

Alternative Reevaluation phase (Phase 1) and the Detailed Analysis phase (Phase 2). The combination of the Phase 1 report and the Phase 2 report will serve as the decision document for Congressional authorization of a project (USACE 2014b).

On April 23, 2010 Governor Chris Christie signed an Executive Order creating the Passaic River Flood Advisory Commission, chaired by Commissioner of the NJDEP, Bob Martin. The goal of the seven member Commission is to identify short and long term recommendations to improve flood-mitigation efforts, emergency response planning and improve post-flood recovery response and efforts and present the findings to Governor Christie by Dec 31, 2010. USACE provided input as requested due to our long history with the Passaic River Basin. The recommendations from the Commission were published in early 2011 and can be found on the NJDEP website: http://www.nj.gov/dep/passaicriver (USACE 2014b).

One of the recommendations was #13, which recommended that New Jersey submit a reevaluation request to the USACE to study and analyze larger potential engineering projects for long-term flood damage reduction. On March 31, 2011 Governor Chris Christie sent a request to then Chief of Engineers, Lieutenant General Robert Van Antwerp to initiate a reevaluation of the authorized Passaic River Basin Project. The Project Management Plan (PMP) was signed by USACE and NJDEP in April 2012 and the Feasibility Cost Sharing Agreement (FCSA) was executed on June 13, 2012. The U.S. Army Corps of Engineers and the New Jersey Department of Environmental Protection are partnering to carry out the Passaic River Basin General Re-Evaluation Study to determine the best flood risk management alternative to help communities throughout the Passaic River Basin. The re-evaluation is one of the 15 recommendations made by New Jersey Governor Chris Christie's Passaic River Flood Advisory Commission. The study was kicked off in June 2012 by the signing of a Feasibility Cost-Sharing Agreement (FCSA) between the Corps of Engineers and the New Jersey Department of Environmental Protection (USACE 2014b).

In August 2013, the District completed its draft Preliminary Alternative Analysis Report and provided it to the NJDEP for their review and concurrence. The District met with NJDEP in January 2014 and agreed to conduct a tiered approach to obtaining public comments by first bring elected officials and then hold several public information sessions. Following these meetings, the NJDEP will make a decision on what alternative(s) that it wants the USACE to exam in detail. As of spring 2014, the Passaic River Basin Flood Risk Management General Re-evaluation Study Preliminary Alternative Analysis Report has been completed and is now available to the public (USACE 2014b).

Results of this Phase 1 reevaluation of the changes in the frequency of flooding show that all flows provided by current gages in the basin, except Chatham, are now greater than those predicted in the 1987 study. Predicted flows for the 100 year storm event have generally increased between 6% and 34% and some water surface elevations have increased up to 1.6 feet. Additionally, the annual risk of flooding has decreased to an estimated 50 or 60 year annual risk of flooding (versus a 100 year annual risk of flooding of any plan analyzed in the 1987 GDM). Over $6 billion in damages have been realized since the authorization of the 1995 Feasibility Plan that indicated a cost of $1.2 billion to construct a comprehensive, basin-wide flood risk management project ($2.1 billion at October 2012 price level). The frequency and intensity of these storms appear to be increasing and catastrophic damages continue to recur. Furthermore, 26 lives have been lost as a direct result of the flooding. There is Federal interest in the protection of property, businesses, infrastructure and the lives of the people in the basin and Flood Risk Management is a major USACE mission area. Implementing an economically, environmental acceptable, publicly supported plan in 1995 if constructed could have avoided over $3.5 billion in damages (USACE 2013).

Regulatory Oversight for Dams

The potential for catastrophic flooding caused by dam failures led to the passage of the National Dam Safety Act (Public Law 92-367). The National Dam Safety Program (NDSP) has been used for 30 years to protect Americans from dam failure. The NDSP is a partnership of the 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 the purchase of needed equipment. New Jersey is one of those participating states. FEMA has also expanded existing training programs and initiated new training programs. Grant assistance from FEMA provides support for the improvement of dam safety programs that regulate most of the dams in the U.S. (FEMA 2013a).

New Jersey Department of Environmental Protection – Dam Safety Section

The NJDEP Dam Safety Section under the Bureau of Dam Safety and Flood Control has responsibility for overseeing dam safety in the State. In 1912, the New Jersey legislature passed a series of safety regulations related to the construction, repair, and inspection of existing and proposed dams in the State. In 1981, the law was amended and became the Safe Dam Act, N.J.S.A. 58:4. Eventually in 1985, the Dam Safety Standards, N.J.A.C. 7:20 regulations were passed eventually leading to the Dam Safety Section.

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 Section also coordinates with the Division of State Police, local and county emergency management officials in the preparations and approval of Emergency Action Plans.

The Dam Safety Section 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 Section evaluate each project, investigate site conditions, and check recommended construction materials. During construction, engineers identify conditions that may require design changes, check for compliance with approved plans and specifications, and approve foundations before material is placed.

Existing dams are periodically inspected to assure that they are adequately maintained and owners are directed to correct any deficiencies found. The regulations require the owner to obtain a professional engineer to inspect their dams on a regular basis. These investigations include a comprehensive review of all pertinent material contained in the Department's files, a visual inspection, technical studies when necessary, and the preparation of a comprehensive report (NJDEP 2012a).

The owners or operators of all dams which raise the waters of any stream more than 70 feet above its usual mean low-water height or which impound more than 10,000 acre-feet of water shall have a regular inspection performed annually and formal inspections performed every three years by a New Jersey licensed professional engineer obtained by the owner. In addition, these inspections must be attended by a professional engineer assigned from the NJDEP.

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 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 1997).

Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) has the largest dam safety program in the United States. FERC cooperates with a large number of federal and state agencies to ensure and promote dam safety and, more recently, homeland security. There are 3,036 dams that are part of regulated hydroelectric projects and are included in the FERC program. Two-thirds of these are more than 50 years old. As dams age, concern about their safety and integrity grows, so oversight and regular inspection are important (FERC 2011). FERC staff inspects hydroelectric projects on an unscheduled basis to investigate the following:

- Potential dam safety problems
- Complaints about constructing and operating a project
- Safety concerns related to natural disasters
- Issues concerning compliance with the terms and conditions of a license (FERC 2011).

Every five years, an independent consulting engineer, approved by the FERC, must inspect and evaluate projects with dams higher than 32.8 feet (10 meters) or with a total storage capacity of more than 2,000 acre-feet (FERC 2011).

FERC monitors and evaluates seismic research in geographic areas where there are concerns about seismic activity. This information is applied in investigating and performing structural analyses of hydroelectric projects in these areas. FERC staff also evaluates the effects of potential and actual large floods on the safety of dams. During and after floods, FERC staff visits dams and licensed projects, determines the extent of damage, and directs any studies or remedial measures the licensee must undertake. FERC's *Engineering Guidelines for the Evaluation of Hydropower Projects* guides the FERC engineering staff and licensees in evaluating dam safety. The publication is frequently revised to reflect current information and methodologies (FERC 2011).

FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans outline an early warning system if there is an actual or potential sudden release of water from a dam failure. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, as well as procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations (FERC 2011).

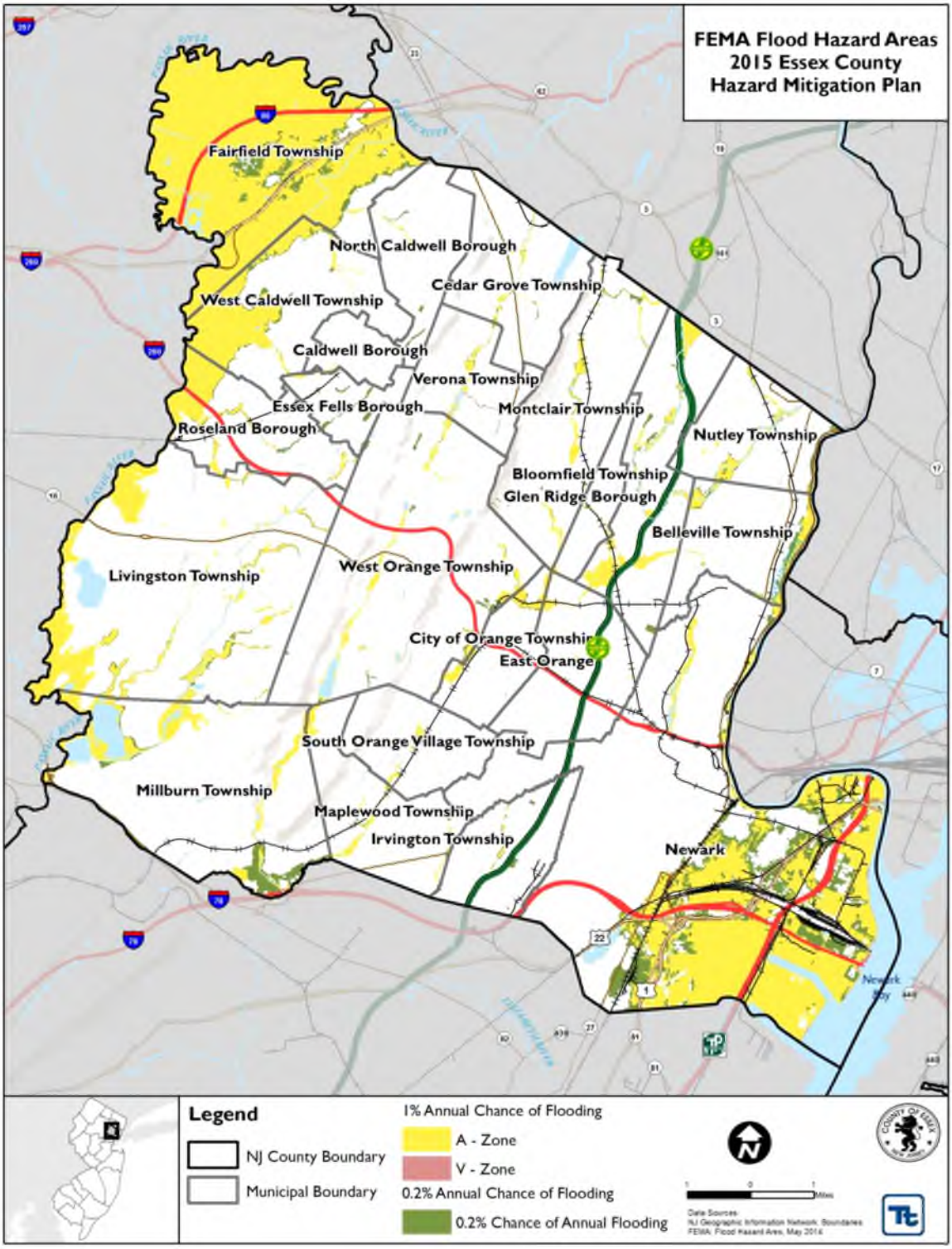
Location

Flooding in New Jersey is often the direct result of frequent weather events such as coastal storms, Nor'easters, heavy rains, tropical storms, and hurricanes. Floods can happen almost anywhere in New Jersey, although they do tend to occur in and around areas near existing bodies of water, such as rivers, streams, and the Atlantic Ocean. The most damaging floods (particularly riverine floods) in New Jersey appear to occur in the northern half of the State. This is a function of several physiographic and physical features of the landscape. Greater geographic relief in the northern half results in flowing water moving down steeper gradients and being naturally or artificially channelized through valleys and gullies.

Development patterns have resulted in denser development in northern New Jersey. In addition, proximity to New York City boosts property values and therefore increases damage dollar totals. Extensive development also leaves fewer natural surfaces available to absorb rainwater, forcing water directly into streams and rivers, swelling them more than when more natural surface buffered the runoff rate. Since the Delaware, Raritan and Passaic Rivers drain more than 90% of the northern New Jersey counties, these rivers and their tributaries are common locations for flooding. The 1% annual chance of flood hazard zones (both A and V-zones)

throughout New Jersey are identified in Figure 5.4.6-2. Southeastern Essex County is located in the 1% annual chance flood hazard zones (both A and V).

Figure 5.4.6-2. FEMA Flood Hazard Areas in Essex County



Source: FEMA 2013
FEMA Federal Emergency Management Agency

The most extensive areas of 100-year FEMA mapped floodplains in Essex County 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 (Essex County Environmental Resource Inventory 2007).

Flood Insurance Study

The following discussion presents flood information as directly provided in the FEMA FIS document(s). The FIS also included dates of historic flood events, which will also be included in this section.

- *Township of Belleville* – The Township of Belleville is subject to flooding from the Passaic River, the Second River, and the Third River. All three flooding sources flow in well-defined channels with flooding occurring in adjacent low-lying areas. Flooding is generally the result of heavy rainfall produced by hurricanes moving up the Atlantic coastline, large frontal storms from the west and south, and local thunderstorms. Frequent flooding is also known to occur along the Third River between Fairway Avenue and Joralemon Street.

  Historic floods occurred in 1902, 1903, 1936, and 1945. The 1903 flood had an estimated peak discharge of 39,800 cubic feet per second (cfs) and estimated 1% annual chance frequency at the confluence of the Passaic River and Newark Bay. The floods inundated large areas, causing damage to buildings and disruption of transportation and utility lines.

- *Township of Bloomfield* – The Township of Bloomfield is subject to flooding from the Passaic River and the Second River. The flooding along the streams within the corporate limits to attributed mainly to backwater created by inadequate storm drains and culverts, clogged bridges, or shallow stream beds. Most of the lands adjacent to the rivers in the Township are affected by flooding, with the exception of the Third River section between John F. Kennedy Drive and Maple Street, where natural high riverbeds combined with natural high grounds confine floodwater to the channel. There are several other areas throughout the Township that experience flooding due to inadequate storm drainage systems. Historic floods in the Township occurred in May 1968, August and September 1971, and February 1973.
- *Township of Cedar Grove* - The Township of Cedar Grove is subject to flooding from the Peckman River and its tributaries. All flooding sources flow in well-defined channels with flooding occurring in adjacent low-lying areas. Flooding occurs along the Peckman River and its tributaries during times of excessive and prolonged rainfall, particularly in residential areas having steep slopes. This flooding is the result of high runoff combined with insufficient carrying capacity of bridge openings and culverts.
- *City of East Orange* - The flooding problem along the channel of the Second River Tributary in the City of East Orange has long been recognized and studied. The first comprehensive report on flooding problems of Second River Tributary in 1940 was stimulated by the 1938 flood. This report contained a master plan for the improvement of Second River Tributary, setting channel slopes and improvements capable of carrying design flows with an expected frequency of 30 years.

  Nishuane Brook has some reported flooding problems at the Dodd Street and Thomas Boulevard crossings. Flood damages during the August 1971 storm (Hurricane Doria) consisted of damage to approximately a dozen homes between Dodd Street and Lake Street along Second River Tributary. No

specific damages were reported for East Orange for the flood of August 1973, even though the reported magnitude of this flood was on the same order as that of the 1971 flood in East Orange.

In addition to the problems outlined above, there is local flooding in East Orange caused by poor pipe drainage facilities along Summit Street and Melmore Gardens west of North Clinton Street, and at the street crossing at the railroad and Fourth Avenue.

- *Borough of Essex Fells* – Flooding within the Borough of Essex Fells usually occurs as a result of heavy rainfall from localized thunderstorms and hurricanes during the summer and fall months. Because of the low permeability of certain soils, the high degree of development, and the borough's inadequate storm sewers, some areas are subject to frequent flooding and ponding of surface water.

  The basements of five houses along Devon Road and one house along Hawthorne Road in Essex Fells suffered considerable damage from flooding during Tropical Storm Doria in August 1971. The flood of August 2, 1973, had an 83-year recurrence interval measured at the nearest upstream gage (No. 01379500) to confluence with Passaic River, and had a less than 10-year recurrence interval measured at the nearest downstream gage (No. 01381900) at Pine Brook. The length of record of the upstream gage is from 1903 to 1911, and 1937 to the present, and the latter is from 1966 to the present. The flood of April 6-7, 1984, measured with the aforementioned gages, had a less than a 10-year recurrence interval upstream and a 44-year recurrence interval downstream. Floodwaters resulting from Hurricane Irene on August 29-30, 2011, measured at the same gages, had a recurrence interval of 16 years upstream and 22 years downstream.

- *Township of Fairfield* – The low-lying area of the wide floodplain of the Passaic River comprises much of the Township of Fairfield and forms a large natural storage area. Floodwaters from the Pompton River enter this storage area from the north near the Two Bridges area. During large floods, Beatties Dam, which is located above Little Falls, constricts the river section enough to cause floodwaters from the Pompton River to enter the Passaic River, flowing in both an upstream and downstream direction at the point where the two rivers join (Richard P. Browne Associates, 1975 and 1976). The storage area thus contains flows from the Passaic River and the Pompton River.

  The flood peaks from the Pompton River are reduced and retarded somewhat due to the lake and reservoir storage on the northern upland tributaries and the valley storage between Pompton Lakes and Two Bridges. According to a USACE analysis, the Pompton River peak reaches the Passaic River approximately 12 to 18 hours before the Passaic River peaks. The southern upland tributaries of the Passaic River are as precipitous as the northern tributaries, but they join the Passaic River at widely separated points which results in desynchronization of their peaks. They are greatly affected by the large valley storage in the lower reaches and are, therefore, low flood producers into the Passaic River floodplains.

- *Borough of Glen Ridge* - Toneys Brook is contained in a deep gorge formed by the railroad embankment and Bloomfield Avenue. The gorge runs from a point upstream of Hillside Avenue to a point behind the Parkway Apartments. Downstream of Hillside Avenue, a limited amount of homes and businesses have experienced minor flooding.
- *Township of Irvington* - The two major sources of flooding in the Township of Irvington are the Elizabeth River and inadequate internal drainage. During the August 2, 1973, (40-year recurrence interval, based upon frequency discharge curve for the Elizabeth River at Hillside) storm there was severe flooding throughout the township with many streets being impassable. During the August 17, 1974, (10-percent-annual-chance recurrence interval, based upon frequency discharge curve for the Elizabeth River at Hillside) storm and during Hurricane Doria (2-percent-annual-chance recurrence

interval, based upon frequency discharge curve for the Elizabeth River at Hillside) in 1971, the township was declared a flood disaster area.

Additional flooding due to inadequate internal drainage has occurred in several areas of Irvington located in the vicinity of Durand Place and Wagner Place, Isabella Avenue and Delmar Place, Augusta Street and Ball Street, and Chestnut Avenue.

- *Township of Livingston* - The Livingston area is subject to frequent rainfalls of great intensity and varying origin. The rainfall may be from local thunderstorms, hurricanes, storms originating over the Atlantic Ocean, or storms coming from the mainland. High intensity, short duration storms tend to cause flooding of the smaller drainage basins of the Township. Lower intensity, longer duration storms are more troublesome to the waterways with larger tributary areas, such as Canoe Brook and the Passaic River.

  The Township of Livingston is highly developed, with buildings and paved areas covering a significant portion of the land area and effectively reducing the amount of land available to absorb precipitation. Throughout most of the Township, the surface soil has a relatively low permeability, although there are a few local deposits of sand and gravel. In general, the slope of the terrain varies from 1 percent to 10 percent throughout most of the Township. The low permeability of the soil, the steep slope of the terrain, and the high degree of development in Livingston all contribute to relatively high amounts of runoff, especially from the high intensity storms experienced on the east coast of the United States. The runoff is carried in open waterways to the Passaic River. The present problems due to storm water runoff are principally related to high velocity flow, channel erosion (particularly in upstream areas), and subsequent depositions of rock and silt in the downstream portions of the brooks.

  Local flooding in Livingston is generally due to inadequate storm sewers, high-water elevations in the streams to which the storm sewers discharge, or blockages, such as silting of the stream channel at the point of discharge from a storm sewer. In addition to causing silting and blockage of the stream channel, the erosion caused by the high velocities also undermines the embankments of the streams and affects the adjacent land area. This type of damage is caused not only by severe floods but also by the cumulative effects of lesser, but more frequent storms.

  The downstream portions of Canoe Brook and Slough Brook, as well as the land area bordering the Passaic River, are greatly influenced by high-water levels in the Passaic River. A historic flood in Livingston in the Passaic River Basin occurred during October 1903; however, because of the low level of development at that time, damages were not too severe. The storm of October 1903 was centered over Paterson, where a total of 15.5 inches of rainfall was recorded.

  A review of the great storms which have occurred in the northeastern states reveals that the Rahway River and its tributaries are located in the North Atlantic storm belt. Under extremely intensive and prolonged rains, the East Branch Rahway River; its tributary, Crooked Brook; and Lightning Brook, a tributary of the Elizabeth River, overflow their banks in the Township of Maplewood. Also some bridges over East Branch Rahway River are topped by floodwaters, thus making roads impassable.

- *Township of Maplewood* - At the time the FIS for the Township of Maplewood was published, local flooding was due mainly to poor drainage. The storm sewer system was originally designed for 5- to 10-percent-annual-chance storms and the storm sewer could not accommodate rainfall resulting from the 1-percent-annual-chance storm.

The Township of Maplewood has sustained damages from floods that have occurred in the past, with the historic floods occurring during July 1901, February 1902, October 1903, August 1927, July 1938, August 1955, September 1971, and August 2, 1973. The damaging storms occurred in Maplewood during the floods of August 2, 1973, and July 1938. The historic flooding occurred during the storm of October 1903; however, because of the absence of development in the community, damages were not as great as those caused by the August 2, 1973 flood.

- *Township of Montclair* - Flooding along the streams within the Township of Montclair is mainly caused by backwater that is created by inadequate pipes, box culverts, and bridges clogged by deposits of silt and debris. Shallow, rocky streambeds and heavy brush cover on overbanks also limit effective flow areas.

  The adjacent land area for the streams studied in detail in Montclair is affected by heavy rainfall, with the exception of a few areas where the channel is relatively wide and the banks are well stabilized. There are several other areas in the township, which, although not adjacent to a body of water, experience flooding due to an inadequate storm water drainage system.

  Montclair has sustained damages from past floods. The significant floods occurred during May 1968, August and September 1971, and on February 2, 1973. Floodwaters caused disruption in traffic, inundation of streets, interruption of businesses, danger to life, and flooding of homes.

- *City of Newark* - The City of Newark is subject to tidal flooding from the Passaic River and Newark Bay. Most of the flood problems occur in the south and eastwardly (Ironbound Section) adjacent to U.S. Route 22 and Frelinghuysen Avenue. Flooding always occurs when an annual peak rainfall coincides with a high tide in Newark Bay. This area is susceptible to flooding because of its flat topography and low elevations.

  A historic tide record was obtained in Newark during the October 1903 flood. The largest flood on record occurred August 28, 1971, with a peak discharge of approximately 6,500 cfs recorded at the USGS Second River at Belleville gage (no. 1392500). Due to drastic changes in urbanization over the gaging period a meaningful statistical return period could not be computed.

- *Borough of North Caldwell* – Due to the steep terrain through which it passes; the floodplain of Green Brook is confined and causes no major flood problems in the Borough.
- *Township of Nutley* - Flooding along the streams within the Township of Nutley is mainly attributable to backwater created by inadequate storm drains and culverts. Flooding that occurs from the culvert between Elm Street and Hillside Avenue on St. Pauls Branch is of particular concern to the township. The narrow, rocky channel and flat overbanks with heavy vegetation also contribute to the flooding problem. Even though some storms may last only a short period of time, heavy rainfall affects most of the adjacent land area along the streams within the community. Certain areas of River Road, which are parallel to the Passaic River, are subject to flooding during a rainstorm of high intensity.

  There are several other areas within the Township of Nutley that, although not adjacent to a body of water, experience flooding because the storm water drainage system is inadequate. Problems also occur due to flooding conditions in the Third River and St. Pauls Branch, causing backwater in the storm drainage system. Another source of flooding is sanitary sewer backup due to excessive infiltration of the storm waters into the sanitary sewer system.

- *City of Orange Township* – The floodplains of Wigwam Brook, the East Branch Rahway River, and the East Fork of East Branch Rahway River in the City of Orange Township have been encroached

upon to the point where most of them are developed. This encroachment has caused flood problems and damage from storms with recurrence intervals of less than one year.

The principal flood problems in the City of Orange Township are due to a combination of urbanization in the floodplain, manmade restrictions within the streams, and inadequate storm drainage. In a report prepared for the City of Orange Township and the Township of West Orange, it was determined that the approximate capacity of the East Fork of East Branch Rahway River between Forest Street and Central Avenue is only 90 cfs (Elson T. Killman Associates, Inc., 1977). The 1-percent-annual-chance flood at this location produces a flow of 560 cfs.

A significant flood along the East Fork of East Branch Rahway River occurred on August 28-29, 1971 (Tropical Storm Doria), and produced a discharge of 385 cfs at Mitchell Street (USACE, 1973). This discharge is equivalent to a flood with a recurrence interval of approximately 30 years. Flooding along Wigwam Brook is rather extensive throughout its length within the City of Orange Township corporate limits. Due to its highly developed floodplain, even minor flooding produces damage to residential and commercial structures.

- *Borough of Roseland* – Flooding within the Borough of Roseland occurs as a consequence of heavy rains usually resulting from localized thunderstorms and hurricanes during the summer and fall months. Due to the low permeability of certain soils, the high degree of development and less than adequate storm sewers in the borough, some areas are subject to frequent flooding and ponding of surface water. A damaging storm occurred on August 2, 1973, creating considerable overbank flooding along Passaic River, Foulerton's Brook, North Branch Foulerton's Brook, and Canoe Brook. This flood on Passaic River had an estimated return period of 83 years. Flooding associated with this storm caused traffic interruptions, property damage, siltation of streambeds, and erosion of embankments. Hurricane Irene on August 29-30, 2011, caused flooding on Passaic River and was estimated to have a 16-year return period.

  Problem flooding locations in Roseland identified at various times include area along Foulerton's Brook at Locust, Second, Third, and Fourth Avenues, all of which have experienced flooding during severe rainstorms. There are other areas along North Branch Foulerton's Brook at Gates, Mitchell, and Godfrey Avenues, Plymouth Place, Freeman Street, and Condit Court where overbank erosion occurred during the August 1973 storm.

- *Township of South Orange Village* – Due to the topography of the East Branch Rahway River, and the Township of South Orange Village's proximity to the headwaters of the river, flood peaks occur rapidly. The flood cycle usually lasts a matter of hours, and, in most cases, lasts less than a day. Local drainage area flooding in Township of South Orange Village follows the same pattern. The major flood damage has occurred in the business community, where the flood waters have entered first-floor levels of retail and service type establishments and businesses; in addition, flood damage has occurred to the basements of residences. Because the village is highly congested, even minor flooding causes damage to both public and private property and creates traffic hazards.

  The Rahway River and its tributaries are located in the North Atlantic Storm Belt and flooding of the East Branch Rahway River in South Orange occurs frequently. Overflow of the East Branch Rahway River causes a flood problem in the Township of South Orange Village, between the northern and southern boundaries of the village, for residential, commercial, industrial, and public facilities. The principal cause of the flooding is the inability of the existing channel to accommodate the precipitation runoff. This is partly due to bridge constrictions and low channel capacities caused by encroaching development.

The Township of South Orange Village has sustained damages from floods; the historic floods occurred during July 1901, February 1902, October 1903, August 1927, July 1938, August 1955, May 1968, September 1971, and August 1973. The damaging storms on record occurred in South Orange during the floods of July 1938. The historic flooding occurred during the storm of October 1903; however, because of the absence of development in the community, damages were not as great as those that occurred during the August 1973 flood.

- *Township of Verona* – The Township is subject to flooding from the Peckman River and its tributaries. All flooding sources flow in well-defined channels, within adjacent low-lying areas. Flooding occurs during times of excessive and prolonged rainfall, particularly in residential areas having steep slopes. The flooding is a result of high runoff combined with insufficient carrying capacity of bridge openings and culverts.
- *Township of West Caldwell* - Flooding in West Caldwell is a result of heavy rainfall produced by hurricanes moving up the coast, large frontal storms from the west and south, and local thunderstorms. Historic floods affecting the Township of West Caldwell occurred in 1902, 1903, 1936, and 1945. The 1903 flood, with an estimated peak discharge of 39,800 cfs at the confluence of the Passaic River and Newark Bay, inundated large areas, causing damage to buildings and disruption of transportation and utility lines (New Jersey, 1974). A storm similar to the one which caused the flood of 1903 would result today in a significantly larger area of inundation and greater discharges, due to the increased percentage of impervious areas (New Jersey, 1973). Flooding has occurred in 1968 and 1971, resulting in estimated damages in excess of 1 million dollars in this locality.

  The Passaic River flows along the western boundary of West Caldwell. The low areas in West Caldwell, adjacent to the Passaic River, are subject to flooding. Areas subject to inundation include residential, commercial, and park lands. The low flat areas adjacent to Pine, Green, and Kane Brooks in the lower reaches are also subject to flooding.

- *Township of West Orange* – The Township has been affected by flooding in most of the low-lying areas located along the numerous open stream courses within its boundaries. Several other areas are also affected by flooding due to poor drainage. In 2010, the Township of West Orange passed 2274-10 An Ordinance Amending and Supplementing Chapter 25 Section 28 of the General Ordinances of the Town of West Orange, Entitled "Steep Slope and Natural Features Ordinance" which amended the steep slope ordinance by placing additional restrictions of State open waters, wetlands, wetland transition areas, flood hazard areas, floodways and riparian zones. This amendment was warranted to prevent flooding, protect water quality, and preserve wildlife and aquatic habitat.

  A major flood area exists along the East Fork of the East Branch Rahway River in West Orange, east of Valley Road between Freeman Street and Kingsley Street. The flooding problem there, which is due to inadequate channel capacity, has been studied by the USACE (USACE, 1973). The upper portions of this stream are steeply sloped but as of the publication of the [date] countywide FIS report, requests have been made to the USACE and NJDEP to assess whether there is flood storage potential at golf courses and other open spaces as a part of the larger study underway to study flood mitigation alternatives in the Rahway River Basin.

  North Branch Wigwam Brook has had serious flooding problems in the vicinity of Harrison and Mississippi Avenues, and along most downstream parts of the improved channel. This is due to excessive velocity and lack of channel capacity, notably at Ashwood Terrace, Whittelsey Avenue, Watson Avenue, and Washington Avenue. South Branch Wigwam Brook has had serious flooding

reported in the vicinity of Watchung Avenue, Lakeside Avenue, Standish Avenue, and Ashland Avenue.

West Branch Rahway River has had flooding problems along its entire length from Northfield Avenue to Lake Vincent, although parts of this river flow through undeveloped or country club areas.

Along Peckman River, flooding has occurred between Nicholas Avenue and Kenz Terrace.

An area on the western boundary of the Township of West Orange known as the Merklin District is subject to frequent flooding due to inadequate pipe sewers and insufficient capacity of the existing storm water pumping station. The area flooded is centered between Hunterdon and Morris Roads and Westover and Tappan Terraces. The Mayfair District centered on Mayfair Drive in the north central part of the township is one such location plagued by flooding related to drainage issues. In this location flooding is caused by an inadequate storm water ejector system (Elson T. Killman Associates, Inc., 1972). The Township of West Orange has been moving forward with plans to undertake storm sewer improvements and in 2011 awarded construction contracts to begin the improvements to help alleviated flooding projects on several streets including Nestro Road, Midro Way, Mayfair Drive and Rosemont Terrace and Rosemont Drive. This project has been financed by a grant from the NJDEP and a loan from the New Jersey Environmental Infrastructure Trust.

Advisory Base Flood Elevation Maps

Prior to Superstorm Sandy, FEMA had begun a coastal flood study to update FIRMs for portions of New York and New Jersey using improved methods and data to better reflect coastal flood risk. The studies included data that were collected and analyzed over a number of years. After Superstorm Sandy in order to help in rebuilding and recovery efforts, FEMA released Advisory Base Flood Elevation (ABFE) maps which were based on best available data and the partially completed coastal flood study for the Atlantic coastal communities. FEMA is currently in the process of releasing preliminary work maps that include full results of the coastal flood study (FEMA Region II, Date Unknown).

ABFEs provide a better picture of current flood risk than the existing FIRMs. The new ABFEs are the recommended elevation of the lowest floor of a building. Some communities may require that the lowest floor be built above the ABFE. ABFEs more accurately reflect the true 1% annual chance flood hazard elevations in a given area. Following large storms, FEMA performs an assessment to determine whether the 1% annual chance flood event, shown on the effective FIRMs, adequately reflects the current flood hazard. In some cases, FEMA determines that ABFEs need to be produced, based on the age of the analysis and the science used to develop the effective FIRMs. ABFEs are provided to communities as a tool to support in the recovery process. ABFEs will aide in making those communities more resilient to future events (FEMA Region II Date Unknown).

The ABFE maps included delineated advisory flood hazard zones (Advisory Zone V, Advisory Zone A, and Advisory Zone X). The maps also included ABFE elevations for 1% and 0.2% annual chance flood elevations and the areas of Limit of Moderate Wave Action (LiMWA). Area and limit of structurally damaging wave action, and preliminary Superstorm Sandy high water marks will also be listed on the ABFE maps, along with coastal barrier resource areas (RiskMAP Date Unknown).

The State of New Jersey has adopted emergency amendments to the Flood Hazard Area Control Act Rules (N.J.A.C. 7:13) which incorporate the use of ABFEs to determine flood elevations. Under these amendments, flood elevations are now determined either using the higher of the ABFE, the effective BFE, or the design flood elevation shown on NJDEP flood maps; or site-specific calculations that demonstrate a different flood elevation (NJDEP 2013a). ABFEs and Advisory Flood Hazard Maps shall take precedence over previous

panels and FIS only in construction and development regulations. Where the SFHA and Advisory Flood Hazard Area maps conflict or overlap, the more stringent requirement will be used (NJDEP 2013b).

The ABFE maps were originally available for 10 New Jersey Counties: Atlantic, Bergen, Burlington, Cape May, Essex, Hudson, Middlesex, Monmouth, Ocean, and Union (RiskMAP Date Unknown).

Dam Failure

According to FEMA, three classification levels are adopted for dams: low, significant, and high. The classification levels build on each other. For example, the higher order classifications add to the list of consequences for the lower classification levels, as noted in Table 5.4.6-2. . This hazard classification system categorizes dams based on the probable loss of human life and the impacts where persons are only temporarily in the potential inundation area. The classification levels are as follows:

- **Low Hazard Potential** – Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are primarily limited to the owner's property.
- **Significant Hazard Potential** – Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant potential classification dams are often located in predominately rural or agricultural areas but could also be located in areas with population and significant infrastructure.
- **High Hazard Potential** – Dams assigned the high hazard potential classification are those where failure or misoperation will most likely cause loss of human life (FEMA, 2004).

Table 5.4.6-2. Hazard Potential Classification for Dams

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable; one or more expected	Yes (but not necessary for this classification)

Source: FEMA, 2004

According to the New Jersey Department of Environmental Protection (NJDEP), there are four hazard classifications of dams in New Jersey. The classifications relate to the potential for property damage and/or loss of life should the dam fail:

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

Refer to Figure 4-24 in the County Profile (Section 4) for dams located in Essex County. Below are descriptions of the dams located in the County according to the National Performance of Dams Program (NPDP) database (Table 5.4.6-3).

Table 5.4.6-3. Dams Located in Essex County

NPDP ID	Dam Name	Dam Type	Location	River	Dam Height (ft)	Dam Storage (acre-feet)
NJ00165	Canoe Brook Dam	Earth Gravity	East Orange	Passaic River	9	160
NJ00361	Orange Reservoir Dam	Earth Gravity	West Orange	West Branch of Rockaway River	34	245
NJ00386	Verona Lake Dam	Masonry	Verona	Peckman River	13	95
NJ00392	Cedar Grove West Res Dam	Earth Gravity	Cedar Grove	Offstream	55	2297
NJ00517	Campbells Pond Dam	Earth Gravity	Millburn	West Branch	18	21
NJ00525	Canoe Brook Reservoir #1 Dam	Earth Gravity	Millburn	Canoe Brook	25	3000
NJ00526	Canoe Brook Reservoir #2 Dam	Earth Gravity	Millburn	Canoe Brook - offstream	29	2200
NJ00527	Canoe Brook Reservoir #3 Dam	Earth Gravity	Livingston	Passaic River – offstream	57	6270
NJ00550	Canoe Brook Reservoir #3 Dike	Earth Gravity	Livingston	Canoe Brook – offstream	40	6000
NJS00031	Diamond Mill Pond Dam	N/A	N/A	N/A	N/A	N/A

Source: NPDP Multi-Attribute Dams Directory Query Summary, Date Unknown
N/A Not Available

It is required by the State of New Jersey that all High Hazard and Significant Hazard dams must have NJDEP-approved Emergency Action Plans in place. It is the responsibility of the dam owner to review and update the EAP on an annual basis. New Jersey Dam Safety Standards also require that are periodically inspected to identify conditions that may adversely affect the safety and functionality a dam its appurtenant structures; to note the extent of deterioration as a basis for long term planning, periodic maintenance or immediate repair; to evaluate conformity with current design and construction practices; and to determine the appropriateness of the existing hazard classification. Inspection guidelines, as identified in the State Hazard Mitigation Plan, are reproduced in Table 5.4.6-4. in brief. Complete inspection and operating requirements for dams can be found in the New Jersey Dam Safety Standards (N.J.A.C 7:20-1.11).

Table 5.4.6-4. New Jersey Dam Inspection Requirements

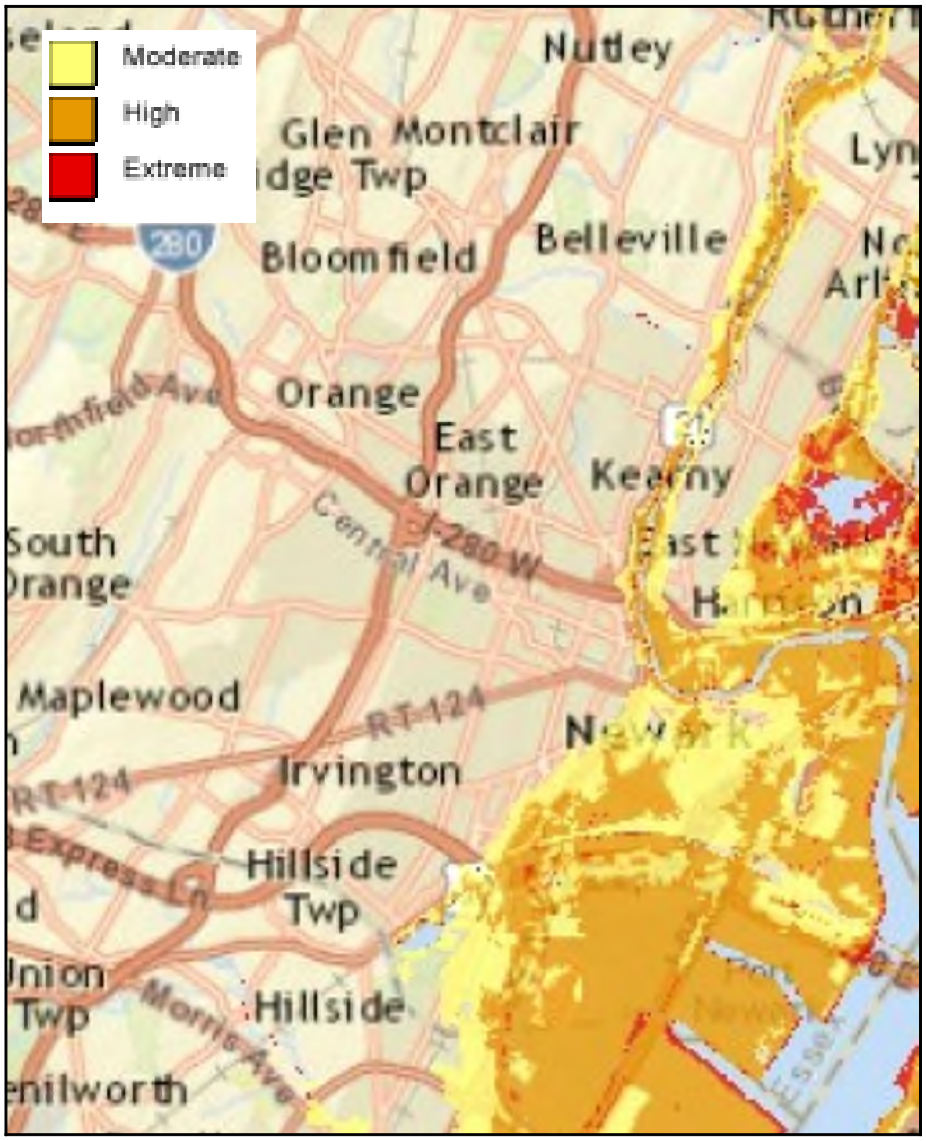
Dam Size/Type	Regular Inspection	Formal Inspection
Class I (High Hazard) Large Dam	Annually	Once every 3 years
Class I (High Hazard) Dam	Once every 2 years	Once every 6 years
Class II (Significant Hazard) Dam	Once every 2 years	Once every 10 years
Class III (Low Hazard) Dam	Once every 4 years	Only as required
Class IV (Zero Hazard) Dam	Once every 4 years	Only as required

In New Jersey, every dam in the State as defined in the Safe Dam Act, N.J.S.A. 58:4 is required to meet State dam safety standards. Dam Safety Laws provide the NJDEP with enforcement capabilities to achieve statewide compliance with dam safety standards. This includes issuing orders for compliance to dam owners, and pursuing legal action if the owner does not comply (with the goal of compliance and possible fines levied on a per-day basis for violations).

Coastal Flood Exposure

This figure below shows a ranking of coastal flooding exposure for the coastal areas of Essex County (Townships of Nutley and Belleville and the City of Newark). The areas exposed to flooding on a more frequent basis were given a higher ranking. Extreme exposure areas are those that are exposed relatively frequent flooding and include those areas subject to the most powerful wave impacts. All three municipalities are bordered to the east by the Passaic River. The municipalities all have a moderate to high exposure, with small areas of extreme exposure that are located along the Passaic River (NJADAPT 2014).

Figure 5.4.6-3. Coastal Flood Exposure in Essex County



Source: NJADAPT 2014

Extent

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

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

The 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% 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.

One hundred-year floodplains (or 1% annual chance floodplain) can be described as a bag of 100 marbles, with 99 clear marbles and one black marble. Every time a marble is pulled out from the bag, and it is the black marble, it represents a 100-year flood event. The marble is then placed back into the bag and shaken up again before another marble is drawn. It is possible that the black marble can be picked one out of two or three times in a row, demonstrating that a “100-year flood event” could occur several times in a row (Interagency Floodplain Management Review Committee 1994).

The 100-year flood, which is the standard used by most federal and state agencies, is used by the NFIP as the standard for floodplain management and to determine the need for flood insurance. A structure located within a SFHA shown on an NFIP map has a 26% chance of suffering flood damage during the term of a 30-year mortgage.

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

The term “500-year flood” is the flood that has a 0.2% 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% (500-year) flood has a 6% 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.

Dam Failure

The extent or magnitude of a dam failure event can be measured in terms of the classification of the dam. FEMA has three classification levels of dams: low, significant, and high. The classification levels build on each other. The hazard potential classification system should be utilized with the understanding that the failure of any dam or water-retaining structure could represent a danger to downstream life and property (FEMA 2004).

- Low hazard potential dams are those where failure or misoperation results is no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.
- Significant hazard potential dams are those where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominately rural or agricultural areas.
- High hazard potential dams are those where failure or misoperation will probably cause loss of human life.

USACE developed the classification system shown in Table 5.4.6-5 for the hazard potential of dam failures. USACE hazard rating systems is based only on the potential consequences of a dam failure; it does not take into account the probability of such failures.

Table 5.4.6-5. U.S. Army Corps of Engineers Hazard Potential Classification

Hazard Category[a]	Direct Loss of Life[b]	Lifeline Losses[c]	Property Losses[d]	Environmental Losses[e]
Low	None (rural location, no permanent structures for human habitation)	No disruption of services (cosmetic or rapidly repairable damage)	Private agricultural lands, equipment, and isolated buildings	Minimal incremental damage
Significant	Rural location, only transient or day-use facilities	Disruption of essential facilities and access	Major public and private facilities	Major mitigation required
High	Certain (one or more) extensive residential, commercial, or industrial development	Disruption of essential facilities and access	Extensive public and private facilities	Extensive mitigation cost or impossible to mitigate

Source: U.S. Army Corps of Engineers 1995

a. Categories are assigned to overall projects, not individual structures at a project.

b. Loss-of-life potential is based on inundation mapping of area downstream of the project. Analyses of loss-of-life potential should take into account the population at risk, time of flood wave travel, and warning time.

c. Lifeline losses include indirect threats to life caused by the interruption of lifeline services from project failure or operational disruption; for example, loss of critical medical facilities or access to them.

d. Property losses include damage to project facilities and downstream property and indirect impact from loss of project services, such as impact from loss of a dam and navigation pool, or impact from loss of water or power supply.

e. Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond what would normally be expected for the magnitude flood event under which the failure occurs

According to the NJDEP, there are four hazard classifications of dams in New Jersey. The classifications relate to the potential for property damage and/or loss of life in the event of a dam failure:

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

Table 5.4.6-6 summarizes the number of dams and their hazard classifications in Essex County.

Table 5.4.6-6. Number of Dams by County in Essex County

County	High Hazard	Significant Hazard	Low Hazard	Other	Total
Essex	8	3	14	8	33

Source: NJDEP 2013

Flood severity from a dam failure can be measured with a low, medium, or high severity level, which is further defined as follows:

- Low severity - No buildings are washed off their foundations; structures are exposed to floodwater depths of less than 10 feet.
- Medium severity - Homes are destroyed but trees or mangled homes remain for people to seek refuge in or on; structures are exposed to floodwater depths of more than 10 feet.
- High severity - Floodwaters sweep the area and nothing remains. Locations are flooded by the near instantaneous failure of a concrete dam, or an earthfill dam that turns into "jello" and washes out in seconds rather than minutes or hours. In addition, the flooding caused by the dam failure sweeps the area clean and little or no evidence of the prior human habitation remains after the floodwater recedes (Graham 1999).

Two factors that influence the potential severity of a full or partial dam failure are: (1) the amount of water impounded; and (2) the density, type, and value of development and infrastructure located downstream (City of Sacramento Development Service Department 2005).

Previous Occurrences and Losses

Many sources provided flooding information regarding previous occurrences and losses associated with flooding (riverine, inland, and stormwater) events throughout Essex County. With so many sources reviewed for the purpose of this Hazard Mitigation Plan (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.

Between 1954 and 2014, FEMA declared that the State of New Jersey experienced 26 flood-related disasters (DR) or emergencies (EM) classified as one or a combination of the following disaster types: hurricane, tropical storm, Nor'easter, snowstorm, severe storms, flooding, inland and coastal flooding, coastal storm, high tides, heavy rain, and severe storms. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Essex County was included in 12 of these declarations.

The 2007 Plan did not discuss specific flooding events that occurred in Essex County. For this 2015 Plan update, flood events were summarized from 2007 to 2014. Please note, between 2007 and 2014 there have been no dam failures or incidents in Essex County and the table will not include dam failure or incident events. Table 5.4.6-7 includes flooding events and FEMA disaster declarations that occurred between 2007 and 2014. With flood documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.6-7 may not include all events that have occurred throughout the County. Please see Section 9 for detailed information regarding impacts and losses to each municipality.

Table 5.4.6-7. Flooding Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
April 15-17, 2007	Severe Storm and Inland and Coastal Flooding (Nor'easter)	DR-1694	Yes	A Nor'easter brought heavy rain that caused widespread and significant river, stream, and urban flooding of low lying and poor drainage areas. Flooding resulted in two deaths and approximately $19 million damages. Rainfall totals ranged from 2.16 inches at Canoe Brook to 8.08 inches at Garret Mountain. In Essex County, rainfall totals ranged from 4.56 inches at the Orange Reservoir to 7.36 inches at Verona. Newark Airport had 6.63 inches of rain. Roads were closed throughout the County. There were widespread power outages and flooding of roadways and homes. There were evacuations in Fairfield Township due to flooded areas of the Township. In Belleville Township, a man was found next to his car on a flooded street. Overall, the County had approximately $4 million in damages from this event.
September 6-7, 2008	Tropical Storm Hanna	N/A	N/A	Tropical Storm Hanna impacted northeast New Jersey, making landfall near the Nassau/Suffolk County border on September 6th. Rainfall totals for this event ranged from 2.52 inches to 5.5 inches throughout New Jersey. The highest sustained wind speed of 39 mph and a peak gust of 45 mph was recorded at Newark Airport (Essex County). In Essex County, trees were reported down. Wind gusts ranged from 30 mph at Caldwell Airport to 45 mph at Newark International Airport. Rainfall totals in Essex County ranged from 3.75 inches at Newark Airport to 4.5 inches at the flood warning system gage in Canoe Brook. In the City of Newark, Meeker Avenue and Elizabeth Avenue were closed with cars floating due to flash flooding. McCarter Highway was closed due to flooding and Routes 1 and 9 were closed with cars stalled in flood waters. The Third River at Bloomfield exceeded its flood stage of 6 feet. The River crested at 7.37 feet and fell below flood stage on the 7th. The Peckman River at Verona exceeded its flood stage of 3.5 feet and crested at 4.10 feet. Water rescues were performed on Cortland Street in Belleville.
March 12 – April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	Between March 12th and 15th, heavy rain fell across parts of New Jersey. In Essex County, rainfall totals ranged from 4.06 inches in Caldwell Township to 5.19 inches in Newark. Peak wind gusts ranged from 45 mph in Newark to 55 mph in Caldwell Township. Numerous trees were down in Maplewood and Millburn Townships and in the Village of South Orange. In Cedar Grove Township, 0.25 inch hail covered the ground temporarily. Between March 22nd and 23rd, heavy rain fell in Essex County, with totals ranging from 1.20 inches in Newark to 2.16 inches in West Orange Township.

Table 5.4.6-7. Flooding Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				Between March 29th and March 31st, heavy rain fell in Essex County with totals ranging from 3.23 inches in Essex Fells Township to 3.97 inches in Verona Township. Peak wind gust of 43 mph was reported in Newark.
March 6-7, 2011	Heavy Rain	N/A	N/A	Rainfall totals in Essex County ranged from 1.97 inches at Newark Airport to 3.40 inches in Verona Township. In Bloomfield Township, flooding was reported on I-280 eastbound ramp to Exit 9 (Pleasant Ave/CR-660). The ramp was closed and detoured.
August 26 – September 5, 2011	Hurricane Irene	DR-4021	Yes	Hurricane Irene moved north along the Atlantic Coast, making landfall near Cape Lookout, North Carolina, on August 27th. The hurricane moved back over open water before making landfall for a second time at Little Egg Inlet in New Jersey on August 28th. This was the first time since 1903 that a hurricane made landfall in New Jersey. Rain fell for an 18-hour period, with totals ranging from six to eight inches across New Jersey. Higher amounts were observed in southwestern, central, and northeastern New Jersey. The heavy rain from the storm caused record-breaking floods on many streams throughout the State. Thirty-nine of the 94 USGS gages with greater than or equal to 20 years of record, had record high peaks. Thirty-three gages experienced peaks equal to or greater than the 100-year recurrence interval. NWS climate site at Newark recorded 8.92 inches of rain. In Essex County, in West Orange Township, nearly 15 homes were damaged from fallen trees. Emergency crews responded to 120 calls and closed several streets. Rainfall totals ranged from 7.32 inches in Essex Fells to 9.96 inches in Orange; with 7.69 inches falling at Newark Airport which was the highest one-day total for Newark Airport. Peak wind gusts of 40 mph and 61 mph were recorded at Caldwell and Newark Airports, respectively. In Belleville, downed trees were reported on Watchung Avenue. Overall, the municipalities experienced flooding, downed trees, power outages, flooding, evacuations, and over $1.8 million in clean-up and other costs to the municipalities. The Passaic River gage at the Passaic Valley Sewage Commission recorded a peak stage of 7.11 feet, 0.64 feet higher than the previous peak of record on March 13, 2010.
October 26 – November 8, 2012	Superstorm Sandy	DR-4048	Yes	As storm surge from Sandy was pushed into the New York and Raritan Bays, sea water piled up within the Hudson River and coastal waterways and wetlands of northeastern New Jersey, including Newark Bay, Passaic and Hackensack Rivers, Kill van Kull, and Arthur Kill. Mandatory evacuations of people living along the coasts and rivers in Union, Essex, and Hudson Counties. In Essex County, inundations of four to six feet were measured across Newark Bay in

Table 5.4.6-7. Flooding Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				Elizabeth and the area around Newark Airport. Storm tide at Newark was 11.6 feet with an estimated inundation (maximum depth of water on land) of 3.5 feet. The City of Newark had 7.65 inches of rainfall. Peak wind gusts ranged from 70 mph at Caldwell Airport to 78 mph at Newark Airport. In Fairfield, peak wind gusts measured at 72 mph and Reef Road flooded to Howard Street.. Overall, the municipalities of Essex County experienced flooding, power outages, evacuations, opening of shelters, and evacuations. The Passaic Valley Sewage Commission reported that the treatment plant in Newark was inundated with at five feet of water during the storm and 840 million gallons of untreated sewage flowed into the Newark Bay. Another three billion gallons of partially treated sewage was sent into the bay before secondary treatment was restored.
April 29 – May 1, 2014	Heavy Rain	N/A	N/A	Rainfall totals in Essex County ranged from 2.36 inches in the Borough of Essex Fells to 5.36 inches at Newark Airport. Many roads in Newark were closed due to flooding. Lanes were closed along the New Jersey Turnpike in Newark as well.

Source: FEMA 2014; NCDC 2013; NWS 2014; SPC 2012; NJ HMP 2012; USGS 2011; NHC 2012; NOAA 2012
DR Disaster Declaration (FEMA)
FEMA Federal Emergency Management Agency
Mph miles per hour
N/A Not Applicable

Probability of Future Occurrences

Given the history of flood events that have impacted Essex County, it is apparent that future flooding of varying degrees will occur. The fact that the elements required for flooding exist and that major flooding has occurred throughout the county in the past suggests that many people and properties are at risk from the flood hazard in the future. It is estimated that Essex County will continue to experience direct and indirect impacts of flooding events annually that may induce secondary hazards such as coastal erosion, storm surge in coastal areas, infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, and transportation delays, accidents and inconveniences.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for drought in the County is considered 'frequent' (likely to occur within 25 years, as presented in Table 5.3-3).

Climate Change Impacts

The climate of New Jersey is already changing and will continue to change over the course of this century. Since 1900, temperatures in the northeastern U.S. have increased an average of 1.5 degrees Fahrenheit (°F). The majority of this warming has occurred since 1970. From 1970 to 2010, average temperatures in New Jersey have increased 1.2°F (Office of the New Jersey State Climatologist [ONJSC] 2013). In terms of winter temperatures, the northeast region has seen an increase in the average temperature of 4°F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007).

By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F, and by 2080 projections show an increase of 4°F to 7.5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013). These trends will certainly affect the probability and frequency of blizzard and snow events as well as ice storms in the State.

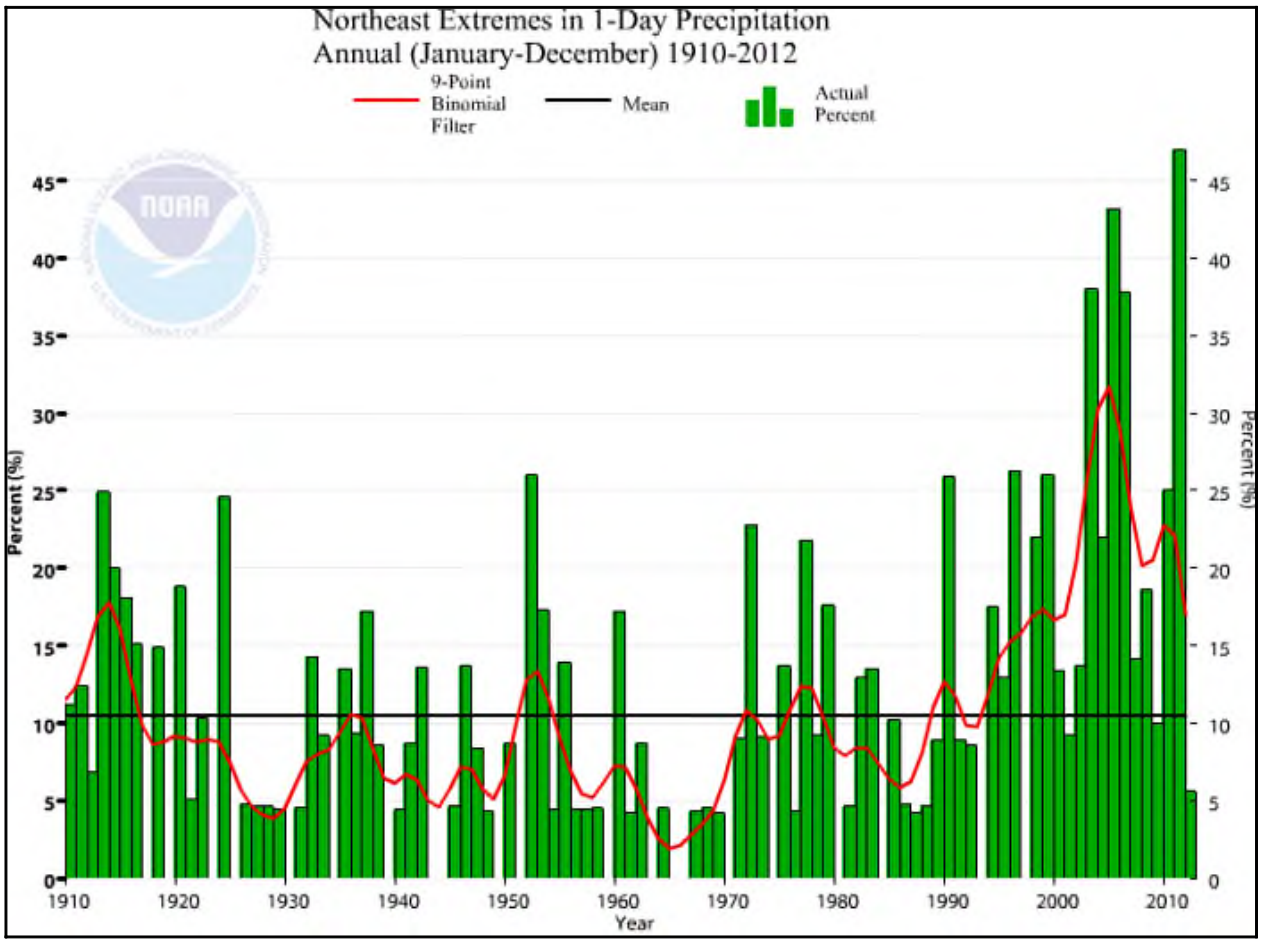
In 2012, New Jersey's statewide average temperature was the highest in 118 years of records. The 56°F average for 2012 is 2.8°F above the 1971 to 2010 mean. Nine of the 10 warmest calendar years on record have occurred since 1990, and the five warmest years have occurred since 1998. This is consistent with the long-term upward trend of 2.2°F increase per century. Abnormal warmth was common through much of 2012, with only one month (November) recording temperatures below the 1981 to 2010 average (Rutgers Climate Institute 2013).

In addition to the effect of increased temperatures, precipitation is expected to increase over the next several decades. Average annual precipitation is projected to increase in the region by 5% by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months, where a 20% to 30% increase is expected late in this century (New York City Panel on Climate Change [NPCC] 2009). Although precipitation is expected to increase, extreme precipitation is the most likely concern for New Jersey. Extreme precipitation has the potential to cause significant flooding and in the winter produce heavy snowfall. While exact projections are not available, it is estimated that the New York City region will see an increase of 10% to 25% of the frequency of intense precipitation events (Sustainable Jersey Climate Change Adaptation Task Force 2013).

Precipitation during 2012 was slightly below normal, averaging 43.21 inches statewide. It ranked as the eighth driest calendar year of the past 30 years. The central coastal area was wettest in 2012, with several stations in Ocean and Burlington Counties receiving more than 53 inches. Over the long term, there has been an upward

trend in annual precipitation in New Jersey. Since 1895, annual precipitation has increased at a rate of 4.1 inches per century. Heavy precipitation events have increased in the past 20 years and it is expected that this trend may continue (Rutgers Climate Institute 2013). Figure 5.4.6-4 shows the frequency of heavy precipitation events in the northeastern U.S.

Figure 5.4.6-4. Frequency of Heavy Precipitation Events in the Northeastern U.S., 1910 to 2010



Source: Rutgers Climate Institute 2013

With this increase in frequency of precipitation, New Jersey may experience more flooding events. More intense, frequent flooding could lead to significant habitat loss for wildlife. Salt marshes and estuaries that serve as critical feeding grounds for birds and waterfowl, and as nursery habitats for commercial fish, could be lost (State of New Jersey 2010). Climate change may also lead to sea level rise which will lead to more frequent and extensive flooding. See Section 5.4.1 (Coastal Erosion) for detailed information regarding sea level rise (NJDEP 2013c).

5.4.6.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed and vulnerable in the identified hazard area. For the flood hazard, areas identified as hazard areas include the 1-percent and 0.2-percent annual chance flood event boundaries (Figure 5.4.5-4). The following text evaluates and estimates the potential impact of flooding for Essex County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

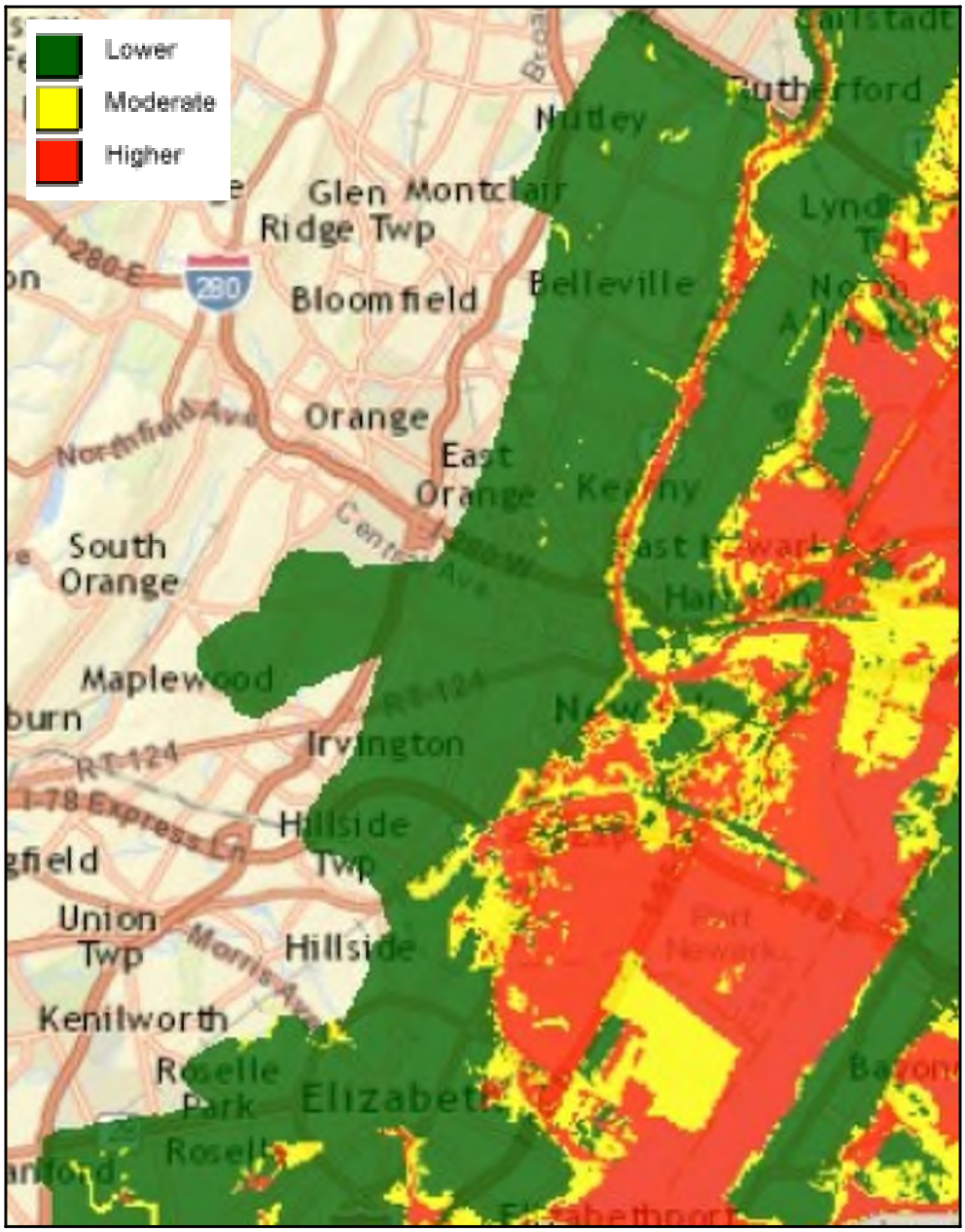
Overview of Vulnerability

Flood is a significant concern for Essex County. To assess vulnerability, exposure to the 1- and 0.2-percent annual chance flood events was examined and potential losses were calculated for 1- percent annual chance flood event using Hazus-MH. The flood hazard exposure and loss estimate analysis is presented below.

Coastal Vulnerability Index (CVI)

The CVI was developed by NJDEP to help coastal communities assess their vulnerability to coastal hazards. The CVI is developed by compositing six geospatial indicators: coastal geomorphology, slope, soil drainage, flood prone areas (FEMA), storm surge (SLOSH), and sea level rise. The figure below shows areas vulnerable to coastal flooding in Essex County. A majority of the Townships of Nutley and Belleville have a lower CVI with small areas of moderate and higher vulnerability along the Passaic River. As for the City of Newark, the western half of the City has a lower vulnerability, where the eastern half has a higher vulnerability to coastal flooding with areas of lower and moderate vulnerability. Newark Liberty International Airport and Port Newark are shown as having a higher vulnerability to coastal flooding (NJADAPT 2014).

Figure 5.4.6-5. Coastal Vulnerability Index in Essex County



Source: NJADAPT 2014

Data and Methodology

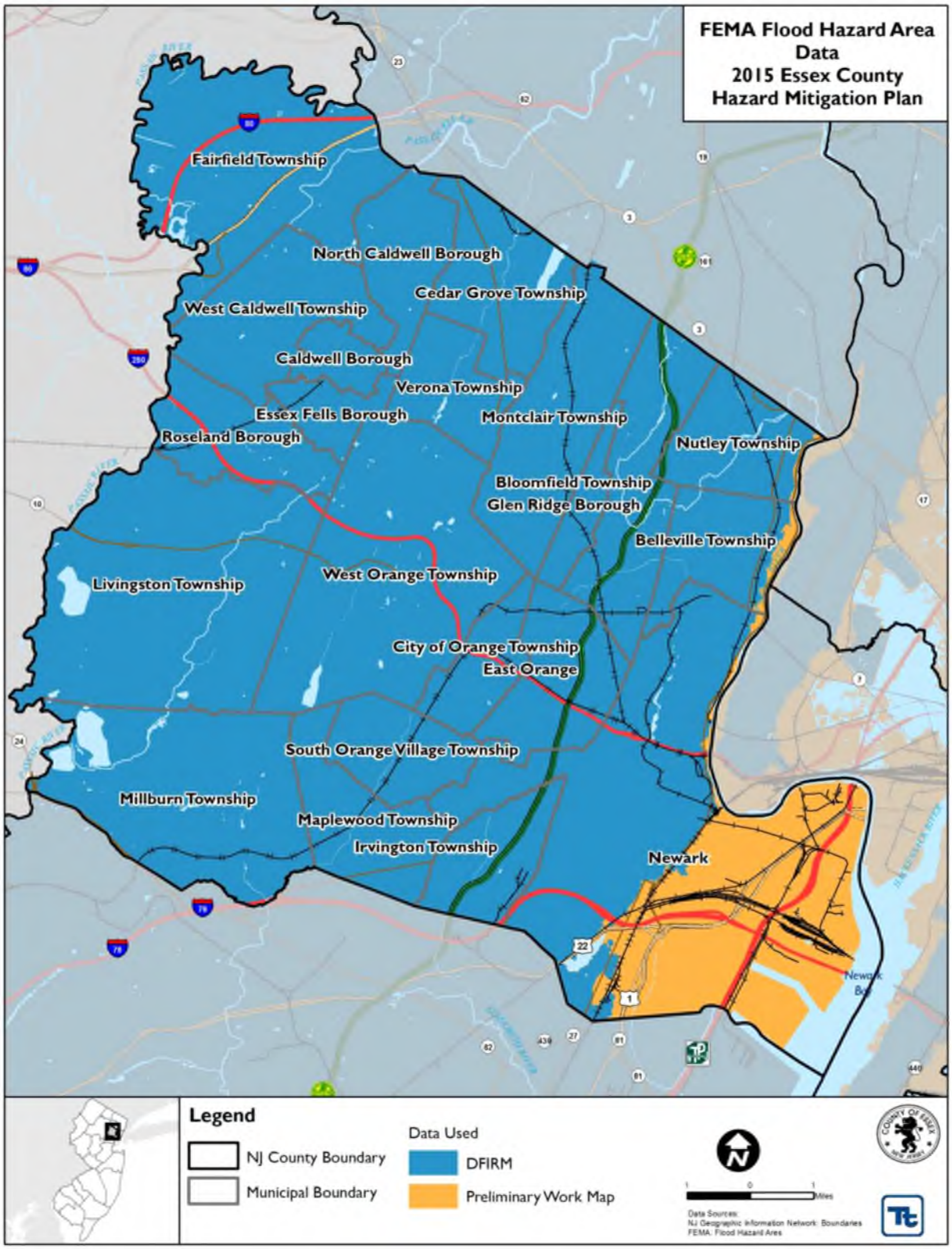
The 1- and 0.2-percent annual chance flood events were examined to evaluate the County's risk to the flood hazard. These flood events are generally those considered by planners and evaluated under federal programs such as the NFIP.

The 1-percent annual chance flood event was examined to evaluate the County's risk and vulnerability to the flood hazard. The FEMA preliminary work map released in July 2013 and FEMA DFIRM from 2007, for the remainder of the County, were used to evaluate the County's exposure to this hazard. The data used for this analysis is shown in Figure 5.4.5-6.

To estimate potential losses, the Hazards U.S. Multi-Hazard (Hazus-MH) flood model was used. Preliminary work map depth grids for the coastal areas provided by NJDEP were incorporated into Hazus-MH. Where existing depth grids were not available, approximate depth grids were generated using the DFIRM databases for detailed study areas or Hazus-MH for reaches without detailed studies. The digital elevation models (DEM) provided by New Jersey Office of Information Technology were used to generate the depth grids. The depth grids were integrated into Hazus-MH and the model was run to estimate potential losses at the structure level using the County's custom structural building inventory.

The Hazus-MH model uses 2000 U.S. Census demographic data. This data was not updated for this analysis; however, the 2010 U.S. Census data was used to estimate population exposure to provide the best available output. In addition, to estimate exposure, the DFIRM flood boundaries were used. Hazus-MH 2.1 calculated the estimated damages to the general building stock and critical facilities based on the depth grid generated and the default Hazus damage functions in the flood model.

Figure 5.4.6-6. Essex County Risk Assessment Flood Data



Source: FEMA

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.

To estimate the population exposed to the 1- and 0.2-percent flood events, the floodplain boundaries were overlaid upon the 2010 Census population data in GIS (U.S. Census 2010). The 2010 Census blocks with their centroid in the flood boundaries were used to calculate the estimated population exposed to this hazard.

Census blocks do not follow the boundaries of the floodplain and can grossly over or under estimate the population exposed when using the centroid or intersects of the Census block with the flood zones. The limitations of these analyses are recognized, and as such the results are only used to provide a general estimate.

The calculation of the 0.2-percent annual chance flood event results is cumulative in nature, as the population exposed to the 1-percent flood event will also be exposed to the 0.2-percent annual chance flood event. Using this approach, it was estimated that 30,213 people are exposed to the 1-percent annual chance event and 50,396 people are exposed to the 0.2-percent annual chance flood event. Table 5.4.6-8 lists the estimated population located within the 1- and 0.2-percent annual chance flood boundaries by municipality.

Table 5.4.6-8. Estimated Population Exposed to the Flood Hazard

Municipality	Total Population	SFHA		0.2-Percent Chance Event	
		Number	% of Total	Number	% of Total
Township of Belleville	35,926	1,371	3.8%	2,170	6.0%
Township of Bloomfield	47,315	2,948	6.2%	2,948	6.2%
Borough of Caldwell	7,822	0	0.0%	0	0.0%
Township of Cedar Grove	12,411	52	0.4%	52	0.4%
City of East Orange	64,270	277	0.4%	277	0.4%
Borough of Essex Fells	2,113	0	0.0%	0	0.0%
Township of Fairfield	7,466	3,711	49.7%	5,250	70.3%
Borough of Glen Ridge	7,527	15	0.2%	15	0.2%
Township of Irvington	53,926	519	1.0%	814	1.5%
Township of Livingston	29,366	1,080	3.7%	1,243	4.2%
Township of Maplewood	23,867	297	1.2%	297	1.2%
Township of Millburn	20,149	223	1.1%	1,483	7.4%
Township of Montclair	37,669	1,390	3.7%	1,647	4.4%
City of Newark	277,140	10,464	3.8%	25,357	9.1%
Borough of North Caldwell	6,183	5	0.1%	37	0.6%
Township of Nutley	28,370	1,480	5.2%	1,565	5.5%
City of Orange Township	30,134	2,318	7.7%	2,321	7.7%
Borough of Roseland	5,819	321	5.5%	407	7.0%
Township of South Orange Village	16,198	394	2.4%	394	2.4%
Township of Verona	13,332	129	1.0%	314	2.4%
Township of West Caldwell	10,759	832	7.7%	832	7.7%
Township of West Orange	46,207	2,387	5.2%	2,973	6.4%
Essex County (Total)	**783,969**	**30,213**	**3.9%**	**50,396**	**6.4%**

Sources: U.S. Census 2010; FEMA
Note: SFHA = Special Flood Hazard Area is the 1-percent chance event.

The table above shows that approximately 3.9 percent of the total population is exposed to the 1-percent annual chance flood event (both riverine and coastal) and that approximately 6.4 percent of the total population is exposed to the 0.2-percent annual chance flood event. For this project, the potential population impacted is used as a guide. Because the estimated population exposed to flooding does not include storm surge, this is a conservative estimate and may be higher if multiple impacts occur (see Section 5.4.7 Hurricane).

Of the population exposed, the most vulnerable include the economically disadvantaged and the population over the age of 65. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the net economic impact to their family. The population over the age of 65 is also more vulnerable because they are more likely to seek or need medical attention which may not be available to due isolation during a flood event and they may have more difficulty evacuating.

Using 2000 U.S. Census data, HAZUS-MH 2.1 estimates the potential sheltering needs as a result of a 1-percent chance flood event. For the 1-percent flood event, HAZUS-MH 2.1 estimates 40,350 households will be displaced and 33,899 people will seek short-term sheltering. These statistics, by municipality, are presented in Table 5.4.6-9.

Table 5.4.6-9. Estimated Population Displaced or Seeking Short-Term Shelter from the 1-Percent Annual Chance Flood Event

Municipality	U.S. Census 2010 Population	1-Percent Annual Chance Event	
		Displaced Households	Persons Seeking Short-Term Sheltering
Township of Belleville	35,926	1,743	1,557
Township of Bloomfield	47,315	4,058	3,669
Borough of Caldwell	7,822	38	35
Township of Cedar Grove	12,411	136	67
City of East Orange	64,270	679	592
Borough of Essex Fells	2,113	34	10
Township of Fairfield	7,466	6,040	5,577
Borough of Glen Ridge	7,527	110	36
Township of Irvington	53,926	966	738
Township of Livingston	29,366	1,203	616
Township of Maplewood	23,867	443	284
Township of Millburn	20,149	1,816	1,623
Township of Montclair	37,669	1,781	1,310
City of Newark	277,140	11,246	9,047
Borough of North Caldwell	6,183	43	4
Township of Nutley	28,370	3,246	2,878
City of Orange Township	30,134	3,117	2,902
Borough of Roseland	5,819	334	208
Township of South Orange Village	16,198	89	27
Township of Verona	13,332	469	353

Table 5.4.6-9. Estimated Population Displaced or Seeking Short-Term Shelter from the 1-Percent Annual Chance Flood Event

Municipality	U.S. Census 2010 Population	1-Percent Annual Chance Event	
		Displaced Households	Persons Seeking Short-Term Sheltering
Township of West Caldwell	10,759	877	775
Township of West Orange	46,207	1,882	1,591
Essex County (Total)	**783,969**	**40,350**	**33,899**

The total number of injuries and casualties resulting from flooding is generally limited based on advance weather forecasting, blockades and warnings. Therefore, injuries and deaths generally are not anticipated if proper warning and precautions are in place. Ongoing mitigation efforts should help to avoid the most likely cause of injury, which results from persons trying to cross flooded roadways or channels during a flood.

Impact on General Building Stock

After considering the population exposed and vulnerable to the flood hazard, the built environment was evaluated. Exposure in the flood zone includes those buildings located in the flood zone. Potential damage is the modeled loss that could occur to the exposed inventory, including structural and content value.

The total land area located in the 1-percent and 0.2-percent annual chance flood zones was calculated for each jurisdiction, as presented in Table 5.4.6-10. To provide a general estimate of the structural/content replacement value exposure, the 1- and 0.2-percent DFIRM flood boundaries were overlaid upon the County's updated building stock inventory at the structure level. The buildings with their centroid in the flood boundary were totaled for each municipality. Table 5.4.6-11 summarizes these results. In summary, there 6,292 buildings located in the 1-percent annual chance flood boundary with an estimated $3.5 billion of building/contents exposed (based on improvement value). This represents approximately 4.2% of the County's total general building stock inventory (approximately $84 billion).

There 10,744 buildings located in the 0.2-percent annual chance flood boundary with an estimated $5 billion of building/contents exposed. This represents approximately 6.1% of the County's total general building stock inventory.

Table 5.4.6-10. Total Land Area Located in the 1-Percent Annual Chance Flood Zones (Acres)

Municipality	Total Area (acres)	1% Flood Event Hazard Area				0.2% Flood Event Hazard Area	
		A-Zone Area (acres)	% of Total	V-Zone Area (acres)	% of Total	Area (acres)	% of Total
Township of Belleville	2,156	195	9.0%	0	0.0%	297	13.76%
Township of Bloomfield	3433.63	394	11.5%	0	0.0%	406	11.81%
Borough of Caldwell	758	6	0.8%	0	0.0%	7	0.86%
Township of Cedar Grove	2,791	49	1.7%	0	0.0%	58	2.08%
City of East Orange	2514.07	42	1.7%	0	0.0%	42	1.68%
Borough of Essex Fells	906.13	9	1.0%	0	0.0%	64	7.10%
Township of Fairfield	6618.41	4,928	74.5%	0	0.0%	5,709	86.25%

Table 5.4.6-10. Total Land Area Located in the 1-Percent Annual Chance Flood Zones (Acres)

Municipality	Total Area (acres)	1% Flood Event Hazard Area				0.2% Flood Event Hazard Area	
		A-Zone Area (acres)	% of Total	V-Zone Area (acres)	% of Total	Area (acres)	% of Total
Borough of Glen Ridge	818	15	1.8%	0	0.0%	16	1.92%
Township of Irvington	1865.65	23	1.2%	0	0.0%	56	3.00%
Township of Livingston	9,040	1,215	13.4%	0	0.0%	1,300	14.38%
Township of Maplewood	2,480	116	4.7%	0	0.0%	127	5.13%
Township of Millburn	6324.45	823	13.0%	0	0.0%	1,030	16.29%
Township of Montclair	3,995	151	3.8%	0	0.0%	185	4.64%
City of Newark	16,778	6,462	38.5%	6	0.0%	9,739	58.05%
Borough of North Caldwell	1967.6	23	1.2%	0	0.0%	45	2.28%
Township of Nutley	2,186	172	7.9%	0	0.0%	219	10.02%
City of Orange Township	1,418	115	8.1%	0	0.0%	126	8.91%
Borough of Roseland	2,361	459	19.5%	0	0.0%	500	21.20%
Township of South Orange Village	1,822	43	2.4%	0	0.0%	43	2.36%
Township of Verona	1,796	65	3.6%	0	0.0%	79	4.39%
Township of West Caldwell	3,239	844	26.1%	0	0.0%	910	28.09%
Township of West Orange	7,756	286	3.7%	0	0.0%	349	4.50%
Essex County (Total)	**83,023**	**16,435**	**19.8%**	**6**	**0.0%**	**21,307**	**25.66%**

Source: FEMA 2009
Note: % = Percent
The area presented includes the area of inland waterways and excludes bays or oceans.

Table 5.4.6-11. Estimated General Building Stock Exposure to the 1-Percent Annual Chance Flood Event – All Occupancies

Municipality	Total # Buildings	Total Improvement Value	Total (All Occupancies) A-Zone			
			# Buildings	% Total	Improvement Value	% Total
Township of Belleville	9,154	$2,905,447,150	440	4.8%	$83,204,500	2.9%
Township of Bloomfield	11,383	$3,827,312,350	663	5.8%	$146,461,100	3.8%
Borough of Caldwell	2,116	$753,639,775	0	0.0%	$0	0.0%
Township of Cedar Grove	3,815	$1,657,089,082	28	0.7%	$7,468,600	0.5%
City of East Orange	9,310	$5,820,599,879	74	0.8%	$29,909,900	0.5%
Borough of Essex Fells	760	$567,106,700	0	0.0%	$0	0.0%
Township of Fairfield	3,169	$3,374,787,200	1,368	43.2%	$913,892,000	27.1%
Borough of Glen Ridge	2,214	$986,279,500	37	1.7%	$6,242,700	0.6%
Township of Irvington	9,312	$2,820,388,050	61	0.7%	$10,560,000	0.4%
Township of Livingston	9,510	$5,547,703,530	204	2.1%	$76,523,300	1.4%
Township of Maplewood	7,275	$2,733,369,500	84	1.2%	$22,112,500	0.8%

Municipality	Total # Buildings	Total Improvement Value	Total (All Occupancies) A-Zone # Buildings	% Total	Improvement Value	% Total
Township of Millburn	6,291	$8,045,533,450	28	0.4%	$31,354,200	0.4%
Township of Montclair	10,486	$5,890,125,479	354	3.4%	$92,296,100	1.6%
City of Newark	38,329	$18,709,618,398	1,798	4.7%	$1,753,302,799	9.4%
Borough of North Caldwell	1,951	$1,431,441,250	6	0.3%	$3,372,100	0.2%
Township of Nutley	8,884	$3,510,270,592	294	3.3%	$75,015,335	2.1%
City of Orange Township	4,354	$1,867,401,350	432	9.9%	$94,477,950	5.1%
Borough of Roseland	1,616	$1,435,628,250	46	2.8%	$47,680,600	3.3%
Township of South Orange Village	4,508	$3,108,688,125	4	0.1%	$625,900	0.0%
Township of Verona	3,907	$1,598,018,325	75	1.9%	$12,165,750	0.8%
Township of West Caldwell	3,634	$2,040,951,278	36	1.0%	$49,759,100	2.4%
Township of West Orange	12,688	$5,503,784,816	260	2.0%	$83,031,900	1.5%
Essex County (Total)	**164,666**	**$84,135,184,028**	**6,292**	**3.8%**	**$3,539,456,334**	**4.2%**

Source: Essex County Planning Department, 2014; FEMA
Note: # = Number; % = Percent.
There are no buildings located in the V-zone in the City of Newark.

Table 5.4.6-12. Estimated General Building Stock Exposure to the 0.2-Percent Annual Chance Flood Event – All Occupancies

Municipality	Total # Buildings	Total Improvement Value	Total (All Occupancies) 0.2-Percent # Buildings	% Total	Improvement Value	% Total
Township of Belleville	9,154	$2,905,447,150	648	7.1%	$118,348,300	4.1%
Township of Bloomfield	11,383	$3,827,312,350	664	5.8%	$150,208,400	3.9%
Borough of Caldwell	2,116	$753,639,775	0	0.0%	$0	0.0%
Township of Cedar Grove	3,815	$1,657,089,082	44	1.2%	$12,547,500	0.8%
City of East Orange	9,310	$5,820,599,879	74	0.8%	$29,909,900	0.5%
Borough of Essex Fells	760	$567,106,700	24	3.2%	$8,968,300	1.6%
Township of Fairfield	3,169	$3,374,787,200	2,262	71.4%	$1,348,087,100	39.9%
Borough of Glen Ridge	2,214	$986,279,500	39	1.8%	$6,698,200	0.7%
Township of Irvington	9,312	$2,820,388,050	207	2.2%	$29,819,500	1.1%
Township of Livingston	9,510	$5,547,703,530	259	2.7%	$89,072,500	1.6%
Township of Maplewood	7,275	$2,733,369,500	114	1.6%	$31,958,300	1.2%
Township of Millburn	6,291	$8,045,533,450	438	7.0%	$264,936,200	3.3%
Township of Montclair	10,486	$5,890,125,479	429	4.1%	$110,489,100	1.9%
City of Newark	38,329	$18,709,618,398	3,988	10.4%	$2,429,236,199	13.0%
Borough of North Caldwell	1,951	$1,431,441,250	27	1.4%	$8,079,900	0.6%
Township of Nutley	8,884	$3,510,270,592	348	3.9%	$102,032,035	2.9%
City of Orange Township	4,354	$1,867,401,350	481	11.0%	$102,907,850	5.5%
Borough of Roseland	1,616	$1,435,628,250	95	5.9%	$57,690,000	4.0%
Township of South Orange Village	4,508	$3,108,688,125	4	0.1%	$625,900	0.0%
Township of Verona	3,907	$1,598,018,325	103	2.6%	$22,911,750	1.4%
Township of West Caldwell	3,634	$2,040,951,278	54	1.5%	$59,851,900	2.9%
Township of West Orange	12,688	$5,503,784,816	442	3.5%	$117,981,900	2.1%

Municipality	Total # Buildings	Total Improvement Value	Total (All Occupancies) 0.2-Percent			
			# Buildings	% Total	Improvement Value	% Total
Essex County (Total)	**164,666**	**$84,135,184,028**	**10,744**	**6.5%**	**$5,102,360,734**	**6.1%**

Source: Essex County Planning Department, 2014
Note: # = Number; % = Percent.

The Hazus-MH model estimated potential damages to the buildings in Essex County at the structure level using the custom County structure inventory developed for this plan. The potential damage estimated by Hazus-MH to the general building stock inventory associated with the 1-percent annual chance flood is nearly $1 billion or 1.2-percent of the total building stock improvement value. The potential damage estimated by Hazus-MH to the residential general building stock inventory associated with the 1-percent annual chance flood is $155 million or less than one-percent of the total building stock improvement value.

Table 5.4.6-13. Estimated General Building Stock Potential Loss to the 1-Percent Annual Chance Flood Event

Municipality	Total Improvement Value	1% Annual Chance Event			
		All Occupancies		Residential	
		Estimated Loss	% of Total	Estimated Loss	% of Total
Township of Belleville	$2,905,447,150	$14,727,102	0.51	$6,250,925	0.22
Township of Bloomfield	$3,827,312,350	$44,453,919	1.16	$22,759,741	0.59
Borough of Caldwell	$753,639,775	$0	0.00	$0	0
Township of Cedar Grove	$1,657,089,082	$934,218	0.06	$837,063	0.05
City of East Orange	$5,820,599,879	$3,781,469	0.06	$728,229	0.01
Borough of Essex Fells	$567,106,700	$0	0.00	$0	0
Township of Fairfield	$3,374,787,200	$196,854,299	5.83	$45,773,911	1.36
Borough of Glen Ridge	$986,279,500	$850,646	0.09	$513,952	0.05
Township of Irvington	$2,820,388,050	$4,665,426	0.17	$2,579,471	0.09
Township of Livingston	$5,547,703,530	$22,064,214	0.40	$6,313,529	0.11
Township of Maplewood	$2,733,369,500	$5,367,294	0.20	$808,868	0.03
Township of Millburn	$8,045,533,450	$45,443,264	0.56	$18,811,390	0.23
Township of Montclair	$5,890,125,479	$11,451,898	0.19	$7,761,541	0.13
City of Newark	$18,709,618,398	$549,978,470	2.94	$14,043,240	0.08
Borough of North Caldwell	$1,431,441,250	$256,105	0.02	$90,529	0.01
Township of Nutley	$3,510,270,592	$20,594,918	0.59	$10,279,065	0.29
City of Orange Township	$1,867,401,350	$22,359,052	1.20	$9,773,874	0.52
Borough of Roseland	$1,435,628,250	$21,002,571	1.46	$551,437	0.04
Township of South Orange Village	$3,108,688,125	$146,547	0.00	$0	0
Township of Verona	$1,598,018,325	$3,429,678	0.21	$2,977,509	0.19
Township of West Caldwell	$2,040,951,278	$4,135,824	0.20	$574,587	0.03
Township of West Orange	$5,503,784,816	$18,895,034	0.34	$4,248,434	0.08
Essex County (Total)	**$84,135,184,028**	**$991,391,949**	**1.18**	**$155,677,297**	**0.19**

Source: Hazus-MH v2.1; Essex County Planning Department, 2014
Note: % = Percent.
Dollar loss is based on the improvement value of the structure as provided by Essex County and estimated content value.

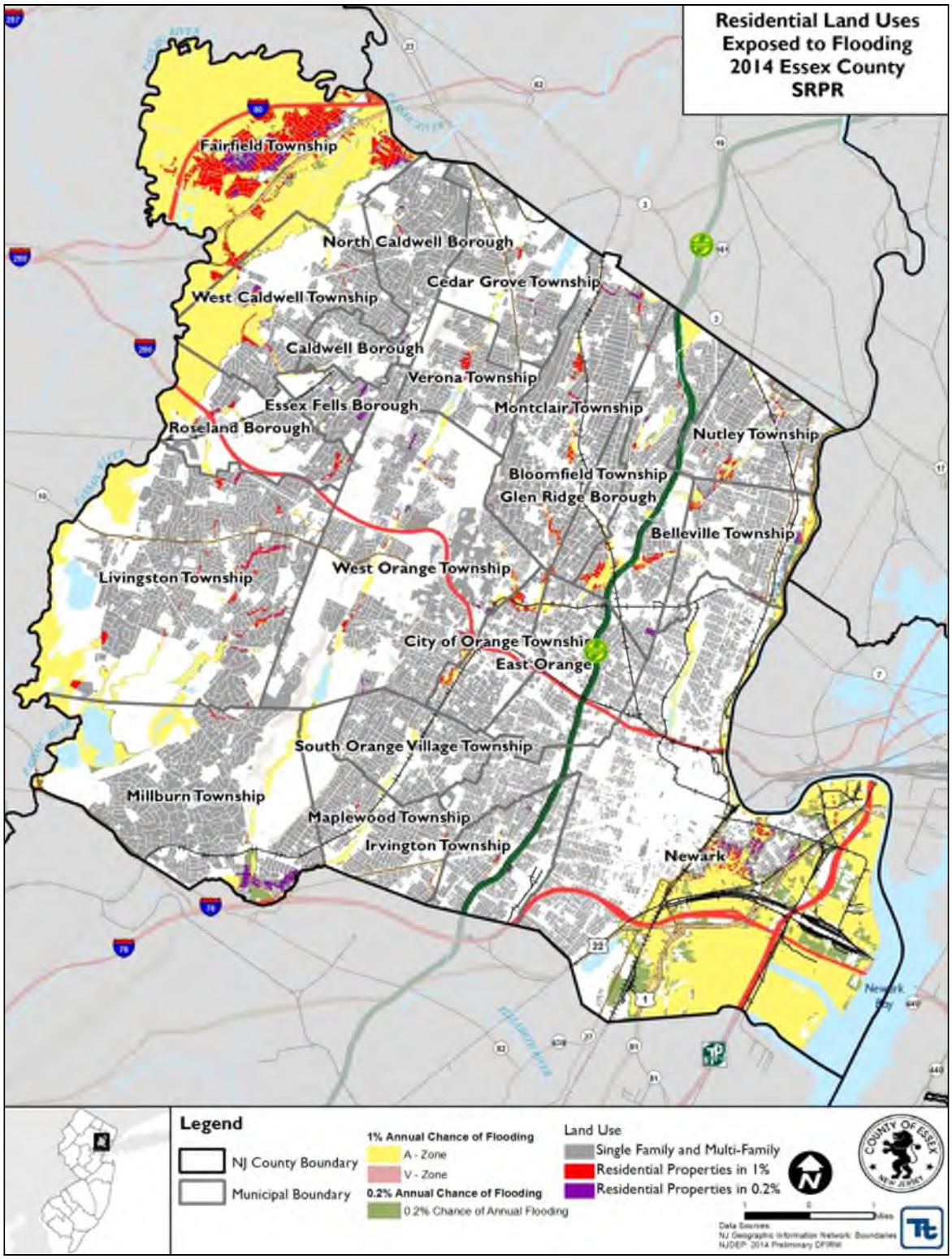
Impact on Land Uses

An exposure analysis was completed to assess the vulnerability of the residential and non-residential land uses within the County to flooding. To estimate the land use exposure to the 1- and 0.2-percent flood events, the floodplain boundaries were overlaid upon the 2014 parcel data in GIS (2014 Essex County Planning) and used to calculate the estimated the number and area of residential and non-residential properties exposed to this hazard.

The analysis shows while most of the residential properties in the County are not vulnerable to flooding, the majority of the residential properties in Fairfield Township are vulnerable. In Fairfield Township approximately 74-percent of the total residential land use acreage and 82-percent of the residential properties are located in the 1-percent annual chance of flooding flood hazard area. Approximately 88-percent of the total residential land use area and 89-percent the residential properties are located in the 0.2-percent annual chance of flooding flood hazard area.

The analysis shows approximately 38-percent of the total acreage of non-residential properties in the County are vulnerable to flooding. In Fairfield Township, approximately 90% of the total non- residential land use acreage and 88-percent of the non-residential properties are located in the 1-percent annual chance of flooding flood hazard area. Approximately 92-percent of the total non-residential land use area and 93-percent of the non-residential properties are located in the 0.2-percent annual chance of flooding flood hazard area.

Figure 5.4.6-7. Essex County Residential Land Uses Flooding Exposure



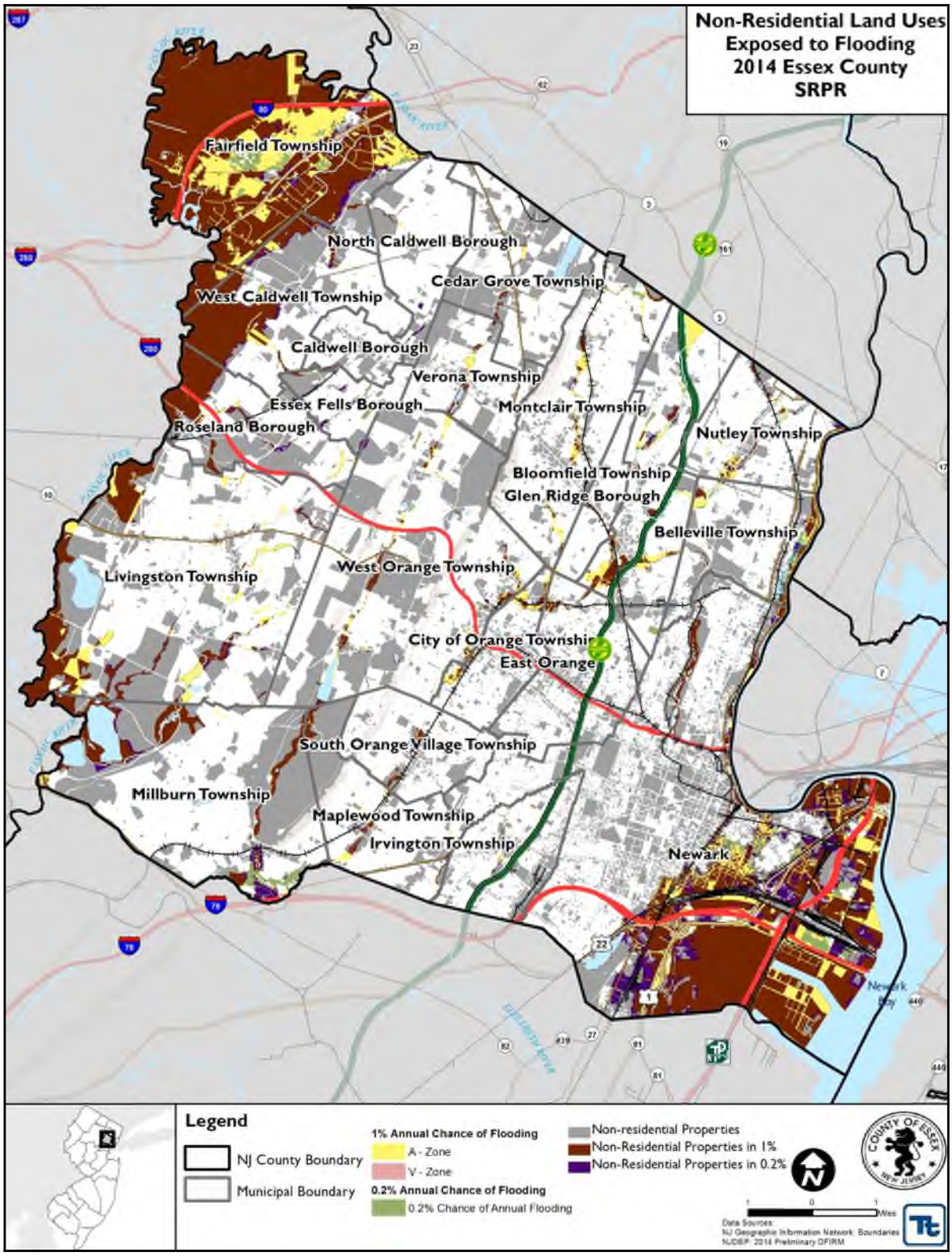
Source: FEMA
SRPR = Strategic Recovery Planning Report
Note: This figure also appears in the Essex County SRPR.

Table 5.4.6-14. Residential Land Use Exposure to the 1-Percent and 0.2-Percent Annual Chance Flood Events

Municipality	Total Residential Land Use Area (acres)	Total Number of Residential Properties	1% Flood Event Hazard Area				0.2% Flood Event Hazard Area			
			Number of Residential Properties in A and V-Zone	% of Total	Residential Land Use Area in A and V-Zone (acres)	% of Total	Number of Residential Properties in 0.2%	% of Total	Residential Land Use Area in 0.2% (acres)	% of Total
Township of Belleville	864	8,464	542	6.4%	23	2.7%	815	9.6%	43	5.0%
Township of Bloomfield	1,397	10,520	699	6.6%	65	4.6%	846	8.0%	79	5.6%
Borough of Caldwell	409	1,880	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Township of Cedar Grove	1,111	3,610	59	1.6%	9	0.9%	86	2.4%	13	1.2%
City of East Orange	1,131	8,379	141	1.7%	7	0.7%	141	1.7%	7	0.7%
Borough of Essex Fells	539	739	10	1.4%	1	0.3%	74	10.0%	23	4.2%
Township of Fairfield	1,093	2,491	2,040	81.9%	806	73.8%	2,228	89.4%	958	87.6%
Borough of Glen Ridge	525	2,159	63	2.9%	4	0.8%	64	3.0%	5	0.9%
Township of Irvington	867	8,269	126	1.5%	8	0.9%	298	3.6%	20	2.3%
Township of Livingston	3,339	9,130	662	7.3%	106	3.2%	704	7.7%	128	3.8%
Township of Maplewood	1,139	6,876	140	2.0%	11	1.0%	185	2.7%	14	1.3%
Township of Millburn	2,506	6,023	94	1.6%	12	0.5%	489	8.1%	76	3.0%
Township of Montclair	2,428	9,786	537	5.5%	61	2.5%	659	6.7%	82	3.4%
City of Newark	2,459	29,806	1,309	4.4%	56	2.3%	2,701	9.1%	141	5.7%
Borough of North Caldwell	1,237	1,925	19	1.0%	9	0.7%	73	3.8%	17	1.4%
Township of Nutley	1,165	8,327	410	4.9%	33	2.8%	515	6.2%	42	3.6%
City of Orange Township	643	3,792	489	12.9%	41	6.4%	514	13.6%	45	7.0%
Borough of Roseland	611	1,520	99	6.5%	25	4.1%	174	11.4%	40	6.6%
Township of South Orange Village	1,128	4,185	37	0.9%	1	0.1%	37	0.9%	1	0.1%
Township of Verona	877	3,684	129	3.5%	19	2.2%	193	5.2%	26	2.9%
Township of West Caldwell	1,137	3,449	171	5.0%	41	3.6%	226	6.6%	58	5.1%
Township of West Orange	2,782	12,094	426	3.5%	36	1.3%	636	5.3%	59	2.1%
Essex County (Total)	**29,387**	**147,108**	**8,202**	**5.6%**	**1,376**	**4.7%**	**11,658**	**7.9%**	**1,876**	**6.4%**

Source: FEMA 2009
Note: % = Percent
The area presented includes the area of inland waterways and excludes bays or oceans.

Figure 5.4.6-8. Essex County Non-Residential Land Uses Flooding Exposure



Source: FEMA

Table 5.4.6-15. Non-Residential Land Use Exposure to the 1-Percent and 0.2 Percent Annual Chance Flood Events

Municipality	Total Non-Res Land Use Area (acres)	Total Number of Non-Res Properties	1% Flood Event Hazard Area				0.2% Flood Event Hazard Area			
			Number of Non-Res Properties in A and V-Zone	% of Total	Non-Res Land Use Area in A and V-Zone (acres)	% of Total	Number of Non-Res Properties in 0.2%	% of Total	Non-Res Land Use Area in 0.2% (acres)	% of Total
Township of Belleville	740	1,146	116	10.1%	74	10.0%	160	14.0%	95	12.8%
Township of Bloomfield	779	1,091	179	16.4%	154	19.8%	194	17.8%	167	21.4%
Borough of Caldwell	184	286	1	0.3%	6	3.5%	2	0.7%	7	3.6%
Township of Cedar Grove	1,188	350	45	12.9%	35	2.9%	49	14.0%	39	3.2%
City of East Orange	632	1,616	62	3.8%	26	4.1%	62	3.8%	26	4.1%
Borough of Essex Fells	232	65	7	10.8%	8	3.3%	22	33.8%	29	12.5%
Township of Fairfield	4,580	1,194	1,050	87.9%	4,129	90.2%	1,110	93.0%	4,258	93.0%
Borough of Glen Ridge	86	87	13	14.9%	7	7.8%	13	14.9%	7	8.7%
Township of Irvington	490	1,433	48	3.3%	9	1.8%	71	5.0%	17	3.5%
Township of Livingston	3,487	777	185	23.8%	848	24.3%	190	24.5%	896	25.7%
Township of Maplewood	845	508	60	11.8%	77	9.2%	81	15.9%	82	9.7%
Township of Millburn	3,034	465	78	16.8%	782	25.8%	176	37.8%	882	29.1%
Township of Montclair	824	1,069	133	12.4%	61	7.4%	140	13.1%	66	8.0%
City of Newark	8,337	13,003	1,879	14.5%	3,720	44.6%	2,648	20.4%	4,544	54.5%
Borough of North Caldwell	437	92	7	7.6%	13	2.9%	12	13.0%	23	5.3%
Township of Nutley	476	762	117	15.4%	75	15.7%	127	16.7%	88	18.4%
City of Orange Township	451	1,048	160	15.3%	45	10.0%	175	16.7%	50	11.0%
Borough of Roseland	1,189	186	64	34.4%	400	33.6%	73	39.2%	427	35.9%
Township of South Orange Village	341	415	20	4.8%	38	11.2%	20	4.8%	38	11.2%
Township of Verona	635	335	21	6.3%	43	6.7%	30	9.0%	48	7.6%
Township of West Caldwell	1,764	296	104	35.1%	888	50.3%	119	40.2%	947	53.7%
Township of West Orange	2,862	1,160	253	21.8%	149	5.2%	303	26.1%	176	6.1%
Essex County (Total)	33,593	27,384	4,602	16.8%	11,586	34.5%	5,777	21.1%	12,912	38.4%

Source: FEMA 2009
Note: % = Percent
Non-Res = Non-residential
The area presented includes the area of inland waterways and excludes bays or oceans.

NFIP Statistics

In addition to total building stock modeling, individual data available on flood policies, claims, Repetitive Loss Properties (RLP) and severe RLP (SRLs) were analyzed. FEMA Region 2 provided a list of residential properties with NFIP policies, past claims and multiple claims (RLPs). According to the metadata provided: "The (*sic* National Flood Insurance Program) NFIP Repetitive Loss File contains losses reported from individuals who have flood insurance through the Federal Government. A property is considered a repetitive loss property when there are two or more losses reported which were paid more than $1,000 for each loss. The two losses must be within 10 years of each other & be as least 10 days apart. Only losses from (*sic* since) 1/1/1978 that are closed are considered."

An RLP is defined by FEMA as an NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978.

SRLs were then examined for the County. According to section 1361A of the National Flood Insurance Act, as amended (NFIA), 42 U.S.C. 4102a, an SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- Has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or
- For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
- For both of the above, at least two of the referenced claims must have occurred within any 10- year period, and must be greater than 10 days apart.

Table 5.4.6-16 through Table 5.4.6-18 and Figure 5.4.6-9 summarizes the NFIP policies, claims and repetitive loss statistics for Essex County. According to FEMA, Table 5.4.6-16 and Table 5.4.6-17 summarize the occupancy classes of the repetitive loss and severe repetitive loss properties in the County. The majority of the repetitive loss occupancy class is single family residences (71%). The majority of severe repetitive loss occupancy class is also single family residences (62%) (FEMA 2014). This information is current as of March 31, 2014.

The location of the properties with policies, claims and repetitive and severe repetitive flooding were geocoded by FEMA with the understanding that there are varying tolerances between how closely the longitude and latitude coordinates correspond to the location of the property address, or that the indication of some locations are more accurate than others.

Table 5.4.6-16. Occupancy Class of Repetitive Loss Structures in Essex County

Occupancy Class	Total Number of Repetitive Loss Properties	Total Number of Severe Repetitive Loss Properties	Total (RL + SRL)
Single Family	226	65	291
Condo	7	1	8
2-4 Family	34	5	39
Other Residential	2	3	5
Non Residential	35	30	65
Essex County	**304**	**104**	**408**

Source: FEMA 2014
Note: RL = Repetitive Loss Property; SRL = Severe Repetitive Loss Property

Table 5.4.6-17. Occupancy Class of Repetitive Loss Structures in Essex County, by Municipality

Municipality	Repetitive Loss Properties					Severe Repetitive Loss Properties				
	2-4 Family	Assumed Condo	Non Residential	Other Residential	Single Family	2-4 Family	Assumed Condo	Non Residential	Other Residential	Single Family
Township of Belleville	6	0	10	1	13	2	0	1	0	1
Township of Bloomfield	5	2	0	0	11	0	0	1	0	0
Borough of Caldwell	0	0	0	0	0	0	0	0	0	0
Township of Cedar Grove	0	0	0	0	0	0	0	0	0	0
City of East Orange	0	0	0	0	0	0	0	0	0	0
Borough of Essex Fells	0	0	0	0	0	0	0	0	0	0
Township of Fairfield	2	3	10	0	139	2	1	24	0	64
Borough of Glen Ridge	0	0	0	0	0	0	0	0	0	0
Township of Irvington	3	0	0	0	3	0	0	0	0	0
Township of Livingston	0	0	0	0	4	0	0	0	0	0
Township of Maplewood	3	0	3	0	3	0	0	1	0	0
Township of Millburn	0	0	3	0	18	0	0	2	0	0
Township of Montclair	6	0	0	0	7	0	0	0	2	0
City of Newark	1	0	7	0	4	0	0	1	0	0
Borough of North Caldwell	0	0	0	0	1	0	0	0	0	0
Township of Nutley	1	2	1	0	10	1	0	0	1	0
City of Orange Township	6	0	0	1	4	0	0	0	0	0
Borough of Roseland	0	0	0	0	0	0	0	0	0	0
Township of South Orange Village	0	0	0	0	0	0	0	0	0	0
Township of Verona	0	0	0	0	3	0	0	0	0	0
Township of West Caldwell	0	0	1	0	1	0	0	0	0	0
Township of West Orange	1	0	0	0	5	0	0	0	0	0
Essex County	**34**	**7**	**35**	**2**	**226**	**5**	**1**	**30**	**3**	**65**

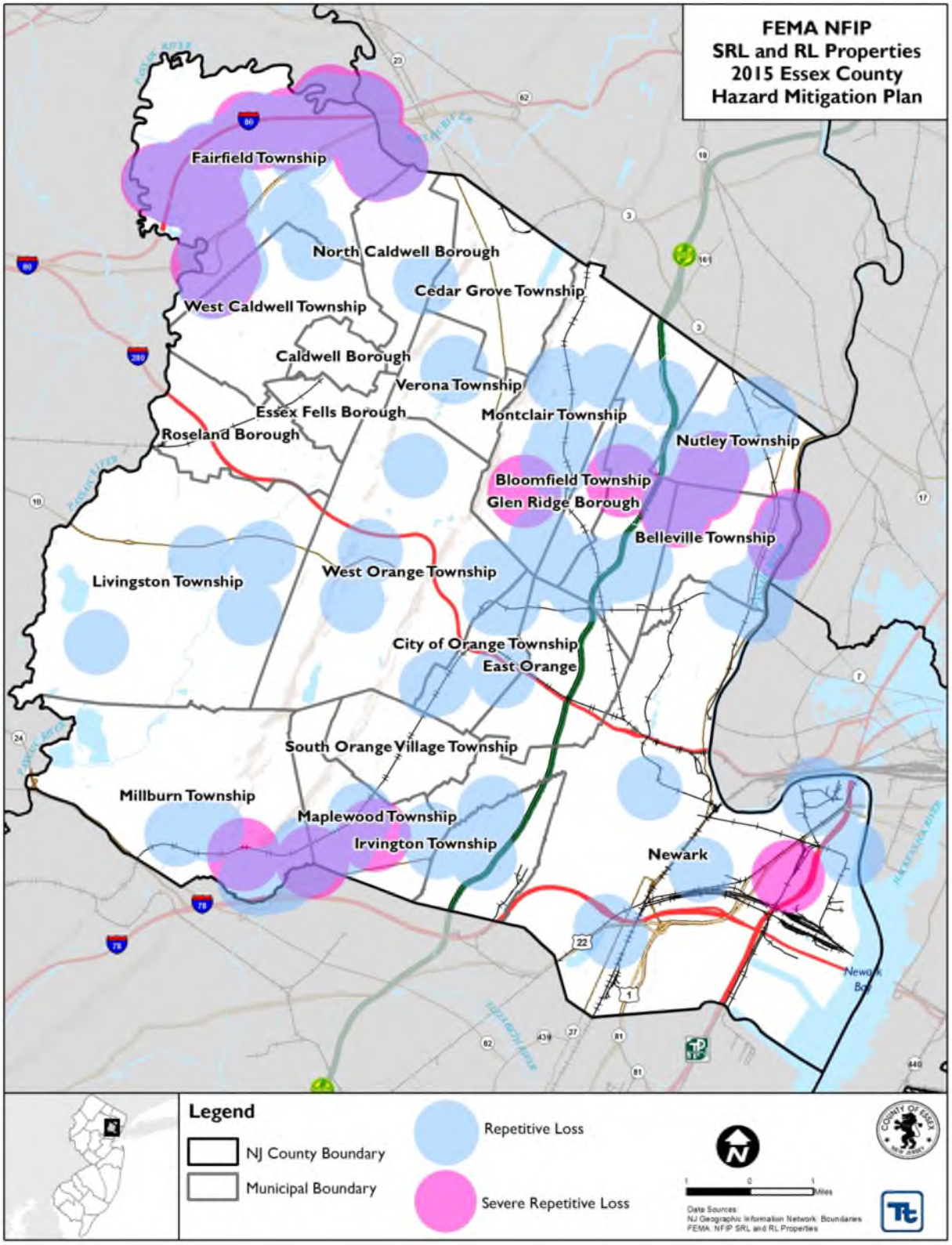
Source: FEMA, 2014
Note (1): Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA Region 2, and are current as of March 31, 2014.
Note (2): The statistics were summarized using the Community Name provided by FEMA Region 2.

Table 5.4.6-18. NFIP Policies, Claims and Repetitive Loss Statistics

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	Severe Rep. Loss Prop. (1)	# Policies in the 1% Flood Boundary (3)	# Policies in the 0.2% Flood Boundary (3)	# Policies Outside the Combined 1% and 0.2% Flood Boundaries Hazard Areas (3)
Township of Belleville	138	159	$6,879,878	30	4	86	111	27
Township of Bloomfield	427	335	$2,731,547	18	1	317	317	110
Borough of Caldwell	1	1	$4,617	0	0	0	0	1
Township of Cedar Grove	43	5	$53,045	0	0	11	11	32
City of East Orange	79	39	$283,663	0	0	31	31	48
Borough of Essex Fells	11	10	$100,750	0	0	4	5	6
Township of Fairfield	1,148	1,670	$64,058,476	154	91	973	1,117	31
Borough of Glen Ridge	53	13	$38,521	0	0	18	18	35
Township of Irvington	66	86	$485,759	6	0	29	41	25
Township of Livingston	323	154	$1,162,839	4	0	97	114	209
Township of Maplewood	157	61	$1,159,326	9	1	32	34	123
Township of Millburn	292	222	$6,609,357	21	2	21	142	150
Township of Montclair	369	143	$1,142,339	13	2	209	227	142
City of Newark	264	182	$16,729,363	12	1	152	189	75
Borough of North Caldwell	31	13	$60,230	1	0	4	5	26
Township of Nutley	209	192	$1,646,681	14	2	134	143	66
City of Orange Township	269	117	$954,986	11	0	223	236	33
Borough of Roseland	40	16	$102,124	0	0	18	23	17
Township of South Orange Village	67	15	$106,783	0	0	0		67
Township of Verona	75	30	$195,146	3	0	34	38	37
Township of West Caldwell	83	32	$1,984,652	2	0	17	17	66
Township of West Orange	274	147	$853,080	6	0	136	151	123
Essex County	**4,419**	**3,642**	**$107,343,162**	**304**	**104**	**2,546**	**2,970**	**1,449**

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

Figure 5.4.6-9. NFIP Repetitive Loss Areas – Essex County



Source: FEMA Region 2, 2014

Impact on Critical Facilities

Hazus-MH was used to estimate the flood loss potential to critical facilities exposed to the flood risk. Using depth/damage function curves, Hazus-MH estimates the percent of damage to the building and contents of critical facilities. Table 5.4.6-19 summarizes the number of critical facilities located in the FEMA flood zones by type and by jurisdiction.

In cases where short-term functionality is impacted by a hazard, other facilities of neighboring municipalities may need to increase support response functions during a disaster event. Mitigation planning should consider means to reduce impact to critical facilities and ensure sufficient emergency and school services remain when a significant event occurs. Actions addressing shared services agreements are included in Section 9 (Mitigation Strategies) of this plan.

Table 5.4.6-19. Number of Critical Facilities Located in the 1-Percent Annual Chance Flood Boundaries

Municipality	Chemical Storage	Correctional Institution	Dam	Electric Power	Fire	Government - Municipal	Other	Police	Potable Water	School	Transportation	Utility	Wastewater
Belleville (T)							2			1			
Bloomfield (T)							1			2			
City of Orange (T)				1			1		1	2	1		
Fairfield (T)					1		2			4	1		4
Livingston (T)					1								
Millburn (T)			5										
Montclair (T)					1								
Newark (C)	3	3			1		2	2		1	8	7	2
Nutley (T)						1							
Roseland (B)							1		1				
West Orange (T)			1		1				1	2			

Source: ECOEM, 2014
Note: Only the municipalities and facility types listed are exposed to the 1-percent annual chance flood event.

Impact on the Economy

For impact on economy, estimated losses from a flood event are considered. Losses include but are not limited to general building stock damages, agricultural losses, business interruption, impacts to tourism and tax base to Essex County. Damages to general building stock can be quantified using Hazus-MH as discussed above. Other economic components such as loss of facility use, functional downtime and social economic factors are less measurable with a high degree of certainty.

Flooding can cause extensive damage to public utilities and disruptions to the delivery of services. Loss of power and communications may occur; and drinking water and wastewater treatment facilities may be temporarily out of operation. Flooded streets and road blocks make it difficult for emergency vehicles to respond to calls for service. Floodwaters can wash out sections of roadway and bridges (Foster, Date Unknown).

Direct building losses are the estimated costs to repair or replace the damage caused to the building. Refer to the 'Impact on General Building Stock' subsection which discusses these potential losses. These dollar value losses to the County's total building inventory replacement value, in addition to damages to roadways and infrastructure, would greatly impact the local economy.

Hazus-MH estimates the amount of debris generated from the flood events as a result of 1- and 0.2-percent events. The model breaks down debris into three categories: 1) finishes (dry wall, insulation, etc.); 2) structural (wood, brick, etc.) and 3) foundations (concrete slab and block, rebar, etc.). The distinction is made because of the different types of equipment needed to handle the debris. Table 5.4.6-20 summarizes the debris Hazus-MH 2.1 estimates for these events.

Table 5.4.6-20. Estimated Debris Generated from the 1-Percent Flood Event

Municipality	1% Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Township of Belleville	3,191	2,226	605	360
Township of Bloomfield	14,357	10,846	2,187	1,324
Borough of Caldwell	135	135	0	0
Township of Cedar Grove	937	850	54	33
City of East Orange	1,674	846	511	318
Borough of Essex Fells	1	1	0	0
Township of Fairfield	30,976	18,444	8,071	4,460
Borough of Glen Ridge	867	477	225	165
Township of Irvington	31,583	4,114	17,855	9,614
Township of Livingston	2,285	2,159	74	51
Township of Maplewood	10,783	2,171	5,272	3,340
Township of Millburn	12,023	6,482	3,598	1,943
Township of Montclair	3,341	3,302	24	15
City of Newark	38,583	29,133	6,294	3,155
Borough of North Caldwell	35	34	0	0
Township of Nutley	34,216	9,363	16,043	8,810
City of Orange Township	5,356	5,116	152	88
Borough of Roseland	963	962	0	0
Township of South Orange Village	3,608	668	1,880	1,060
Township of Verona	1,763	1,687	47	29

Table 5.4.6-20. Estimated Debris Generated from the 1-Percent Flood Event

Municipality	1% Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Township of West Caldwell	1,473	1,468	3	2
Township of West Orange	3,553	3,507	28	18
Essex County (Total)	**201,702**	**103,994**	**62,923**	**34,786**

Source: Hazus-MH 2.1

Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by the type, frequency and intensity of weather events. Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of extremes such as flood events. While predicting changes of flood events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society and the environment (U.S. Environmental Protection Agency [EPA], 2006).

A 2013 report by Rutgers University indicates that sea level has been steadily rising with sea levels along the New Jersey coastline rising faster than the global average. Continued Seal Level Rise could indicate more frequent and more severe coastal flooding events (Rutgers 2013b). Flooding events associated with storm surge caused by hurricanes and tropical storms could therefore also increase. Section 5.4.1 (Coastal Erosion) contains a discussion on sea level rise.

Change of Vulnerability

Essex County and its municipalities continue to be vulnerable to the flood hazard. However, there are several differences between the exposure and potential loss estimates between this plan update to the results in the original 2008 HMP. Their differences are due to the new and updated population (U.S. Census 2010 is now available) and building inventories used, and more accurate flood depth grids used to estimate potential losses in HAZUS-MH due to the availability of their DFIRM.

Differences in exposure and potential losses estimated from the 2008 HMP can be attributed to the difference in building stock inventory and methodology used for the risk assessment. For example, the 2008 HMP building inventory was the default HAZUS-MH general building stock with replacement values based on 2006 RS Means. For this plan update, the potential loss analysis was conducted using a custom County-wide building inventory using the best available parcel and tax assessor date; improvement value and estimated contents were used.

Overall, this vulnerability assessment uses a more accurate and updated building inventory which provides more accurate estimated exposure and potential losses for Essex County.

Future Growth and Development

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the flood hazard if located within the identified hazard areas. Figure 5.4.6-10 illustrates the identified areas of potential new development in relation to the flood boundaries. It is the intention of the County and all participating municipalities to discourage development in vulnerable areas or to encourage higher regulatory standards on the local level.

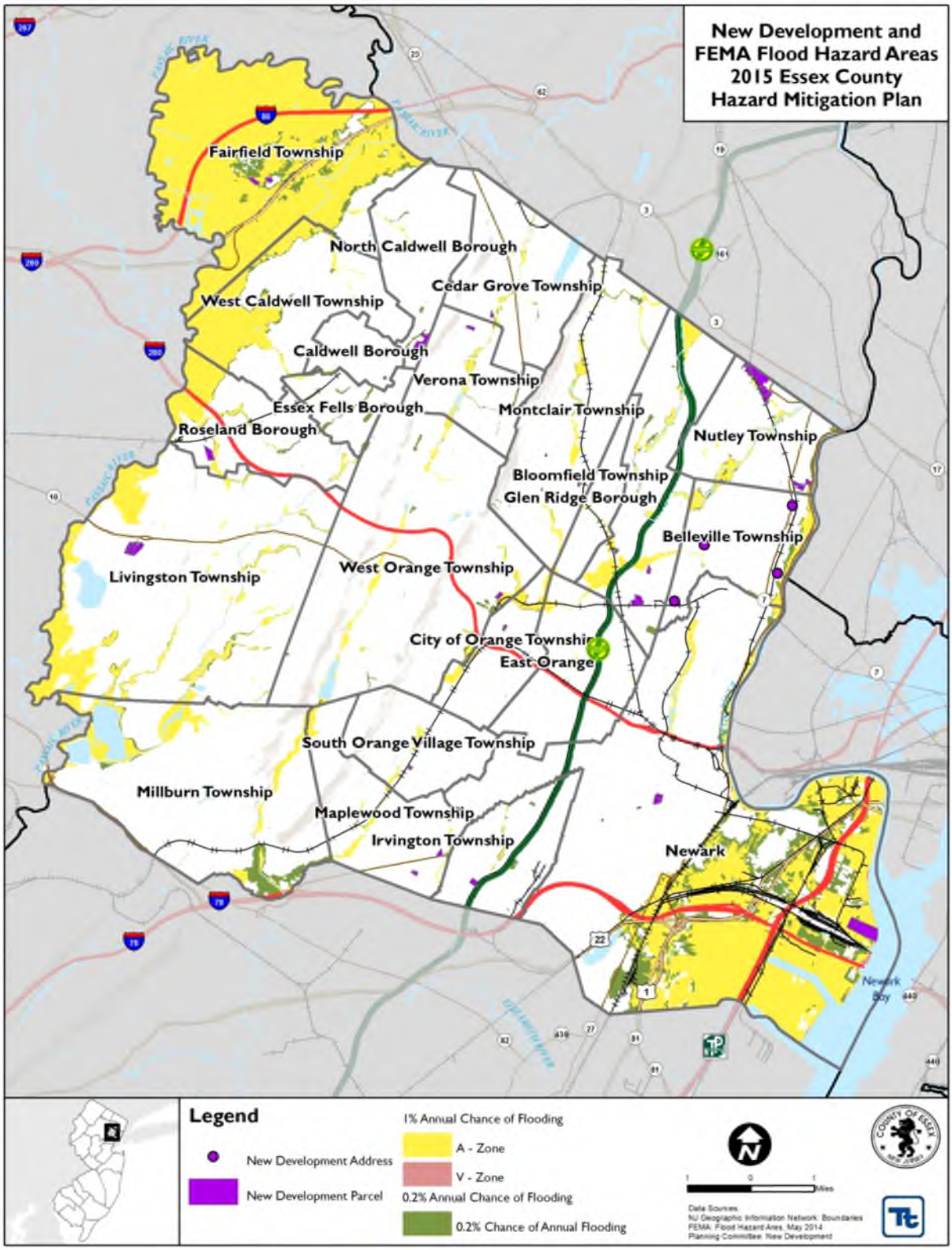
Additional Data and Next Steps

A Hazus-MH flood analysis was conducted for Essex County using the most current and best available data including updated building and critical facility inventories, and DFIRM. For future plan updates, more accurate loss estimates can be produced by replacing the national default demographic inventory with 2010 U.S. Census data when it becomes available in the Hazus-MH model.

As additional FEMA Risk Mapping, Assessment, and Planning (Risk MAP) products become available, these may be used to further enhance this assessment (e.g. depth grids for additional recurrence intervals).

Specific mitigation actions addressing improved data collection and further vulnerability analysis is included in Volume II, Section 9 of this plan.

Figure 5.4.6-10. Potential New Development and Flood Boundaries



Source: FEMA, 2009; Planning Committee

5.4.7 Geological Hazards

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the geological hazards in Essex County.

2015 Plan Update Changes

- For the 2015 Update, the geological hazards profile includes landslides, expansive soils, land subsidence, and sinkholes. In the 2008 County HMP, only land subsidence and expansive soils were discussed in individual sections.
- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on geological hazards are discussed.
- New and updated figures from other federal and state agencies are incorporated.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- The vulnerability assessment section is new for the geological hazards profiled. NJGWS data was used to determine landslide susceptibility in Essex County. The spatial data was used to estimate population, building stock and critical facility exposure in the County. The vulnerability assessment directly follows the hazard profile.

5.4.7.1 Profile

Hazard Description

Landslides

According to the U.S. Geological Survey (USGS), the term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other contributing factors (USGS 2013). Among the contributing factors are: (1) erosion by rivers, glaciers, or ocean waves which create over-steepened slopes; (2) rock and soil slopes weakened through saturation by snowmelt or heavy rains; (3) earthquakes which create stresses making weak slopes fail; and (4) excess weight from rain/snow accumulation, rock/ore stockpiling, waste piles, or man-made structures. Scientists from the USGS also monitor stream flow, noting changes in sediment load in rivers and streams that may result from landslides. All of these types of landslides are considered aggregately in USGS landslide mapping.

In New Jersey, there are four main types of landslides: slumps, debris flows, rockfalls, and rockslides. Slumps are coherent masses that move downslope by rotational slip on surfaces that underlie and penetrate the landslide deposit (Briggs et al 1975). 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 (Delano and Wilshusen 2001).

Mass movements of geological material can occur suddenly or slowly. The velocity of movement may range from a slow creep of inches per year to many feet per second, depending on slope angle, material, and water content. Some methods used to monitor mass movements can provide an idea of the type of movement and the amount of time prior to failure. It is also possible to determine what areas are at risk during general time

periods. Assessing the geology, vegetation, and amount of predicted precipitation for an area can help in these predictions. However, there is no practical warning system for individual landslides. The current standard operating procedure is to monitor situations on a case-by-case basis, and respond after the event has occurred. Generally accepted warning signs for landslide activity include:

- Springs, seeps, or saturated ground in areas that have not typically been wet before
- New cracks or unusual bulges in the ground, street pavements, or sidewalks
- Soil moving away from foundations
- Ancillary structures, such as decks and patios, tilting and/or moving relative to the main house
- Concrete floors and foundations tilting or cracking
- 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 (soil content)
- Sudden decrease in creek water levels though rain is still falling or just recently stopped
- Sticking doors and windows, and visible open spaces indicating jams 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 (United States Search and Rescue Task Force Date Unknown)

Landslides can cause several types of secondary effects, such as blocking access to roads, which can isolate residents and businesses and delay commercial, public, and private transportation. This could result in economic losses for businesses. Other potential problems resulting from landslides are power and communication failures. Vegetation or poles on slopes can be knocked over, resulting in possible losses to power and communication lines. Landslides also have the potential of destabilizing the foundation of structures, which may result in monetary loss for residents. They also can damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat.

Subsidence/Sinkholes

Land subsidence can be defined as the sudden sinking or gradual downward settling of the earth's surface with little or no horizontal motion, owing to the subsurface movement of earth materials (USGS 2000). Subsidence often occurs through the loss of subsurface support in karst terrain, which may result from a number of natural- and human-caused occurrences. Karst describes a distinctive topography that indicates dissolution of underlying carbonate rocks (limestone and dolomite) by surface water or groundwater over time. The dissolution process causes surface depressions and the development of sinkholes, sinking stream, enlarged bedrock fractures, caves, and underground streams (New Jersey State HMP 2014).

The main causes of subsidence are due to human activities. Mining, groundwater usage and subsequent compaction of the aquifer and removal of organic materials are some of the most common human-induced causes of subsidence. Human-placed fill can also cause subsidence due to poor compaction or the use of inappropriate, degradable materials, such as refuse or wood that can breakdown and leave void space and collapse (Essex County HMP 2007).

Natural forces can also cause subsidence: natural compaction of sediments, thawing permafrost, deterioration of organic material, and movement along faults can all cause subsidence. Collapse of soluble rock or compression of weak rock, as is found in karst landscapes, can also cause subsidence (Essex County HMP 2007).

Sinkholes, the type of subsidence most frequently seen in the New Jersey, are a natural and common geologic feature in areas with underlying limestone, carbonate rock, salt beds, or other rocks that are soluble in water. Over periods of time, measured in thousands of years, the carbonate bedrock can be dissolved through acidic rain water moving in fractures or cracks in the bedrock. This creates larger openings in the rock through which water and overlying soil materials will travel. Over time the voids will enlarge until the roof over the void is unable to support the land above will collapse forming a sinkhole. In this example the sinkhole occurs naturally, but in other cases the root causes of a sinkhole are anthropogenic. These anthropogenic causes can include those that involve changes to the water balance of an area such as: over-withdrawal of groundwater; diverting surface water from a large area and concentrating it in a single point; artificially creating ponds of surface water; and drilling new water wells. These actions can serve to accelerate the natural processes of creation of soil voids, which can have a direct impact on sinkhole creation (New Jersey State HMP 2014).

Both natural and man-made sinkholes can occur without warning. Slumping or falling fence posts, trees, or foundations, sudden formation of small ponds, wilting vegetation, discolored well water, and/or structural cracks in walls and floors, are all specific signs that a sinkhole is forming. Sinkholes can range in form from steep-walled holes, to bowl, or cone-shaped depressions. When sinkholes occur in developed areas they can cause severe property damage, disruption of utilities, damage to roadways, injury, and loss of life (New Jersey State HMP 2014).

Subsidence and sinkholes can occur gradually or abruptly without warning. Geologists have a firm understanding of the risk factors that lead to sinkholes, thus areas of concern are highlighted on the risk maps. Additionally, human activities have exacerbated the sinkhole risk for the State. Although specific warning signs may not be present, there are some general warning signs that may indicate a sinkhole is about to occur.

Warning signs for sinkholes include:

- Fresh exposure on fence posts, foundations and trees that result when the ground sinks
- Slumping, sagging or slanting fence posts, trees or other objects
- Ponding (small ponds of rainfall forming where water has not been collected before)
- Wilting of small, circular areas of vegetation because the moisture that normally supports vegetation in the area is draining into the sinkhole developing below the surface
- Turbidity of water in nearby wells during early stages of sinkhole development
- Structural cracks in walls, floors and pavement; cracks in the ground surface (Southwest Florida Water Management District Date Unknown)

Like landslides, subsidence/sinkholes can cause several types of secondary effects such as blocking roadways and access points to businesses and critical infrastructure. As noted in the previous occurrences section, subsidence/sinkholes have impacted major roadways in New Jersey, including the Garden State Parkway. This impact can cause traffic accidents, especially on major routes. Sinkholes may also cause utility failures, as was the case in Hoboken where several water mains were broken as a result of a sinkhole. Sinkholes also have the potential to cause damage to chemical infrastructures such as pipelines and facilities that store or transport hazardous materials. The result from a breach of one of these systems may result in a hazardous materials release and damage the environment.

Expansive Soils

Expansive soil is usually comprised of a fine-grained clay that occurs naturally and is generally found in areas that historically were a flood plain or lake area, but can occur in hillside areas also. Expansive soil is subject to swelling and shrinkage, varying in proportion to the amount of moisture present in the soil (Essex County HMP 2007).

Other than soil moisture, the most important property affecting the degree of volume change in a soil is mineralogy. Clay minerals are the most common cause of expansive soils, although calcium sulfates (gypsum and anhydrite) and iron sulfides can also experience volume changes. Generally speaking, expansive soils often appear sticky when wet, and have surface cracks when dry (Essex County HMP 2007).

Structures built on this type soil tend to subside. Expansive movement can easily crack foundations, slabs, walls, stucco and fences. Because soils dry from the surface down, this type of soil can successfully host structures if foundations and/or footings are placed deep enough into the soil. If the surface receives enough moisture so that the soil column never dries to the bottom of the footing, the structure should not settle or lift (Essex County HMP 2007).

Location

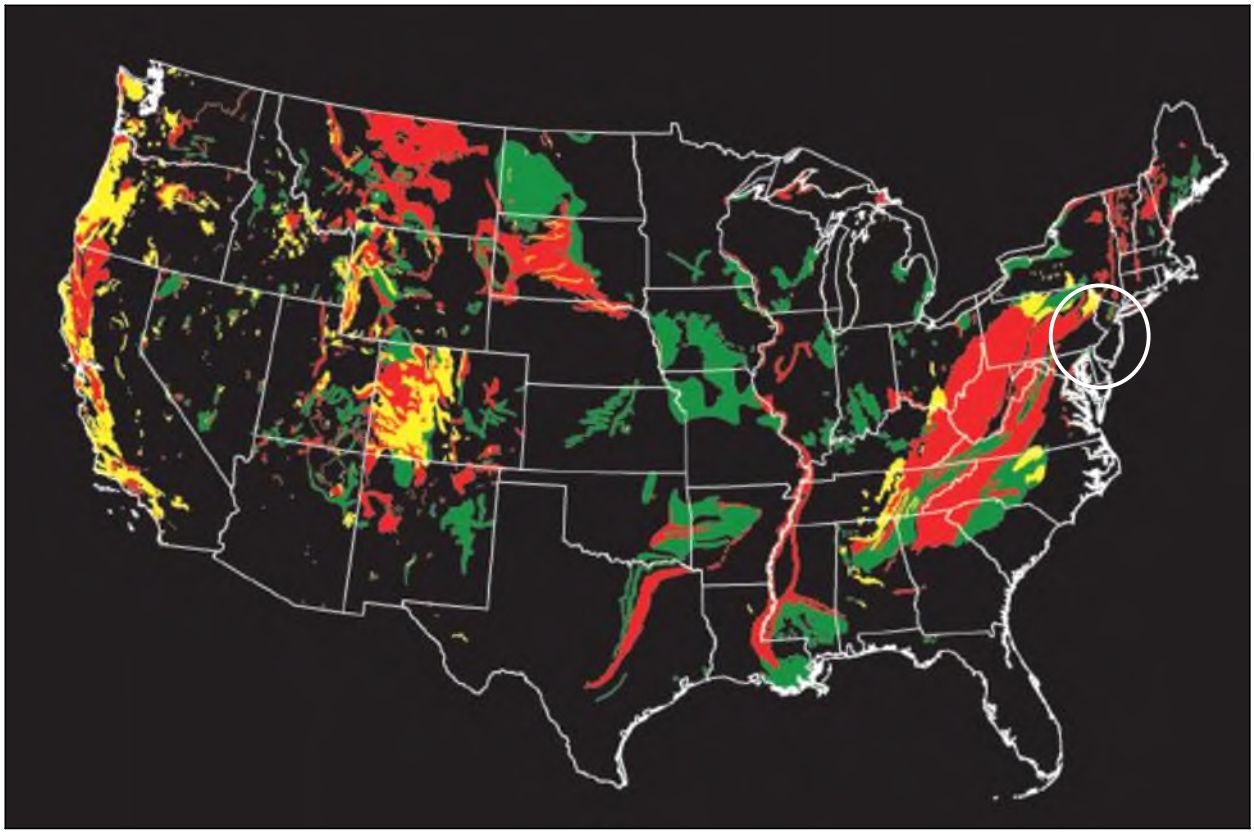
Within Essex County, the highest elevations of approximately 660 feet above sea level are found at four areas along the Second Watchung Mountain within Verona, North Caldwell and Essex Fells. Areas along the First Watchung Mountain near Eagle Rock Reservation and Mills Reservation reach elevations of approximately 600 feet. Elevations decrease eastward of the first Watchung; ranging between 500 and 600 feet approximately eight miles outside central Newark and decreasing to around 200 feet five miles from the city. Elevations are near sea level at Newark Bay (Essex County Environmental Resource Inventory 2007).

Essex County contains a number of steep slope areas, particularly along the Watchung Ridges in central Essex. “Steep” slopes are those slopes typically at a 15% gradient or greater. Slopes included in the mapping are between 15% and 60% gradients. Essex County steep slope areas exist primarily along the second Watchung Mountain Ridge in Cedar Grove, Verona, and south through portions of the Second and along the First Watchung Mountain Ridge in West Orange and through Maplewood. NJDEP mapping identifies steep slopes extending along the eastern edge of the First Watchung Mountain from South Mountain in Montclair southwest through West Orange and South Orange. Many additional small areas of steep slopes are mapped in central Essex County. In east Essex County, pockets of steep slope areas are mapped around portions of Weequahic Lake in Newark and near Yantacaw Park in Nutley (Essex County Environmental Resource Inventory 2007).

Landslides

The entire U.S. experiences landslides, with 36 states having moderate to highly severe landslide hazards. Expansion of urban and recreational developments into hillside areas exposes more people to the threat of landslides each year. Figure 5.4.7-1 illustrates the potential for landslides in the U.S.

Figure 5.4.7-1. Landslide Potential of the Conterminous U.S



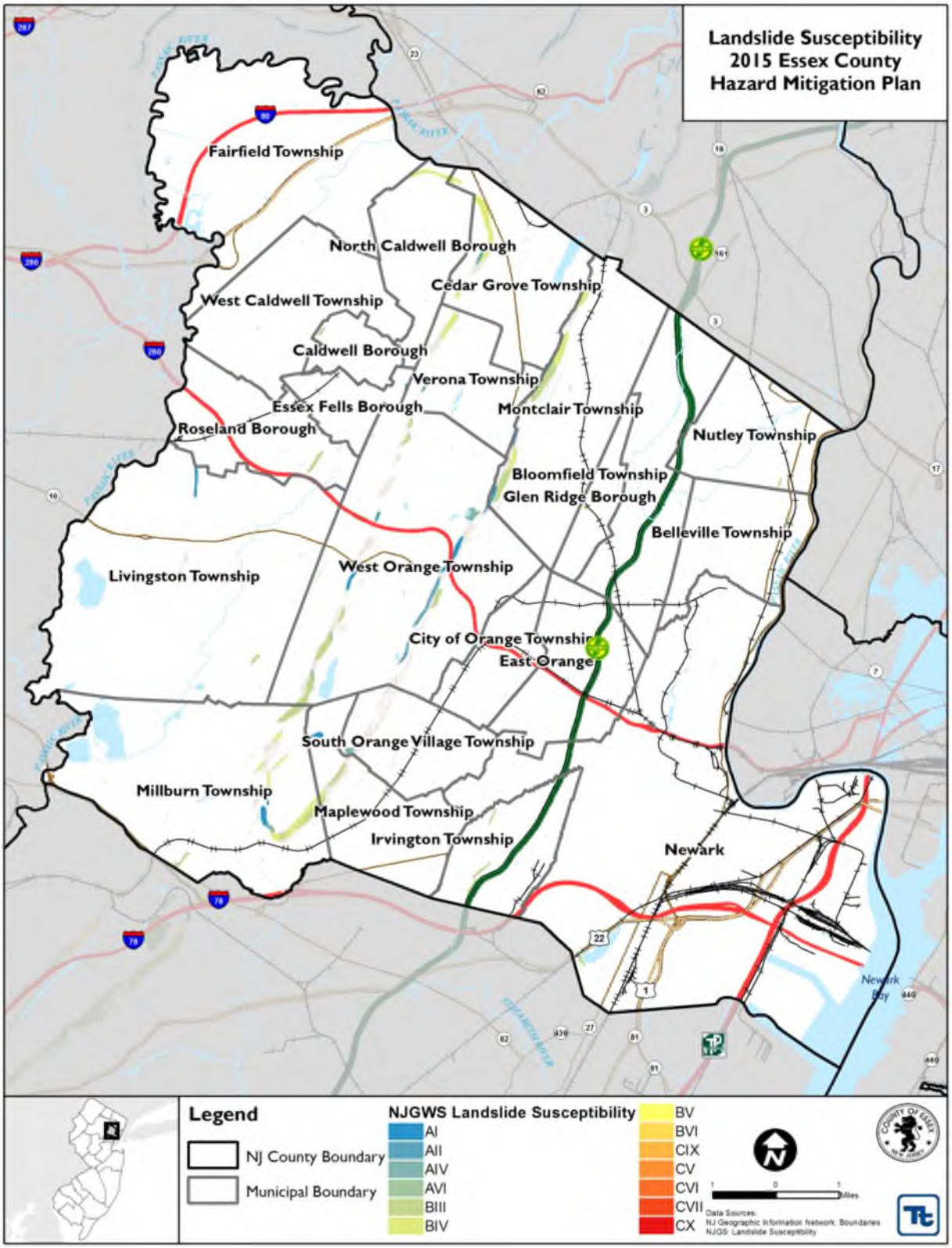
Source: USGS 2005

Note: Red areas have very high potential, yellow areas have high potential, and green areas have moderate potential. Landslides can and do occur in the black areas, but the potential is low. Map not to scale. Circle indicates the approximate location of New Jersey.

Landslides are common in New Jersey, primarily in the northern region of the State. As noted in the previous occurrences section, New Jersey has an extensive history of landslides, and the landslides occur for a variety of reasons. The New Jersey Geologic Survey (currently known as the New Jersey Geological and Water Survey) determined landslide susceptibility for nine counties in New Jersey (Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union). Areas within these counties are classified into Class A, B, and C landslide susceptible classes, and several subclasses within the main classifications. These classes are consistent with HAZUS User Manual Table 9.2. Class A areas in New Jersey include classes AII, AIV, AVI which is strongly cemented rock at varying slope angles; Class B includes classes BIII, BIV, BV, and BVI which includes weakly cemented rock and soil at varying slope angles; and Class C includes classes CV, CVI, CVII, CIX, and CX which includes shale and clayey soil at varying slope angles.

Figure 5.4.7-2 shows the landslide susceptibility in Essex County. A majority of the County does not have landslide susceptibility. There are small areas in the central portion of the County that are susceptible to landslide events (Class AI, AII, AIV, AVI, BIII, and BIV). Table 5.4.7-1 summarizes the area within each class. According to the figure and table, the Townships of Fairfield and Millburn have the largest areas landslide susceptible areas. Overall, approximately 1.4 square miles of Essex County are located in landslide hazard areas; 0.42 square miles in Class A and 0.94 square miles in Class B.

Figure 5.4.7-2. Landslide Susceptibility in Essex County



Source: Godt 2001; NJGWS 2000-2009
NJGWS New Jersey Geological and Water Survey

Table 5.4.7-1. Total Land Area Located in the Landslide Susceptible Areas

Municipality	Total Area (sq mi)	NJGWS-Defined Landslide Susceptible Areas			
		Class A (sq mi)	% Total	Class B (sq mi)	% Total
Township of Belleville	3	0.00	0%	0.01	<1%
Township of Bloomfield	5.36	0.00	0%	0.00	0%
Borough of Caldwell	1	0.00	0%	0.01	<1%
Township of Cedar Grove	4	0.04	<1%	0.13	2.89%
City of East Orange	3.92	0.00	0%	0.00	0%
Borough of Essex Fells	1.41	<1	<1%	0.00	0%
Township of Fairfield	10.34	0.00	0%	0.00	0%
Borough of Glen Ridge	1	0.00	0%	0.00	<1%
Township of Irvington	2.91	0.00	0%	0.03	1.17%
Township of Livingston	14	0.02	<1%	0.01	<1%
Township of Maplewood	4	0.01	<1%	0.04	1.15%
Township of Millburn	9.88	0.04	<1%	0.22	2.23%
Township of Montclair	6	0.07	1.1%	0.21	3.41%
City of Newark	26	0.00	0%	0.03	<1%
Borough of North Caldwell	3.07	0.00	0%	0.04	1.34%
Township of Nutley	3	0.00	0%	0.00	<1%
City of Orange Township	2	0.00	0%	0.00	0%
Borough of Roseland	4	<1	<1%	0.02	<1%
Township of South Orange Village	3	0.01	<1%	0.00	0%
Township of Verona	3	0.01	<1%	0.03	1.08%
Township of West Caldwell	5	0.00	0%	0.00	0%
Township of West Orange	12	0.22	1.85%	0.14	1.12%
Essex County (TOTAL)	**130**	**0.42**	**0.33%**	**0.94**	**0.72%**

Source: NJGWS 2005

Notes: *Class A includes classes AII, AIV, AVI which is strongly cemented rock at varying slope angles. Class B includes classes BIII, BIV, BV, and BVI which includes weakly cemented rock and soil at varying slope angles. No Class C soils types were identified in Essex County.*

Total area includes land and water.

% *percent*

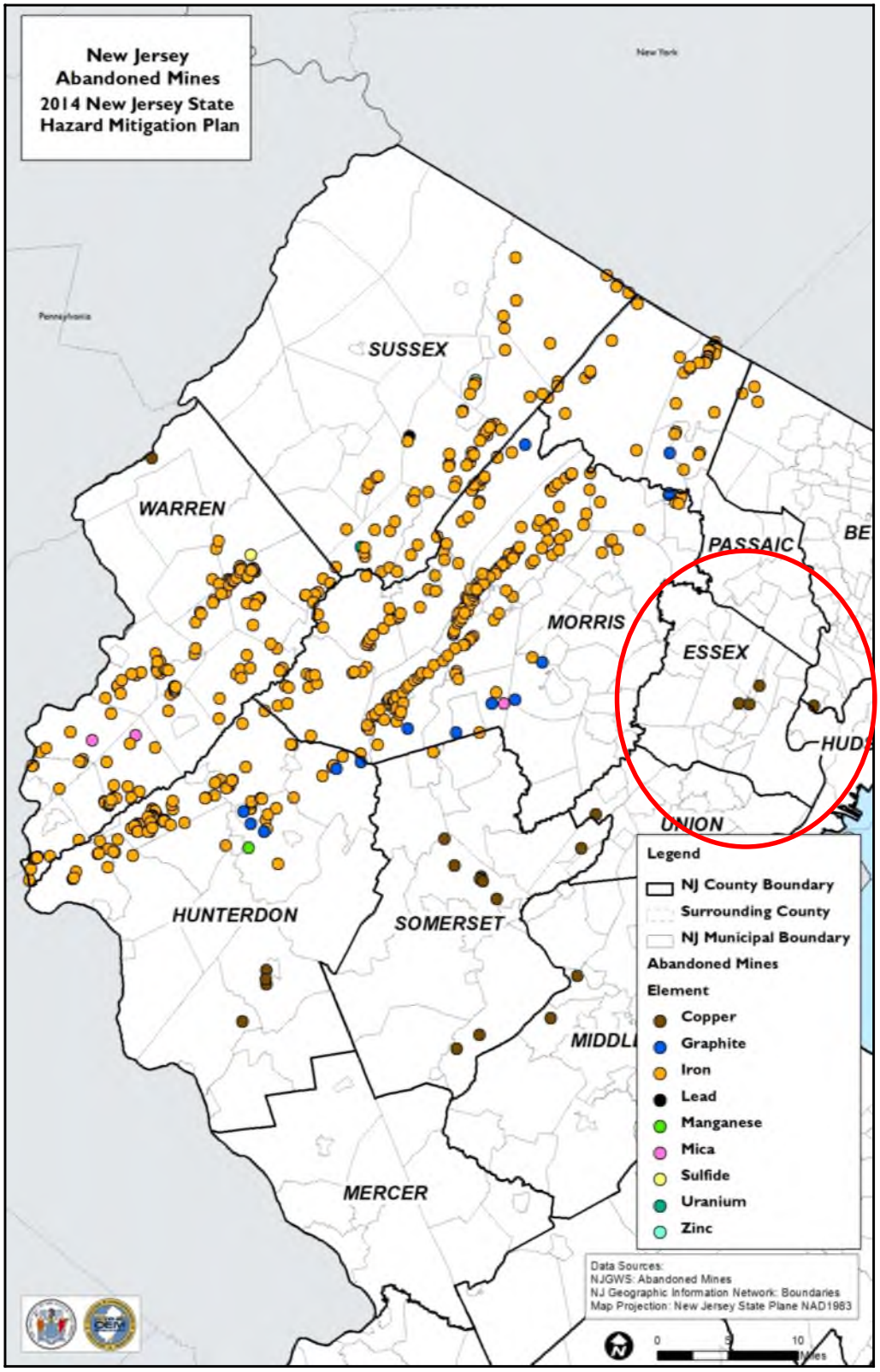
sq mi *square miles*

Subsidence/Sinkholes

New Jersey is susceptible to the effects of subsidence and sinkholes, primarily in the northern region of the State. The State's susceptibility to subsidence is due in part to the number of abandoned mines throughout New Jersey. The State historically was an iron-producing state and the first mines in New Jersey were drilled in the early 1700s, with operations continuing until 1986 when the last active mine was closed. Although mines have closed in New Jersey, continued development in the northern part of the State has been 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 are not 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.

Figure 5.4.7-3 shows the location of the mapped abandoned mines in New Jersey. The data from NJGWS and the figure indicate that Essex County has three abandoned mines. All three mines in Essex County were copper mines: located in East Orange, Orange, and Glen Ridge (NJGWS 2006).

Figure 5.4.7-3. Abandoned Mines in New Jersey



Source: *NJGWS 2006*

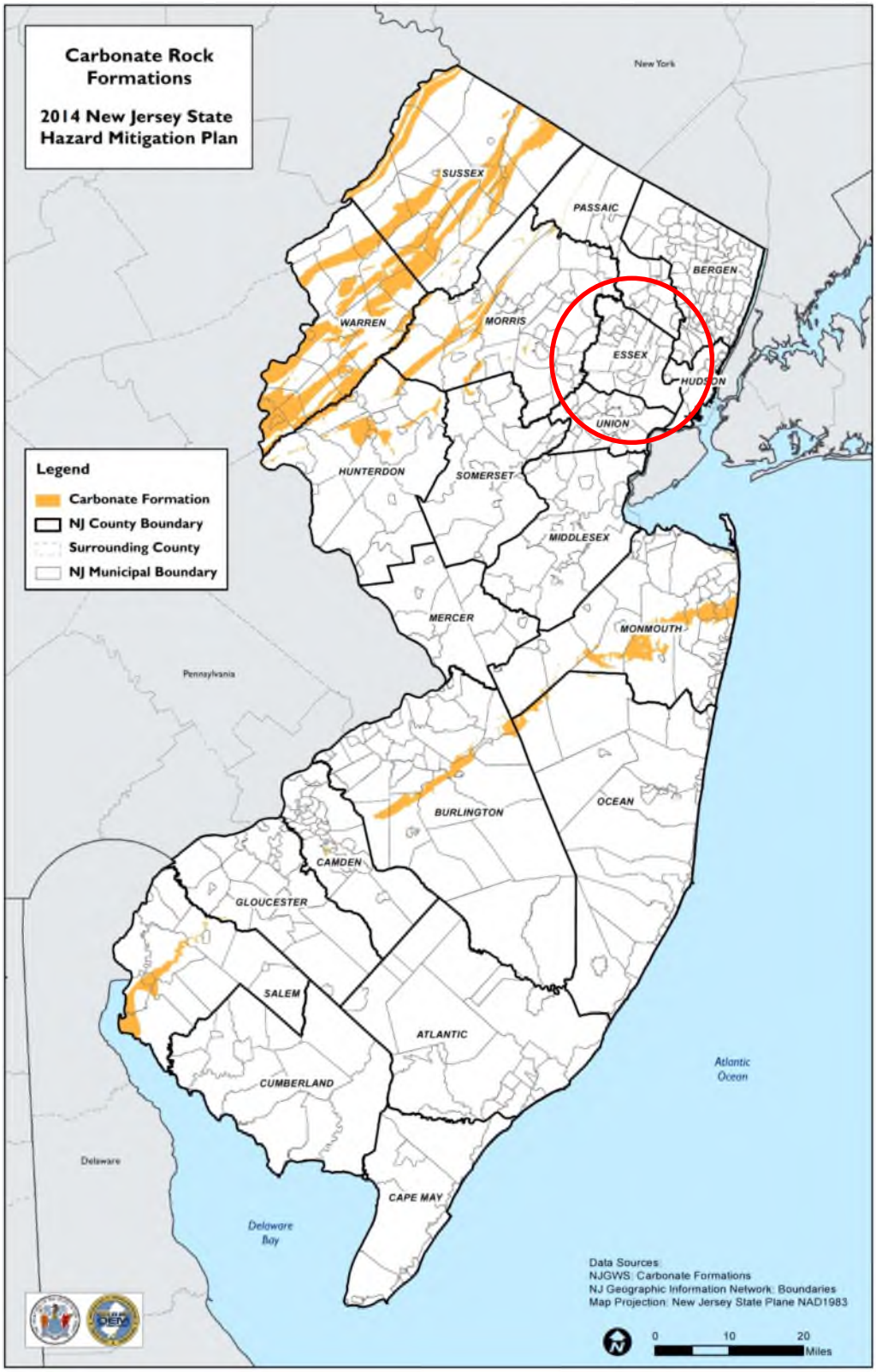
Note: *The red circle indicates the location of Essex County. According to the figure, the County has three abandoned copper mines.*

Naturally occurring subsidence and sinkholes in New Jersey occur within bands of carbonate bedrock. In northern New Jersey, there are more than 225 square miles that are underlain by limestone, dolomite, and marble. In some areas, no sinkholes have appeared, while in others, sinkholes are common. In southern New Jersey, there are approximately 100 miles which are locally underlain by a lime sand with thin limestone layers. No collapse sinkholes have been identified; however, there are some features which could be either very shallow solution depressions or wind blowout features. Sinkholes in New Jersey are generally concentrated in the northwestern part.

Areas underlain by carbonate rock may contain surface depressions and open drainage passages making such areas unstable and susceptible to subsidence and surface collapse. As a result, the alteration of drainage patterns, placement of impervious coverage, grade changes or increased loads can result in land subsidence and sinkhole formation (Piefer 2006).

Figure 5.4.7-4 illustrates the locations of carbonate-bearing geologic formations of New Jersey. These formations are areas of potential natural subsidence. These geologic units contain a high enough percentage of carbonate minerals such as calcite and/or dolomite for karst features such as sinkholes to form. Some of these units are more prone to sinkhole development than others due to a greater carbonate content in the rock. Although not every unit listed has documented sinkholes, all are susceptible to dissolution by groundwater so various karst features, including sinkholes, may be found on any of these units. According to this figure, Essex County does not contain carbonate rock formations.

Figure 5.4.7-4. Carbonate Rock Regions of New Jersey



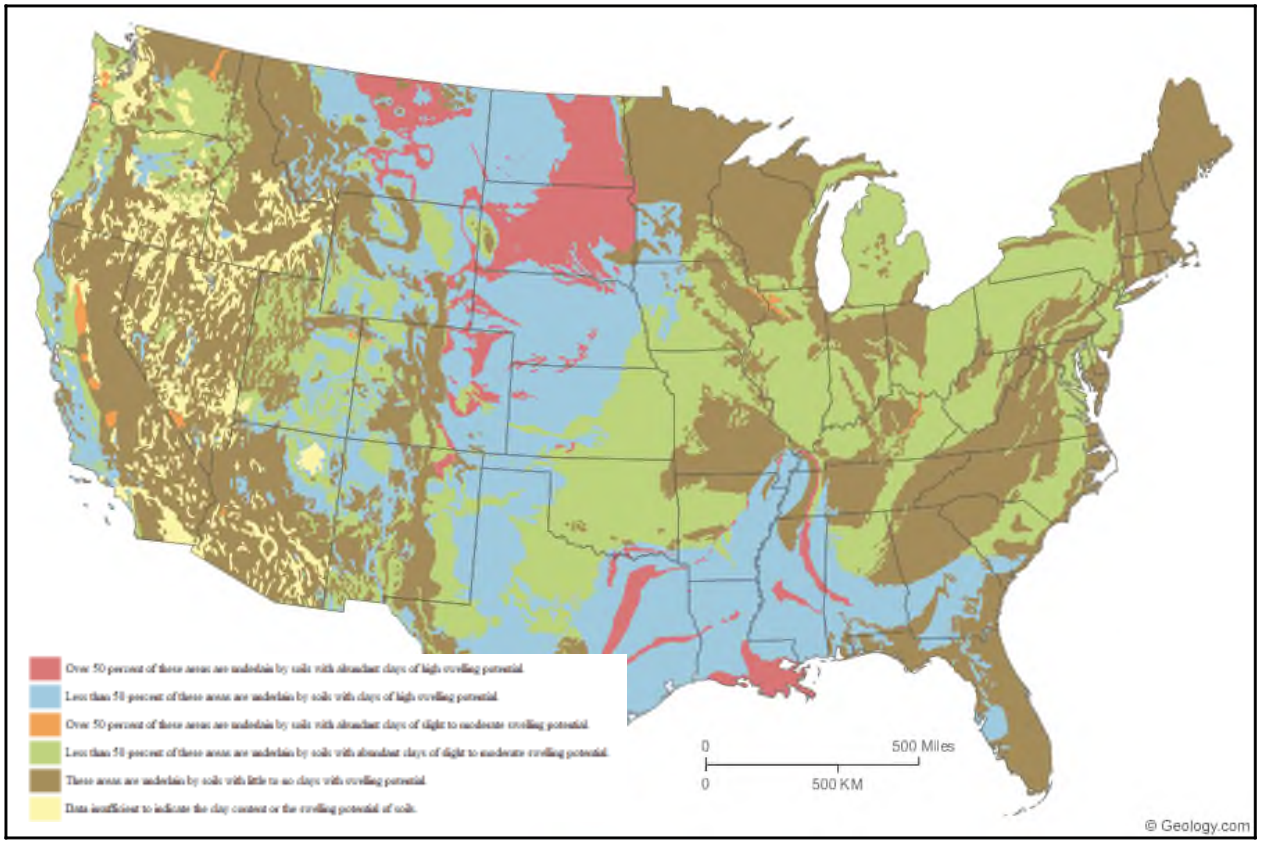
Source: New Jersey Geological Survey (NJGS) 2004
Note: The red circle indicates the location of Essex County. The County does not have carbonate formations.

While fewer karst features have been mapped in existing urban areas, human activity can often be the cause of a subsidence or sinkhole event. Furthermore, the lack of karst features exhibited in maps of urban areas is likely a result of development activities that disguise, cover, or fill existing features rather than an absence of the features themselves. Leaking water pipes or structures that convey stormwater runoff may also result in areas of subsidence as the water dissolves substantial amounts of rock over time. In some cases, construction, land grading, or earthmoving activities that cause changes in stormwater flow can trigger sinkhole events. Subsidence or sinkhole events may occur in the presence of mining activity, especially in areas where the cover of a mine is thin, even in areas where bedrock is not necessarily conducive to their formation. Piggott and Eynon (1978) indicated that sinkhole development normally occurs where the interval to the ground surface is less than three to five times the thickness of the extracted seam, and the maximum interval is up to ten times the thickness of the extracted seam. Sub-surface (i.e. underground) extraction of materials such as oil, gas, coal, metal ores (copper, iron, and zinc), clay, shale, limestone, or water may result in slow-moving or abrupt shifts in the ground surface.

Expansive Soils

Portions of New Jersey are underlain by soils with little to no clays with swelling potential. A majority of the State, including Essex County, have less than 50% of the area underlain by soils with abundant clays of slight to moderate swelling potential (Figure 5.4.7-5).

Figure 5.4.7-5. Expansive Soils of the United States



Source: Geology.com 2014

Extent

Landslide

To determine the extent of a landslide hazard, the affected areas need to be identified and the probability of the landslide occurring within some time period 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 landslide hazard is often represented by landslide incidence and/or susceptibility, as defined below:

- 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 landsliding; 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 (State of Alabama Date Unknown).
- 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 landsliding (State of Alabama Date Unknown).

Subsidence/Sinkhole

Landslide subsidence occurs slowly and continuously over time or abruptly for various reasons. Subsidence and sinkholes can occur due to either natural processes (karst sinkholes in areas underlain by soluble bedrock) or as a result of human activities.

Expansive Soils

The plasticity index (PI) is expressed as the numerical difference between the plastic limit (the percent moisture content at which clay passes from the solid to the plastic state) and the liquid limit (the percent moisture content at which clay passes from the plastic to liquid state). The PI bears a direct relation to the amount and type of clay minerals present and to the orientation and size of clay particles. Other factors remain constant, the PI increases with amount of clay minerals, decreases with degree of parallel orientation of the clay minerals, and decreases with clay particle size (FEMA 1996).

The PI is generally a good indicator of swelling potential. Scientists have found the PI to be one of the most useful indicators of swelling potential. Expansive soils can be recognized either by visual inspection in the field or by conducting laboratory analyses (FEMA 1996).

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with geological hazard 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.

Between 1954 and 2014, FEMA issued a disaster (DR) or emergency (EM) declaration for the State of New Jersey for one geological hazard-related event, classified as a mudslide. Of those events, Essex County has not been included any declarations (EM and DR) (FEMA 2014).

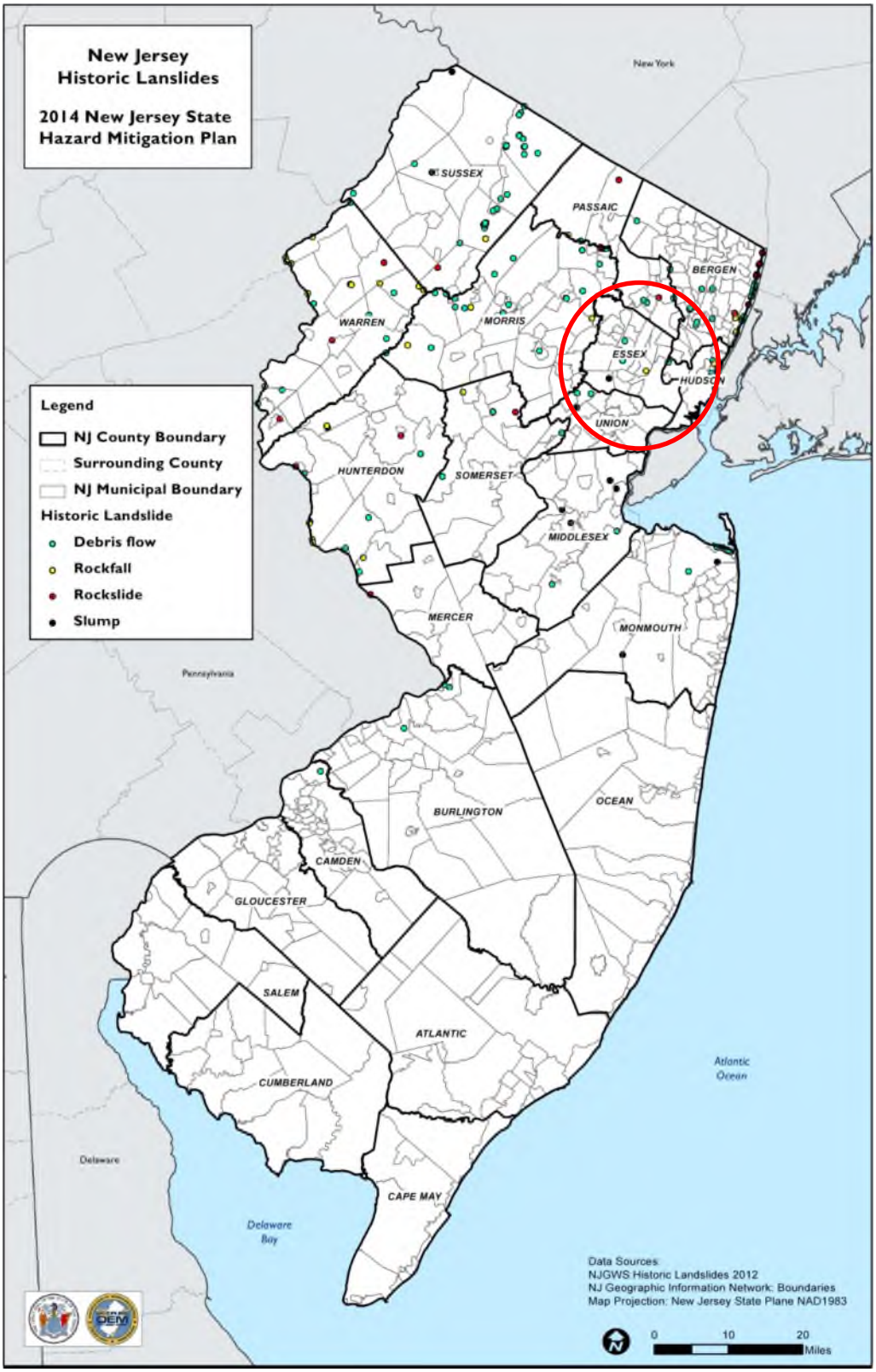
For this 2015 Plan Update, known geological hazard events that have impacted Essex County between 2007 and 2014 are identified in Table 5.4.7-2. With geological hazard documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.7-2 may not include all events that have occurred in the County.

Table 5.4.7-2. Geological Hazard Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
June 22, 2008	Debris flow	N/A	N/A	In West Orange Township, a contractor was buried to the waist and trapped for three hours when a storm caused a mudslide in the trench he was digging.
Unknown	Rockfall	N/A	N/A	In West Orange Township, the roadway cut was highly fractured and caused loose rock fragments to fall on the road due to weathering.
Unknown	Rockfall	N/A	N/A	Rockfall area along Interstate 280 in West Orange Township
Unknown	Rockfall	N/A	N/A	Rockfall along Interstate 280 in East Orange.
Unknown	Rockfall	N/A	N/A	Large rockfall during the night in West Orange Township due to weathering, fragments spilled onto the shoulder and into half of the middle lane.
Unknown	Rockfall	N/A	N/A	Small rockfall in West Orange Township due to weathering.
Unknown	Rockfall	N/A	N/A	Small rockfall in West Orange Township due to weathering.
Unknown	Slump	N/A	N/A	In Millburn Township, a 60-foot tall, 200-foot long streambank slump area was reactivated during heavy rains. The slumps here were active since at least 1970s.

Source: NJDEP 2012; NOAA-NCDC 2013
N/A Not applicable
NCDC National Climatic Data Center
NJDEP New Jersey Department of Environmental Protection
NOAA National Oceanic and Atmospheric Administration

Figure 5.4.7-6. Historic Landslide Events



Source: *NJGWS 2012*

Note: *The red circle indicates the location of Essex County. The figure shows that the County has had several landslide events.*

Probability of Future Occurrences

Based upon risk factors for and past occurrences, it is likely that geological hazards will occur in Essex County in the future. It is estimated that Essex County will continue to experience direct and indirect impacts of geological hazards and its impacts on occasion, with the secondary effects causing potential disruption or damage to communities.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for geological hazards in the County is considered 'occasional' (likely to occur within 100 years, as presented in Table 5.3-3).

Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

The New Jersey Climate Adaptation Alliance is a network of policymakers, public and private-sector practitioners, academics, non-governmental organizations (NGO), and business leaders aligned to build climate change preparedness in the state of New Jersey. The Alliance is facilitated by Rutgers University, which provides science and technical support, facilitates the Alliance's operations and advances its recommendations. A document titled Change in New Jersey: Trends and Projections was developed to identify recommendations for State and local public policy that will be designed to enhance climate change preparedness and resilience in New Jersey (Rutgers 2013).

Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC, 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4°F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).

Both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over 5" (12%) greater than the average from 1895-1970. Southern New Jersey became 2" (5%) wetter late in the 20th century (Office of New Jersey State Climatologist).

Future climate change may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Increase in global temperature could affect the snowpack and its ability to hold and store water. Warming temperatures also could increase the occurrence and duration of droughts, which could increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. All of these factors could increase the probability for landslide occurrences.

Landslides

Climate change may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Increase in global temperature could affect the snowpack and its ability to hold and store water. Warming temperatures also could increase the occurrence and duration of droughts, which would

increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. All of these factors would increase the probability for landslide occurrences.

Subsidence/Sinkholes

Similar to landslides, climate change will affect subsidence and sinkholes in New Jersey. As discussed throughout this profile, one of the triggers for subsidence and sinkholes is an abundance of moisture which has the potential to permeate the bedrock causing an event. Climatologists expect an increase in annual precipitation amounts. This increase will coincide with an increased risk in subsidence and sinkholes in vulnerable areas.

Expansive Soils

As the climate changes and temperatures increase, soils have the potential to dry out, resulting in expansive soils shrinking and failing. This could lead to a big problem in residential areas where buildings have shallow foundations; the soils will be unable to support the weights of a building. When expansive soils get dry, they begin to repel moisture instead of soaking it up. The water is more likely to run off, creating flash floods. It takes a slow and steady rain, over an extended period of time, to restore expansive clay soils (Gehr 2014).

5.4.7.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For geological hazards, the known landslide and subsidence/sinkhole vulnerable areas as identified by the New Jersey Geologic and Water Survey have been identified as the hazard area. The following text evaluates and estimates the potential impact of geologic hazards on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Vulnerability to ground failure hazards is a function of location, soil type, geology, type of human activity, use, and frequency of events. The effects of ground failure on people and structures can be lessened by total avoidance of hazard areas or by restricting, prohibiting, or imposing conditions on hazard-zone activity. Local governments can reduce ground failure effects by educating themselves on past hazard history of the site and by making inquiries to planning and engineering departments of local governments (National Atlas, 2007).

To determine vulnerability, a spatial analysis was conducted in GIS using the landslide susceptibility datasets discussed below. When the analysis determined the hazard area would impact the area in a jurisdiction, or the location of critical facilities, these locations were deemed vulnerable to the hazard.

Data and Methodology

The New Jersey Geologic Survey (currently known as the New Jersey Geological and Water Survey) determined landslide susceptibility for nine counties in New Jersey (Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union). Figure 5.4.7-2 earlier in this section illustrates the classifications in Essex County. Based upon the analysis using NJGWS data, the areas of landslide susceptibility are specific to hilly or mountainous areas with steep slopes and erodible soils. This spatial data set was used to estimate population, building stock and critical facility exposure in Essex County.

The limitations of this analysis are recognized and are only used to provide a general estimate of exposure and vulnerability. Over time additional data will be collected to allow better analysis for this hazard. Available information and a preliminary assessment are provided below.

Impact on Life, Health and Safety

To estimate the population located within the landslide susceptibility hazard areas, the hazard area boundaries were overlaid upon the 2010 Census population data (U.S. Census, 2010). The Census blocks with their center (centroid) within the boundary of the landslide incidence hazard areas were used to calculate the estimated population considered exposed to this hazard. Please note the Census blocks do not align exactly with the hazard areas and, therefore, these estimates should be considered for planning purposes only. Table 5.4.7-3 summarizes the population within each identified area by municipality (U.S. Census 2010). Specifically, the population located downslope of the landslide hazard areas are particularly vulnerable to this hazard. Due to the nature of Census block data, it is difficult to determine demographics of populations vulnerable to mass movements of geological material.

As discussed earlier, naturally occurring subsidence and sinkholes in New Jersey occur within bands of carbonate bedrock. According to the NJGWS dataset, there is no carbonate rock in the County. As noted earlier in this section, there are three abandoned mines located in Glen Ridge, East Orange, and the City of Orange.

Based on the analysis, municipalities that contain sections of the Watchung Mountains have higher exposure to potential landslides. The analysis shows that a relative small percentage of the population is exposed to this hazard. The Township of Irvington has the highest number of people potentially exposed (an estimated 635 people representing 1.18 percent of the total population potentially exposed).

Table 5.4.7-3. Estimated Population Located in the Landslide Hazard Areas

Municipalities	Total Population (2010 U.S. Census)	NJGWS-Defined Landslide Susceptible Areas			
		Class A	% Total	Class B	% Total
Township of Belleville	35,926	0	0.00%	272	0.76%
Township of Bloomfield	47,315	0	0.00%	0	0.00%
Borough of Caldwell	7,822	0	0.00%	601	7.68%
Township of Cedar Grove	12,411	331	2.67%	0	0.00%
City of East Orange	64,270	0	0.00%	0	0.00%
Borough of Essex Fells	2,113	0	0.00%	0	0.00%
Township of Fairfield	7,466	0	0.00%	0	0.00%
Borough of Glen Ridge	7,527	0	0.00%	26	0.35%
Township of Irvington	53,926	0	0.00%	635	1.18%
Township of Livingston	29,366	0	0.00%	0	0.00%
Township of Maplewood	23,867	0	0.00%	306	1.28%
Township of Millburn	20,149	0	0.00%	331	1.64%
Township of Montclair	37,669	204	0.54%	148	0.39%
City of Newark	277,140	0	0.00%	0	0.00%
Borough of North Caldwell	6,183	0	0.00%	107	1.73%
Township of Nutley	28,370	0	0.00%	175	0.62%
City of Orange Township	30,134	0	0.00%	0	0.00%
Borough of Roseland	5,819	0	0.00%	0	0.00%
Township of South Orange Village	16,198	0	0.00%	0	0.00%
Township of Verona	13,332	0	0.00%	0	0.00%
Township of West Caldwell	10,759	0	0.00%	0	0.00%
Township of West Orange	46,207	195	0.42%	0	0.00%
Essex County (Total)	**783,969**	**730**	**0.09%**	**2,601**	**0.33%**

Source: United States Census 2010; NJGWS, 2005

Note: Class A includes classes AII, AIV, AVI which is strongly cemented rock at varying slope angles. Class B includes classes BIII, BIV, BV, and BVI which includes weakly cemented rock and soil at varying slope angles. No Class C soils were identified in Essex County.

% percent

NJGWS New Jersey Geological Water Survey

- No data available to conduct the analysis. NJGWS data was only available for nine counties in New Jersey (Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union).

Impact on General Building Stock

In general, the built environment located in the high susceptibility zones and the population, structures and infrastructure located downslope are vulnerable to this hazard. In an attempt to estimate the general building stock exposed to this hazard, the building improvement values (structure only) were determined for the buildings with their centroids within the approximate landslide hazard areas.

Based on the analysis, 125 buildings and $50 Million in improvements are located in Class A zones. Class A includes classes AII, AIV, AVI which is strongly cemented rock at varying slope angles. In addition, based on this analysis, there are 555 buildings and $213 Million in improvements located in Class B zones. Class B includes classes BIII, BIV, BV, and BVI which includes weakly cemented rock and soil at varying slope angles. Refer to Table 5.4.7-4 which summarizes these results by municipality.

Table 5.4.7-4. Number of Buildings in the Landslide Hazard Area by Municipality

Municipality	Total Number of Buildings	Total Improved Value (Structure Only)	Class A				Class B			
			# Buildings	% Total	Improved Value (Structure Only)	% Total	# Buildings	% Total	Improved Value (Structure Only)	% Total
Township of Belleville	9,154	$2,905,447,150	0	0.00%	$0	0.00%	6	0.07%	$1,294,400	0.04%
Township of Bloomfield	11,383	$3,827,312,350	0	0.00%	$0	0.00%	0	0.00%	$0	0.00%
Borough of Caldwell	2,116	$753,639,775	0	0.00%	$0	0.00%	10	0.47%	$2,558,000	0.34%
Township of Cedar Grove	3,815	$1,657,089,082	7	0.18%	$6,425,100	0.39%	42	1.10%	$16,023,100	0.97%
City of East Orange	9,310	$5,820,599,879	0	0.00%	$0	0.00%	0	0.00%	$0	0.00%
Borough of Essex Fells	760	$567,106,700	1	0.13%	$291,200	0.05%	0	0.00%	$0	0.00%
Township of Fairfield	3,169	$3,374,787,200	0	0.00%	$0	0.00%	1	0.03%	$370,000	0.01%
Borough of Glen Ridge	2,214	$986,279,500	0	0.00%	$0	0.00%	3	0.14%	$1,357,000	0.14%
Township of Irvington	9,312	$2,820,388,050	0	0.00%	$0	0.00%	129	1.39%	$15,890,400	0.56%
Township of Livingston	9,510	$5,547,703,530	4	0.04%	$1,023,500	0.02%	6	0.06%	$2,896,900	0.05%
Township of Maplewood	7,275	$2,733,369,500	0	0.00%	$0	0.00%	36	0.49%	$11,652,300	0.43%
Township of Millburn	6,291	$8,045,533,450	0	0.00%	$0	0.00%	105	1.67%	$49,194,700	0.61%
Township of Montclair	10,486	$5,890,125,479	29	0.28%	$18,543,900	0.31%	142	1.35%	$86,531,900	1.47%
City of Newark	38,329	$18,709,618,398	0	0.00%	$0	0.00%	0	0.00%	$0	0.00%
Borough of North Caldwell	1,951	$1,431,441,250	0	0.00%	$0	0.00%	13	0.67%	$4,372,600	0.31%
Township of Nutley	8,884	$3,510,270,592	0	0.00%	$0	0.00%	21	0.24%	$5,155,800	0.15%
City of Orange Township	4,354	$1,867,401,350	0	0.00%	$0	0.00%	0	0.00%	$0	0.00%
Borough of Roseland	1,616	$1,435,628,250	0	0.00%	$0	0.00%	2	0.12%	$628,200	0.04%
Township of South Orange Village	4,508	$3,108,688,125	6	0.13%	$1,869,000	0.06%	0	0.00%	$0	0.00%
Township of Verona	3,907	$1,598,018,325	11	0.28%	$1,581,800	0.10%	6	0.15%	$925,400	0.06%
Township of West Caldwell	3,634	$2,040,951,278	0	0.00%	$0	0.00%	0	0.00%	$0	0.00%
Township of West Orange	12,688	$5,503,784,816	67	0.53%	$20,977,900	0.38%	33	0.26%	$14,394,100	0.26%
Essex County (Total)	**164,666**	**$84,135,184,028**	**125**	**0.08%**	**$50,712,400**	**0.06%**	**555**	**0.34%**	**$213,244,800**	**0.25%**

Source: NJGWS 2005; Essex County 2014

Note: NJGWS New Jersey Geological Water Survey

Class A includes classes AII, AIV, AVI which is strongly cemented rock at varying slope angles. Class B includes classes BIII, BIV, BV, and BVI which includes weakly cemented rock and soil at varying slope angles. No Class C soils were identified in Essex County.

Impact on Critical Facilities

To estimate exposure, the approximate landslide hazard areas were overlaid upon the essential and municipal facilities. Table 5.4.7-5 lists the number essential facilities (i.e., police, fire, EOCs, hospitals and schools) that are located in the landslide susceptibility hazard areas. Based on this analysis, the Township of Montclair has one critical facility, a dam, located in a landslide hazard area.

In addition to critical facilities, a significant amount of infrastructure can be exposed to mass movements of geological material:

- *Roads*—Access to major roads is crucial to life-safety after a disaster event and to response and recovery operations. Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems, and delays for public and private transportation. This can result in economic losses for businesses.
- *Bridges*—Landslides can significantly impact road bridges. Mass movements can knock out bridge abutments or significantly weaken the soil supporting them, making them hazardous for use.
- *Power Lines*—Power lines are generally elevated above steep slopes; but the towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses.

Several other types of infrastructure may also be exposed to landslides, including water and sewer infrastructure. At this time all critical facilities, infrastructure, and transportation corridors located within the hazard areas are considered vulnerable until more information becomes available.

Table 5.4.7-5. Critical Facilities Exposed to the Landslide Hazard Areas (Classes A through B)

Municipality	Dam
Township of Montclair	1

Source: NJGWS 2005

Note: NJGWS New Jersey Geological Water Survey

Class A includes classes AII, AIV, AVI which is strongly cemented rock at varying slope angles. Class B includes classes BIII, BIV, BV, and BVI which includes weakly cemented rock and soil at varying slope angles. No Class C soils were identified in Essex County.

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 2003). 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.

Direct building losses are the estimated costs to repair or replace the damage caused to the building as a result of a geologic hazard. These dollar value losses to Essex County's total building improved value would impact the County's tax base and the local economy.

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.

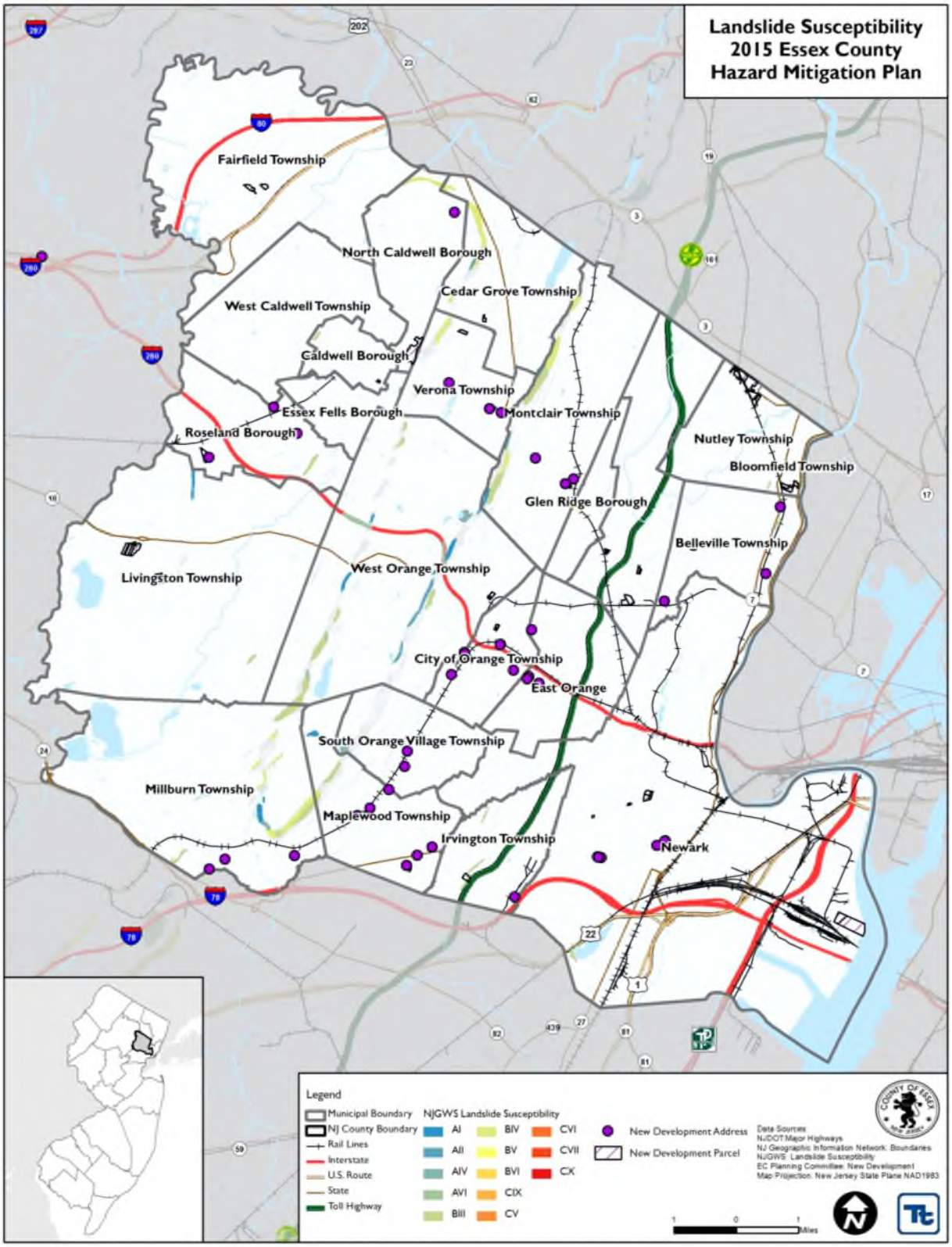
In general, development of slopes is not recommended due to the increased risk of erosion, stormwater runoff and flooding potential. The additional runoff results in sedimentation of down slope surface waters, which damages habitat and has the potential to damage property. The sloping land increases the rate of runoff, which reduces the rate of groundwater infiltration. This effect is exacerbated when vegetation is unnecessarily stripped from the slope (Essex County Environmental Resource Inventory 2007). Several municipalities within the County have steep slope ordinances to restrict development in these areas.

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 agricultural and forest productivity.

Future Growth and Development

As discussed in Section 4 and Volume II, Section 9, areas targeted for future growth and development have been identified across Essex County. It is anticipated that new development within the identified hazard area will be exposed to such risks.

Table 5.4.7-6. Potential New Development and Landslide Hazard Areas



Source: NJGWS

Change of Vulnerability

A population, building or critical facility exposure analysis was not conducted as part of the 2008 HMP for geologic hazards. Therefore, changes in vulnerability for this hazard of concern cannot be determined. Essex County and all plan participants continue to be vulnerable to geological hazards.

Effect of Climate Change on Vulnerability

Landslides

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

The New Jersey Climate Adaptation Alliance is a network of policymakers, public and private-sector practitioners, academics, non-governmental organizations (NGO), and business leaders aligned to build climate change preparedness in the state of New Jersey. The Alliance is facilitated by Rutgers University, which provides science and technical support, facilitates the Alliance's operations and advances its recommendations. A document titled Change in New Jersey: Trends and Projections was developed to identify recommendations for State and local public policy that will be designed to enhance climate change preparedness and resilience in New Jersey (Rutgers 2013).

Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC, 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4°F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).

Both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over 5" (12%) greater than the average from 1895-1970. Southern New Jersey became 2" (5%) wetter late in the 20th century (Office of New Jersey State Climatologist).

Future climate change may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Increase in global temperature could affect the snowpack and its ability to hold and store water. Warming temperatures also could increase the occurrence and duration of droughts, which could increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. All of these factors could increase the probability for landslide occurrences.

Subsidence/Sinkholes

Similar to landslides, future climate change could affect subsidence and sinkholes in New Jersey. As discussed throughout this profile, one of the triggers for subsidence and sinkholes is an abundance of moisture which has the potential to permeate the bedrock causing an event. Climatologists predict an increase in annual precipitation amounts. Both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over 5" (12%) greater than the average from 1895-1970. Southern New Jersey became 2" (5%) wetter late in the 20th century (Office of New Jersey State Climatologist). Average annual precipitation is projected to increase in the region by 5% by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New

York City Panel on Climate Change [NPCC] 2009). This increase will coincide with an increased potential risk in subsidence and sinkholes in vulnerable areas.

Additional Data and Next Steps

Obtaining historic damages to buildings and infrastructure incurred due to geologic hazards will help with loss estimates and future modeling efforts, given a margin of uncertainty. In addition, as building and critical facility inventories are updated so should the vulnerability assessment. Further, research on rainfall thresholds for forecasting landslide potential may also be an option for Essex County.

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5.4.8 Severe Weather

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the severe weather hazard in Essex County.

2015 Plan Update Changes

- The 2015 Plan Update groups high winds, tornadoes, thunderstorms, and hailstorms in the severe weather profile. The 2008 County HMP profiled these as individual hazards; however, the high wind hazard was not included in the 2008 Plan.
- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the severe weather hazard is discussed.
- New and updated figures from federal and state agencies are incorporated.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- A vulnerability assessment was conducted for all severe weather hazards. The vulnerability assessment is new for the high winds, tornadoes and hailstorms hazards. It now directly follows the hazard profile.

5.4.8.1 Profile

Hazard Description

In 2012, the U.S. Natural Hazards Statistics provided statistical information on fatalities, injuries, and damages caused by weather-related hazards. These statistics were compiled by the Office of Services and the National Climatic Data Center (NCDC) from information contained in in the publication *Storm Data*. According to this 2012 data, New Jersey had 24 fatalities, 21 injuries, and over $24 million in property and crop damages. This data includes statistics on cold, flood, heat, lightning, tornado, tropical cyclone, wind, and winter storm events. In relation to severe weather, New Jersey experienced three lightning-related fatalities and 11 wind-related fatalities in 2012 (National Oceanic and Atmospheric Administration [NOAA] 2013). For the purpose of this HMP Update and as deemed appropriated by the Essex County Planning Committee, the severe weather hazard includes high winds, tornadoes, thunderstorms, and hail, which are defined below.

High Winds

High winds, other than tornadoes, are experienced in all parts of the U.S. Areas that experience the highest wind speeds are coastal regions from Texas to Maine, and the Alaskan coast; however, exposed mountain areas experience winds at least as high as those along the coast (FEMA 1997; Robinson 2013). In New Jersey, the northwest ridge tops most often experience the highest winds in the State, followed by the coastal locations (Robinson 2013). 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. Effects from high winds can include downed trees and power lines, and damages to roofs, windows, etc. (Ilicak 2005). The following table provides the descriptions of winds used by the NWS.

Table 5.4.8-1. NWS Wind Descriptions

Descriptive Term	Sustained Wind Speed (mph)
Strong, dangerous, or damaging	≥40
Very Windy	30-40

Descriptive Term	Sustained Wind Speed (mph)
Windy	20-30
Breezy, brisk, or blustery	15-25
None	5-15 or 10-20
Light or light and variable wind	0-5

Source: NWS 2010
mph miles per hour

Extreme windstorm events are associated with extra-tropical and tropical cyclones, winter cyclones, severe thunderstorms, and accompanying mesoscale offspring such as tornadoes and downbursts. Winds vary from zero at ground level to 200 miles per hour (mph) in the upper atmospheric jet stream at six to eight miles above the earth's surface (FEMA 1997).

A type of windstorm that is experienced often during rapidly moving thunderstorms is a derecho. A derecho is a long-lived windstorm that is associated with a rapidly moving squall line of thunderstorms. It produces straight-line winds gusts of at least 58 mph and often has isolated gusts exceeding 75 mph. This means that trees generally fall and debris is blown in one direction. To be considered a derecho, these conditions must continue along a path of at least 240 miles. Derechos are more common in the Great Lakes and Midwest regions of the U.S., though, on occasion, can persist into the mid-Atlantic and northeast U.S. (ONJSC Rutgers University 2013a).

High wind storms cause disruptions to power and have the potential to damage structures in the State. High winds storms also have the potential to knock down tree limbs which subsequently damage power and other utility lines thus contributing to widespread power outages. High wind storms are often accompanied by other events such as thunderstorms, or part of hurricane and tropical storms. The worst case scenario for a high wind event includes widespread power outages to populated cities and municipalities.

Tornadoes

Tornadoes are nature's most violent storms and can cause fatalities and devastate neighborhoods in seconds. A tornado appears as a rotating, funnel-shaped cloud that extends from a thunderstorm to the ground with whirling winds that can reach 250 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 typically move at speeds between 30 and 125 mph and can generate internal winds exceeding 300 mph. The lifespan of a tornado rarely is longer than 30 minutes (FEMA 1997).

Tornadoes do occur in New Jersey, although generally they are relatively weak and short lived. Climatologically, past occurrences indicate that the State experiences about two tornadoes per year. Tornado season in New Jersey is generally March through August, though tornadoes can occur at any time of the year. Over 80% of all tornadoes strike between noon and midnight.

Tornado watches and warning are issued by the local NWS office. A tornado watch is released when tornadoes are possible in an area. A tornado warning means a tornado has been sighted or indicated by weather radar. The current average lead time for tornado warnings is 13 minutes; however, warning times for New Jersey may be shorter due to the fact that the State experiences smaller tornadoes that are difficult to warn for. Occasionally, tornadoes develop so rapidly, that little, if any, advance warning is possible (NOAA 2013; FEMA, 2013; Robinson 2013).

Thunderstorms

A thunderstorm is a local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder (NWS 2009d). A thunderstorm forms from a combination of moisture, rapidly rising warm air, and a force capable of lifting air such as a warm and cold front, a sea breeze, or a mountain. Thunderstorms form from the equator to as far north as Alaska. These storms occur most commonly in the tropics. Many tropical land-based locations experience over 100 thunderstorm days each year (Pidwirny 2007). Although thunderstorms generally affect a small area when they occur, they have the potential to become dangerous due to their ability in generating tornadoes, hailstorms, strong winds, flash flooding, and lightning. The NWS considers a thunderstorm severe only if it produces damaging wind gusts of 58 mph or higher or large hail one-inch (quarter size) in diameter or larger or tornadoes (NWS 2010).

The rising air in a thunderstorm cloud causes various types of frozen precipitation to form within the cloud, which includes very small ice crystals and larger pellets of snow and ice. The smaller ice crystals are carried upward toward the top of the clouds by the rising air while the heavier and denser pellets are either suspended by the rising air or start falling towards the ground. Collisions occur between the ice crystals and the pellets, and these collisions serve as the charging mechanism of the thunderstorm. The small ice crystals become positively charged while the pellets become negatively charged, resulting in the top of the cloud becomes positively charged and the middle to lower part of the storm becomes negatively charged. At the same time, the ground below the cloud becomes charged oppositely. When the charge difference between the ground and the cloud becomes too large, a small amount of charge starts moving toward the ground. When it nears the ground, an upward leader of opposite charge connects with the step leader. At the instant this connection is made, a powerful discharge occurs between the cloud and ground. The discharge is seen as a bright, visible flash of lightning (NOAA Date Unknown). Thunder is the sound caused by rapidly expanding gases in a lightning discharge (NWS 2009c).

Meteorologists can often predict the likelihood of a severe thunderstorm. This can give several days warning. However, meteorologists cannot predict the exact time of onset, specific location, or the severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

The most common problems associated with severe storms are immobility and loss of utilities. Fatalities are uncommon, but can occur due to lightning strikes. Roads may become impassable due to flooding, downed trees, or a landslide. Power lines may be downed due to high winds, and services such as water or phone may be disrupted. Lightning can cause severe damage and injury. Wind storms can be a frequent problem and have caused damage to utilities. Wind storms, as mentioned previously, may occur as part of thunderstorms or independently. The predicted wind speed given in wind warnings issued by the NWS is for a one-minute average; gusts may be 25 to 30% higher.

In the U.S., an average of 300 people are injured and 80 people are killed by lightning each year. Typical thunderstorms are 15 miles in diameter and last an average of 30 minutes. An estimated 100,000 thunderstorms occur each year in the U.S., with approximately 10% of them classified as severe. During the warm season, thunderstorms are responsible for most of the rainfall.

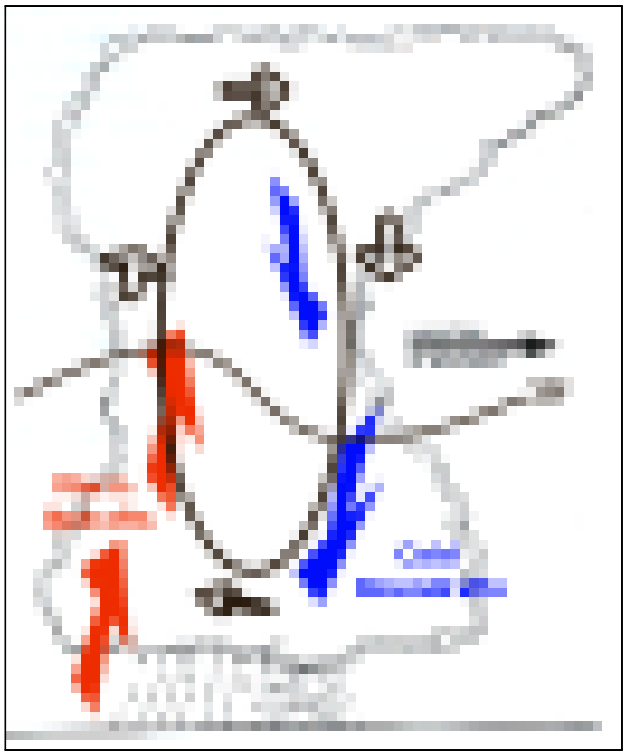
Hailstorms

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 may thaw as it moves into warmer air toward the bottom of the thunderstorm. However, the droplet may be picked up again by another updraft and carried back into the cold air and 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. Most hail is small and typically less than two inches in diameter (NWS 2010). Figure 5.4.8-1 illustrates the process that occurs in hail formulation.

The size of hailstones is a direct function of the size and severity of the storm. The size varies and is related to the severity and size of the thunderstorm that produced it. The higher the temperatures at the earth's surface, the greater the strength of the updrafts, and the greater the amount of time the hailstones are suspended, giving them more time to increase in size. Damage to crops and vehicles are typically the most significant impacts of hailstorms.

Figure 5.4.8-1. Hail Formation



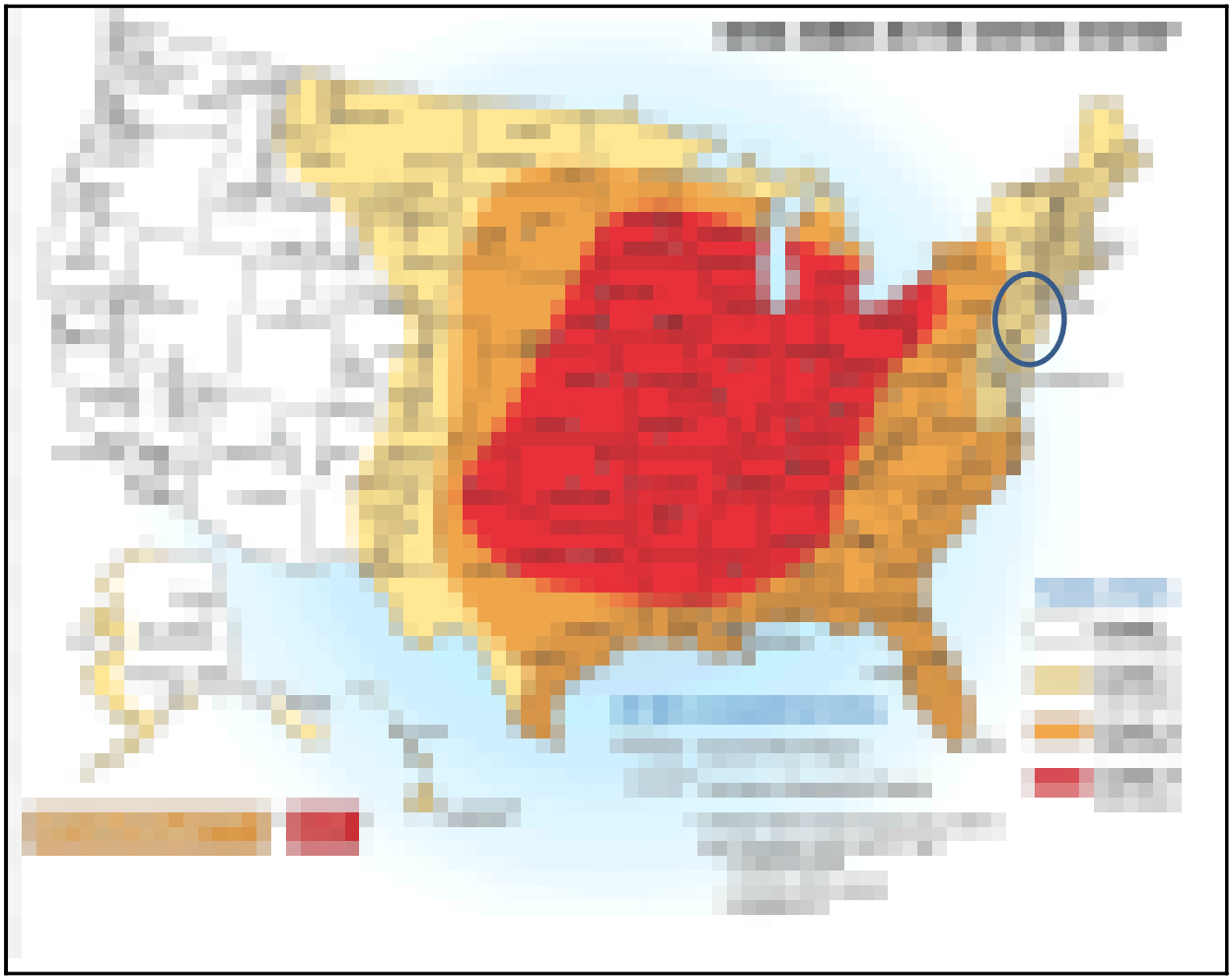
Source: NOAA 2012
°F degrees Fahrenheit

Location

High Winds

Figure 5.4.8-2 indicates how the frequency and strength of windstorms impacts the U.S. and the general location of the most wind activity. This is based on 40 years of tornado data and 100 years of hurricane data, collected by FEMA. States located in Wind Zone IV have experienced the greatest number of tornadoes and the strongest tornadoes. New Jersey is located within Wind Zone II, which may experience wind speeds up to 160 mph. The entire State is also located within the hurricane-susceptible region. Table 5.4.8-2 describes the areas affected by the different U.S. wind zones.

Figure 5.4.8-2. Wind Zones in the U.S.



Source: FEMA, 2012
Note: The blue circle indicates the location of New Jersey. According to this figure, the State (and Essex County) is located in Wind Zone II and located in the Hurricane-Susceptible Region.
mph miles per hour

Table 5.4.8-2. Wind Zones in the U.S.

Wind Zone	Areas Affected
Zone I (≤130 mph)	All of Washington, Oregon, California, Idaho, Utah, and Arizona. Western parts of Montana, Wyoming, Colorado, and New Mexico. Most of Alaska, except the east and south coastlines.
Zone II (131 - 160 mph)	Eastern parts of Montana, Wyoming, Colorado, and New Mexico. Most of North Dakota. Northern parts of Minnesota, Wisconsin, and Michigan. Western parts of South Dakota, Nebraska, and Texas. All New England States. Eastern parts of New York, Pennsylvania, Maryland, and Virginia. All of New Jersey, Delaware, and Washington, DC.
Zone III (161 - 200 mph)	Areas of Minnesota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas, Louisiana, Mississippi, Alabama, Georgia, Tennessee, Kentucky, Pennsylvania, New York, Michigan, and Wisconsin. Most or all of Florida, Georgia, South Carolina, North Carolina, Virginia, and West Virginia. All of American Samoa, Puerto Rico, and Virgin Islands.

Table 5.4.8-2. Wind Zones in the U.S.

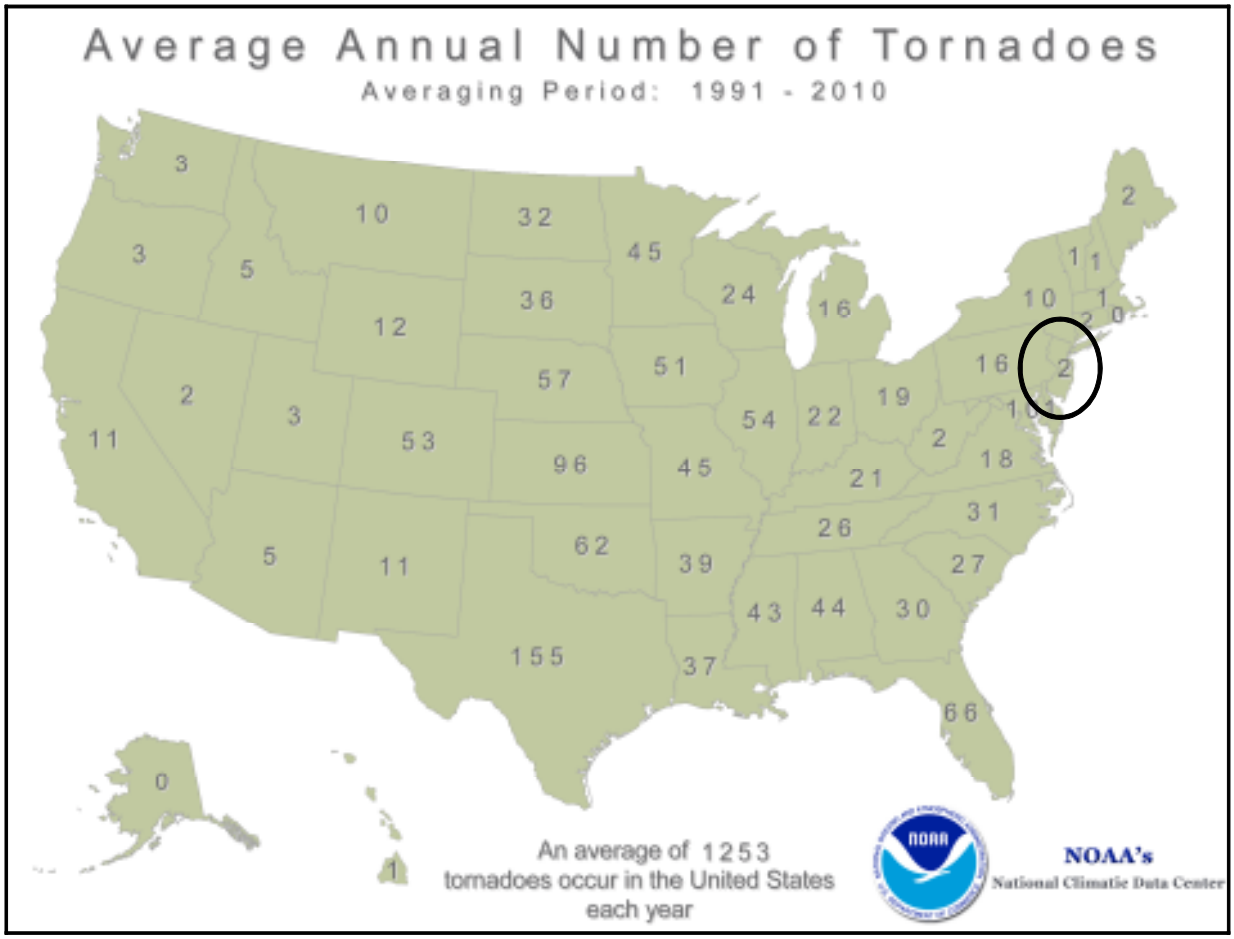
Wind Zone	Areas Affected
Zone IV (201 - 250 mph)	Mid U.S. including all of Iowa, Missouri, Arkansas, Illinois, Indiana, and Ohio and parts of adjoining states of Minnesota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Louisiana, Mississippi, Alabama, Georgia, Tennessee, Kentucky, Pennsylvania, Michigan, and Wisconsin. Guam.
Special Wind Region	Isolated areas in the following states: Washington, Oregon, California, Idaho, Utah, Arizona, Montana, Wyoming, Colorado, New Mexico. The borders between Vermont and New Hampshire; between New York, Massachusetts and Connecticut; between Tennessee and North Carolina.
Hurricane Susceptible Region	Southern U.S. coastline from Gulf Coast of Texas eastward to include entire state of Florida. East Coastline from Maine to Florida, including all of Massachusetts, Connecticut, Rhode Island, New Jersey, Delaware, and Washington DC. All of Hawaii, Guam, American Samoa, Puerto Rico and Virgin Islands.

mph *miles per hour*

Tornadoes

The U.S. experiences more tornadoes than any other country. In a typical year, approximately 1,000 tornadoes affect the U.S. The peak of the tornado season is April through June, with the highest concentration of tornadoes in the central U.S. The potential for a tornado strike is about equal across locations in New Jersey, except in the northern section of the State which typically has steeper terrain and therefore is less likely to experience tornadoes. Figure 5.4.8-3 shows the annual average number of tornadoes between 1991 and 2010. New Jersey experienced an average of two tornadoes annually between 1991 and 2010. However, based on the number of tornadoes that have occurred in New Jersey between 1951 and 2012 (144 events); New Jersey can expect to experience an average of two to three tornadoes each year.

Figure 5.4.8-3. Annual Average Number of Tornadoes in the U.S., 1991 to 2010



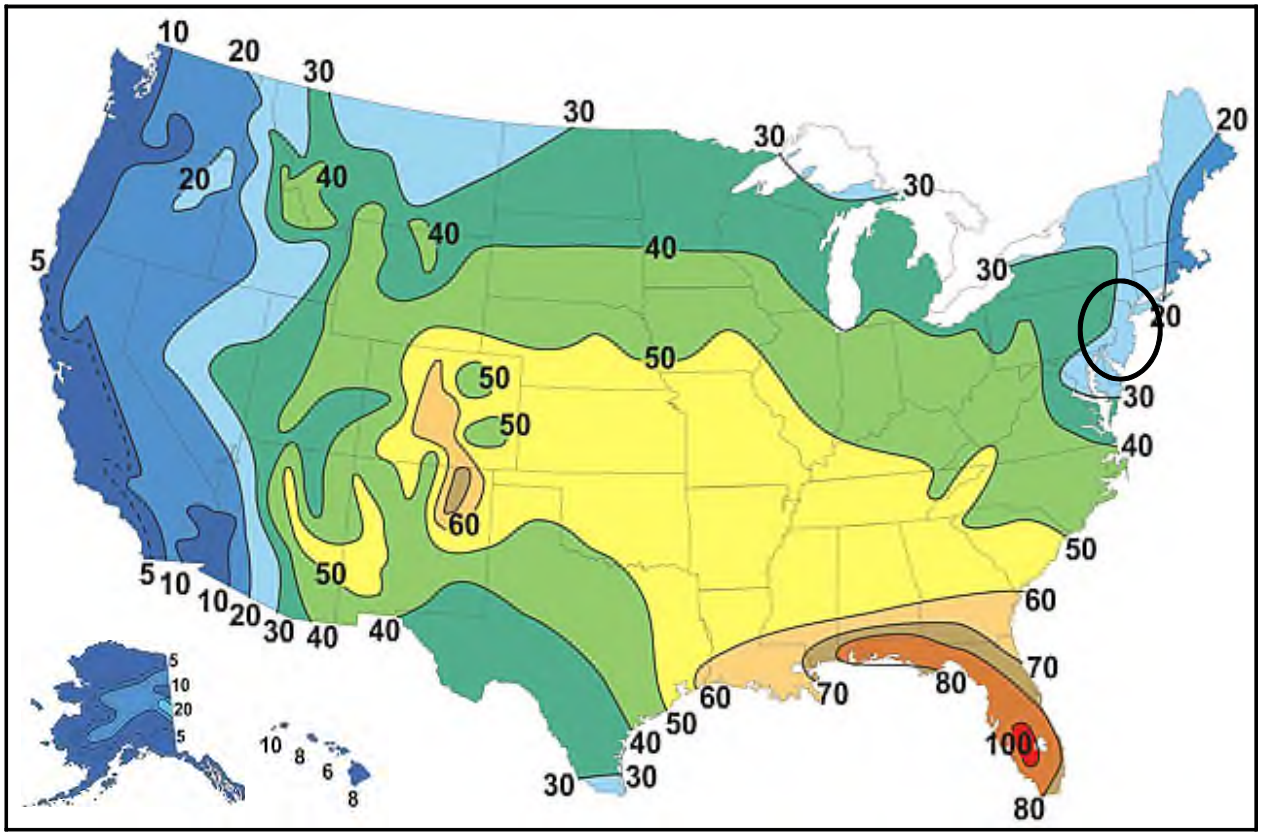
Source: *NCDC 2013*

Note: *The black circle indicates the location of New Jersey. According to this figure, the State (and Essex County) has an average of two tornadoes a year.*

Thunderstorms

Thunderstorms affect relatively small localized areas, rather than large regions like winter storms and hurricane events. Thunderstorms can strike in all regions of the U.S.; however, they are most common in the central and southern states. The atmospheric conditions in these regions of the country are ideal for generating these powerful storms. It is estimated that there are as many as 40,000 thunderstorms each day worldwide. Figure 5.4.8-4 shows the average number of thunderstorm days throughout the U.S. The most thunderstorms are seen in the southeast states, with Florida having the highest incidences (80 to over 100 thunderstorm days each year). Figure 5.4.8-4 illustrates New Jersey experiences between 20 and 30 thunderstorm days each year (NWS 2009d; NWS 2010).

Figure 5.4.8-4. Annual Average Number of Thunderstorm Days in the U.S.



Source: NWS 2010

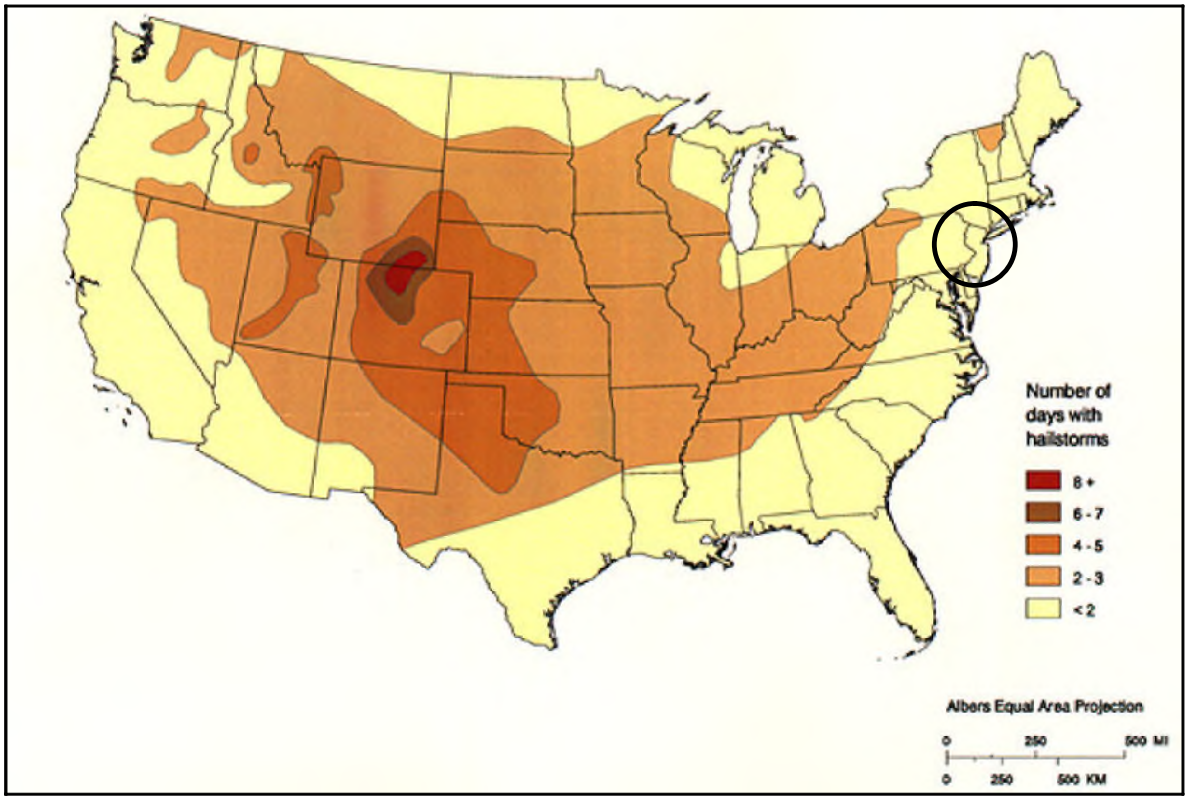
Note: The black circle indicates the approximate location of New Jersey. According to this figure, New Jersey experiences an average between 20 and 30 thunderstorms annually.

Thunderstorms spawned in Pennsylvania and New York State often move into northern New Jersey, where they usually reach maximum development during the evening hours. This region of the State has about twice as many thunderstorms as the coastal zone. The conditions most favorable to thunderstorm development occur between June and August, with July being the peak month for all weather stations in New Jersey.

Hailstorms

Hail causes nearly $2 billion in crop and property damages, on average, each year in the U.S. Hail occurs most frequency in the southern and central plain states; however, since hail occurs with thunderstorms, the possibility of hail damage exists throughout the entire U.S. (Federal Alliance for Safe Homes, 2006). Figure 5.4.8-5 indicates that New Jersey experiences less than two hailstorms a year, on average.

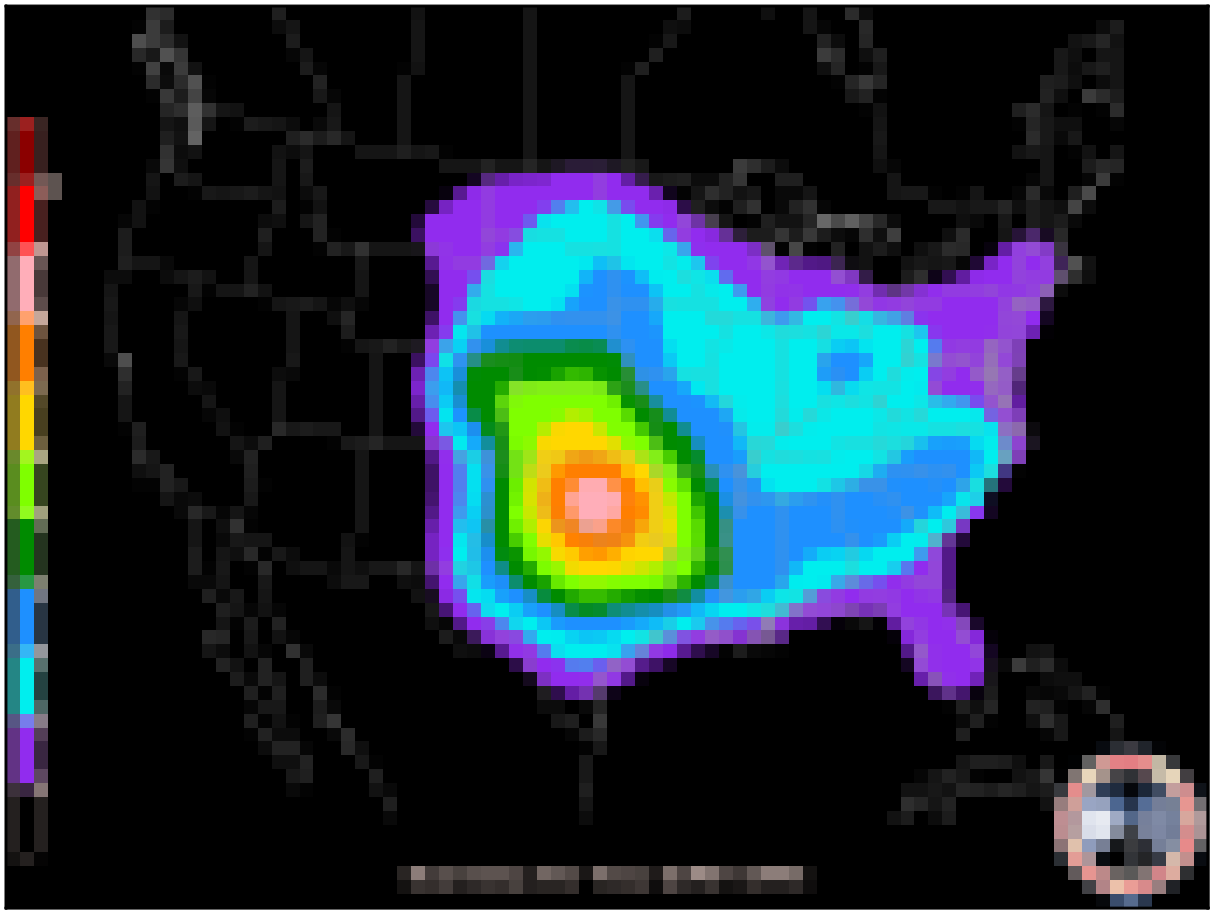
Figure 5.4.8-5. Annual Frequency of Hailstorms in the U.S.



Source: FEMA, 1996
Note: The black circle indicates the approximate location of New Jersey.

NOAA's National Severe Storms Laboratory (NSSL) started a project that estimates the likelihood of severe weather hazards in the U.S. Severe thunderstorms were defined in the U.S. as having either tornadoes, gusts at least 58 mph, or hail at least 0.75-inch in diameter. Figure 5.4.8-6 illustrates the average number of days per year of hail events occurring within 25 miles of any point. In New Jersey, the figure shows an average of one to two days per year of hail events at least 0.75-inch diameter.

Figure 5.4.8-6. Total Annual Threat of Hail Events (0.75-inch diameter or greater) in the U.S., 1980 to 1999



Source: NSSL, 2003

Note: The mean number of days per year with one or more events within 25 miles of a point is shown here. The fill interval for hail days is 0.2, with the purple starting at 0.2 days. For the non-hail threats, the fill interval is 1, with the purple starting at 1. For the significant (violent), it's 5 days per century (millennium)

Extent

High Winds

The extent of a severe storm is largely dependent upon sustained wind speed. Straight-line winds, winds that come out of a thunderstorm, in extreme cases, can cause wind gusts exceeding 100 mph. These winds are most responsible for hailstorm and thunderstorm wind damage. One type of straight-line wind, the downburst, can cause damage equivalent to a strong tornado (Northern Virginia Regional Commission [NVRC], 2006).

Windstorms have been known to cause damage to utilities. The predicted wind speed given in wind warnings issued by the NWS is for a one-minute average; gusts may be 25% to 30% higher.

The NWS issues advisories and warnings for winds. A wind advisory is issued for sustained winds between 24 and 39 mph, or sustained winds of less than 25 mph but frequent gusts between 25 and 30 mph. High wind advisories, watches, and warnings are products issued by the NWS when wind speeds may pose a hazard or are life threatening. The criterion for each of these varies from state to state (NWS 2010).

Tornadoes

The magnitude or severity of a tornado was originally categorized using the Fujita Scale (F-Scale) or Pearson Fujita Scale introduced in 1971, based on a relationship between the Beaufort Wind Scales (B-Scales) (measure of wind intensity) and the Mach number scale (measure of relative speed). It is used to rate the intensity of a tornado by examining the damage caused by the tornado after it has passed over a man-made structure (Tornado Project, Date Unknown). The F-Scale categorizes each tornado by intensity and area. The scale is divided into six categories, F0 (Gale) to F5 (Incredible) (Edwards 2012). Table 5.4.8-3 explains each of the six F-Scale categories.

Table 5.4.8-3. Fujita Damage Scale

Scale	Wind Estimate (mph)	Typical Damage
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena occur.

Source: Storm Prediction Center (SPC) Date Unknown
mph miles per hour

Although the F-Scale has been in use for over 30 years, there are limitations to the scale. The primary limitations are a lack of damage indicators, no account of construction quality and variability, and no definitive correlation between damage and wind speed. These limitations have led to the inconsistent rating of tornadoes and, in some cases, an overestimate of tornado wind speeds. The limitations listed above led to the development of the Enhanced Fujita Scale (EF-Scale). The Texas Tech University Wind Science and Engineering (WISE) Center, along with a forum of nationally renowned meteorologists and wind engineers from across the country, developed the EF-Scale (NOAA 2008).

The EF-Scale became operational on February 1, 2007. 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. The EF-Scale was revised from the original F-

Scale to reflect better examinations of tornado damage surveys. This new scale considers how most structures are designed (NOAA 2008). Table 5.4.8-4 displays the EF-Scale and each of its six categories.

Table 5.4.8-4. Enhanced Fujita Damage Scale

EF-Scale Number	Intensity Phrase	Wind Speed (mph)	Type of Damage Done
EF0	Light tornado	65–85	**Light damage**. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	Moderate tornado	86-110	**Moderate damage**. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	Significant tornado	111-135	**Considerable damage**. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	Severe tornado	136-165	**Severe damage**. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	Devastating tornado	166-200	**Devastating damage**. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	Incredible tornado	>200	**Incredible damage**. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); high-rise buildings have significant structural deformation; incredible phenomena occur.

Source: SPC Date Unknown
EF-Scale Enhanced Fujita Scale
mph miles per hour

In the F-Scale, there was a lack of clearly defined and easily identifiable damage indicators. The EF-Scale takes into account more variables than the original F-Scale did when assigning a wind speed rating to a tornado. The EF-Scale incorporates 28 DIs, such as building type, structures, and trees. For each damage indicator, there are eight DODs, ranging from the beginning of visible damage to complete destruction of the damage indicator. Table 5.4.8-5 lists the 28 DIs. Each one of these indicators has a description of the typical construction for that category of indicator. Each DOD in every category is given an expected estimate of wind speed, a lower bound of wind speed, and an upper bound of wind speed.

Table 5.4.8-5. EF-Scale Damage Indicators

Number	Damage Indicator	Abbreviation	Number	Damage Indicator	Abbreviation
1	Small barns, farm outbuildings	SBO	15	School - 1-story elementary (interior or exterior halls)	ES
2	One- or two-family residences	FR12	16	School jr. or sr. high school	JHSH
3	Single-wide mobile home (MHSW)	MHSW	17	Low-rise (1 to 4 story) bldg.	LRB
4	Double-wide mobile home	MHDW	18	Mid-rise (5 to 20 story) bldg.	MRB
5	Apartment, condo, townhouse (3 stories or less)	ACT	19	High-rise (over 20 stories)	HRB
6	Motel	M	20	Institutional bldg.	IB

Table 5.4.8-5. EF-Scale Damage Indicators

Number	Damage Indicator	Abbreviation	Number	Damage Indicator	Abbreviation
				(hospital, government, or university)	
7	Masonry apt. or motel	MAM	21	Metal building system	MBS
8	Small retail building (fast food)	SRB	22	Service station canopy	SSC
9	Small professional (doctor office, branch bank)	SPB	23	Warehouse (tilt-up walls or heavy timber)	WHB
10	Strip mall	SM	24	Transmission line tower	TLT
11	Large shopping mall	LSM	25	Free-standing tower	FST
12	Large, isolated ("big box") retail building	LIRB	26	Free standing pole (light, flag, luminary)	FSP
13	Automobile showroom	ASR	27	Tree - hardwood	TH
14	Automotive service building	ASB	28	Tree - softwood	TS

Source: SPC Date Unknown
EF-Scale Enhanced Fujita Scale

Thunderstorms

Observational methodology of thunderstorms has varied over the years. In the 1990s there was the transition to the Automated Surface Observing Stations (ASOS) at NWS and Federal Aviation Administration (FAA) weather stations, mainly situated at airports. With ASOS deployment, an Automated Lightning Detection and Ranging System (ALDARS) took the place of human observers for identifying thunderstorms. Human observations appear to have caused major inconsistencies regarding thunderstorm days based on comparing pre-ASOS records to those gathered since the ASOS network was deployed. In many cases, the number of thunderstorm days dropped by as much as 50% from the past to present periods, though this was not apparent at all Mid-Atlantic stations (ONJSC Rutgers University 2013a).

These inconsistencies make it impossible to produce a useful map of thunderstorm days across New Jersey and nearby environs. What had been a general rule of thumb of approximately 30 thunderstorm days per year in this region based on human observations likely still holds true. This includes some sub-regional aspects, such as there being more inland storms than coastal thunderstorms (ONJSC Rutgers University 2013a).

With time, lightning detection climatology may prove more valuable than the former manual methodology. This should continue to be evaluated as future updates to the hazard mitigation plan are generated (ONJSC Rutgers University 2013a).

Hailstorms

The severity of hail is measured by duration, hail size, and geographic extent. All of these factors are directly related to thunderstorms, which creates hail. There is wide potential variation in these severity components. The most significant impact of hail is damage to crops. Hail also has the potential to damage structures and vehicles during hailstorms. The State has a relatively low potential for significant hail events, based on previous records.

Hail can be produced from many different types of storms. Typically, hail occurs with thunderstorm events. The size of hail is estimated by comparing it to a known object. Most hailstorms are made up of a variety of sizes, and only the very largest hail stones pose serious risk to people, when exposed. Table 5.4.8-6 shows the different sizes of hail and the comparison to real-world objects.

Table 5.4.8-6. Hail Size

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

Source: NOAA 2012

Like high wind events and thunderstorms, meteorologists can forecast the potential of hailstorms, often giving several hours of notice that hail may form. In addition, meteorologists can give live updates during severe weather to indicate areas that are experiencing or will experience hail. Since hailstorms often occur as part of other events, such as thunderstorms, forecasts for hailstorms may be available several days in advance.

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with severe weather events throughout the State of 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.

Between 1954 and 2014, the State of New Jersey was included in 14 FEMA declared severe weather-related disasters (DR) or emergencies (EM) classified as one or a combination of the following hazards: severe storm, flooding, mudslides, hail, tornadoes, and high wind. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Of those declarations, Essex County has been included in six declarations (FEMA 2014).

For this 2015 Plan Update, known severe weather events that have impacted Essex County between 2007 and 2014 are identified in Table 5.4.8-7. With severe weather documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.8-7 may not include all events that have occurred in the County. Please see Section 9 for detailed information regarding impacts and losses to each municipality.

Table 5.4.8-7. Severe Weather Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
April 15-17, 2007	Severe Storm and Inland and Coastal Flooding (Nor'easter)	DR-1694	Yes	A Nor'Easter brought heavy rain that caused widespread and significant river, stream, and urban flooding of low lying and poor drainage areas. Flooding resulted in two deaths and approximately $19 million damages. Rainfall totals ranged from 2.16 inches at Canoe Brook to 8.08 inches at Garret Mountain. In Essex County, rainfall totals ranged from 4.56 inches at the Orange Reservoir to 7.36 inches at Verona. Newark Airport had 6.63 inches of rain. Roads were closed throughout the County. There were widespread power outages and flooding of roadways and homes. There were evacuations in Fairfield Township due to flooded areas of the Township. In Belleville Township, a man was found next to his car on a flooded street. Overall, the County had approximately $4 million in damages from this event.
May 16, 2007	High Wind	N/A	N/A	Thunderstorms developed, causing a microburst that moved through Essex, Hudson and Union Counties during the afternoon of the 16th. Strong winds caused a tree to fall on a house in Newark.
June 21-22, 2007	Severe Thunderstorms	N/A	N/A	Severe thunderstorms produced damaging winds and large hail in Essex County. High winds downed trees and wires across multiple locations in Newark. A tree fell through a home in Newark, injuring two people. Many cars were damaged due to fallen trees. Nickel size hail was reported in Newark.
August 17, 2007	Hail	N/A	N/A	Severe thunderstorms developed over northeast New Jersey, causing nickel size hail to fall in North Caldwell in Essex County.
March 4, 2008	Strong Wind	N/A	N/A	Strong winds downed trees, closing Clinton Road in West Caldwell.
May 27, 2008	Wind	N/A	N/A	Isolated severe weather moved across Essex County. In Maplewood Township, wind gusts of 50 mph were recorded and downed power lines were reported throughout the Township.
May 31, 2008	Wind	N/A	N/A	An isolated severe thunderstorm developed across Essex County, causing strong winds to impact the County. A large tree fell onto another trees which fell onto a house and a wind gust of 50 mph was reported in Livingston Township.
June 10, 2008	Severe Thunderstorms	N/A	N/A	A strong cold front moved across northeast New Jersey causing multiple severe thunderstorms across the region. In Essex County, trees fell on 30 cars and numerous homes in Nutley and Belleville Townships. Nickel size hail was reported in Belleville Township as well. Wind gusts ranged from 52 mph to 70 mph; 0.88" sized hail fell in the County. Bloomfield Township reported road closures, power outages, and schools were closed. In the City of East Orange, the City was severely impacted due to falling trees and

Table 5.4.8-7. Severe Weather Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				power outages. Property damage was estimated at $158,000 in the County.
June 22, 2008	Hail	N/A	N/A	Severe thunderstorms moved across northeast New Jersey, producing nickel size hail along the New Jersey Turnpike in Newark and golf ball size hail at Newark Airport.
August 15, 2008	Lightning	N/A	N/A	Severe thunderstorms moved across portions of northeast New Jersey. In Essex County, a lightning strike caused major damage to a home on North Street in the City of Newark. In Roseland Borough, there were power outages throughout. Lightning struck and damaged the first aid building and the fire/DPW building. There was also damage to the Canoe Brook Pump Station. Approximately $50,000 in property damage.
December 25, 2008	Strong Wind	N/A	N/A	Gusty northwest winds of 40 to 50 mph downed a 40-foot trees onto a car traveling on the Garden State Parkway in Bloomfield; killing two people and injuring two people.
June 30, 2009	Hail	N/A	N/A	Thunderstorms formed across portions of northeastern New Jersey, producing lightning, high winds, large hail, and flash flooding. In Essex County, roads were closed due to flooding in Caldwell; ping pong size hail was reported in Upper Montclair; and a large tree fell in Belwood Park. The County had approximately $1,000 in damages from this storm.
July 26, 2009	Severe Thunderstorms	N/A	N/A	Multiple severe thunderstorms produced flash flooding across northeast New Jersey. Numerous trees and power lines were reported down in Essex County. In Newark, lightning struck four people under a tree, killing one person and injuring three. 0.75" to 1" sized hail fell across in the County. Approximately $8,500 in property damage.
August 12, 2009	Heavy Rainfall	N/A	N/A	Slow moving thunderstorms developed, which resulted in very heavy rainfall and flash flooding across portions of Essex County. Winds of 30 to 40 mph; downed trees; approximately $10,000 in property damage.
December 9, 2009	Hail	N/A	N/A	Large hail fell in northeast New Jersey, with golf ball size hail reported in West Caldwell.
March 12 – April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	Between March 12th and 15th, heavy rain fell across parts of New Jersey. In Essex County, rainfall totals ranged from 4.06 inches in Caldwell Township to 5.19 inches in Newark. Peak wind gusts ranged from 45 mph in Newark to 55 mph in Caldwell Township. Numerous trees were down in Maplewood and Millburn Townships and in the Village of South Orange. In Cedar Grove Township, 0.25 inch hail covered the ground temporarily. Between March 22nd and 23rd, heavy rain fell in Essex County, with totals ranging from 1.20 inches in Newark to 2.16 inches in West Orange Township.

Table 5.4.8-7. Severe Weather Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				Between March 29th and March 31st, heavy rain fell in Essex County with totals ranging from 3.23 inches in Essex Fells Township to 3.97 inches in Verona Township. Peak wind gust of 43 mph was reported in Newark.
October 1, 2010	Strong Wind	N/A	N/A	Strong winds moved across the area, producing wind gusts of up to 52 mph at Newark Airport and causing approximately $20,000 in property damage. The City of East Orange was severely impacted due to fallen trees and power outages.
October 11, 2010	Heavy Rain, Flash Flooding, and Hail	N/A	N/A	Strong to severe thunderstorms moved across the tri-state area, producing penny to quarter size hail, heavy rain, and flash flooding in Essex County. Many roads were flooded throughout West Caldwell. A vehicle was trapped in high waters on Belleville Avenue in Belleville.
October 16, 2010	Strong Wind	N/A	N/A	Strong wind gusts of around 40 to 50 mph impacted Essex County. A wind gust of 46 mph was measuring at Newark Airport. The winds caused approximately $20,000 in property damage in the County.
March 6-7, 2011	Heavy Rain	N/A	N/A	Rainfall totals in Essex County ranged from 1.97 inches at Newark Airport to 3.40 inches in Verona Township. In Bloomfield Township, flooding was reported on I-280 eastbound ramp to Exit 9 (Pleasant Ave/CR-660). The ramp was closed and detoured.
April 12, 2011	Thunderstorm	N/A	N/A	A cold pool of air triggered thunderstorms across northeast New Jersey, with one lightning strike near Newark. Lightning struck a house in Cedar Grove, causing a fire and. The County had approximately $5,000 in damages from this storm.
June 17, 2011	Thunderstorm, Lightning, and Hail	N/A	N/A	Isolated strong to severe storms crossed over northeast New Jersey, producing penny to quarter size hail in Essex County. Lightning struck a home in Montclair, causing a fire. 0.75" (West Caldwell) to 1" (Montclair) sized hail fell in the County. The County had approximately $10,000 in damages from this storm.
October 29, 2011	Severe Storm	DR-4048	Yes	Rain began to fall in southern New Jersey early on October 29, 2011 and spread north. Some northern areas of the State saw the precipitation begin as snow and during the morning, the rain turned to snow in central and northern New Jersey. Moderate to heavy snow continued into the afternoon, mixing with sleet in lower elevations. Once the snow tapered off during the morning of October 30, 2011, New Jersey had experienced its largest October snowstorm since the late 18th century. Once several inches of snow had accumulated, tree branches and entire trees began to snap and crash onto homes, power lines and cars. By the end of the storm, over 600,000 customers lost power, with some remaining without power for over a week.

Table 5.4.8-7. Severe Weather Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				In Essex County, snowfall totals ranged from 4.9 inches in Belleville Township to 8 inches in West Orange Township. In Verona Township, the wastewater treatment plant flooded and sustained damage to its system. Many municipalities reported road closures, loss of utilities, closed schools and debris removal. Several residents were evacuated from their homes in Roseland Borough. Shelters were open throughout the County as well. Overall, the County had over $1.5 million in clean-up costs and other expenses to the municipalities.
August 5, 2012	Wind	N/A	N/A	Severe, isolated thunderstorms formed over Passaic and Essex County. Wind gust of 52 mph was reported at Newark Airport.
September 18, 2012	Strong Wind	N/A	N/A	Strong winds developed, downing numerous trees and large branches across Essex County. A wind gust of 46 mph was reported at Newark Airport. The strong winds caused approximately $100,000 in property damages in the County.
September 22, 2012	Wind	N/A	N/A	A line of showers and thunderstorms moved towards northeast New Jersey, with some strong thunderstorms at times. In Essex County, wind gusts of 52 mph were reported in Essex Fells Borough. Tree limbs and wires down on Roseland Avenue in the Borough. The storms caused approximately $1,000 in property damage.
October 26 – November 8, 2012	Hurricane Sandy	DR-4048	Yes	As storm surge from Sandy was pushed into the New York and Raritan Bays, sea water piled up within the Hudson River and coastal waterways and wetlands of northeastern New Jersey, including Newark Bay, Passaic and Hackensack Rivers, Kill van Kull, and Arthur Kill. Mandatory evacuations of people living along the coasts and rivers in Union, Essex, and Hudson Counties. In Essex County, inundations of four to six feet were measured across Newark Bay in Elizabeth and the area around Newark Airport. Storm tide at Newark was 11.6 feet with an estimated inundation (maximum depth of water on land) of 3.5 feet. The City of Newark had 7.65 inches of rainfall. Peak wind gusts ranged from 70 mph at Caldwell Airport to 78 mph at Newark Airport. In Fairfield, peak wind gusts measured at 72 mph and Reef Road flooded to Howard Street.. Overall, the municipalities of Essex County experienced flooding, power outages, evacuations, opening of shelters, and evacuations. The Passaic Valley Sewage Commission reported that the treatment plant in Newark was inundated with at five feet of water during the storm and 840 million gallons of untreated sewage flowed into the Newark Bay. Another three billion gallons of partially treated sewage was sent into the bay before secondary treatment was restored.
January 31, 2013	Strong Winds	N/A	N/A	High south winds resulted in areas of damage and disruptions to power. At Newark

Table 5.4.8-7. Severe Weather Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				Airport, a wind gust of 59 mph was measured, with sustained winds of 45 mph reported. In Bloomfield, a trees was knocked down onto a home. Scattered power outages were noted throughout the County. The winds caused approximately $100,000 in property damage in Essex County.
March 6, 2013	Strong Winds	N/A	N/A	Strong winds struck Essex County, downing power lines in Livingston and causing approximately $10,000 in property damage.
May 8, 2013	Heavy Rain / Flash Flooding	N/A	N/A	Rainfall totals ranged from 0.97 inches at Caldwell Airport to 2.51 inches in Bloomfield.
May 11, 2013	Wind / Thunderstorms	N/A	N/A	Isolated severe thunderstorms struck northeast New Jersey bringing heavy rain, strong winds and flash flooding to the area. In Essex County, wind gusts ranged from 56 mph in East Orange to 61 mph in South Orange. Trees were reported down throughout the County. The storm caused approximately $5,000 in property damage.
June 6-8, 2013	Heavy Rain	N/A	N/A	Rainfall totals ranged from 2.76 inches in Essex Fells to 3.91 inches at Newark Airport.
July 7, 2013	Thunderstorms / Hail	N/A	N/A	Scattered showers and thunderstorms impacted northeast New Jersey, impacting Essex County. Trees and wires were down in Caldwell. A tree was down on a house on West Brook Road in Franklin. Power lines were down on Franklin Avenue in Nutley. Wind gusts in Essex County ranged from 52 to 61 mph. The storms caused approximately $5,000 in property damage.
September 12, 2013	Lightning	N/A	N/A	A possible lightning strike damaged the Glenwood School fire alarm in Millburn Township. This caused approximately $10,000 to $15,000 in repairs. Fire Watch was provided by the fire department to prevent school closures.
November 27, 2013	Rain and Wind	N/A	N/A	Rainfall totals ranged from 2.48 inches at Newark Airport to 3.77 inches in Cedar Grove. Peak wind gusts of 36 mph were measured at Newark Airport.
April 29 – May 1, 2014	Heavy Rain	N/A	N/A	Rainfall totals in Essex County ranged from 2.36 inches in the Borough of Essex Fells to 5.36 inches at Newark Airport. Many roads in Newark were closed due to flooding. Lanes were closed along the New Jersey Turnpike in Newark as well.

Source: NCDC 2013; ONJSC Rutgers University 2013; SPC 2014

DPW Department of Public Works
DR Major Disaster Declaration (FEMA)
FEMA Federal Emergency Management Agency
mph miles per hour
N/A Not Applicable
NCDC National Climatic Data Center
ONJSC Office of the New Jersey State Climatologist
SPC Storm Predication Center

Probability of Future Occurrences

Predicting future severe storm events in a constantly changing climate has proven to be a difficult task. Predicting extremes in New Jersey is particularly difficult because of the region's geographic location. It is positioned roughly halfway between the equator and the North Pole and is exposed to both cold and dry airstreams from the south. The interaction between these opposing air masses often leads to turbulent weather across the region (Keim1997).

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for severe storms in the County is considered 'frequent' (likely to occur within 25 years, as presented in Table 5.3-3).

It is estimated that the County will continue to experience direct and indirect impacts of severe storms annually that may induce secondary hazards such as flooding, infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, and transportation delays, accidents and inconveniences.

Climate Change Impacts

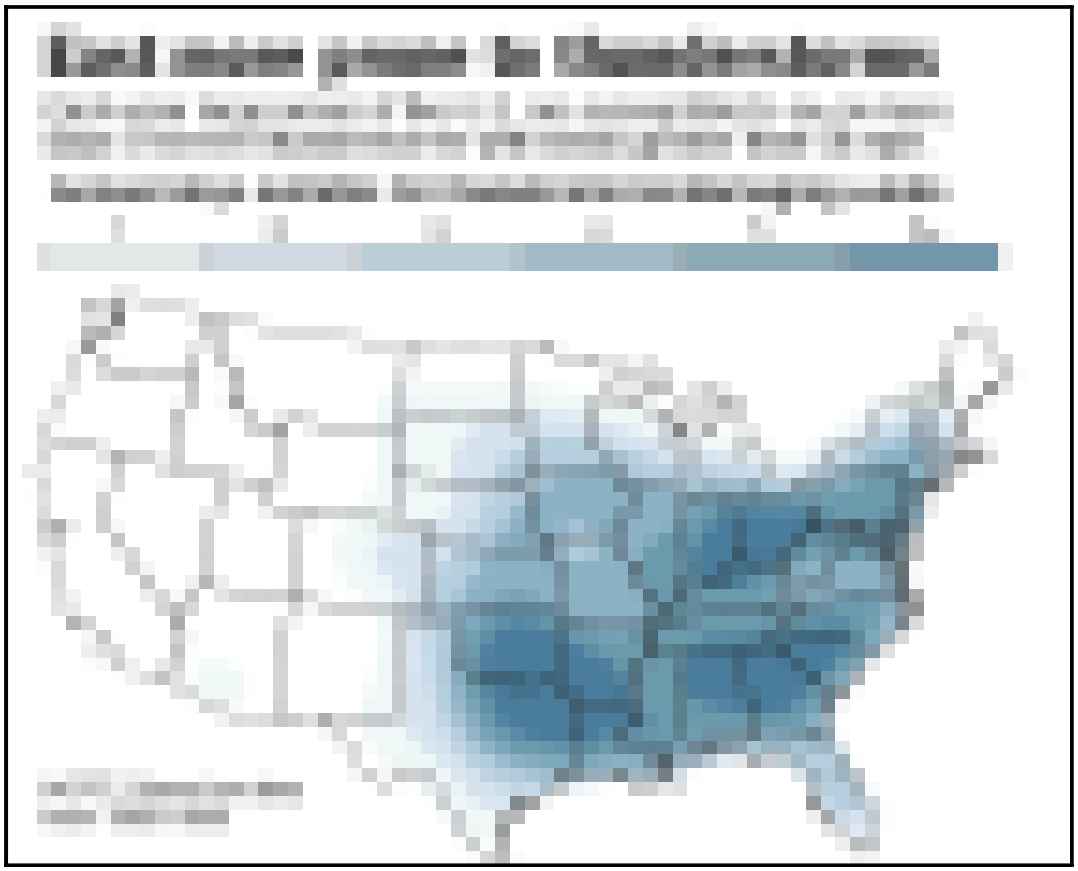
Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

Climate Change in New Jersey: Trends and Projections describe changes in temperature, precipitation, and Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC, 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4°F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).

Both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over five inches (12%) greater than the average from 1895-1970. Southern New Jersey became two inches (5%) wetter late in the 20th century (Office of New Jersey State Climatologist). Average annual precipitation is projected to increase in the region by five-percent by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New York City Panel on Climate Change [NPCC] 2009).

National Aeronautics and Space Administration (NASA) scientists suggest that the U.S. will face more severe thunderstorms in the future, with deadly lightning, damaging hail, and the potential for tornadoes in the event of climate change. A recent study conducted by NASA predicts that smaller storm events like thunderstorms will also be more dangerous due to climate change. As prepared by the NWS Figure 5.4.8-7 identifies those areas, particularly within the eastern U.S., that are more prone to thunderstorms, including New Jersey (NWS 2010).

Figure 5.4.8-7. Annual Days Suitable for Thunderstorms/Damaging Winds



Source: Borenstein, 2007
mph miles per hour

5.4.8.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For severe weather, all of Essex County is exposed to this the hazard. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in Section 4 (County Profile), are exposed and potentially vulnerable. The following text evaluates and estimates the potential impact of severe storms on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

People and property in virtually the entire United States are exposed to damage, injury, and loss of life from severe storm events (thunderstorms, lightning, wind, hail, tornadoes). Everywhere they occur; thunderstorms are responsible for significant structural damage to buildings, forest and wildfires, downed power lines and trees, and loss of life. For the purposes of this HMP, all of the County is exposed to severe storm events. Refer to Section 5.4.2 (Coastal Storms) for a detailed and quantitative assessment on the wind and storm surge hazards. The section below discusses severe storm events in a qualitative nature.

Data and Methodology

The 2010 U.S. Census population and general building stock data were used to support an evaluation of assets exposed to this hazard and the potential impacts associated with this hazard. Refer to Section 5.4.2 (Coastal Storms) for additional information on the methodology pertaining to the wind and storm surge impacts.

Impact on Life, Health and Safety

For the purposes of this HMP, the entire population of Essex County (783,969 people) is exposed to severe weather events (U.S. Census, 2010). Residents may be displaced or require temporary to long-term sheltering due to severe weather events. In addition, downed trees, damaged buildings, and debris carried by high winds can lead to injury or loss of life. Socially vulnerable populations are most susceptible, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing.

People located outdoors (i.e., recreational activities and farming) are considered most vulnerable to hailstorms, thunderstorms and tornadoes. This is because there is little to no warning and shelter may not be available. Moving to a lower risk location will decrease a person's vulnerability.

Impact on General Building Stock and Critical Facilities

Damage to buildings is dependent upon several factors including wind speed and duration, and building construction. Refer to Section 5.4.2 (Coastal Storms) for a presentation on potential wind losses associated with 100- and 500-year mean return period events. Damage will result from hail stones themselves and will have a specific impact on roofs. The extent of damage will depend on the size of the hailstorm.

Impact on Economy

As discussed, severe storm events can impact structures and the economy. 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.

Future Growth and Development

As discussed in Section 4, areas targeted for future growth and development have been identified across Essex County. Any areas of growth could be potentially impacted by the severe storm hazard because the entire County is exposed and vulnerable. Areas targeted for potential future growth and development in the next five (5) years have been identified across the County at the municipal level. Refer to the jurisdictional annexes in Volume II of this HMP.

Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by the type, frequency and intensity of weather events. Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of severe storm events that may be associated with increases in temperatures. While predicting changes to the impacts of severe storms under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society and the environment (U.S. Environmental Protection Agency [EPA], 2006).

Change of Vulnerability

Overall, the County's vulnerability has not changed and the entire County will continue to be exposed and vulnerable to severe weather events.

Additional Data and Next Steps

The collection of additional/actual valuation data for general building stock, critical infrastructure and economic losses would further support future estimates of potential exposure and damage for these inventories and the economy.

5.4.9 Severe Winter Weather

The following section provides the hazard profile and vulnerability assessment for the severe winter storm hazard in Essex County.

2015 Plan Update Changes

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the severe winter weather hazard is discussed.
- New and updated figures from federal and state agencies are incorporated.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- A vulnerability assessment was conducted for the severe winter weather hazard. It now directly follows the hazard profile.

5.4.9.1 Profile

Hazard Description

A winter storm is considered a storm with significant snowfall, ice, and/or freezing rain. The quantity of precipitation varies by elevation. Heavy snowfall in non-mountainous areas is 4 inches or more in a 12-hour period, or 6 inches or more in a 24-hour period. In mountainous areas, heavy snowfall is considered 12 inches or more in a 12-hour period or 18 inches or more in a 24-hour period. Blizzards are storms with considerable falling and/or blowing snow combined with sustained winds or frequent wind gusts of 35 mph or greater that frequently reduce visibility to less than 0.25 mile for at least 3 hours.

Some winter storms are large enough to immobilize an entire region while others may only affect a single community. Winter storms are typically accompanied by low temperatures, high winds, freezing rain or sleet, and heavy snowfall. The aftermath of a winter storm can have an impact on a community or region for days, weeks, or even months; potentially causing cold temperatures, flooding, storm surge, closed and/or blocked roadways, downed utility lines, and power outages. In Essex County, winter storms include blizzards, snow storms, Nor'Easters and ice storms. Nor'Easters are also a common type of storm that may occur during winter months within the State of New Jersey; however, given the frequency of these types of storms in the State and their severe potential impact, Nor'Easters are considered by the Planning Committee as a separate hazard and are further discussed in Section 5.4.1 (Coastal Storms) within this plan. Extreme cold temperatures and wind chills are also associated with winter storms; however, based on input from the Planning Committee, these events are further discussed in this Plan in Section 5.4.5 (Extreme Temperatures).

Heavy 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), when 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 a snow crystals or snow pallet, which then falls to the earth. Snow falls in different forms: snowflakes, snow pellets, or sleet. Snowflakes are clusters of ice crystals that form from a cloud. Snow pellets are opaque ice particles in the atmosphere. They form as ice crystals fall through super-cooled cloud droplets, which are below freezing but remain a liquid. The cloud droplets then freeze to the crystals. Sleet is made up of drops of rain that freeze into ice as they fall through colder air layers. They are usually smaller than 0.30 inches in diameter (NSIDC 2013).

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 the predominant over a 3-hour period. Extremely 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 near or below 10°F, winds exceeding 45 mph, and visibility reduced by snow to near zero. Storm systems powerful enough to cause blizzards usually form when the jet stream dips far to the south, allowing cold air from the north to clash with warm, moister air from the south. Blizzard conditions often develop on the northwest side of an intense storm system. The difference between the lower pressure in the storm and the higher pressure to the west creates a tight pressure gradient, resulting in strong winds and extreme conditions caused by the blowing snow (The Weather Channel 2012).

Ice Storms

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 (NWS 2013). Heavy accumulations of ice can bring down trees, power lines, 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 (NWS 2008).

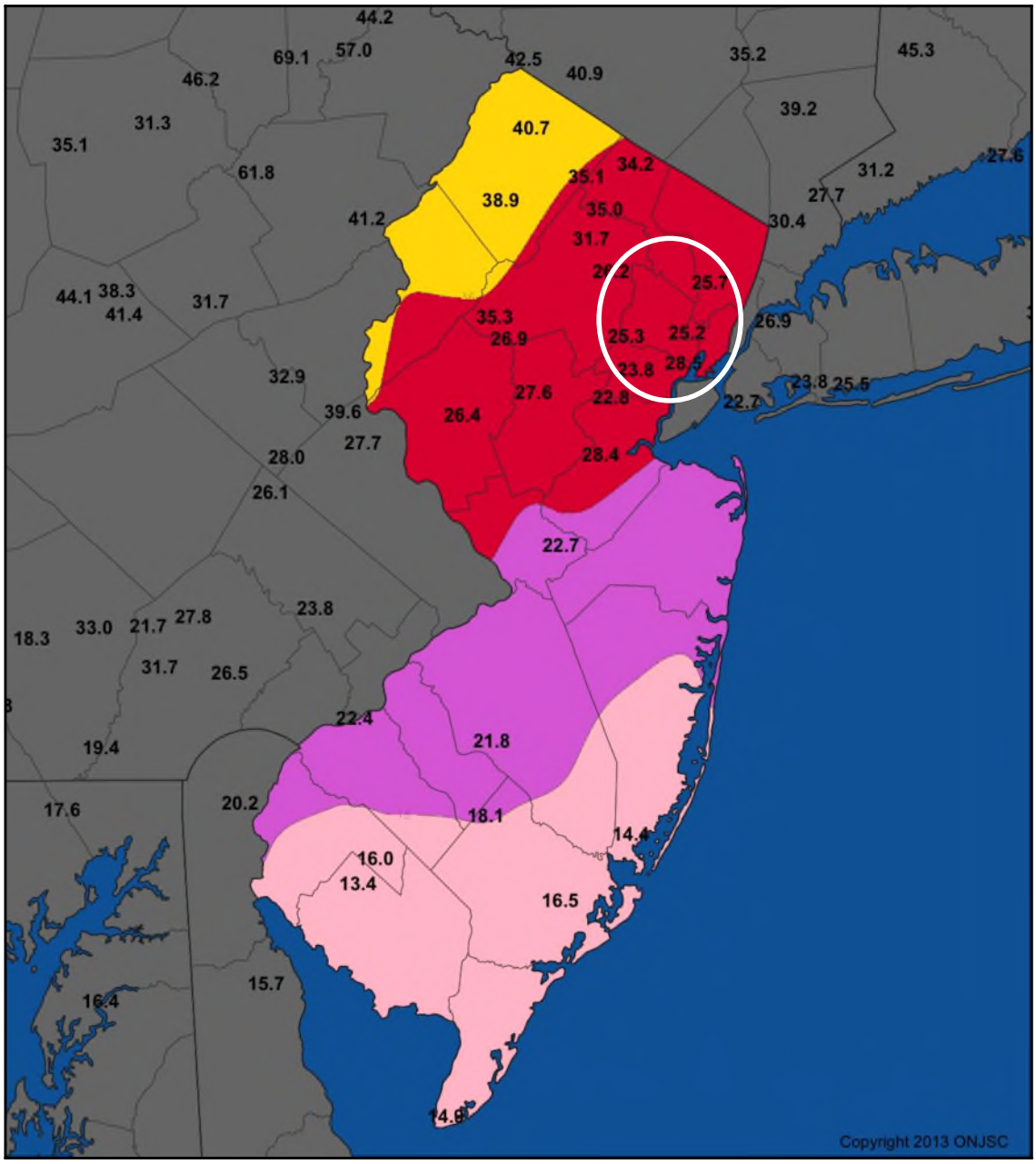
Location

Snow and Blizzards

The trajectory of the storm center—whether it passes close to the New Jersey coast or at a distance—largely determines both the intensity and the duration of the snowfall over the State. Winter storms tend to have the heaviest snowfall within a 150-mile wide swath to the northwest of what are generally southwest to northeast moving storms. Depending on whether all or a portion of New Jersey falls within this swath, the trajectory determines which portion of the State (or all of the State) receives the heaviest amount of snow.

Normal seasonal snowfall in New Jersey varies from 14.9 inches annually in Cape May County to over 40 inches in Sussex County. However, there is great variability from year to year. Figure 5.4.9-1 illustrates the normal seasonal snowfall for the State of New Jersey from 1981 to 2010. The figure indicates that Essex County's normal seasonal snowfall is approximately 25.2 inches.

Figure 5.4.9-1. Normal Seasonal Snowfall, 1981-2010



Source: *ONJSC Rutgers University 2013a*

Note: *The numbers on the map represent the normal seasonal snowfall totals in inches. The white circle indicates the location of Essex County and the County receives between 25 and 28 inches of snow annually.*

Ice Storms

All regions of New Jersey are subject to ice storms. The distribution of ice storms often coincides with general distribution of snow within several zones in the State. A cold rain may be falling over the southern portion of the State, freezing rain over the central region, and snow over the northern counties as a coastal storm moves northeastward offshore. A locality's distance to the passing storm center is often the crucial factor in determining the temperature and type of precipitation during a winter storm.

Normally experiencing lower temperatures on most winter days, the north has a greater chance of all types of winter storms occurring. Elevation can play a role in lowering the temperature to cause ice and snow to form on hilltops while valley locations remain above freezing, receiving only rain or freezing rain. Often a difference of only 100 to 200 feet can make a difference between liquid rain, adhering ice, and snow. Essex County's Orange Mountains, with an elevation of only 200 feet above the valley, have on occasion been locked in an icy sheath while valley residents have experienced only rain. Conversely, ice storms may occur in valleys and not on hilltops if cold air gets trapped in the valleys of regions with greater relief.

Extent

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

The extent of a severe winter storm can be classified by meteorological measurements and by evaluating its societal impacts. NOAA's National Climatic Data Center (NCDC) is currently producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two-thirds of the United States. The RSI ranks snowstorm impacts on a scale from 1 to 5. It is based on the spatial extent of the storm, the amount of snowfall, and the interaction of the extent and snowfall totals with population (based on the 2000 Census). The NCDC has analyzed and assigned RSI values to over 500 storms since 1900 (NOAA-NCDC 2011). Table 5.4.9-1 presents the five RSI ranking categories.

Table 5.4.9-1. RSI Ranking Categories

Category	Description	RSI Value
1	Notable	1-3
2	Significant	3-6
3	Major	6-10
4	Crippling	10-18
5	Extreme	18.0+

Source: NOAA-NCDC 2011
Note: RSI = Regional Snowfall Index

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 (NWS 2013).

The NWS uses winter weather watches, warnings and advisories to ensure that people know what to expect in the coming hours and days. A winter storm watch means that severe winter conditions (heavy snow, ice, etc.) may affect a certain area, but its occurrence, location and timing are uncertain. A watch is issued to provide 12 to 48 hour notice of the possibility of severe winter weather. A watch is upgraded to a winter storm warning when hazardous winter weather, in the form of heavy snow, heavy freezing rain or heavy sleet, is imminent or occurring. They are usually issued 12 to 24 hours before the event is expected to begin. Winter weather advisories inform people that winter weather conditions are expected to cause significant inconveniences that may be hazardous. The NWS may also issue a blizzard warning when snow and strong winds combine and produce a blinding snow, deep drifts, and wind chill (NWS 2013).

Previous Occurrences and Losses

Many sources provided winter storm information regarding previous occurrences and losses associated with winter storm events throughout Essex County. With so many sources reviewed for the purpose of this Hazard Mitigation Plan (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.

Between 1954 and 2014, FEMA declared that the State of New Jersey experienced seven winter storm-related disasters (DR) or emergencies (EM) classified as one or a combination of the following disaster types: severe winter storm, snowstorm, blizzard, and ice conditions. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Essex County was included in four of these declarations.

The 2007 Plan did not discuss specific winter storms events that occurred in Essex County. For this 2015 Plan update, winter storm events were summarized from 2007 to 2014. Table 5.4.9-2 includes flooding events and FEMA disaster declarations that occurred between 2007 and 2014. With winter storm documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.9-2 may not include all events that have occurred throughout the County. Please see Section 9 for detailed information regarding impacts and losses to each municipality.

Table 5.4.9-2. Severe Winter Weather Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
March 16-17, 2007	Snow	N/A	N/A	Snowfall totals in Essex County ranged from 4 inches in West Orange Township to 7.1 inches in Montclair Township.
December 19-20, 2009	Heavy Snow	N/A	N/A	Snowfall totals in Essex County ranged from 7.1 inches in Cedar Grove Township to 11.2 inches in Newark. A peak wind gust of 44mph was recorded in Newark.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	An intense low pressure system spread snowfall across the region, with bands of heavy snow, thunderstorms and strong winds. This blizzard brought between 20 and 30 inches of snow across northeast New Jersey. Winds of 25 to 40 mph and gusts exceeded 60 mph also impacted the area. In Essex County, snowfall totals ranged from 21.1 inches in Cedar Grove Township to 24.8 inches in Belleville Township. A wind gust of 35 mph was recorded in Caldwell Borough.
January 11-12, 2011	Heavy Snow	N/A	N/A	Heavy snow fell across most of New Jersey from the early evening of January 11th through the early morning on the 12th. In northeast New Jersey, the band of snow was responsible for snowfall rates of three to four inches per hour and the final heavy snow totals of eight to 16 inches across the region. In Essex County, snowfall totals ranged from 8 inches in Bloomfield Township to 9.1 inches at Newark Airport.
January 26-27, 2011	Heavy Snow	N/A	N/A	Moderate to heavy snow fell across the region, with periods of snow falling at a rate of three to four inches per hour, resulting in totals of 15 to 20 inches across most of the region. Snowfall totals in Essex County ranged from 12 inches in West Orange Township to 18.9 inches at Newark Airport. A peak wind gust of 40 mph was measured at Newark Airport. This was the snowiest January on record for Newark.
October 29, 2011	Severe Storm	DR-4048	Yes	Rain began to fall in southern New Jersey early on October 29, 2011 and spread north. Some northern areas of the State saw the precipitation begin as snow and during the morning, the rain turned to snow in central and northern New Jersey. Moderate to heavy snow continued into the afternoon, mixing with sleet in lower elevations. Once the snow tapered off during the morning of October 30, 2011, New Jersey had experienced its largest October snowstorm since the late 18th century. Once several inches of snow had accumulated, tree branches and entire trees began to snap and crash onto homes, power lines and cars. By the end of the storm, over 600,000 customers lost power, with some remaining without power for over a week.

Table 5.4.9-2. Severe Winter Weather Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				In Essex County, snowfall totals ranged from 4.9 inches in Belleville Township to 8 inches in West Orange Township. In Verona Township, the wastewater treatment plant flooded and sustained damage to its system. Many municipalities reported road closures, loss of utilities, closed schools and debris removal. Several residents were evacuated from their homes in Roseland Borough. Shelters were open throughout the County as well. Overall, the County had over $1.5 million in clean-up costs and other expenses to the municipalities.
November 7, 2012	Winter Weather	N/A	N/A	This storm came on the heels of Hurricane Sandy, producing heavy wet snow, strong winds and minor coastal flooding. Snowfall totals ranged from three to six inches across the region. In Essex County, 6.2 inches of snow was measured at Newark Airport.
February 8-9, 2013	Blizzard	N/A	N/A	In Essex County, snowfall totals ranged from 9.6 inches in Belleville Township to 14 inches in Verona Township. Twenty-four hour snowfall totals in the County ranged from 8.3 inches in Montclair Township to 13.5 inches in West Caldwell Township.
February 13-14, 2014	Nor'Easter	N/A	N/A	In Essex County, snowfall totals ranged from 11.8 inches in Maplewood Township and 15.5 inches in West Orange Township. Heavy wet snow likely caused a roof collapse in Cedar Grove Township on Pompton Avenue.

Source: NOAA-NCDC 2014; NWS 2014; FEMA 2014
DR Disaster Declaration
FEMA Federal Emergency Management Agency
N/A Not Applicable
NCDC National Climatic Data Center
NOAA National Oceanic and Atmospheric Administration
NWS National Weather Service

Probability of Future Occurrences

Severe winter weather is a common occurrence each season in New Jersey. The majority of the State will receive at least one measureable snow event during the winter months. The months of January, February, March, April, October, November and December are typically when a vast majority of New Jersey has been observed to receive measurable snow. Generally, counties in the northern region experience more snow events than those in the southern region. It is estimated that Essex County will continue to experience the direct and indirect impacts of severe winter weather events annually that many induce secondary hazards such as: structural damage (snow and ice load), wind damage, impact to life safety, disruption of traffic, loss of productivity, economic impact, loss of ability to evacuate, taxing first-responder capabilities, service disruption (power, water, etc.), and communication disruption.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for drought in the County is considered 'frequent' (likely to occur within 25 years, as presented in Table 5.3-3).

Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC, 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4°F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).

Both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over five inches (12%) greater than the average from 1895-1970. Southern New Jersey became two inches (5%) wetter late in the 20th century (Office of New Jersey State Climatologist). Average annual precipitation is projected to increase in the region by 5% by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months. (New York City Panel on Climate Change [NPCC] 2009).

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

5.4.9.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the severe winter weather hazard, all of Essex County has been identified as the hazard area. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), are vulnerable to a winter storm. The following text evaluates and estimates the potential impact of the severe winter weather hazard on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2007 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Severe winter storms are of significant concern to the County because of the frequency and magnitude of these events in the region, the direct and indirect costs associated with these events, delays caused by the storms, and impacts on the people and facilities of the region related to snow and ice removal, health problems, cascade effects such as utility failure (power outages) and traffic accidents, and stress on community resources.

Data and Methodology

Default HAZUS-MH population and general building stock data were used to support an evaluation of assets exposed to this hazard and the potential impacts associated with this hazard. Additionally, as available economic losses were provided by the Planning Committee to support this vulnerability assessment.

Impact on Life, Health, and Safety

According to the NOAA National Severe Storms Laboratory (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. 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 (NSSL, 2006).

Heavy snow can immobilize a region and paralyze a city, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse buildings and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. In the mountains, heavy snow can lead to avalanches. The cost of snow removal, repairing damages, and loss of business can have large economic impacts on cities and towns (NSSL, 2006).

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. Bridges and overpasses are particularly dangerous because they freeze before other surfaces (NSSL, 2006).

For the purposes of this HMP, the entire population of Essex County (783,969 people) is exposed to severe winter storm events (U.S. Census, 2010). Snow accumulation and frozen/slippery road surfaces increase the frequency and impact of traffic accidents for the general population, resulting in personal injuries. Refer to Section 4 (County Profile) for population statistics for each participating municipality.

The elderly are considered most susceptible to this hazard due to their increased risk of injuries and death from falls and overexertion and/or hypothermia from attempts to clear snow and ice. In addition, severe winter storm events can reduce the ability of these populations to access emergency services. Residents with low incomes may not have access to housing or their housing may be less able to withstand cold temperatures (e.g., homes with poor insulation and heating supply).

Impact on General Building Stock

The entire general building stock inventory is exposed and vulnerable to the severe winter storm hazard. In general, structural impacts include damage to roofs and building frames, rather than building content. Table 5.4.9-3 presents the total exposure value for general building stock for each participating municipality.

Current modeling tools are not available to estimate specific losses for this hazard. As an alternate approach, this plan considers percentage damages that could result from severe winter storm conditions. Table 5.4.9-3 below summarizes percent damages that could result from severe winter storm conditions for the Planning Area's total general building stock. Given professional knowledge and the currently available information, the potential loss for this hazard is many times considered to be overestimated because of varying factors (building structure type, age, load distribution, building codes in place, etc.). Therefore, the following information should be used as estimates only for planning purposes with the knowledge that the associated losses for severe winter storm events vary greatly.

Table 5.4.9-3. General Building Stock Exposure and Estimated Losses from Severe Winter Storm Events

Municipality	Total (All Occupancies)	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Township of Belleville	$1,780,790,900	$17,807,909	$89,039,545	$178,079,090
Township of Bloomfield	$2,357,334,000	$23,573,340	$117,866,700	$235,733,400
Borough of Caldwell	$473,112,350	$4,731,124	$23,655,618	$47,311,235
Township of Cedar Grove	$1,033,371,891	$10,333,719	$51,668,595	$103,337,189
City of East Orange	$3,307,598,833	$33,075,988	$165,379,942	$330,759,883
Borough of Essex Fells	$372,840,100	$3,728,401	$18,642,005	$37,284,010
Township of Fairfield	$1,851,889,900	$18,518,899	$92,594,495	$185,188,990
Borough of Glen Ridge	$636,208,000	$6,362,080	$31,810,400	$63,620,800
Township of Irvington	$1,713,187,200	$17,131,872	$85,659,360	$171,318,720
Township of Livingston	$3,377,301,894	$33,773,019	$168,865,095	$337,730,189
Township of Maplewood	$1,710,931,300	$17,109,313	$85,546,565	$171,093,130
Township of Millburn	$4,983,926,600	$49,839,266	$249,196,330	$498,392,660

Table 5.4.9-3. General Building Stock Exposure and Estimated Losses from Severe Winter Storm Events

Municipality	Total (All Occupancies)	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Township of Montclair	$3,674,389,469	$36,743,895	$183,719,473	$367,438,947
City of Newark	$10,389,656,399	$103,896,564	$519,482,820	$1,038,965,640
Borough of North Caldwell	$907,763,000	$9,077,630	$45,388,150	$90,776,300
Township of Nutley	$2,140,629,971	$21,406,300	$107,031,499	$214,062,997
City of Orange Township	$1,134,204,300	$11,342,043	$56,710,215	$113,420,430
Borough of Roseland	$811,613,700	$8,116,137	$40,580,685	$81,161,370
Township of South Orange Village	$1,887,112,250	$18,871,123	$94,355,613	$188,711,225
Township of Verona	$990,817,150	$9,908,172	$49,540,858	$99,081,715
Township of West Caldwell	$1,193,780,164	$11,937,802	$59,689,008	$119,378,016
Township of West Orange	$3,379,895,883	$33,798,959	$168,994,794	$337,989,588
Essex County	**$50,108,355,254**	**$501,083,553**	**$2,505,417,763**	**$5,010,835,525**

Source: EC DPW, 2014
Notes: Based on Improvement Value

A specific area that is vulnerable to the severe winter storm hazard is the floodplain. Severe winter storms can cause flooding through blockage of streams or through snow melt. At-risk residential infrastructures are presented in the flood hazard profile (Section 5.4.6). Generally, losses resulting from flooding associated with severe winter storms should be less than that associated with a 100-year flood. In addition, coastal areas are at high risk during winter storm events that involve high winds. Please refer to the coastal storm (Section 5.4.1) and severe storm (Section 5.4.9) profiles for losses resulting from wind.

Impact on Critical Facilities

Full functionality of critical facilities such as police, fire and medical facilities is essential for response during and after a severe winter storm event. These critical facility structures are largely constructed of concrete and masonry; therefore, they should only suffer minimal structural damage from severe winter storm events. Because power interruption can occur, backup power is recommended. Infrastructure at risk for this hazard includes roadways that could be damaged due to the application of salt and intermittent freezing and warming conditions that can damage roads over time. Severe snowfall requires the clearing roadways and alerting citizens to dangerous conditions; following the winter season, resources for road maintenance and repair are required.

Impact on Economy

The cost of snow and ice removal and repair of roads from the freeze/thaw process can drain local financial resources. Another impact on the economy includes impacts on commuting into, or out of, the area for work or school. The loss of power and closure of roads prevents the commuter population traveling to work within and outside of the County.

Future Growth and Development

As discussed in Sections 4 and 9, areas targeted for future growth and development have been identified across Essex County. Any areas of growth could be potentially impacted by the severe winter storm hazard because the entire planning area is exposed and vulnerable. Please refer to the specific areas of development indicated

in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.

Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by the type, frequency and intensity of weather events. Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of extremes such winter storms. While predicting changes of winter storm events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society and the environment (U.S. Environmental Protection Agency [EPA], 2006).

Both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over five inches (12%) greater than the average from 1895-1970. Southern New Jersey became two inches (5%) wetter late in the 20th century (Office of New Jersey State Climatologist). Average annual precipitation is projected to increase in the region by 5% by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New York City Panel on Climate Change [NPCC] 2009).

In terms of snowfall and ice storms in New Jersey, there is a lack of quantitative data to predict how future climate change will affect this hazard. It is likely that the number of winter weather events may decrease, and the winter weather season may shorten; however, it is also possible that the intensity of winter storms may increase. The exact effect on winter weather is still highly uncertain (Sustainable Jersey Climate Change Adaptation Task Force 2013). Future enhancements in climate modeling will provide an improved understanding of how the climate will change and impact the Northeast.

Change of Vulnerability

Overall, the County's exposure and vulnerability have not changed and the entire County will continue to be exposed and vulnerable to severe winter storm events.

Additional Data and Next Steps

The assessment above identifies vulnerable populations and economic losses associated with this hazard of concern. Historic data on structural losses to general building stock are not adequate to predict specific losses to this inventory; therefore, the percent of damage assumption methodology was applied. This methodology is based on FEMA's How to Series (FEMA 386-2), Understanding Your Risks, Identifying and Estimating Losses (FEMA, 2001) and FEMA's Using HAZUS-MH for Risk Assessment (FEMA 433) (FEMA, 2004). The collection of additional/actual valuation data for general building stock and critical infrastructure losses would further support future estimates of potential exposure and damage for the general building stock inventory. Mitigation strategies addressing early warning, dissemination of hazard information, provisions for snow removal and back-up power are included in Volume II, Section 9 of this plan.

5.4.10 Wildfire

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the wildfire hazard in Essex County.

2015 Plan Update Changes

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the wildfire hazard is discussed.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- NJFFS Wildfire Fuel Hazard data was used to identify wildfire fuel rankings in Essex County. The 2010 NJFFS wildfire risk and fuel maps were also used to identify hazard areas in the County.
- The vulnerability assessment is a new addition for the wildfire hazard. It directly follows the hazard profile. To determine exposure, a spatial analysis was conducted using the NJFFS Fuel Hazard Area guidelines.

5.4.10.1 Profile

Hazard Description

A wildland fire can be defined as any non-structural fire that occurs in the wildland. Three distinct types of wildland fires have been defined and include wildfire naturally occurring wildfire, human-caused wildfire, and prescribed fire. Many of these are highly destructive and can be very uncontrollable. They occur in forested, semi-forested, or less developed area. Wildland fires can be caused by lightning, human carelessness, and arson. Most frequently, wildland fires in the State of New Jersey are caused by humans. Wildland fires can be naturally occurring—such as those ignited when lightning or wind-falling trees collide with power lines—or caused by humans, which is the primary cause of all types of fires. Wildfires result in the uncontrolled destruction of forests, brush, field crops, grasslands, real estate, and personal property, and have secondary impacts on other hazards such as flooding, by removing vegetation and destroying watersheds.

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 could 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 failures on slopes. Major landslides can occur several years after a wildfire. Most wildfires 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.

Wildfires can increase the probability of other natural disasters, specifically floods and mudflows. Wildfires, particular large-scale, can dramatically alter the terrain and ground conditions, making land already devastated by fire susceptible to floods. Lands impacted by wildfire increase the risk of flooding and mudflow in those areas impacted by wildfire. Normally, vegetation absorbs rainfall, reducing runoff. However, wildfires leave the ground charred, barren, and unable to absorb water; thus, creating conditions perfect for flash flooding and mudflows. Flood risk in these impacted areas remain significantly higher until vegetation is restore, which can take up to five years after a wildfire (FEMA, 2013).

Flooding after a wildfire is often more severe, as debris and ash left from the fire can form mudflows. During and after a rain event, as water moves across charred and denuded ground, it can also pick up soil and sediment and carry it in a stream of floodwaters. These mudflows have the potential to cause significant damage to

impacted areas. Areas directly affected by fires and those located below or downstream of burn areas are most at risk for flooding (FEMA, 2013). For detailed information regarding flooding, see Section 5.4.6 (Flood).

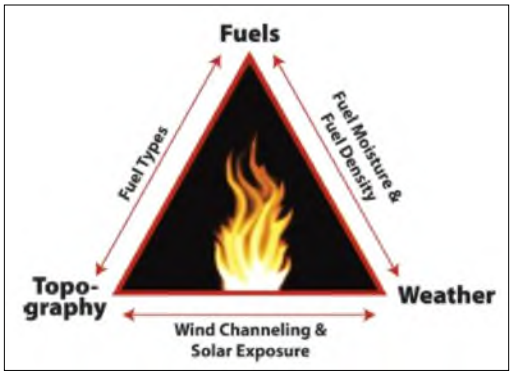
New Jersey's high population density has created land use pressures in which more people are moving from urban areas to build homes in rural wildland areas. With more people living in the State's wildlands, the number of fires started could increase. A potentially explosive combination is created when hazardous wildland fuels interface home development, and an increased risk of human-caused ignition come together under extreme fire weather conditions.

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. While the spring season is historically the period in which wildfire danger is the highest, wildland fires can occur every month of the year. Drought, snow pack, and local weather conditions can expand the length of the fire season. The early and late shoulders of the fire season usually are associated with human-caused fires. Lightning generally is the cause of most fires in the peak season.

In the State of New Jersey, an average of 1,500 wildfires damage or destroy 7,000 acres of the State's forests. Wildfires not only damage woodlands, but could threaten homeowners who live within or adjacent to forest environments. From January 1, 2014 to May 11, 2014, 567 wildfires occurred in New Jersey, burning approximately 6,289.25 acres (NJFFS 2014).

Fire Ecology and Wildfire Behavior

The "wildfire behavior triangle" illustrates how three primary factors influence wildfire behavior: fuel, topography, and weather. Each point of the triangle represents one of the three factors; the sides represent the interplay between the factors. 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 of 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, and climate change is also considered a potential source of influence. These four factors are described below:

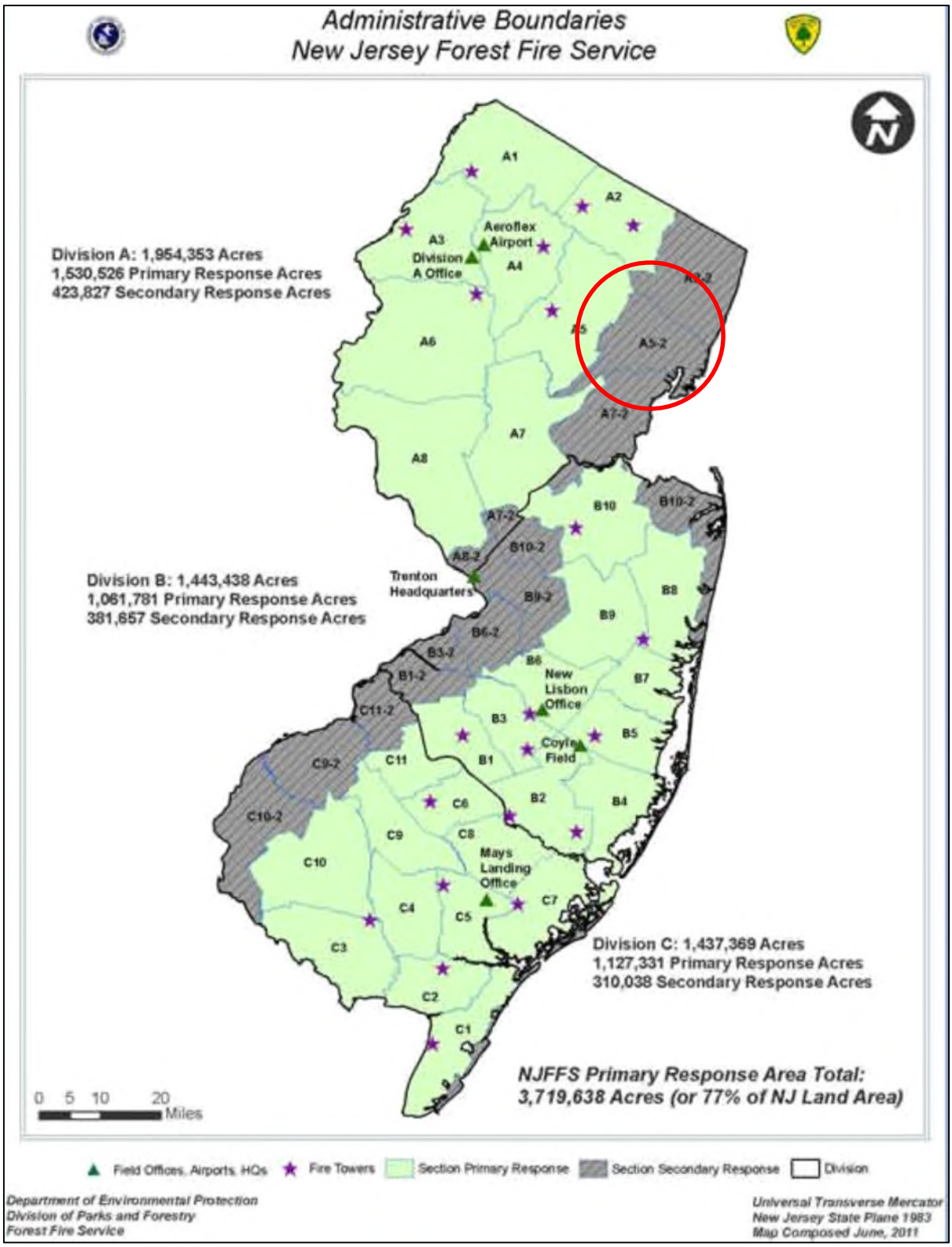
- Fuel
  - Lighter fuels such as grasses, leaves, and needles quickly expel moisture and burn rapidly, while heavier fuels such as tree branches, logs, and trunks take more time to warm and ignite.
  - Snags and hazard trees–especially those that are diseased, dying, or dead—are quickly engulfed and allow fires to spread quickly.
- Weather
  - Strong winds within the vicinity of the flames produce extreme fire conditions. Of particular concern are wind events that potentially persist for longer periods of time, or ones with significant wind speeds, which can sustain and quickly promote the spread of fire through movement of embers or exposure within tree crowns.
  - Spring and summer drying months, many of which maintain drought-like conditions extending beyond the normal season, also expand the average fire season. Likewise, the passage of a dry, cold

front through the region can result in a sudden increase in wind speeds and a change in wind direction affecting fire spread.
    - Thunderstorm activity, which typically begins with wet storms, turns dry with little or no precipitation reaching the ground as the seasons progress.
- Terrain
    - Topography of a region or local area influences the amount and moisture of fuel.
    - Barriers such as highways and lakes can affect the spread of fire.
    - Elevation and slope of landforms affect fire spread, and flames move more easily uphill than downhill.
- Changes to Environment
    - Without an increase in summer precipitation (greater than any predicted by climate models), areas susceptible to future burning are very likely to increase.
    - Infestation from insects is also of concern as it may impact forest health. Potential insect populations may increase with warmer temperatures as a result of warmer temperatures. Infested, stressed trees increase fuel amount.
    - Tree species composition will change as species respond uniquely to a changing climate.
    - Wildfires cause both short-term and long term losses. Short-term losses can include destruction of timber, wildlife habitat, scenic vistas, and watersheds. Long-term effects include smaller timber harvests, reduced access to affected recreational areas, and the destruction of cultural and economic resources and community infrastructure.

NJFFS, a division of the New Jersey Department of Environmental Protection (NJDEP), is responsible for protecting the 3.25 million acres of wildland in the State. NJFFS is under the direction of the State firewarden and is headquartered in Trenton. NJFFS has 85 full-time employees that provide an array of services including staffing the State's 21 fire towers, which are operational during the months of March, April, May, October, and November.

NJFFS divides the State into three regions (Northern, Central, Southern) each totaling about 1,250,000 acres. There are 29 125,000 acre sections with a dedicated forest fire warden in each; and 269 districts each consisting of 15,000-20,000 acres In total, 29 section forest fire wardens, 269 district forest fire wardens and 2,000 trained crew members respond to fires on an as-needed basis (NJFFS 2013). Figure 5.4.10-1 illustrates the NJFFS region divisions within the State. Essex County is located in Division A (Northern NJ).

Figure 5.4.10-1. Fire Divisions of New Jersey



Source: *NJDEP 2013*

Note: *The red circle indicates the location of Essex County. The County is located in Fire Division A.*

Location

According to the U.S. Fire Administration (USFA), the fire problem in the U.S. varies from region to region. This often is a result of climate, poverty, education, demographics, and other causal factors (USFA, 2012). Wildfires occur in virtually all of the U.S. The western portion of the U.S. is subject to more frequent wildfires, due to their more arid climate and prevalent conifer and brush fuel types. Wildfires have proven to be the most destructive in California, but have become an increasingly frequent and damaging phenomenon nationwide (FEMA, 1997). States with a large amount of wooded, brush, and grassy areas, such as California, Colorado, New Mexico, Montana, Kansas, Mississippi, Louisiana, Georgia, Florida, North and South Carolina, Tennessee, Massachusetts, and the national forests of the western U.S. are at highest risk for wildfires (University of Florida, 1998).

In New Jersey's north, northern hardwood, white pine, eastern hemlock, mixed oak, and a variety of other species including isolated stands of red spruce are part of the forest composition. The oak/hickory-type group is, and has been, the most common-type forest in New Jersey. This group makes up nearly half of New Jersey's forested area. This forest contains many mast-producing species that provide important forage for wildlife.

While wildfires in other parts of the State rarely attain the intensity as found in the Pine Barrens, 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. These higher intensity fires, or those fires that burn during drought conditions, consume the soil organic layers and can be damaging to the relatively thin-barked trees. Adding to the temperature intensity are the various species of rhododendron and laurel that are found on soils with high iron content.

Especially on the Outer Coastal Plain, soils tend to be sandier, more drought-prone, and lower in many plant nutrients. Differences in these edaphic factors–especially limitations in available soil moisture—are ultimately responsible for the much of the unique vegetation in the region. Despite the fact that, like the rest of the State, our Pinelands average over 42 inches of rain-equivalent per-year, upland plant communities are all dominated by xeriphytic species adapted to establishment, growth, and reproduction in drought-prone sites (NJFFS 2013).

Generally, wildfires in Essex County are more likely to occur in the western and southern portions of the County, as compared to the more urban communities (Essex County HMP 2007).

Extent

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

- The **Buildup Index (BUI)** is a number that reflects the combined cumulative effects of daily drying and precipitation in fuels with a 10-day time lag constant. The BUI can represent three to four inches of compacted litter or can represent up to six inches or more of loose litter (North Carolina Forest Service 2009).
- The **Keetch-Byram Drought Index (KBDI)** is a drought index designed for fire potential assessment as defined by the United States Department of Agriculture Forest Service. It is a number representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers. The index increases each day without rain and decreases when it rains. The scale ranges from zero (no moisture deficit) to 800 (maximum drought possible). The Florida

Forest Service states that the range of the index is determined by assuming that 8 inches of moisture in a saturated soil is readily available to the vegetation. For different soil types, the depth of soil required to hold eight inches of moisture varies. A prolonged drought influences fire intensity, largely because more fuel is available for combustion. The drying of organic material in the soil can lead to increased difficulty in fire suppression.

Several tools are available to estimate fire potential, extent, danger and growth, including (but not limited to) the following:

- **Wildland/Urban Interface (WUI)** is the area where houses and wildland vegetation coincide. Interface neighborhoods are found all across the United States, and include many of the sprawling areas that grew during the 1990s. Housing developments alter the structure and function of forests and other wildland areas. The outcomes of the fire in the WUI are negative for residents; some may only experience smoke or evacuation, while others may lose their homes to a wildfire. All states have at least a small amount of land classified as WUI. To determine the WUI, structures per acre and population per square mile are used. Across the United States, 9.3% of all land is classified as WUI. The WUI in the area is divided into two categories: intermix and interface. Intermix areas have more than one house per 40 acres and have more than 50% vegetation. Interface areas have more than one house per 40 acres, have less than 50% vegetation, and are within 1.5 miles of an area over 1,235 acres that is more than 75% vegetated (Stewart et al. 2006).

  Concentrations of WUI can be seen along the east coast of the United States, where housing density rarely falls below the threshold of one housing unit per 40 acres and forest cover is abundant. In the mid-Atlantic and north central regions of the United States, the areas not dominated by agriculture have interspersed WUI and low density vegetated areas. Areas where recreation and tourism dominate are also places where WUI is common, especially in the northern Great Lakes and Missouri Ozarks (Stewart et al. 2006).

- **Wildland Fire Assessment System (WFAS)** is an Internet-based information system that provides a national view of weather and fire potential, including national fires danger, weather maps and satellite-derived "greenness" maps. As per the USFS, the WFAS was developed by the Fire Behavior unit at the Fire Sciences Laboratory in Missoula, Montana, and is currently supported and maintained at the National Interagency Fire Center (NIFC) in Boise, Idaho.

  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 takes into account current and antecedent weather, fuel types, and both live and dead fuel moisture. This information is provided by local station managers. Table 5.4.10-1 describes the fire danger ratings and color codes.

Table 5.4.10-1. Fire Danger Rating and Color Code

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, but with the exception of 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 fast. The average fire is of moderate intensity,

Fire Danger Rating and Color Code	Description
	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 tree tops) 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: USFS 2014

- The **Fire Potential Index (FPI)** is derived by combining daily weather and vegetation condition information and can identify the areas most susceptible to fire ignition. The combination of relative greenness and weather information identifies the moisture condition of the live and dead vegetation. The weather information also identifies areas of low humidity, high temperature, and no precipitation to determine which areas are most susceptible to fire ignition. The FPI enables local and regional fire planners to quantitatively measure fire ignition risk (USGS 2005). The United States Forest Service provides FPI maps on a daily basis. The scale ranges from 0 (low) to 100 (high). The calculations used in the NFDRS are not part of the FPI, except for a 10-hour moisture content (Burgan et al. 2000).

- **Fuel Moisture (FM)** content is the quantity of water in a fuel particle expressed as a percent of the oven-dry weight of the fuel particle. The NWS indicates that the FM content is an expression of the cumulative effects of past and present weather events and must be considered in evaluating the effects of current or future weather on fire potential. FM is computed by dividing the weight of the "water" in the fuel by the oven-dry weight of the fuel and then multiplying by 100 to get the percent of moisture in a fuel.

  NOAA states that there are two kinds of FM: live and dead. Live FM is much slower to respond to environmental changes and is most influenced by things such as a long drought period, natural disease and insect infestation, annuals curing out early in the season, timber harvesting, and changes in the fuel models caused by being blown down from windstorms and ice storms. Dead FM is the moisture in any cured or dead plant part, whether attached to a still-living plant or not. Dead fuels absorb moisture through physical contact with water (such as rain and dew) and absorb water vapor from the atmosphere. The drying of dead fuels is accomplished by evaporation. These drying and wetting processes of dead fuels are such that the moisture content of these fuels is strongly affected by fuel sizes, weather, topography, decay classes, fuel composition, surface coatings, fuel compactness, and arrangement (Schroeder and Buck 1970).

  Fuels are classified into four categories that respond to changes in moisture. This response time is referred to as a time lag. A fuel's time lag is proportional to its diameter and is loosely defined as the time it takes a fuel particle to reach two-thirds of its way to equilibrium with its local environment. The four categories include:

- 1-hour fuels: up to 0.25-inch diameter – fine, flashy fuels that respond quickly to weather changes. Computed from observation time, temperature, humidity, and cloudiness.
- 10-hour fuels: 0.25-inch to 1-inch diameter - computed from observation time, temperature, humidity, and cloudiness or can be an observed value.
- 100-hour fuels: 1-inch to 3-inch diameter - computed from 24-hour average boundary condition composed of day length (daylight hours), hours of rain, and daily temperature/humidity ranges
- 1,000-hour fuels: 3-inch to 8-inch diameter - computed from a seven-day average boundary condition composed of day length, hours of rain, and daily temperature/humidity ranges (National Park Service 2013)

- The **Haines Index**, also known as the Lower Atmosphere Stability Index, is a fire-weather index based on stability and moisture content of the lower atmosphere that measures the potential for existing fires to become large fires. It is named after its developer, Donald Haines, a Forest Service research meteorologist, who did the initial work and published the scale in 1988 (Storm Prediction Center [SPC] 2014).

  The Haines Index can range between two and six. The drier and more unstable the lower atmosphere is, the higher the index. It is calculated by combining the stability and moisture content to the lower atmosphere into a number that correlates well with large fire growth. The stability term is determined by the temperature difference between two atmospheric layers; the moisture term is determined by the temperature and dew point difference. The index has shown to correlate with large fire growth on initiating and existing fires where surface winds do not dominate fire behavior (USFS 2014). The Haines Index levels are described below:

  - Very Low Potential (2) – moist, stable lower atmosphere
  - Very Low Potential (3)
  - Low Potential (4)
  - Moderate Potential (5)
  - High Potential (6) – dry, unstable lower atmosphere (USFS 2014)

  The SPC states that the Haines Index is intended to be used all over the United States. It is adaptable for three elevation regimes: low elevation, middle elevation, and high elevation. Low elevation is for fires at or very near sea level. Middle elevation is for fires burning in the 1,000 to 3,000 feet in elevation range. High elevation is intended for fires burning above 3,000 feet in elevation.

Because wildfires are often caused by humans (intentionally or accidentally), there is no way to predict accurately when one might break out. Because fireworks often cause brush fires, extra diligence is warranted around the Fourth of July holiday when the use of fireworks is highest. Dry seasons and droughts are factors that greatly increase fire likelihood. Dry lightning may trigger wildfires. Severe weather can be predicted; therefore, special attention can be paid during weather events that might include lightning. Reliable NWS lightning warnings are available on average 24 to 48 hours prior to a significant electrical storm.

If a fire does break out and spread rapidly, residents may need to evacuate within days or hours. A fire's peak burning period generally is between 1:00 p.m. and 6:00 p.m. Once a fire has started, fire alerting is reasonably rapid in most cases. The rapid spread of cellular and two-way radio communications in recent years has further contributed to a significant improvement in warning time.

New Jersey Wildfire Fuel Hazard

NJFFS, a division of NJDEP, has developed Wildfire Fuel Hazard data for the State based upon NJDEP's 2002 Land Use/Land Cover (LU/LC) datasets and NJDEP's 2002 10-meter Digital Elevation Grid datasets. NJFFS took the NJDEP Modified Anderson Land Use/Land Cover Classification System 2002 and assigned Wildfire Fuel Hazard Rankings to it. NJFFS used NJDEP's 2002 10-meter Digital Elevation Grids and calculated areas of 30% or greater slope throughout New Jersey. For areas of Wildfire Fuel Hazard one to four (i.e. Low to Very High) that were coincident with areas of 30% or greater slope, the Wildfire Fuel Hazard Ranking was increased by one value (i.e. Low was increased to Moderate, Moderate to High, etc.). For areas of Wildfire Fuel Hazard zero, and five through eight, the Wildfire Fuel Hazard Ranking remained the same. Once the LU/LC was coded according to Wildfire Fuel Hazard, taking into account 30% or greater slopes, the data were divided by county. The project was completed in May 2009. Figure 5.4.10-2 and Figure 5.4.10-3 illustrate the wildfire fuel hazard and wildfire risk for Essex County. A majority of the County has low fuel hazard and low risk. Very small areas throughout the County are identified as having extreme fuel hazards. Fairfield Township has a moderate to high fire risk.

Table 5.4.10-2 indicates the amount of land in each of the wildfire fuel hazard ranking zones for Essex County. Table 5.4.10-3 explains the approximate area in the NJFFS risk areas in the County.

Table 5.4.10-2. Area in the Wildfire Fuel Hazard Ranking Zones in Essex County

Hazard Area	Area (Square Miles)
Extreme	0.3
Very High	0.1
High	1.6
Moderate	9.7
Low	29.0

Source: NJFFS 2013

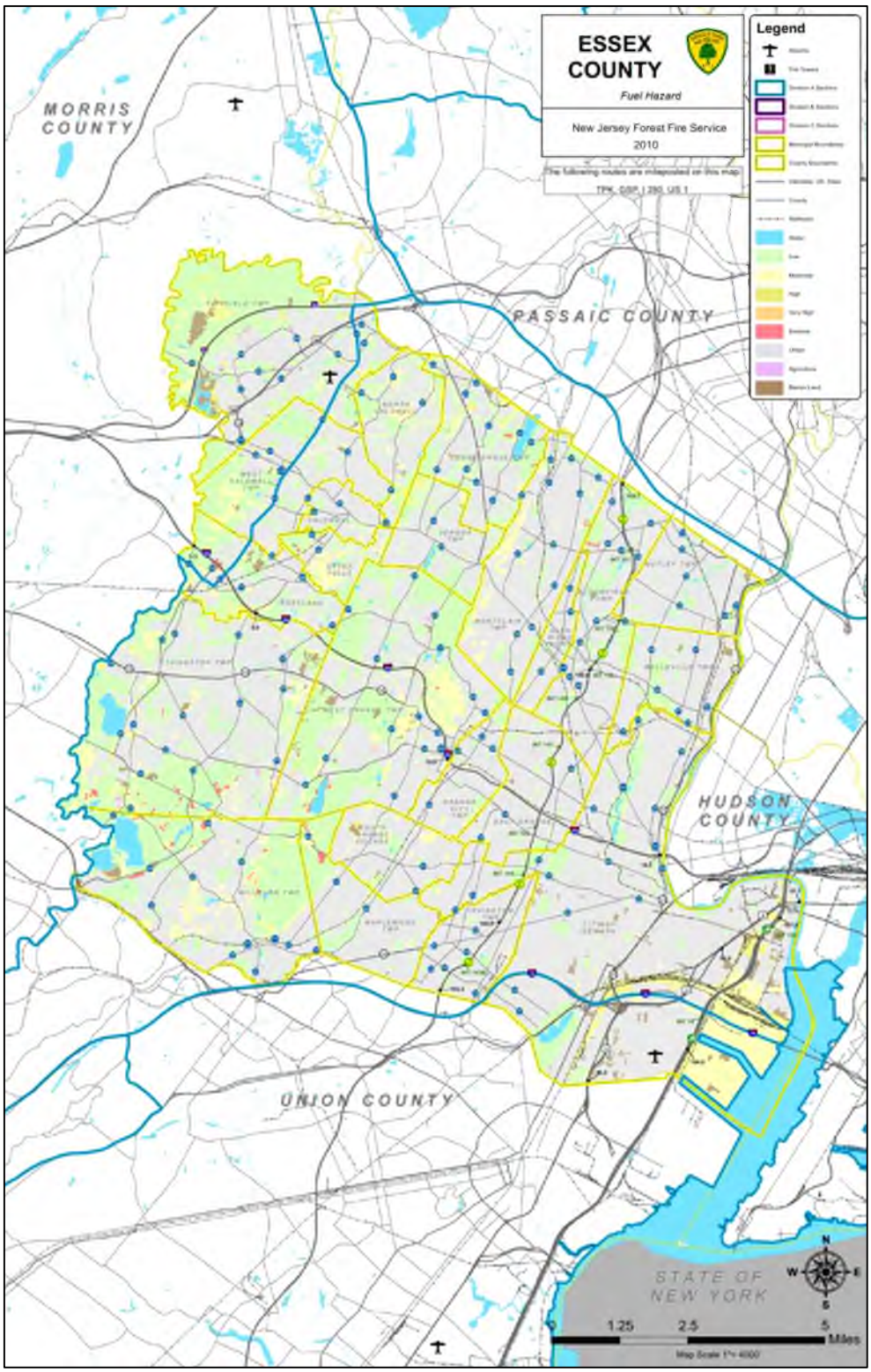
Table 5.4.10-3. Approximate Area in Wildfire Fuel Hazard Ranking Zones in Essex County

Municipality	Total Area (Square Miles)	NJ Forest Service Risk Areas			
		Low to Moderate	% in Hazard Area	High to Extreme	% in Hazard Area
Township of Belleville	3	0.52	15.6%	0.02	0.5%
Township of Bloomfield	5.36	1.02	19.0%	0.02	0.4%
Borough of Caldwell	1	0.18	15.1%	0.00	0.0%
Township of Cedar Grove	4	1.49	34.3%	0.09	2.0%
City of East Orange	3.92	0.28	7.3%	0.00	0.1%
Borough of Essex Fells	1.41	0.75	53.2%	0.03	2.1%
Township of Fairfield	10.34	4.99	48.2%	0.31	3.0%
Borough of Glen Ridge	1	0.13	9.9%	0.00	0.0%
Township of Irvington	2.91	0.18	6.1%	0.00	0.2%
Township of Livingston	14	5.62	39.8%	0.24	1.7%
Township of Maplewood	4	1.08	28.0%	0.04	1.0%
Township of Millburn	9.88	4.26	43.1%	0.16	1.6%
Township of Montclair	6	1.13	18.2%	0.03	0.5%
City of Newark	26	4.96	18.9%	0.69	2.6%
Borough of North Caldwell	3.07	1.16	37.6%	0.04	1.2%

Municipality	Total Area (Square Miles)	NJ Forest Service Risk Areas			
		Low to Moderate	% in Hazard Area	High to Extreme	% in Hazard Area
Township of Nutley	3	0.32	9.3%	0.02	0.5%
City of Orange Township	2	0.27	12.4%	0.00	0.0%
Borough of Roseland	4	1.64	44.5%	0.11	3.0%
Township of South Orange Village	3	0.39	13.6%	0.02	0.6%
Township of Verona	3	0.76	27.3%	0.05	1.6%
Township of West Caldwell	5	2.03	40.1%	0.04	0.7%
Township of West Orange	12	5.61	46.3%	0.16	1.3%
Essex County (Total)	**130**	**38.76**	**29.9%**	**2.05**	**1.6%**

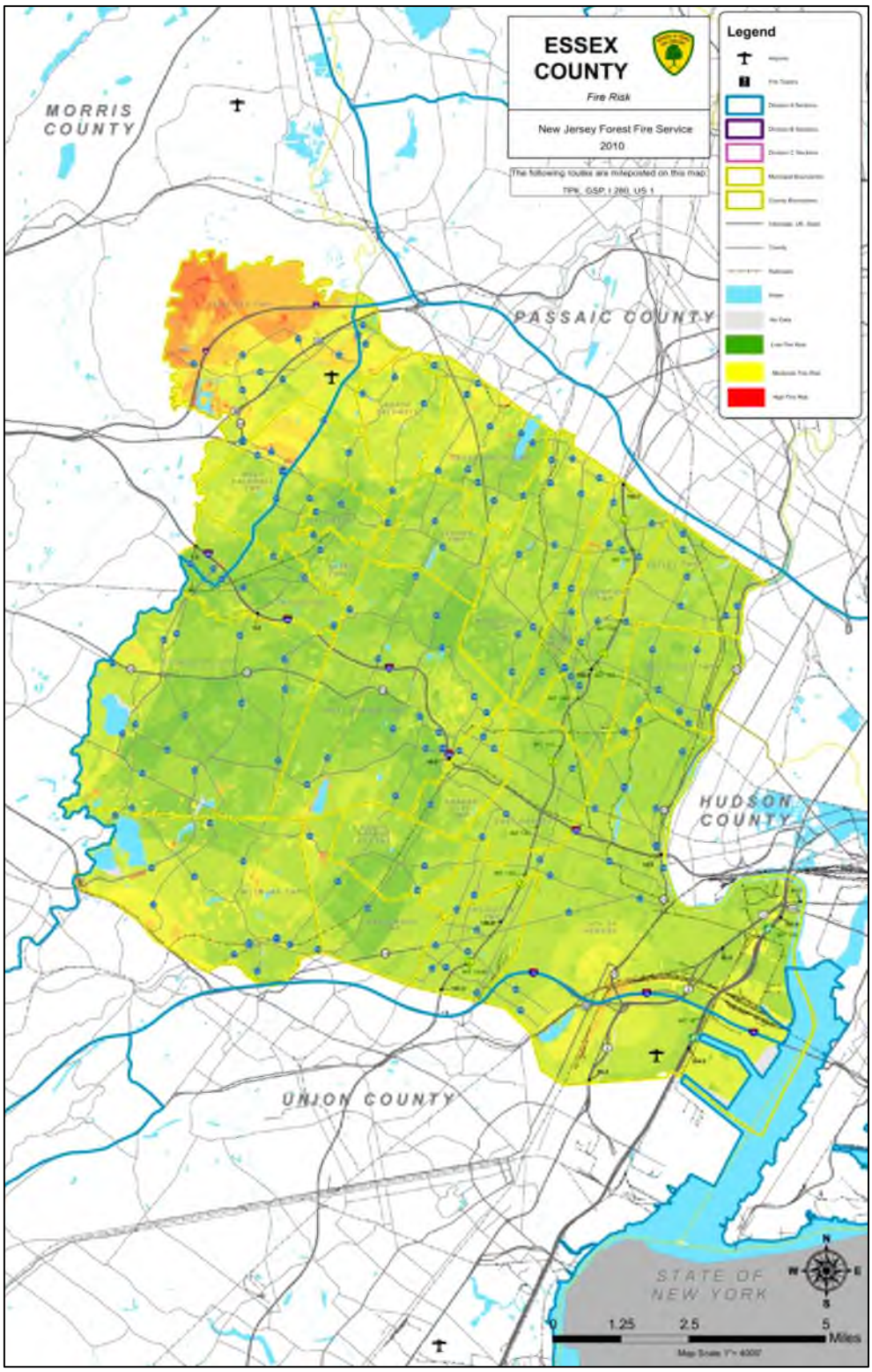
Source: NJFFS 2013

Figure 5.4.10-2. Wildfire Fuel Hazard for Essex County



Source: New Jersey Forest Fire Service 2010

Figure 5.4.10-3. Wildfire Risk for Essex County



Source: New Jersey Forest Fire Service 2010

Previous Occurrences and Losses

Many sources provided wildfire information regarding previous occurrences and losses associated with wildfire throughout New Jersey. With so many sources reviewed for the purpose of this Hazard Mitigation Plan (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.

Between 1954 and 2014, New Jersey was included in two FEMA fire management assistance (FMA) declarations. Generally, these disasters cover a wide range of the State; therefore, the disaster may have impacted many counties. Essex County was not included in any FMA declarations.

The 2007 Plan did not discuss specific wildfire events that occurred in Essex County. For this 2015 Plan Update, wildfire events were summarized from 2007 to 2014. Based on all sources used to research and identify wildfires in the County, there have been no wildfire incidents in Essex County between 2007 and 2014.

Probability of Future Occurrences

New Jersey is unique, in that it is the most densely populated state with over 8.7 million residents, and over 50 percent of the land is used for individual residences and housing developments. The continual increase of developments expands into forested regions. This spread of development into the forested regions is known as the wildland urban interface. According to the New Jersey Hazard Mitigation Plan, the wildland urban interface is defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildlands or vegetative fuel. The New Jersey Forest Fire Service is faced with a significant threat with the increase of wildland urban interface. New Jersey will continue to face wildfires as a threat due to growing population, development, and increased wildland urban interface areas.

Wildfire experts say there are four reasons why wildfire risks are increasing:

- Fuel, in the form of fallen leaves, branches and plant growth, have accumulated over time on the forest floor. Now this fuel has the potential to “feed” a wildfire.
- Increasingly hot, dry weather in the U.S.
- Changing weather patterns across the country.
- More homes built in the areas called the Wildland/Urban Interface, meaning homes are built closer to wildland areas where wildfires can occur (NYSOEM, 2005).

The likelihood of urban fires and wildfires is difficult to predict in a probabilistic manner; in other words estimating the approximate number of a catastrophic wildfires to occur in New Jersey every year is next to impossible. 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 WUI zone. Based on available data, urban fires and wildfires will continue to present a risk. 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 5.3, 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 Planning Committee, the probability of occurrence for wildfire in the County is considered ‘occasional’ (likely to occur within 100 years, as presented in Table 5.3-3).

Climate Change Impacts

Fire is determined by climate variability, local topography, and human intervention. Hot, dry spells create the highest fire risk. Increased temperatures may intensify wildfire danger by warming and drying out vegetation. When climate alters fuel loads and fuel moisture, this changes the forest susceptibility to wildfires. Climate changes also may increase winds that spread fires. Faster fires are harder to contain, and thus are more likely to expand into residential neighborhoods.

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

The New Jersey Climate Adaptation Alliance is a network of policymakers, public and private-sector practitioners, academics, non-governmental organizations (NGO), and business leaders aligned to build climate change preparedness in the state of New Jersey. The Alliance is facilitated by Rutgers University, which provides science and technical support, facilitates the Alliance's operations and advances its recommendations. A document titled *Change in New Jersey: Trends and Projections* was developed to identify recommendations for State and local public policy that will be designed to enhance climate change preparedness and resilience in New Jersey (Rutgers 2013).

Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC, 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4 °F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).

Both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over five inches (12%) greater than the average from 1895-1970. Southern New Jersey became two inches (five-percent) wetter late in the 20th century (Office of New Jersey State Climatologist). Average annual precipitation is projected to increase in the region by five-percent by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New York City Panel on Climate Change [NPCC] 2009).

5.4.10.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. The portions of Essex County in the NJFFS Wildfire Fuel Hazard "extreme', 'very high' and 'high' areas are identified as the wildfire hazard areas. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), located in the hazard area are exposed and potentially vulnerable to wildfire. The following text evaluates and estimates the potential impact of the wildfire hazard on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Wildfire hazards can impact significant areas of land, as evidenced by wildfires throughout the State and U.S. over the past several years. Fire in urban areas has the potential for great damage to infrastructure, loss of life, and strain on lifelines and emergency responders because of the high density of population and structures that can be impacted in these areas. Wildfire, however can spread quickly, become a huge fire complex consisting of thousands of acres, and present greater challenges for allocating resources, defending isolated structures, and coordinating multi-jurisdictional response. If a wildfire occurs at a wildfire urban interface, it can also cause an urban fire and in this case has the potential for great damage to infrastructure, loss of life, and strain on lifelines and emergency responders because of the high density of population and structures that can be impacted in these areas.

Potential losses from wildfire include human life, structures and other improvements, and natural resources. Given the immediate response times to reported wildfires, the likelihood of injuries and casualties is minimal. Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations including children, the elderly, and those with respiratory and cardiovascular diseases. Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. In addition, wildfire can lead to ancillary impacts such as landslides in steep ravine areas and flooding caused by the impacts of silt in local watersheds.

Data and Methodology

The New Jersey Forest Fire Service (NJFFS) uses Wildfire Fuel Hazard data to assign wildfire fuel hazard rankings across the State. This data, developed in 2009, is based upon NJDEP's 2002 Land Use/Land Cover datasets and NJDEP's 2002 10-meter Digital Elevation Grid datasets. Figure 5.4.9 3 presented earlier in this section illustrates the defined wildfire fuel hazard rankings for Atlantic County. For the wildfire hazard, the NJFFS Wildfire Fuel Hazard "extreme', 'very high' and 'high' areas are identified as the wildfire hazard area. The statistics in the 'moderate' to 'low' areas are also reported.

To determine vulnerability, a spatial analysis was conducted using the NJFFS Fuel Hazard Area guidelines. When the analysis determined the hazard area would impact the area in a jurisdiction, or the location of critical facilities, these locations were deemed vulnerable to the hazard. The limitations of this analysis are recognized, and as such the analysis is only used to provide a general estimate.

Impact on Life, Health and Safety

As demonstrated by historic wildfire events in New Jersey and other parts of the country, potential losses include 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.

Wildfires can cost thousands of taxpayer dollars to suppress and control and 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 work to fight these fires.

As a way to estimate the County's population vulnerable to the wildfire hazard, the population located within the NJFFS hazard areas were overlaid upon the 2010 Census population data (U.S. Census, 2010). The Census blocks with their center within the hazard area were used to calculate the estimated population exposed to the wildfire hazard. Table 5.4.10-4 summarizes the estimated population exposed by municipality. The limitations of this analysis are recognized, and as such the analysis is only used to provide a general estimate.

Table 5.4.10-4. Estimated Vulnerable Population

Municipality	US. Census 2010 Population	Estimated Population Exposed			
		Extreme, Very High and High	% of Total Exposed	Moderate and Low	% of Total Exposed
Township of Belleville	35,926	347	0.97%	1,702	4.74%
Township of Bloomfield	47,315	283	0.60%	4,161	8.79%
Borough of Caldwell	7,822	0	0.00%	1,278	16.34%
Township of Cedar Grove	12,411	423	3.41%	3,486	28.09%
City of East Orange	64,270	0	0.00%	3,306	5.14%
Borough of Essex Fells	2,113	88	4.16%	808	38.24%
Township of Fairfield	7,466	49	0.66%	1,868	25.02%
Borough of Glen Ridge	7,527	0	0.00%	638	8.48%
Township of Irvington	53,926	0	0.00%	712	1.32%
Township of Livingston	29,366	11	0.04%	7,185	24.47%
Township of Maplewood	23,867	0	0.00%	1,162	4.87%
Township of Millburn	20,149	0	0.00%	3,856	19.14%
Township of Montclair	37,669	0	0.00%	5,142	13.65%
City of Newark	277,140	559	0.20%	6,578	2.37%
Borough of North Caldwell	6,183	0	0.00%	2,699	43.65%
Township of Nutley	28,370	0	0.00%	1,867	6.58%
City of Orange Township	30,134	0	0.00%	1,131	3.75%
Borough of Roseland	5,819	0	0.00%	682	11.72%
Township of South Orange Village	16,198	0	0.00%	1,552	9.58%
Township of Verona	13,332	0	0.00%	3,300	24.75%
Township of West Caldwell	10,759	35	0.33%	1,483	13.78%
Township of West Orange	46,207	0	0.00%	10,142	21.95%
Essex County (TOTAL)	**783,969**	**1,795**	**0.23%**	**64,738**	**8.26%**

Source: 2010 US Census, NJFFS, 2013

Impact on General Building Stock

The most vulnerable structures to wildfire events are those located within the NJFFS identified extreme, very high or high fuel hazard areas. 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. To estimate the buildings exposed to the wildfire hazard, the hazard areas were overlaid upon the building inventory in the County (Census block). The replacement cost value of the structures with their center in the hazard area were totaled. Table 5.4.10-5 summarizes the estimated building stock inventory exposed by municipality. The limitations of this analysis are recognized, and as such the analysis is only used to provide a general estimate.

Table 5.4.10-5. Building Stock Replacement Value Located in Wildfire Fuel Hazard Ranking Zones

Municipality	Total RV (Structure and Contents)	Building RV Exposed			
		Extreme, Very High and High	% of Total Exposed	Moderate and Low	% of Total Exposed
Township of Belleville	$2,905,447,150	$0	0.00%	$12,312,900	0.42%
Township of Bloomfield	$3,827,312,350	$0	0.00%	$27,720,600	0.72%
Borough of Caldwell	$753,639,775	$0	0.00%	$15,578,700	2.07%
Township of Cedar Grove	$1,657,089,082	$2,303,400	0.14%	$82,630,100	4.99%
City of East Orange	$5,820,599,879	$0	0.00%	$40,010,300	0.69%
Borough of Essex Fells	$567,106,700	$1,303,100	0.23%	$124,489,200	21.95%
Township of Fairfield	$3,374,787,200	$23,819,300	0.71%	$109,469,100	3.24%
Borough of Glen Ridge	$986,279,500	$0	0.00%	$9,312,600	0.94%
Township of Irvington	$2,820,388,050	$0	0.00%	$14,352,200	0.51%
Township of Livingston	$5,547,703,530	$1,189,000	0.02%	$370,329,600	6.68%
Township of Maplewood	$2,733,369,500	$0	0.00%	$22,165,000	0.81%
Township of Millburn	$8,045,533,450	$2,356,900	0.03%	$466,117,600	5.79%
Township of Montclair	$5,890,125,479	$11,453,100	0.19%	$194,639,200	3.30%
City of Newark	$18,709,618,398	$6,155,600	0.03%	$357,854,600	1.91%
Borough of North Caldwell	$1,431,441,250	$4,014,400	0.28%	$239,572,600	16.74%
Township of Nutley	$3,510,270,592	$0	0.00%	$24,159,156	0.69%
City of Orange Township	$1,867,401,350	$0	0.00%	$18,784,800	1.01%
Borough of Roseland	$1,435,628,250	$41,306,200	2.88%	$134,148,200	9.34%
Township of South Orange Village	$3,108,688,125	$16,598,600	0.53%	$67,473,700	2.17%
Township of Verona	$1,598,018,325	$102,500	0.01%	$80,466,100	5.04%
Township of West Caldwell	$2,040,951,278	$101,800	0.00%	$117,288,200	5.75%
Township of West Orange	$5,503,784,816	$3,840,300	0.07%	$371,254,320	6.75%
Essex County (Total)	**$84,135,184,028**	**$114,544,200**	**0.14%**	**$2,900,128,776**	**3.45%**

Source: HAZUS-MH 2.1; NJFFS, 2013

Notes: RV = Replacement Value

Impact on Critical Facilities

It is recognized that a number of critical facilities are located in the wildfire hazard area, and are also vulnerable to the threat of wildfire. Many of these facilities are the locations for vulnerable populations (i.e., schools, senior facilities) and responding agencies to wildfire events (i.e., fire, police). Table 5.4.10-6 and 5.4.10-7 summarize the critical facilities located within the wildfire hazard area by jurisdiction.

Table 5.4.10-6. Facilities in Extreme, Very High, or High Wildfire Fuel Hazard Ranking Zones in Essex County

Municipality	Facility Types
	School
Township of West Orange	1
Essex County	**1**

Source: NJFFS, 2013

Table 5.4.10-7. Facilities in Moderate and Low Wildfire Fuel Hazard Ranking Zones in Essex County

Municipality	Facility Types																					
	Bus	Communication	Commercial	Community Center	County Building	DAM	EMS	Electric Substation	Finance	Fire	Government	Light Rail	Nursing Homes	Park	Police	Potable Water Treatment	Safety	School	Train Station	Transportation	Waste Water Pump	Waste Water Treatment
Township of Belleville			1					1			1	1						1				
Township of Bloomfield																						
Borough of Caldwell																		1				
Township of Cedar Grove						1																
City of East Orange	1															2			2	4		
Borough of Essex Fells																			2			
Township of Fairfield																						
Borough of Glen Ridge																				1		
Township of Irvington											1								1			
Township of Livingston		1																		1		
Township of Maplewood		1				2	1															
Township of Millburn		1					1				1								1			
Township of Montclair		1				4	1			1				1		2			2			
City of Newark						1													5			
Borough of North Caldwell	1											5			1		1	1	3			2
Township of Nutley											1											
City of Orange Township	1							1								1						
Borough of Roseland									1													
Township of South Orange Village				1														1	2			
Township of Verona																2						
Township of West Caldwell																						1
Township of West Orange		3			3	1		1					2			2					3	
Essex County	**3**	**7**	**1**	**1**	**3**	**9**	**3**	**3**	**1**	**1**	**4**	**6**	**2**	**1**	**1**	**9**	**1**	**4**	**18**	**6**	**3**	**3**

Source: NJFFS, 2013

Impact on Economy

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. Wildfires can cost thousands of taxpayer dollars to suppress and control and 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.

Future Growth and Development

Areas targeted for potential future growth and development in the next five years have been identified across Essex County at the municipal level. Refer to the jurisdictional annexes in Volume II of this HMP. It is anticipated that any new development and new residents in the extreme, very high or high fuel hazard areas will be exposed to the wildfire hazard.

Effect of Climate Change on Vulnerability

According to the U.S. Fire Service (USFS), climate change will likely alter the atmospheric patterns that affect fire weather. Changes in fire patterns will, in turn, impact carbon cycling, forest structure, and species composition. Climate change associated with elevated greenhouse gas concentrations may create an atmospheric and fuel environment that is more conductive to large, severe fires (USFS, 2011). Under a changing climate, wildfires are expected to increase by 50% across the U.S. (USFS, 2013).

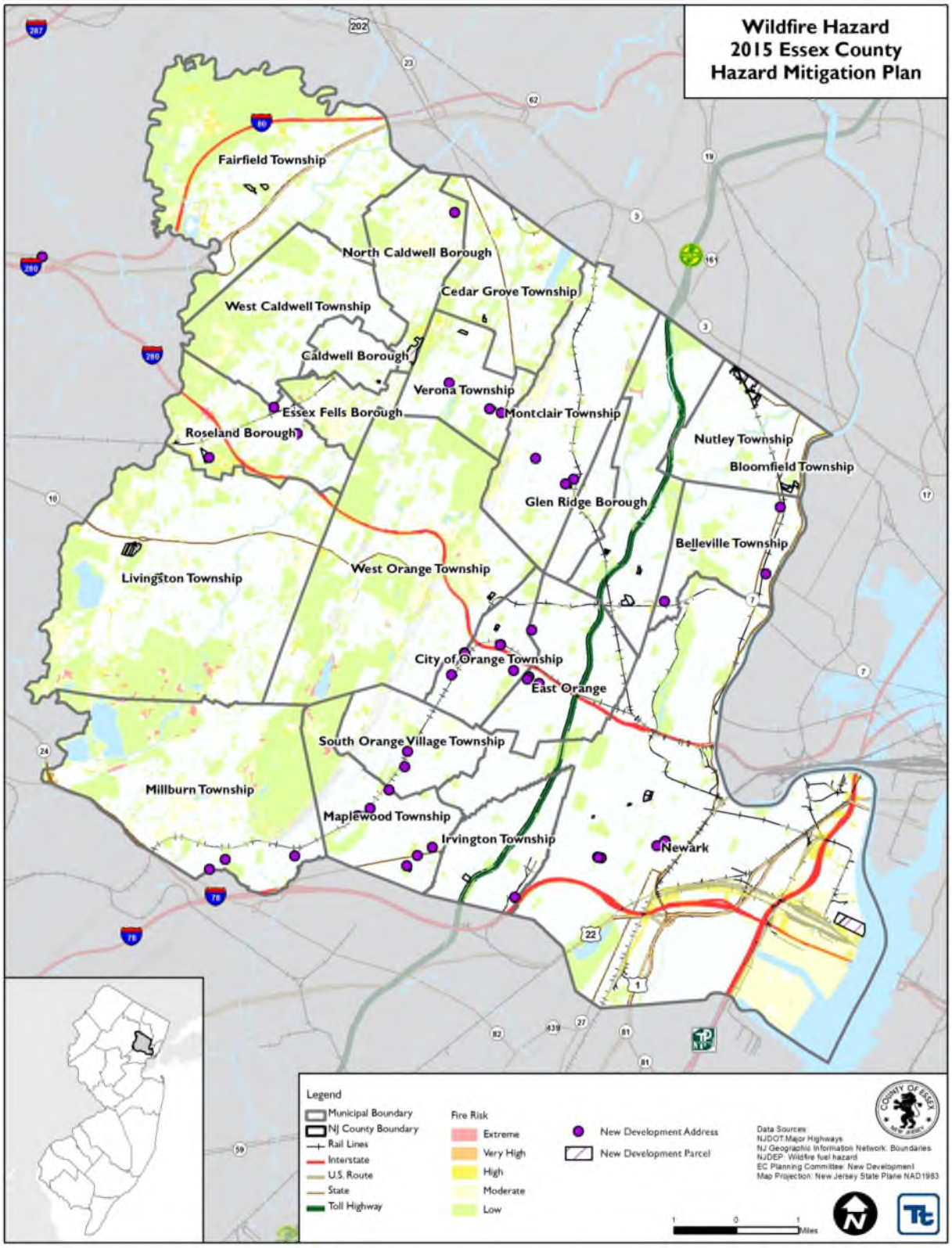
Fire interacts with climate and vegetation (fuel) in predictable ways. Understanding the climate/fire/vegetation interactions is essential for addressing issues associated with climate change that include:

- Effects on regional circulation and other atmospheric patterns that affect fire weather
- Effects of changing fire regimes on the carbon cycle, forest structure, and species composition, and
- Complications from land use change, invasive species and an increasing wildland-urban interface (USFS, 2011).

It is projected that higher summer temperatures will likely increase the high fire risk by 10 to 30-percent. Fire occurrence and/or area burned could increase across the U.S. due to the increase of lightning activity, the frequency of surface pressure and associated circulation patterns conductive to surface drying, and fire-weather conditions, in general, which is conductive to severe wildfires. Warmer temperatures will also increase the effects of drought and increase the number of days each year with flammable fuels and extending fire seasons and areas burned (USFS, 2011).

Future changes in fire frequency and severity are difficult to predict. Global and regional climate changes associated with elevated greenhouse gas concentrations could alter large weather patterns, thereby affecting fire-weather conducive to extreme fire behavior (USFS, 2011).

Figure 5.4.10-4. Wildfire Risk and New Development for Essex County



Source: NJDEP

Change of Vulnerability

The WUI (interface and intermix) obtained through the SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin-Madison was not used for the 2008 HMP vulnerability assessment. The updated vulnerability assessment provides a more current exposure analysis for the County.

Additional Data and Next Steps

As the custom building inventory is updated additional building attributes regarding the construction of structures, such as roofing material, fire detection equipment, structure age, etc. may be incorporated as available. As stated earlier, 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. The proximity of these building types to the fuel hazard areas should be identified for further evaluation. Development and availability of such data would permit a more detailed estimate of potential vulnerabilities, including loss of life and potential structural damages.

5.4.11 Civil Disorder

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the civil disorder hazard in Essex County.

2015 Plan Update Changes

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the civil disorder hazard is discussed.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- The vulnerability assessment is a new addition for the civil disorder hazard. It directly follows the hazard profile.

5.4.11.1 Profile

Hazard Description

Civil disorder is a broad term that is typically used by law enforcement to describe one or more forms of unrest caused by a group of people. It involves a disruption of the typical social order that can involve a strike or protest, and it can be peaceful or involve violence (NJHMP Update 2014). Demonstrations, civil unrest, public disorder, and riots happen for a number of reasons that include economic hardships, social injustices, ethnic differences, objections to word organizations or certain governments, political grievances, and terrorist acts. An event can be triggered by a single cause or a combination of causes (U.S. Army 2005).

Civil disturbances can take the form of small gatherings or large groups blocking or impeding access to a building, or disrupting normal activities by generating noise and intimidating people. Demonstrations can range from a peaceful sit-in to a full-scale riot, in which a mob burns or otherwise destroys property and terrorizes individuals. Even in its more passive forms, a group that blocks roadways, sidewalks, or buildings interferes with public order. Often protests intended to be a peaceful demonstration to the public and the government can escalate into general chaos.

There are two types of large gatherings typically associated with civil disturbances: a crowd and a mob. A crowd can be identified as causal, sighting, agitated, or mob-like:

- A causal crowd is identified as individuals or small groups with nothing in common to bind them together. If they have an agenda, it is their own. Casual crowds are made up of individuals or small groups occupying the same common place.
- Sighting crowds are similar to casual crowds; however, they are gathering for an event. People migrate as a crowd to sporting events, group of people attracted to fires and accidents, and those that attend music concerts are all types of sighting crowds. Individuals or small groups gather at these events for the same purpose. It is the event and/or one's curiosity that compels a crowd to come together.
- Agitated crowds add responses that are based on the elements (people, space, and event). Individuals with strong emotional feelings within a crowd can quickly spread and infect the rest of the crowd. As more people within the crowd become emotionally involved, a sense of unity may develop, causing changes in the overall demeanor of the crowd. Yelling, screaming, and name-calling or all associated with an agitated crowd.

- Mobs have all the elements found in the crowd types described above, in addition to aggressive, physical, and sometimes violent actions. Under these conditions, individuals within a crowd will often say or do things they usually would not do. Extreme acts of violence and property damage are often part of mob activities. They consist of, or involve, the elements of people and groups being mixed together and becoming fluid (U.S. Army 2005).

A mob can be defined as a large disorderly crowd or throng. Mobs are usually emotional, loud, tumultuous, violent, and lawless. Similar to crowds, mobs have different levels of commitment, and can be classified into the following four categories (Alvarez and Bachman 2007):

- Aggressive Mob: An aggressive mob is one that attacks, riots, and terrorizes. The object of violence may be a person, property, or both. An aggressive mob is distinguished from an aggressive crowd only by lawless activity. Examples of aggressive mobs are the inmate mobs in prisons and jails, mobs that act out their frustrations after political defeat, or violent mobs at political protests or rallies.
- Escape Mob: An escape mob is attempting to flee from something such as a fire, bomb, flood, or other catastrophe. Members of escape mobs are generally difficult to control and can be characterized by unreasoning terror.
- Acquisitive Mob: An acquisitive mob is one motivated by a desire to acquire something. Riots caused by other factors often turn into looting sprees. This mob exploits an authority's lack of control in safeguarding property.
- Expressive Mob: An expressive mob is one that expresses fervor or revelry following some sporting event, religious activity, or celebration. Members experience a release of pent up emotions in highly charged situations.

Civil unrest and disturbances affect the following factions of society:

- The Public: The general population could serve as participants or targets in actions of civil unrest. Wide spread unrest could cause fear amongst the populace and cause them to be absent from school or work activities. During an event, bystanders may be harmed because of the activities of participants.
- Responders: Responses to civil unrest events are generally handled at the local level. In a large event, the resources of a local jurisdiction may be exceeded. In this instance, State resources would be activated to fill the need. During an event responders may become targets, which could hamper their effectiveness.
- Continuity Of Operations, including delivery of services: The outbreak of widespread rioting or looting could have potential impact on the State's ability to provide services and conduct its normal operations. Protesters could occupy government buildings and interrupt the normal functions of government, or targeted attacks on government facilities could interrupt operations entirely.
- Property: Private property often serves as a target in instances of civil unrest. Businesses can be targeted for looting or vandalism. If an event is particularly large, damage could reach millions of dollars and recovery could take years.
- Facilities: Often in acts of civil unrest government facilities become the focal point of protests or targets for vandalism. Damage suffered during an event or the inability of a worker to enter a facility may greatly reduce a facility's effective capacity or close it completely.
- Infrastructure: Similar to government facilities, public and private infrastructure can become targets of civil unrest. Damage to transportation, communications, or utilities infrastructure could further exacerbate the situation.
- Environment: Normally, instance of civil unrest will have a minimal impact on the environment. However, if petroleum or other chemical facilities were a target for vandalism or large-scale fires occurred, the impact on the environment could be significant.

- Economic Condition of the State: Civil unrest could prove economically crippling to the State of New Jersey. Large-scale events are usually accompanied by wide-spread absenteeism and damage to private property.
- Public Confidence in the State's Governance: If an event becomes prolonged or is perceived to be mismanaged, it could greatly decrease public confidence in the governance of the State. If the response is seen to be inadequate, individuals may attempt to protect their property by their own means and further degrade the situation.

Civil disturbances often occur with little to no warning; however, certain events may trigger riots. As demonstrated in the Past Occurrences and Losses section and discussions regarding severity, riots can occur as a result of controversial court rulings, unfair working conditions, or general unrest. Riots can also be triggered as a result of favorable or unfavorable sports outcomes. Thus, generally there will be a certain degree of warning time that a riot may occur; however, achieving certainty that an incident is imminent is not possible.

Civil disorders can result in numerous secondary hazards. Depending on the size and scope of the incident, civil unrest may lead to widespread urban fire, utility failure, transportation interruption, and environmental hazards. The most significant impact of civil unrest is the secondary hazard of interruption of continuity of government, which can also lead to several of the aforementioned secondary hazards. The extent of secondary hazards will vary significantly based on the extent and nature of the civil unrest.

In the State of New Jersey, a municipality in which a civil disorder occurs bears the first and primary responsibility to control the disturbance. Civil unrest that remains uncontrolled warrants local mutual aid from neighboring municipal and/or county resources. If the civil unrest remains beyond the capabilities of local law enforcement agencies alone, limited State Police assistance may be requested. If the restoration of law and order is beyond local, county and state abilities, the Governor may declare a State of Emergency calling on federal support such as the New Jersey National Guard to restore order (New Jersey State HMP 2011).

Civil disorder can also be identified as crime, which is classified into four major classifications: violent crime, property crime, public order crime, and hate crime. Violent crimes are physical acts against an individual such as murder, robbery, or assault. Property crimes are acts against the property of others such as burglary, theft, or vandalism. Public order crimes are crimes that have no specific victim, such as prostitution, drugs, or insider trading. Hate crimes can be either violent or property crimes motivated by bias against a particular social group (Essex County HMP 2007).

Location

Government facilities, landmarks, prisons, and universities are common sites where crowds and mobs may gather. The concentration of buildings in and density of northeastern New Jersey, and State government buildings in Trenton may be targets of civil disturbance. New Jersey also has correctional facilities, treatment units, and youth development centers, as well as federal prison facilities and local and private facilities throughout the State that may be targets for civil unrest.

Extent

The magnitude or severity of a civil disorder depends on the nature of the disturbance. They can take form as small gatherings or large groups blocking access to buildings or disrupting normal activities. They can range from peaceful sit-ins to a full-scale riot.

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with civil disorders events throughout 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.

Between 1954 and 2014, the State of New Jersey has not been included in any FEMA civil disorder related disasters (DR) or emergencies (EM) (FEMA 2014).

For this 2015 Plan Update, known civil disorder events that have impacted Essex County between 2007 and 2014 are identified in Table 5.4.11-1. With civil disorder documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.11-1 may not include all events that have occurred in the County.

Table 5.4.11-1. Civil Disorders in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
March 7, 2010	Protest	N/A	N/A	Nicholas Botti, an animal welfare advocate, protested the treatment of animals by a circus outside of the Prudential Center. He was arrested because he refused to stand in the designated protest area.
July 20, 2013	Protest/Rally	N/A	N/A	Approximately 400 people rallied in the intersection of Broad and Court Streets in the City of Newark during a "Justice for Trayvon" rally. This protest was one of more than 100 throughout the U.S. held one week after George Zimmerman was found not guilty of murder charges in the killing of the 17 year old. A call-and-response rang out outside the Peter W. Rodino Jr. Federal Building in Newark where the 400 people rallied to protest the not guilty verdict. It was a two-hour protest where people of all ages and races gathered to listen to speeches by religions leaders and group representatives.
April 3, 2014	Walkout/Protest	N/A	N/A	A student walkout was lead towards City Hall to protest Governor Christie's recent superintendent appointee to Newark schools. Hundreds of students left school and gathered at Newark City Hall.
April 30, 2014	Protest	N/A	N/A	The firing of a teacher at West Side High School in the City of Newark led to a protest by students. Police were called by school officials when protesters began yelling and banging on hall doors.

Probability of Future Occurrences

Civil disorder incidents are often spontaneous and can occur at any time. When they do occur, they have the potential to become extremely disruptive and difficult to control. This makes it difficult to predict the probability of future occurrences. However, it can be assumed that civil disorders will continue to occur in Essex County. These types of civil disorders include marches, protests, demonstrations, and gatherings throughout the County.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for civil disorder in the County is considered 'occasional' (likely to occur within 100 years, as presented in Table 5.3-3).

Climate Change Impacts

Because civil unrest is a short-term, human-caused hazard, no climate change impacts are associated with the hazard.

5.4.11.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the civil disorder hazard, all of Essex County has been identified as the hazard area. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), are vulnerable to civil disorders. The following text evaluates and estimates the potential impact of the civil disorder hazard on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Overall, it is difficult to quantify potential losses of civil disorder due to the many variables and human elements.

Data and Methodology

For this hazard, data was obtained from Essex County and the Planning Committee.

Impact on Life, Health and Safety

The entire County is considered vulnerable to this hazard. Potential losses from civil disorder incidents include human health and life and property resources. Civil disorder incidents can lead to injury and/or death for both the involved persons and the innocent bystanders. If a civil disorder turns violent, they can lead to injury and/or death for personnel responding to the incident. The number of people exposed to a civil disorder depends on the population density. Increases in population or the hosting of major political, economic or social events could increase the likelihood and severity of a civil disorder incident.

Impact on General Building Stock

The general building stock of Essex County may be damaged or destroyed during a civil disorder incident. Depending on the scale of the incident, damages could range from broken windows to the destruction of major pieces of infrastructure.

Impact on Critical Facilities

Critical facilities may be targets for civil unrest disturbances. Refer to Section 4, County Profile, which summarizes the number and type of critical facilities in Essex County. Disruptions to critical facilities may have cascading secondary effects such as power outages and utility failure. Because these facilities are vulnerable to civil disorders and may be a focal point during a protest, these facilities will need to be protected during incidents.

Impact on Economy

Civil disorder events can have negative economic and social effects on Essex County as a whole. Economic conditions could be adversely affected and dependent upon time and length of cleanup and investigation of the incident. Some incidents may target the business sector, impacting the economy of that municipality where the

incident is occurring. For the purpose of this assessment, all of Essex County's economy is considered exposed to the effects of civil disorders.

Future Growth and Development

As discussed in Sections 4 and 9, areas targeted for future growth and development have been identified across Essex County. Any areas of growth could be potentially impacted by the civil disorder hazard because the entire County is exposed and vulnerable. An increase in development and population has the ability to increase the likelihood of a civil disorder incident. Future migration to larger jurisdictions may also increase the likelihood of a civil disorder incident. Please refer to the specific areas of development indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.

Effect of Climate Change on Vulnerability

Because a civil disorder is a short-term, human-caused hazard, no climate change impacts are associated with the hazard.

Change of Vulnerability

Overall, the County's vulnerability has not changed and the entire County will continue to be exposed and vulnerable to civil disorder events.

Additional Data and Next Steps

For the Plan Update, any additional information regarding localized concerns and past impacts will be collected and analyzed. This data will be developed to support future revisions to the plan. Mitigation efforts could include building on existing New Jersey, Essex County, and local efforts.

5.4.12 Cyber Attack

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the cyber attack hazard in Essex County.

2015 Plan Update Changes

- For the 2015 Plan Update, cyber attack is included as a hazard of concern for Essex County. Cyber attack was not profiled in the 2008 HMP.
- The hazard profile is new for the 2015 Plan Update and includes a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the cyber attack hazard is discussed.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- The vulnerability assessment is a new addition for the cyber attack hazard. It directly follows the hazard profile.

5.4.12.1 Profile

Hazard Description

A cyber attack is a crime both intentional and malicious in nature. It compromises the digital infrastructure of a person or organization, often for financial or terror-related reasons. Such attacks vary in nature and are perpetrated using digital mediums or sometimes social engineering to target human operators. Generally, attacks last minutes to days, but large scale events and their impacts can last much longer (NYS HMP 2014).

Cyber attacks differ by motive, attack type and vector, and perpetrator profile. Motives for cyber attacks can vary, ranging from the pursuit of financial gain to political or social aims. Cyber threats are difficult to identify and comprehend. Types of threats include viruses erasing entire systems, intruders breaking into systems and altering files, intruders using someone's personal computer to attack others, or intruders stealing confidential information. The spectrum of cyber risks is limitless, with threats having a wide-range of effects on the individual, community, organizational, and national threat (FEMA 2013). These risks include:

- Organized cyber crime, state-sponsored hackers, and cyber espionage can pose national security risks to the U.S.
- Transportation, power, and other services may be disrupted by large scale cyber incidents. The extent of the disruption is highly uncertain as it will be determined by many unknown factors such as the target and size of the incident.
- Vulnerability to data breach and loss increases if an organization's network is compromised. Information about a company, its employees, and its customers can be at risk.
- Individually-owned devices such as computers, tablets, mobile phones, and gaming systems that connect to the internet are vulnerable to intrusion. Personal information may be at risk without proper security (FEMA 2013).

Cyber terrorism is the use of existing computers and information, particularly over the Internet, to cause physical or financial harm or a severe disruption of infrastructure service. Transportation, public safety, and utility services are all critical, and are highly dependent on information technology. The motive behind such disruptions can be driven by religious, political, or other objectives. Three kinds of attacks that can be conducted on computers include attacks of physical means, electronic means, and attacks using malicious code (Waldron 2011). Specifically, these types of include:

- Directing conventional kinetic weapons against computer equipment, a computer facility, or transmission lines to create a physical attack that disrupts the reliability of equipment.
- The power of electromagnetic energy, most commonly in the form of an electromagnetic pulse (EMP), can be used to create an electronic attack (EA) directed against computer equipment or data transmissions. By overheating circuitry or jamming communications, an EA disrupts the reliability of equipment and the integrity of data.
- Malicious code can be used to create a cyber attack, or computer network attack (CNA), directed against computer processing code, instruction logic, or data. The code can generate a stream of malicious network packets that can disrupt data or logic through exploiting vulnerability in computer software, or a weakness in the computer security practices of an organization. This type of cyber attack can disrupt the reliability of equipment, the integrity of data, and the confidentiality of communications (Wilson and Clay 2007)

Cyber terrorists typically have two broad motivations to carry out an attack. These motivations include:

- Effects-based: Cyber terrorism exists when computer attacks result in effects that are disruptive enough to generate fear comparable to a traditional act of terrorism.
- Intent-based: Cyber terrorism exists when unlawful or politically motivated computer attacks are done to intimidate or coerce a government or people to further a political objective, or to cause grave harm or severe economic damage (Rollins and Clay 2007).

In terms of specific attacks on computers, cyber terrorists have the ability to attack several types of computer systems in a variety of ways. The systems include:

- All system and network devices BIND weaknesses: The Berkeley Internet Name Domain (BIND) package is the most widely used implementation of Domain Name Service (DNS) by which systems on the Internet are located by name, without having to know specific Internet protocol (IP) addresses. In a typical example of a BIND attack, intruders erase system logs and install tools to gain administrative access. They then compile and install Internet Relay Chat (IRC) utilities and network scanning tools, which are used to scan more than a dozen class-B networks in search of additional systems running vulnerable versions of BIND. In a matter of minutes, they can use the compromised system to attack hundreds of remote systems.
- Vulnerable Common Gateway Interface (CGI) programs and application extensions (such as ColdFusion) installed on Web servers (multiple UNIX and Linux systems): Most Web servers support CGI for data collection and verification. Intruders are known to have exploited vulnerable CGI programs to vandalize Web pages and steal credit cards.
- RPC weaknesses (all Web servers): Remote procedure calls (RPC) allow programs on one computer to execute programs on a second computer. They are widely used to access network services such as shared files in the Network File System (NFS). There is compelling evidence that the vast majority of service attacks launched during 1999 and early 2000 were executed by systems that had been victimized because they had RPC vulnerabilities. In 1998, the broadly successful attack on U.S. military systems during the Solar Sunrise incident also exploited an RPC flaw found on hundreds of Department of Defense systems.
- RDS security hole in Microsoft IIS (multiple UNIX and Linux systems): Programming flaws in Microsoft's Internet Information Server (IIS) used to host websites deployed on Microsoft Windows NT and Windows 2000 are employed by malicious users to run remote commands with administrator privileges. Experts who developed the "Top Ten" list of the most exploited internet security flaws believe that exploits of other IIS flaws, such as .HTR files, are at least as common as exploits of Remote Desktop Services (RDS).

- Sadmind (Solaris machines only): Global file sharing and inappropriate information sharing via NetBIOS and Windows NT ports allow file sharing over networks. When improperly configured, they can expose critical system files or give full file system access to hostile parties.
- User IDs, especially root/administrator with no or weak passwords (UNIX, Windows, and Macintosh systems): Some systems come with "demo" or "guest" accounts with no passwords or with widely-known default passwords. Service workers often leave maintenance accounts with no passwords, while some database management systems install administration accounts with default passwords. In addition, busy system administrators often select system passwords that are easily guessable ("love," "money," "wizard" are common) or use a blank password. Many attackers try default passwords and then try to guess passwords before resorting to more sophisticated methods.
- IMAP and POP buffer overflow vulnerabilities or incorrect configuration (all systems): Internet message access protocol (IMAP) and Post Office Protocol (POP) are popular remote access mail protocols, allowing users to access their e-mail accounts. The "open access" nature of these services makes them especially vulnerable to exploitation because openings are frequently left in firewalls to allow for external e-mail access. Attackers who exploit flaws in IMAP or POP often gain instant root-level control.
- Default SNMP community strings set to "public" and "private" (multiple UNIX and Linux systems): The Simple Network Management Protocol (SNMP) is widely used by network administrators to monitor and administer all types of network-connected devices, ranging from routers to printers to computers. SNMP uses an unencrypted "community string" as its only authentication mechanism. Lack of encryption is creates one level of security vulnerability, but the default community string used by the vast majority of SNMP devices is "public," with a few clever network equipment vendors changing the string to "private," which presents a greater security risk. Attackers can use this vulnerability in SNMP to reconfigure or shut down devices remotely.

In addition to the motivations for cyber terrorism and the vulnerable systems, cyber attacks can be further divided by the complexity of the attack. The categories of attacks include:

- Simple-Unstructured: Simple-unstructured attacks are the most common. These are amateurish attacks with relatively minimal consequences.
- Advanced-Structured: Advanced-structured attacks are more sophisticated and consequential, and have a greater emphasis on targeting victims prior to an attack, resulting in a more debilitating effect.
- Complex-Coordinated: Complex-coordinated attacks are the most advanced and most troublesome type of attack where success could mean a network shutdown.

Because virtually all critical systems are reliant upon computer systems, the secondary hazards that could result from a cyber terrorism attack could be devastating. For example, many of New Jersey's roadway systems rely on sophisticated traffic control systems that prevent gridlock and accidents daily. Without these systems, the risk of not only auto accidents increases but also hazardous materials in-transit incidents. Additionally, a cyber attack on a nuclear power plant could have devastating consequences should the plant suffer an intentional catastrophic failure. A cyber attack could also completely incapacitate the communications infrastructure not only in New Jersey but across the United States, leading to disturbing secondary consequences and hazards. Because the power grid is also largely controlled by computer systems, a widespread power outage is also a possibility. A failure of the power grid would impact individuals reliant on power such as those with medical needs. The number of critical systems reliant on computer systems are numerous, thus disruption of one or more of the systems would cause severe secondary-cascading hazards.

In Essex County, the Prosecutor's Office formed a Cyber Crimes Unit in December 2010. This was created to investigate child pornography, computer fraud, and the use of the internet and other technology in crimes. The

Cyber Crimes Unit works with local, state and federal law enforcement agencies (Essex County Prosecutors Office 2014).

Location

Cyber threats to critical infrastructures can be posed by anyone with the capability, technology, opportunity, and intent to do harm. Potential threats can be foreign or domestic, internal or external, State-sponsored or a single rogue element. Terrorists, insiders, disgruntled employees, and hackers are included in this profile. The fact that most of the nation's vital services are delivered by private companies creates a significant challenge in assigning the responsibility for protecting our critical infrastructures from cyber attacks. Across New Jersey, countless systems rely on computers for day-to-day operations including but not limited to traffic signals, power plants, HVAC systems, as well as systems responsible for ensuing New Jersey's State government can operate. While these are just a few examples of critical systems vulnerable to cyber attacks, it should be noted that an attack could cripple not only the operations of New Jersey's systems but also the economy (New Jersey State HMP 2014).

New Jersey remains a valuable target as it possesses a wealth of critical information infrastructure, much of which is inherently interdependent. New Jersey is strategically located along a heavy transit corridor for people and goods, and is a major node along the fiber path through the northeastern United States, connecting New Jersey to Philadelphia and Washington, D.C. Furthermore, New Jersey is one of the wealthiest states in the country and is home to many Fortune 500 companies. Any disruption to the State's economy could have a drastic impact on the national economy and thus the nation's economic stability (New Jersey Office of Homeland Security and Preparedness [NJ OHSP] 2008).

In Essex County, there are several Fortune 500 companies. Prudential Financial is located in Newark, ranking 1st in the State for revenue ($84.8 billion). Automatic Data Processing in located in Roseland, ranking 8th in the State for revenue ($10.7 billion). Lastly, Public Service Enterprise Group is located in Newark and ranks 9th in the State for revenue ($9.8 billion) (Choose New Jersey 2013). Any disruption in the County's government could have an impact on the State's economy.

Extent

A cyber attack can affect a variety of sectors with potentially severe consequences. The following areas may be affected by an attack:

- Health and safety of persons in affected areas: No direct loss of life is expected from an attack. Indirect injuries or deaths may result from secondary effects to critical life-sustaining resources such as energy and water.
- Health and safety of response personnel: No direct affects to the health and safety of response personnel are expected; however, critical response systems may be affected.
- Continuity of operations: Severe effects to continuity of operations could result if a cyber attack reached critical operational systems or systems that were needed to carry out the operation.
- Property, facilities, and infrastructure: Effects can range from annoyance to complete shutdown of critical infrastructures caused by infiltration of supervisory control and data acquisition (SCADA) systems. Secondary effects could disturb public welfare and property by denying services or providing false readings.
- Delivery of services: Cyber attacks may affect delivery of services if the system was infiltrated and directed to malfunction by self-destructing or overloading.
- Environment: Generally, cyber terrorism has no direct effect on the environment; however, the environment may be affected should a release of a hazardous material occur because of critical infrastructure failure.

- Economic and financial conditions: Because of the heavy reliance on the electronic transfer of economic and commercial information, the economy could be affected by communication difficulties.
- Regulatory and contractual obligations: Cyber attacks would have no significant effect on regulatory or contractual obligations, other than the possible elimination of electronic records, which would affect both.
- Reputation of the entity: If exposed vulnerabilities were known and not reduced or eliminated before the attack, the entity would suffer major damage to their reputation for not taking action before the incident.

The extent, nature, and timing of cyber incidents are impossible to predict. There may or may not be any warning. Some cyber incidents take a long time (weeks, months or even years) to be discovered and identified (FEMA 2013). The magnitude of severity of an incident will vary greatly based on the extent and duration of the impact. The extent will also vary based upon which specific system is affected by an attack, the warning time, and the ability to preempt an attack.

A cyber terrorism attack can occur with relatively little or no warning. The New Jersey Office of Homeland and Preparedness is charged with gathering intelligence and monitoring cyber terrorism threats affecting the State. At the federal level, numerous agencies (such as FBI and CIA) are working collaboratively to thwart cyber terrorism attacks. The warning time depends upon the ability of these agencies to recognize that a threat exists and their ability to stop the attack. Even with these agencies on task to monitor cyber threats, a cyber attack can occur with no warning.

The Multi-State Information Sharing and Analysis Center (MS-ISAC) created the Cyber Alert Level Indicator. It shows the current level of malicious cyber activity and reflects the potential for, or actual damage. There are five cyber alert levels: low, guarded, elevated, high, and severe. Each level is indicated by a color. The following is additional information regarding these levels:

- **Low** – Indicates a low risk. No unusual activity exists beyond the normal concern for known hacking activities, known viruses, or other malicious activity.
- **Guarded** – Indicates a general risk of increased hacking, virus, or other malicious activity. The potential exists for malicious cyber activities, but no known exploits have been identified, or known exploits have been identified but no significant impact has occurred.
- **Elevated** – Indicates a significant risk due to increased hacking, virus, or other malicious activity which compromises systems or diminishes service. At this level, there is known vulnerabilities that are being exploited with a moderate level of damage or disruption, or the potential for significant damage or disruption is high.
- **High** - Indicates a high risk of increased hacking, virus or other malicious cyber activity which targets or compromises core infrastructure, causes multiple service outages, multiple system compromises or compromises critical infrastructure. At this level, vulnerabilities are being exploited with a high level of damage or disruption, or the potential for severe damage or disruption is high.
- **Severe** - Indicates a severe risk of hacking, virus or other malicious activity resulting in wide-spread outages and/or significantly destructive compromises to systems with no known remedy or debilitates one or more critical infrastructure sectors. At this level, vulnerabilities are being exploited with a severe level or wide spread level of damage or disruption of Critical Infrastructure Assets.

Currently, there is no official index for measuring the severity of a cyber attack. The Gibson Index is a ranking system for the relative severity of cyber attacks. It ranges from zero to seven, with seven being the most severe class of attack, resulting in multiple intentional deaths and/or egregious financial/economic damage. It is an open-source ranking system created in February 2013 that is widely used in cyber threat

analysis (Gibson Index 2014) (http://www.gibsonindex.org/overview/). The following describes each of the levels:

- Gibson Level Zero – A level 0 is one that causes little to no disruption/damage, or is the result of mitigating circumstance.
- Gibson Level One – A level 1 event is one that has some small real-world consequences, but can often have non-malicious explanations. Typically, such an event would only target one website or computer network. Certain data leaks can be seen as Level 1 events, especially if the data being leaked is something that should be publicly available to begin with.
- Gibson Level Two – Level 2 attacks have a clear malicious intent and can result in longer outages, more significant privacy issues, and generally more damage than Level 1 threats.
- Gibson Level Three – Minor financial damages and moderate privacy implications, generally stemming from a partial penetration of systems.
- Gibson Level Four – Major financial damages or privacy implications. Well-defended systems breached by vulnerability, with a clear intention of theft or destruction.
- Gibson Level Five – Systematic, coordinated, broad penetration of a multitude of networks, likely perpetrated by a well-funded large team or nation-state.
- Gibson Level Six – This level remains mostly theoretical. It consists of attacks that manifest themselves in real-world, targeted, intentional damage.
- Gibson Level Seven – This level would result in mass casualties from intentional, targeted efforts (Gibson Index 2014).

Previous Occurrences and Losses

While no major direct cyber attacks have affected New Jersey or its counties, as mentioned, cyber terrorism is an emerging hazard that can impact the State's computer infrastructure and the systems and services that are provided to the public. Across the United States, concerns over cyber terrorism are growing; former FBI director Louis Freeh warns that cyber terrorism could have a crippling effect in the United States (ANI 2013).

A few smaller-scale attacks have occurred in New Jersey. Local animal rights extremists have carried out minor cyber attacks, employing low-level techniques targeting Internet sites and e-mail systems of companies and businesses associated with animal research programs in New Jersey.

Probability of Future Occurrences

It is expected for cyber attacks to have a significant impact throughout the U.S. The level of success of an attack and the subsequent damage it can create will vary greatly. With the growing popularity and use of computers, there has been a significant increase in investigations where computers are being utilized for the commission of fraud and identify theft. However, the probability of a cyber attack that will affect Essex County is difficult to calculate. It is estimated that Essex County will continue to experience direct and indirect impacts of cyber attacks and its impacts on occasion.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for cyber attacks in the County is considered 'occasional' (likely to occur within 100 years, as presented in Table 5.3-3).

Climate Change Impacts

Because cyber attacks are human-caused, no climate change impacts are associated with the hazard.

5.4.12.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the cyber attack hazard, all of Essex County is exposed to this hazard. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), are exposed and potentially vulnerable to a cyber attack. The following text evaluates and estimates the potential impact of the drought hazard on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

The entire County is vulnerable to a cyber attack. Because it is difficult to predict the particular target of cyber terrorism, assessing vulnerability to the hazard is also difficult. All populations who directly use a computer or those receiving services from automated systems are vulnerable to cyber terrorism. Although all individuals in Essex County are vulnerable to an attack, certain types of attacks would impact specific segments of the population.

If the cyber attack targeted the State's power or utility grid, individuals with medical needs would be impacted the greatest. These populations are most vulnerable because many of the life-saving systems they rely on require power. Also, if an attack occurred during months of extreme hot or cold weather, the County's elderly population (those 65 years of age and older) would be vulnerable to the effects of the lack of climate control. These individuals would require shelter or admission to a hospital. Other populations vulnerable to the secondary effects of cyber terrorism are young children.

If a cyber attack targeted a facility storing or manufacturing hazardous materials, individuals living adjacent to these facilities would be vulnerable to the secondary effects, should the attack successfully cause a critical failure at that facility. Individuals living within 10 miles of a nuclear power plant would be vulnerable should an attack occur at that caused a failure at a facility.

Data and Methodology

For this hazard, data was obtained from Essex County and the Planning Committee.

Impact on Life, Health and Safety

Cyber attacks can affect the entire population of Essex County. They can also have a damaging effect on public trust in systems that are traditionally considered stable and secure. Cyber attacks can also have extensive economic impacts. Companies and government services can lose large sums of unrecoverable revenue from site down-time and possible compromise of sensitive confidential data.

A significant portion of New Jersey's economy is exposed to the effects of cyber attacks, including Essex County's economy. Cyber crimes against banks and other financial institutions can cost many hundreds of millions of dollars every year. Cyber theft of intellectual property and business-confidential information can cost developed economies billions of dollars—how many billions is an open question. These losses could be

considered simply the cost of doing business, or they could be a major new risk for companies and nations as these illicit acquisitions damage global economic competitiveness and undermine technological advantage (McAfee 2013).

The cost of malicious cyber activity involves more than the loss of financial assets or intellectual property. Cyber crimes can cause damage to a company's brand and reputation, consumer losses from fraud, the opportunity costs of service disruption and "cleaning up" after cyber incidents, and the cost of increased spending on cybersecurity (McAfee 2013).

In the United States, the costs of cyber terrorism is estimated somewhere between $24 billion and $120 billion annually. These costs represent approximately 0.2% to 0.8% of the total GDP in the United States (McAfee 2013).

Impact on General Building Stock

A cyber attack can have effects on the general building stock in Essex County, both public and private infrastructures. Cyber attacks can cause physical damage if real assets or the end consumers are affected by service disruption (New York City HMP 2014).

Impact on Critical Facilities

Critical facilities are vulnerable to cyber attacks based on the significance of the facilities, and the potential to interrupt critical systems in the County. As previously mentioned, many critical facilities are reliant upon computer networks to monitor and control critical functions. A cyber attack could result in catastrophic failure of one of these facilities. The power grid is reliant upon computer systems to distribute power to the State. An attack could disrupt power to millions of New Jersey residents. This is just one example of how critical facilities are vulnerable to cyber attacks. Given the importance of critical facilities to daily living activities, facilities are highly vulnerable to cyber attacks.

Impact on the Economy

Given the proliferation of electronic commerce and the reliance on electronics, virtually all elements of New Jersey's economy are vulnerable to cyber attacks. The secondary impacts of a significant attack would be devastating to the economy. For example, an attack that caused the loss of power to hundreds of thousands of businesses during peak holiday shopping months could potentially cost the State millions of dollars in tax revenue if these businesses were closed. Additionally, a disruption in New Jersey's manufacturing, agricultural, or tourism sectors would have devastating impacts on the economy. While it is difficult to quantitatively measure the economic impact of a cyber terrorism attack, it is safe to say that the impact would be great, thus the economy is vulnerable to cyber terrorism attacks.

Future Growth and Development

As discussed in Sections 4 and 9, areas targeted for future growth and development have been identified across Essex County. Any areas of growth could be potentially impacted by the cyber attack hazard because the entire County is exposed and vulnerable. Please refer to the specific areas of development indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.

Effect of Climate Change on Vulnerability

Because cyber attacks are human-caused, no climate change impacts are associated with the hazard.

Change of Vulnerability

Overall, the County's vulnerability has not changed and the entire County will continue to be exposed and vulnerable to civil disorder events.

Additional Data and Next Steps

For the Plan Update, any additional information regarding localized concerns and past impacts will be collected and analyzed. This data will be developed to support future revisions to the plan. Mitigation efforts could include building on existing New Jersey, Essex County, and local efforts.

5.4.13 Disease Outbreak

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the disease outbreak hazard in Essex County.

2015 Plan Update Changes

- For the 2015 Plan Update, disease outbreak is included as a hazard of concern for Essex County. It was not profiled in the 2008 Plan.
- The hazard profile is new for the 2015 Plan Update and includes a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the disease outbreak hazard is discussed.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- The vulnerability assessment is a new addition for the disease outbreak hazard. It directly follows the hazard profile.

5.4.13.1 Profile

Hazard Description

An outbreak or an epidemic exists when there are more cases of a particular disease than expected in a given area, or among a specific group of people, over a particular period of time. An aggregation of cases in a given area over a particular period, regardless of the number of the number of cases, is called a cluster. In an outbreak or epidemic, it is presumed that the cases are related to one another or that they have a common cause (Center for Disease Control [CDC] 2004).

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 (New Jersey Department of Health and Senior Services 2008). New Jersey has been impacted by various past and present infestations including: high population of mosquitoes (mosquito-borne diseases) and deer ticks (tick-borne diseases).

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 are: West Nile Virus (WNV), Eastern equine encephalitis (EEE) virus, and St. Louis encephalitis (SLE) virus. These diseases rely on mosquitos to spread. They 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 2013a).

Tick-borne diseases are bacterial illnesses that spread to humans through infected ticks. The most common tick-borne diseases in New Jersey are: Lyme disease, Ehrlichiosis, Anaplasmosis, Rocky Mountain Spotted Fever, and Babesiois. These types of diseases rely on ticks for transmission. Ticks become infected by mirco-organisms when feeding on small infected mammals (mice and voles). Different tick-borne diseases are caused by different micro-organisms, and it is possible to be infected with more than one tick-borne disease at a time. 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. The three types of ticks in New Jersey that may carry disease-causing micro-organisms are the deer tick, lone star tick, and the American dog tick (New Jersey Department of Health 2013b).

For the purpose of this HMP Update, the following arboviruses will be discussed in further detail: West Nile Virus, Eastern equine encephalitis virus, St. Louis encephalitis virus, La Crosse encephalitis (LCE), and Lyme disease. Influenza will also be discussed due to several outbreaks in the past five years.

West Nile Virus

West Nile Virus (WNV) encephalitis is a mosquito-borne viral disease, which can cause an inflammation of the brain. WNV is commonly found in Africa, West Asia, the Middle East and Europe. For the first time in North America, WNV was confirmed in the New York metropolitan area during the summer and fall of 1999. WNV successfully over-wintered in the northeastern U.S. and has been present in humans, horses, birds, and mosquitoes since that time. WNV is spread to humans by the bite of an infected mosquito. A mosquito becomes infected by biting a bird that carries the virus (New Jersey Department of Health 2014).

Eastern Equine Encephalitis

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 2012a). New Jersey represents a major focus for the infection with some form of documented viral activity nearly every year. Horse cases are most common in the southern half of New Jersey because the acid water swamps that produce the major mosquito vectors are especially prevalent on the southern coastal plain (Crans 2013).

St. Louis Encephalitis

St. Louis Encephalitis (SLE) is a rare but serious viral infection. It is transmitted to humans by the bite of an infected mosquito. Most cases of SLE disease have occurred in eastern and central states. Most persons infected with SLE 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 (CDC, 2010).

La Crosse Encephalitis

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 (Center for Disease Control [CDC], 2009).

Lyme Disease

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. In New Jersey, the commonly infected tick is the deer tick. Immature ticks become infected by feeding on infected white-footed mice and other small mammals. Deer ticks can also spread other tick-borne diseases. Anyone who is bitten by a tick carrying the bacteria can become infected (New Jersey Department of Health 2012b).

Influenza

The risk of a global influenza pandemic has increased over the last several years. This disease is capable of claiming thousands of lives and adversely affecting critical infrastructure and key resources. An influenza pandemic has the ability to reduce the health, safety, and welfare of the essential services workforce; immobilize core infrastructure; and induce fiscal instability.

Pandemic influenza is different from seasonal influenza (or "the flu") because outbreaks of seasonal flu are caused by viruses that are already among people. Pandemic influenza is caused by an influenza virus that is new to people and is likely to affect many more people than seasonal influenza. In addition, seasonal flu occurs every year, usually during the winter season, while the timing of an influenza pandemic is difficult to predict. Pandemic influenza is likely to affect more people than the seasonal flu, including young adults. A severe pandemic could change daily life for a time, including limitations on travel and public gatherings (Barry-Eaton District Health Department 2013).

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

Ebola Virus

Ebola, previously known as Ebola hemorrhagic fever, is a rare and deadly disease caused by infection with one of the Ebola virus strains. According to the CDC, the 2014 Ebola epidemic is the largest in history affecting multiple countries in West Africa. Two imported cases, including one death, and two locally-acquired cases in healthcare workers have been reported in the United States. CDC and partners are taking precautions to prevent the further spread of Ebola in the United States (CDC, 2014).

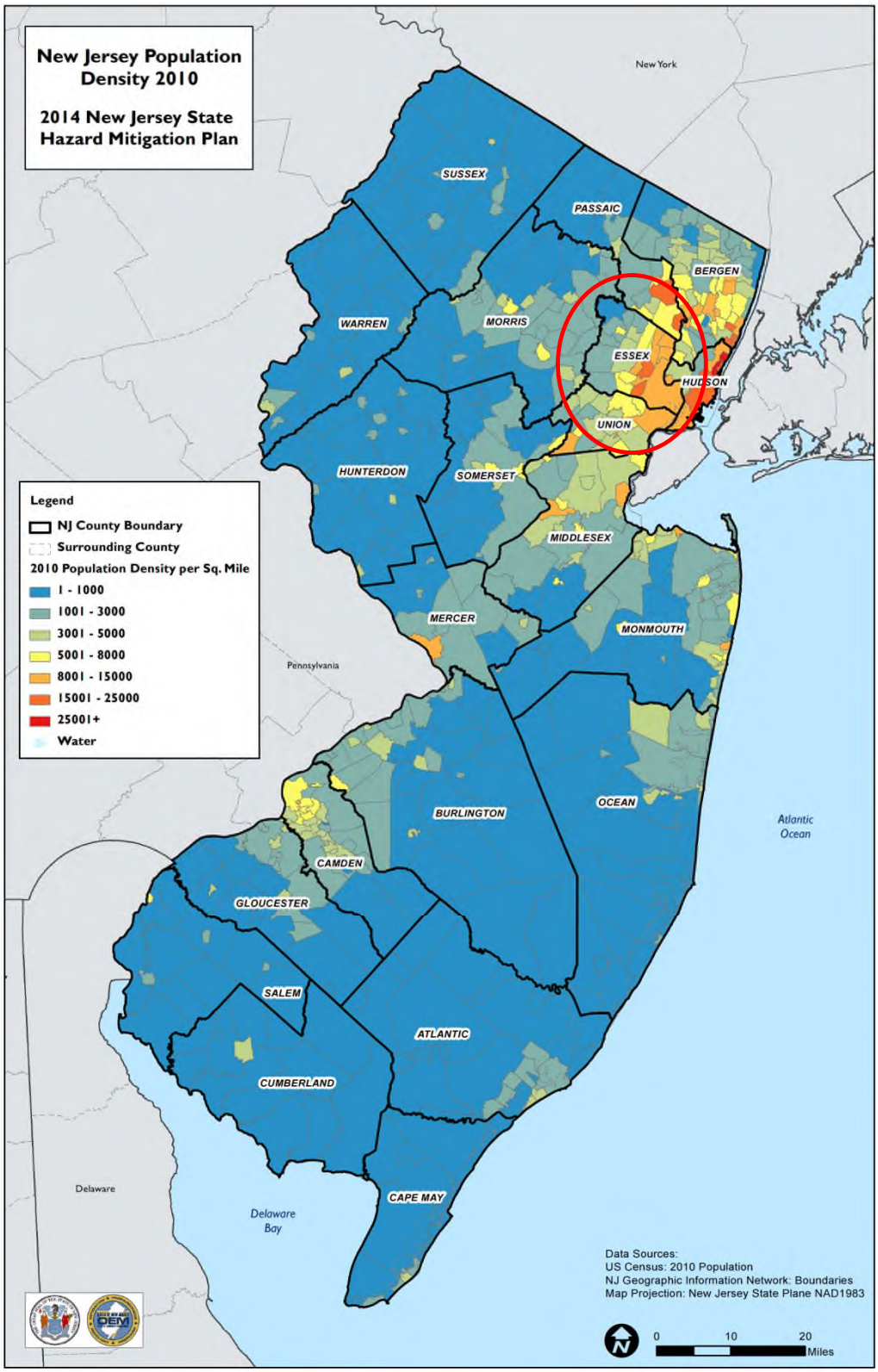
Location

New Jersey's geographic and demographic characteristics make it particularly vulnerable to importation and spread of infectious diseases. All 21 counties in New Jersey have experienced the effects of a pandemic or disease outbreak. In terms of pandemic influenza, all counties may experience pandemic influenza outbreak caused by factors such as population density and the nature of public meeting areas. Densely populated areas will spread diseases quicker than less densely populated areas. Figure 5.4.13-1 shows population density throughout the State. This figure indicates that Essex County contains many densely populated areas throughout the County. Additionally, much of the State can experience other diseases such as WNV due to the abundance of water bodies throughout the State, which provide a breeding ground for infected mosquitos. Figure 5.4.13-2 shows the locations of water sources throughout the State and Essex County.

Essex County's population density and the presence of Newark Liberty International Airport in the County serving as a hub for international travel makes Essex County a logical location to implement efforts to contain the highly infectious Ebola virus. On October 16, 2014 active screening began at Newark Liberty International Airport, located in Essex County, for passengers who had begun their travel in an affected West African country. New Jersey Office of Homeland Security and Preparedness (OHSP)

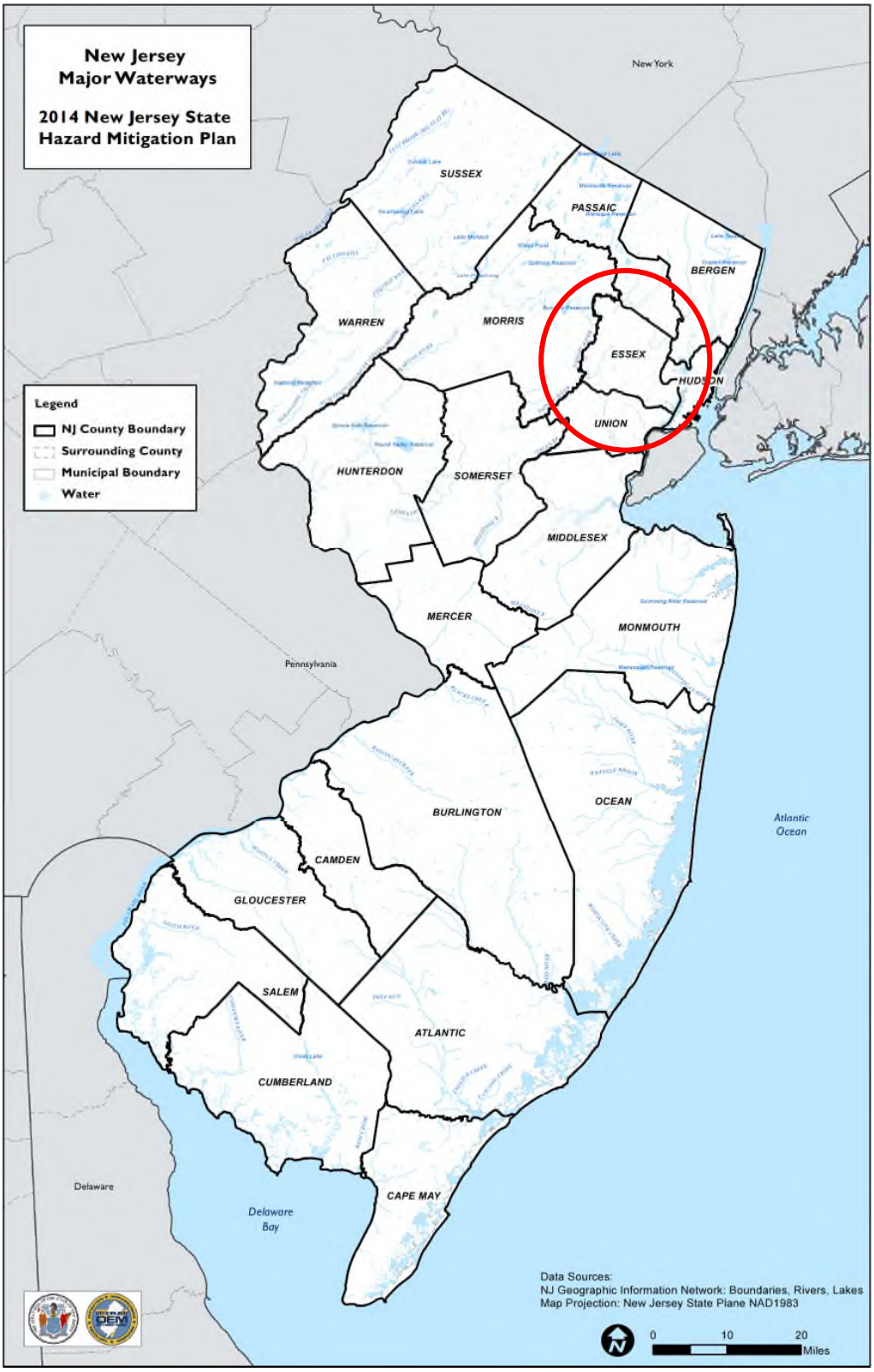
is working with Customs Border Patrol to document the number of passengers screened per incoming flight. The Department of Human Services has made temporary housing arrangements for asymptomatic at-risk individuals who are non-New Jersey residents but are in transit to other domestic destinations upon arrival at Newark Liberty International Airport. Governor Christie has designated three hospitals in the State to treat potential patients with Ebola, one of which is the University Hospital in the City of Newark.

Figure 5.4.13- 1. New Jersey Population Density (United States Census 2010)



Source: United States Census 2010; New Jersey Geographic Information Network (NJGIN)

Figure 5.4.13- 2. Water Sources in New Jersey



Source: NJGIN

Extent

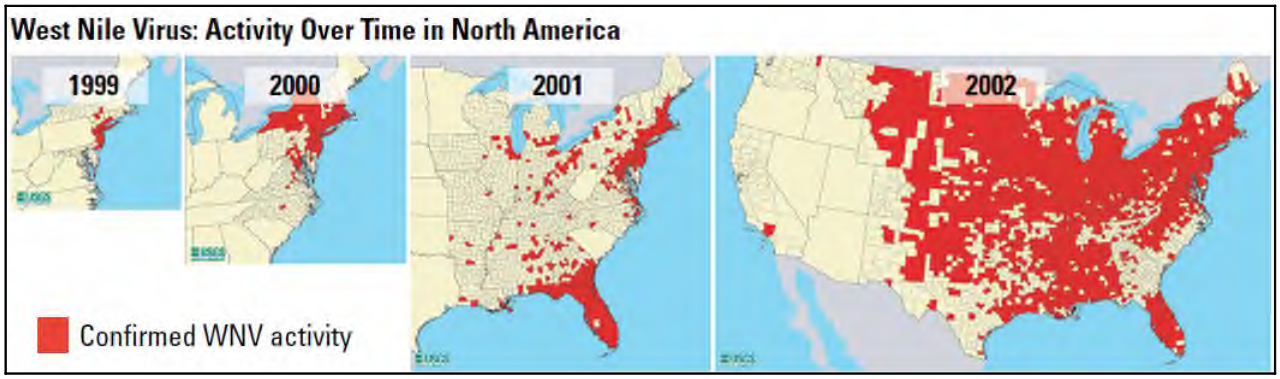
The extent and location of disease outbreaks depends on the preferred habitat of the species, as well as the species' ease of movement and establishment. Each of these viruses can impact most areas of New Jersey, including Essex County.

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.

West Nile Virus

Since it was discovered in the western hemisphere, WNV has spread rapidly across North America, affecting thousands of birds, horses and humans. WNV swept from the New York City region in 1999 to almost all of the continental U.S., seven Canadian provinces and throughout Mexico and parts of the Caribbean by 2004 (USGS, 2012). Figure 5.4.13-3 shows the activity of WNV over time in North America, from 1999 to 2002.

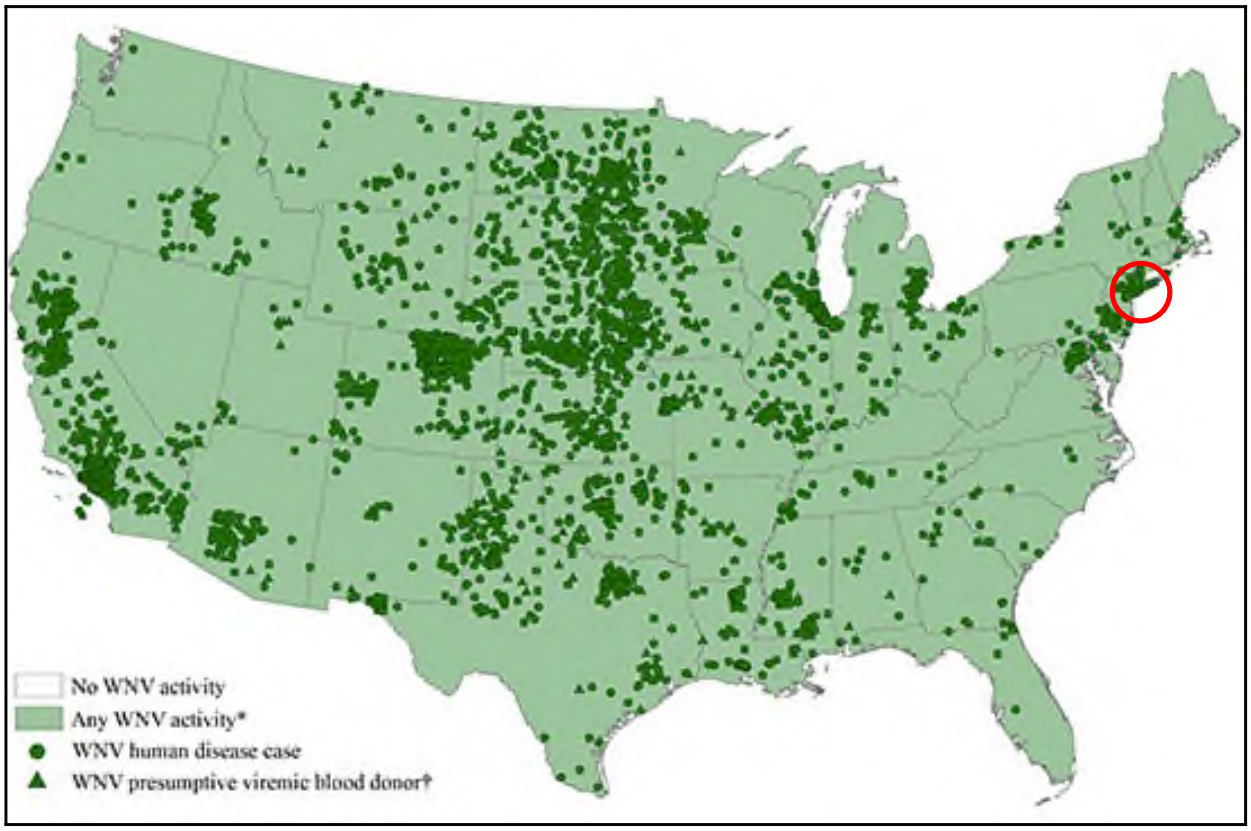
Figure 5.4.13- 3. WNV Activity Over Time in North America



Source: USGS, 2012

The CDC has a surveillance program for WNV. Data is collected on a weekly basis and reported for five categories: wild birds, sentinel chicken flocks, human cases, veterinary cases and mosquito surveillance (CDC, 2011). Figure 5.4.13-4 illustrates WNV activity in the U.S. for 2013.

Figure 5.4.13- 4. WNV Activity in the U.S., 2013



Source: *CDC 2014*

Note: *The circle indicates the approximate location of Essex County. Essex County is indicated has having human disease cases or presumptive viremic blood donors.*

Eastern Equine Encephalitis

In the U.S., EEE is reported to the CDC an average of 6 human cases per year (CDC 2010.)

St. Louis Encephalitis

In the U.S., between 80 and 100 cases of La Cross Encephalitis are reported to the CDC.

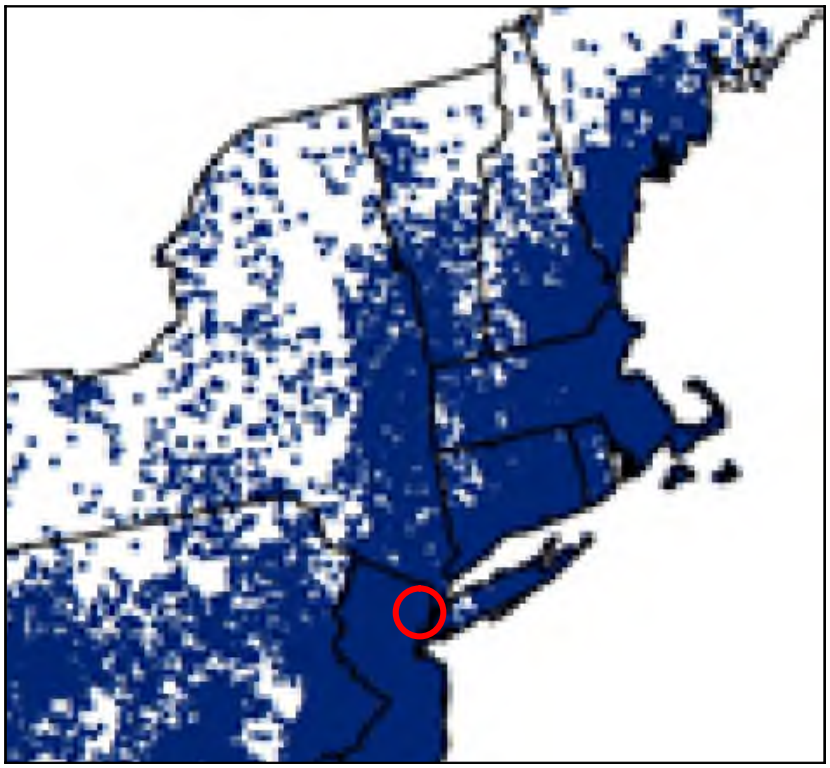
La Crosse Encephalitis

In the U.S., there have been over 4,000 confirmed cases of SLE. Since 1964, the average number of cases per year is 193.

Lyme Disease

Lyme disease is the most commonly reported vectorborne illness in the U.S. In 2009, it was the fifth most common nationally notifiable disease. In 2012, 95% of Lyme disease cases in the U.S. were reported from 13 states, which included New Jersey (CDC 2014). Between 2007 and 2011, there were 649 confirmed cases of Lyme disease in Essex County (CDC 2013). Figure 5.4.13-5 shows the reported cases of Lyme disease in the northeast U.S. for 2012.

Figure 5.4.13- 5. 2012 Reported Cases of Lyme Disease in the Northeast U.S.

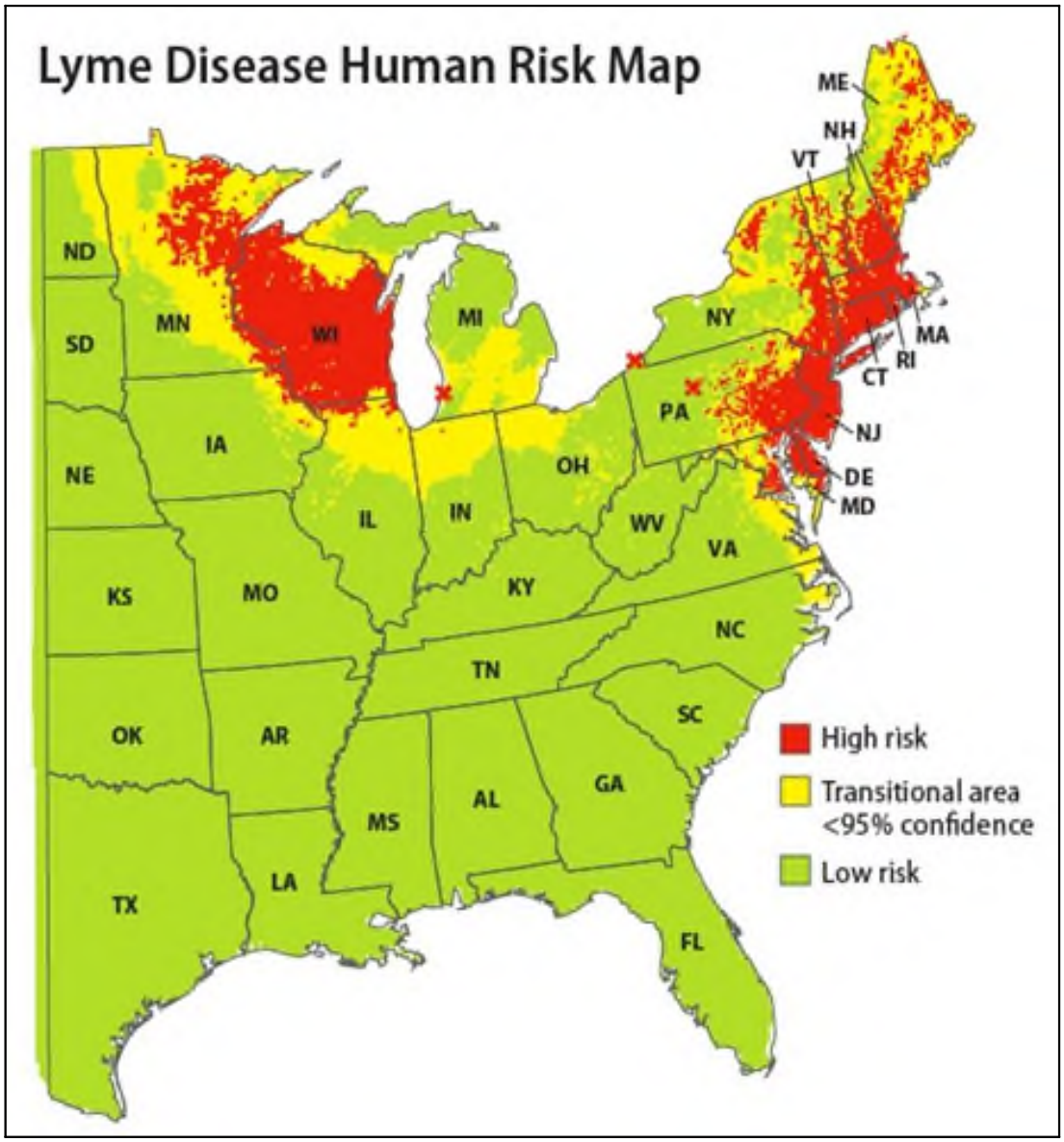


Source: CDC 2012

Note: The red circle indicates the approximate location of Essex County.

Figure 5.4.13-6 shows the risk of Lyme disease in the northeastern U.S. The figure indicates that Essex County is located in a high risk area.

Figure 5.4.13- 6. Lyme Disease Human Risk Map in the Northeast U.S.



Source: Yale School of Public Health, 2013

Note (1): All of Essex County located in a high risk area.

The CDC Division of Vector Borne Diseases (DVBD) indicated in 2012 that New Jersey was the state with the third-highest number of confirmed Lyme disease cases, totaling approximately 2,732 cases. For total number of cases between 2003 and 2012, New Jersey ranked third highest for the number of confirmed Lyme disease cases, totaling approximately 31,776 (13.26% of the total reported cases in the U.S.).

Influenza and Ebola

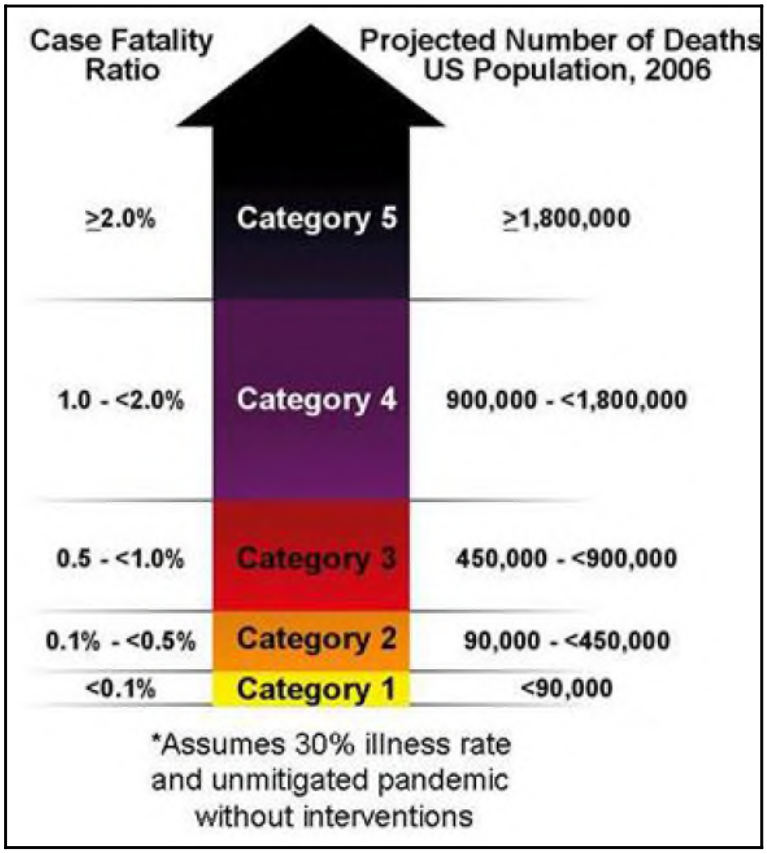
The exact size and extent of an infected population depends on how easily the illness is spread, the mode of transmission, and the amount of contact between infected and uninfected individuals. The transmission rates of pandemic illnesses are often higher in more densely populated areas. The transmission rate of

infectious diseases will depend on the mode of transmission of a given illness. The Ebola virus is spread to others through direct contact; it is not spread through the air like influenza.

The severity and length of the next pandemic cannot be predicted; however, experts expect that its effect on the United States could be severe. Based on previous pandemics and without medications or vaccines available, it is estimated that a severe pandemic could cause almost 2 million deaths in the United States, more than nine million hospitalizations, and more than 90 million people ill (New Jersey Department of Health [NJDOH] 2012).

The CDC and Prevention Community Strategy for Pandemic Influenza Mitigation guidance introduced a Pandemic Severity Index (PSI), which uses the case fatality ratio as the critical driver for categorizing the severity of a pandemic. The index is designed to estimate the severity of a pandemic on a population to allow better forecasting of the impact of a pandemic, and to enable recommendations on the use of mitigation interventions that are matched to the severity of influenza pandemic. Pandemics are assigned to one of five discrete categories of increasing severity (Category 1 to Category 5) (NJDOH 2012). Figure 5.4.13-7 illustrates the five categories of the PSI.

Figure 5.4.13- 7. Pandemic Severity Index



Source: NJDOH 2012

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 2005). The WHO pandemic phases are outlined in Table 5.4.13-1.

Table 5.4.13-1. WHO Global Pandemic Phases

Phase	Description
Interpandemic Phase	
Phase 1	No new influenza virus subtypes have been detected in humans. An influenza virus subtype that has caused human infection may be present in animals. If present in animals, the risk of human infection or disease is considered to be low.
Phase 2	No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk of human disease.
Pandemic Alert Period	
Phase 3	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 4	Small cluster(s) of influenza with limited human-to-human transmission, but spread is highly localized, suggesting that the virus is not well adapted to humans.
Phase 5	Larger cluster(s) of influenza but human-to-human spread is still localized, suggesting that the virus is becoming increasingly better adapted to humans but may not yet be fully transmissible (substantial pandemic risk).
Pandemic Period	
Phase 6	Disease has increased and sustained transmission in the general population.
Postpandemic Period	
	Return to the Interpandemic Period (Phase 1)

Source: WHO2005

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 5.4.13-2 compares the federal and New Jersey pandemic influenza phases and situations.

Table 5.4.13-2. 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	Novel (new) influenza virus in birds or other animals in the U.S./NJ
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)
		5	Clusters of human cases outside the U.S.
3	Widespread human outbreak in multiple locations overseas (WHO Phase 6)		
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

Table 5.4.13-2. Federal and New Jersey Pandemic Phases and Situations

Federal Pandemic Influenza Stage		New Jersey Situations	
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
		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./NJ
6	Recovery and preparation for subsequent waves (WHO Phase 5 or 6)	10	Reduced spread of influenza or end of pandemic

Source: Homeland Security Council 2006; NJDOH 2012
NJ New Jersey
U.S. United States
WHO World Health Organization

Previous Occurrences and Losses

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.

Between 1954 and 2014, the State of New Jersey was included in one disease outbreak-related emergency (EM) declaration, classified as a virus threat (EM-3156, May – November 2000). Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. However, not all counties were included in the disaster declarations. Essex County was included in this declaration (FEMA 2014).

For this 2015 Plan Update, known disease outbreak events that have impacted Essex County between 2007 and 2014 are identified in Table 5.4.13-3. With disease outbreak documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.13-3 may not include all events that have occurred in the County.

Table 5.4.13-3. Disease Outbreak Events in Essex County, 2007 to 2014

Date(s) of Event	Disease Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
2007 – 2011	Lyme Disease	N/A	N/A	Between 2007 and 2011, there have been 649 confirmed cases of Lyme disease in Essex County.
2007 – 2013	St. Louis Encephalitis	N/A	N/A	Between 2007 and 2013, SLE samples have been submitted for Essex County; however, there have been no positive test results for SLE in the County.
2007	West Nile Virus	N/A	N/A	In 2007, there were four mosquito WNV infections reported in Essex County.
2008	West Nile Virus	N/A	N/A	In 2008, there was one WNV human disease case and 34 mosquito infections reported in Essex County.
2009	Global H1N1 Pandemic	N/A	N/A	The first novel H1N1 patient in the United States was confirmed by laboratory testing at CDC on April 15, 2009. The second patient was confirmed on April 17, 2009. It was quickly determined that the virus was spreading from person to person. On April 22, the CDC activated its Emergency Operations Center to better coordinate the public health response. On April 26, 2009, the U.S. government declared a public health emergency and began actively and aggressively implementing the country's pandemic response plan. By June 19, 2009, all 50 states in the United States, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands had reported novel H1N1 infection. While nationwide U.S. influenza surveillance systems indicate that overall influenza activity was decreasing in the country at this time, novel H1N1 outbreaks were ongoing in parts of the United States, in some cases with intense activity. On June 11, 2009, the WHO signaled that a global pandemic of H1N1 was underway by raising the worldwide pandemic alert level to Phase 6. This action was a reflection of the spread of the new H1N1 virus, not the severity of illness caused by the virus. At the time, more than 70 countries had reported cases of novel influenza A (H1N1) infection and there were ongoing community level outbreaks of novel H1N1 in multiple parts of the world. In total there were 18,306 lab-confirmed deaths as a result of H1N1 worldwide. In the United States between April 2009 and August 2009 there were 9,079 cases that required hospitalization and 593 deaths. In New Jersey, cases were widespread in July 2009, with 1,414 confirmed cases and 15 deaths. In Essex County, a man died from complications of the flu strain in June 2009. This was New Jersey's first swine flu-related death. Another Essex County man died in November 2009 due to swine flu.
2009	Lyme Disease	N/A	N/A	There were 209 confirmed cases of Lyme disease in Essex County for 2009.

Table 5.4.13-3. Disease Outbreak Events in Essex County, 2007 to 2014

Date(s) of Event	Disease Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
2009	West Nile Virus	N/A	N/A	In 2009, there were two mosquito WNV infections reported in Essex County.
2010	Lyme Disease	N/A	N/A	There were 134 confirmed cases of Lyme disease in Essex County for 2010.
2010	West Nile Virus	N/A	N/A	In 2010, there were four WNV human disease cases and 25 mosquito infections reported in Essex County.
2011	West Nile Virus	N/A	N/A	In 2011, there were 16 mosquito WNV infections reported in Essex County.
2012	West Nile Virus	N/A	N/A	In 2012, there were four WNV human disease cases and 29 mosquito infections reported in Essex County. One of the human cases led to a fatality.
2013	West Nile Virus	N/A	N/A	In 2013, there was one WNV human disease case and four mosquito infections reported in Essex County.

Source: USGS 2014; New Jersey Department of Health 2012; Lyme Disease Association 2014

EEE Eastern Equine Encephalitis

N/A Not Available

SLE St. Louis Encephalitis

WNV West Nile Virus

Probability of Future Occurrences

All of the critical components necessary to sustain the threat of mosquito-borne disease in Essex County have been clearly documented and appear to be occurring more frequently (i.e., the simultaneous presence of pathogenic organisms, mosquito species (vectors) capable of transmitting disease, and a susceptible population). 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 (Steere, Coburn, and Glickstein, 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 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for disease outbreaks in the County is considered 'frequent' (likely to occur within 25 years, as presented in Table 5.3-3).

Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

Temperatures in the northeast U.S. have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4 °F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).

ONJSC indicates that both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over five inches (12%) greater than the average from 1895-1970. Southern New Jersey became two inches (5%) wetter late in the 20th century. Average annual precipitation is projected to increase in the region by 5% by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New York

City Panel on Climate Change [NYCPCC] 2009). In addition, heavy precipitation events have increased in the past 20 years.

The relationship between climate change and infectious diseases is somewhat controversial. The notion that rising temperatures will increase the number of mosquitoes that can transmit malaria among humans (rather than just shift their range) has been the subject of debate over the past decade. Some believe that climate change may affect the spread of disease, while others are not convinced. However, many researchers point out that climate is not the only force at work in increasing the spread of infectious diseases into the future. Other factors, such as expanded rapid travel and evolution of resistance to medical treatments, are already changing the ways pathogens infect people, plants, and animals. As climate change accelerates, it may be likely to work synergistically with many of these factors, especially in populations increasingly subject to massive migration and malnutrition (Harmon 2010).

5.4.13.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For disease outbreaks, all of Essex County is considered exposed to the hazard. Therefore, all assets in the County, as described in the County Profile (Section 4), are exposed and potentially vulnerable. The following text evaluates and estimates the potential impact of disease outbreaks on Essex County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Disease outbreaks are a significant concern to Essex County, mainly due to its impact on public health and natural resources. Estimated losses are difficult to quantify; however disease outbreaks can impact Essex County's population and economy. Areas with a higher population density will have a higher exposure to disease outbreaks, especially those populations living in areas prone to mosquitoes and ticks. Additionally, vulnerable populations such as the young and elderly are considered at higher risk.

Data and Methodology

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.

Impact on Life, Health and Safety

The entire population of Essex County is vulnerable to the disease outbreak hazard. Healthcare providers and first responders have an increased risk of exposure due to their frequent contact with infected populations.

Impact on General Building Stock and Critical Facilities

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

Impact on 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 DPW 2014).

Effect of Climate Change on Vulnerability

The relationship between climate change and infectious diseases is somewhat controversial. The notion that rising temperatures will increase the number of mosquitoes that can transmit malaria among humans (rather than just shift their range) has been the subject of debate over the past decade. Some believe that climate change may affect the spread of disease, while others are not convinced. However, many researchers point out that climate is not the only force at work in increasing the spread of infectious diseases into the future. Other factors, such as expanded rapid travel and evolution of resistance to medical treatments, are already changing the ways pathogens infect people, plants, and animals. Climate change accelerates may likely to work synergistically with many of these factors, especially in populations increasingly subject to massive migration and malnutrition (Harmon 2010).

Impact of Future Growth and Development

As discussed in Section 4, 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.

Change of Vulnerability

Overall, the County's vulnerability has not changed since the 2008 HMP and the entire County will continue to be exposed and vulnerable to disease outbreaks.

Additional Data and Next Steps

For the Plan Update, any additional information regarding historic costs incurred to conduct surveillance, prevent, treat and eradicate disease outbreaks may help with quantifying losses, given a margin of uncertainty. This data will be developed to support future revisions to the plan. Mitigation efforts could include building on existing New Jersey, Essex County, and local efforts.

5.4.14 Hazardous Substances

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the hazardous substances hazard in Essex County.

2015 Plan Update Changes

- For the 2015 Plan Update, hazardous substances includes fixed site, in-transit and offshore. The offshore category is new for the 2015 Plan Update.
- The hazard profile includes a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the hazardous substances hazard is discussed.
- The U.S. EPA Hazardous Waste Report was used to identify large quantity generators in Essex County.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- The vulnerability assessment for hazardous substances directly follows the hazard profile.

5.4.14.1 Profile

Hazard Description

Hazardous substances 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. The Superfund law designates more than 800 substances as hazardous and identifies many more as potentially hazardous due to their characteristics and the circumstances of their release (USEPA 2013). Superfund's definition of a hazardous substance includes the following:

- Any element, compound, mixture, solution, or substance designated as hazardous under section 102 of CERCLA.
- Any hazardous substance designated under section 311(b)(2)(a) of the Clean Water Act (CWA), or any toxic pollutant listed under section 307(a) of the CWA. There are over 400 substances designated as either hazardous or toxic under the CWA.
- Any hazardous waste having the characteristics identified or listed under section 3001 of the Resource Conservation and Recovery Act.
- Any hazardous air pollutant listed under section 112 of the Clean Air Act, as amended. There are over 200 substances listed as hazardous air pollutants under the Clean Air Act (CAA).
- Any imminently hazardous chemical substance or mixture which the EPA Administrator has "taken action under" section 7 of the Toxic Substances Control Act (USEPA 2013).

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.

Transportation of hazardous substances on highways involves tanker trucks or trailers, which are responsible for the greatest number of hazard substance release incidents. New Jersey is composed of over 39,213 miles of highway, many of which are used to transport hazardous substances (New Jersey Department of Transportation [NJDOT] 2013). These roads cross rivers and streams at many points; hazardous substance spills on roads

have the potential to pollute watersheds that serve as domestic water supplies for parts of the State. Potential also exists for hazardous substance releases to occur along rail lines as collisions and derailments of train cars can result in large spills.

Pipelines can also transport hazardous liquids and flammable substances such as natural gas and petroleum. Incidents can occur when pipes corrode, when they are damaged during excavation, incorrectly operated, or damaged by other forces. In New Jersey, most of the large pipeline leaks have been caused by marine traffic hitting or the anchors of ships effecting pipelines in the waterways. In addition, hazardous substances can be transported by aircraft or by watercraft. Crashes, spills of materials, and fires on these vessels can pose a hazard.

Essex County hazardous materials response program has been in effect since 1999 with Nutley as the sole subcontractor for the County Environmental Health Act (CEHA) program. In 2004, Newark also became a subcontractor for hazardous material response for the CEHA program. Nutley handles all of the low concern and emergency responses within Essex County on a daily basis. The partnership between the Essex County Health Department (ECHD), Nutley and Newark has enabled Essex County to increase response capacity. Further, the County has created a mass decon program comprised of 10 Essex County municipal fire departments. The decon program includes the New Jersey Department of Health decon trailer that is operated by Belleville Fire Department. Because of several grants and other initiatives available much needed emergency equipment was purchased that is utilized for low concern, environmental emergency response and terrorist attacks.

Location

The following provides information regarding the location of hazardous substance incidents.

Hazardous Substances Fixed Site

Many years ago, numerous wastes were dumped on the ground, in rivers, or left out in the open. As a result, thousands of uncontrolled or abandoned contaminated sites were created. These sites included abandoned warehouses, manufacturing facilities, processing plants, and landfills. In response to concerns regarding health and environmental risks, Congress established the Superfund program in 1980 to clean up these sites. The Superfund program is administered by the USEPA in cooperation with individual states. In New Jersey, the Department of Environmental Protection (NJDEP) Site Remediation Program oversees the Superfund program (NJDEP 2013).

Federal regulations, include the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) required that a National Priorities List (NPL) of sites throughout the United States be maintained and revised at least annually (NJDEP 2013).

Fixed-site facilities that use, manufacture, or store hazardous substances in New Jersey pose risk and must comply with Title III of the federal SARA. SARA was signed into law on October 17, 1986. It is a federal law that applies nationwide. It must be realized that this law is linked to N.J.S.A. 34:5A, the New Jersey Worker and Community Right to Know Act. SARA requires the governor of each state to establish a State Emergency Response Commission (SERC). New Jersey's SERC was established by Executive Order on February 13, 1987. SARA also requires that the emergency planning districts be established by the SERC. The Act specified that these districts can be existing political subdivisions. The function of the emergency planning district is to facilitate preparation and implementation of emergency plans. In New Jersey, all municipalities and counties have been designated emergency planning districts (total of 588). The Local

Emergency Planning Committees (LEPC) is the policy body for the emergency planning district (New Jersey Division of Fire Safety 2011).

The State enacted the Toxic Catastrophe Prevention Act (TCPA), N.J.S.A. 13:1K-19 et seq. Currently, implementation of the requirements established under this Act is facilitated by the TCPA Program. Certain industrial facilities using materials considered extraordinarily hazardous must take steps to prevent releases and protect public safety. New Jersey has also mandated that facilities storing large quantities of hazardous substances take preventative measures to reduce the likelihood of a leak or discharge. Established under the New Jersey Spill Compensation and Control Act (N.J.S.A. 58:10-23.11), these requirements include testing and inspection of storage tanks, training of employees, and emergency response planning. The Discharge Prevention Containment and Countermeasure (DPCC) program facilitates implementation of these requirements. Regulations related to reporting of chemical and petroleum discharges are also administered under this program. The Program is sometimes referred to by the acronym DPCC, which refers to an important preparedness document that major facilities develop under the program (NJDEP 2012).

The Community Right to Know (CRTK) program collects, processes, and disseminates the chemical inventory, environmental release and materials accounting data required to be reported under the New Jersey Worker and Community Right to Know Act, N.J.S.A.34:5A and the federal Emergency Planning and Community Right to Know Act of 1986 (EPCRA). EPCRA is also known as Title III of the SARA. This information is used by the public, emergency planners, and first responders to determine the chemical hazards in the community (NJDEP 2012). In Essex County, there are 18 Superfund sites (USEPA 2013).

New Jersey employers, whose businesses are assigned covered North American Industry Classification System (NAICS) codes listed in the New Jersey Worker and Community Right to Know (CRTK) regulations, are required to submit CRTK surveys listing the environmental hazardous substances (EHSs) present at their facilities in quantities that exceed 500 pounds, unless the EHS is on the federal Emergency Planning and Community Right to Know Act (EPCRA) Section 302 list of extremely hazardous substances with a lower reporting threshold. In addition, Section 312 of EPCRA requires owners and operators of federal facilities and private sector facilities that are subject to the United States Occupational Safety and Health Administration's (OSHA) Hazard Communication Standard to report their inventories of any chemical that requires a Materials Safety Data Sheet (MSDS) and is present on site in quantities that exceed 10,000 pounds, unless the chemical is an Extremely Hazardous Substance with a lower reporting threshold (NJDEP 2011).

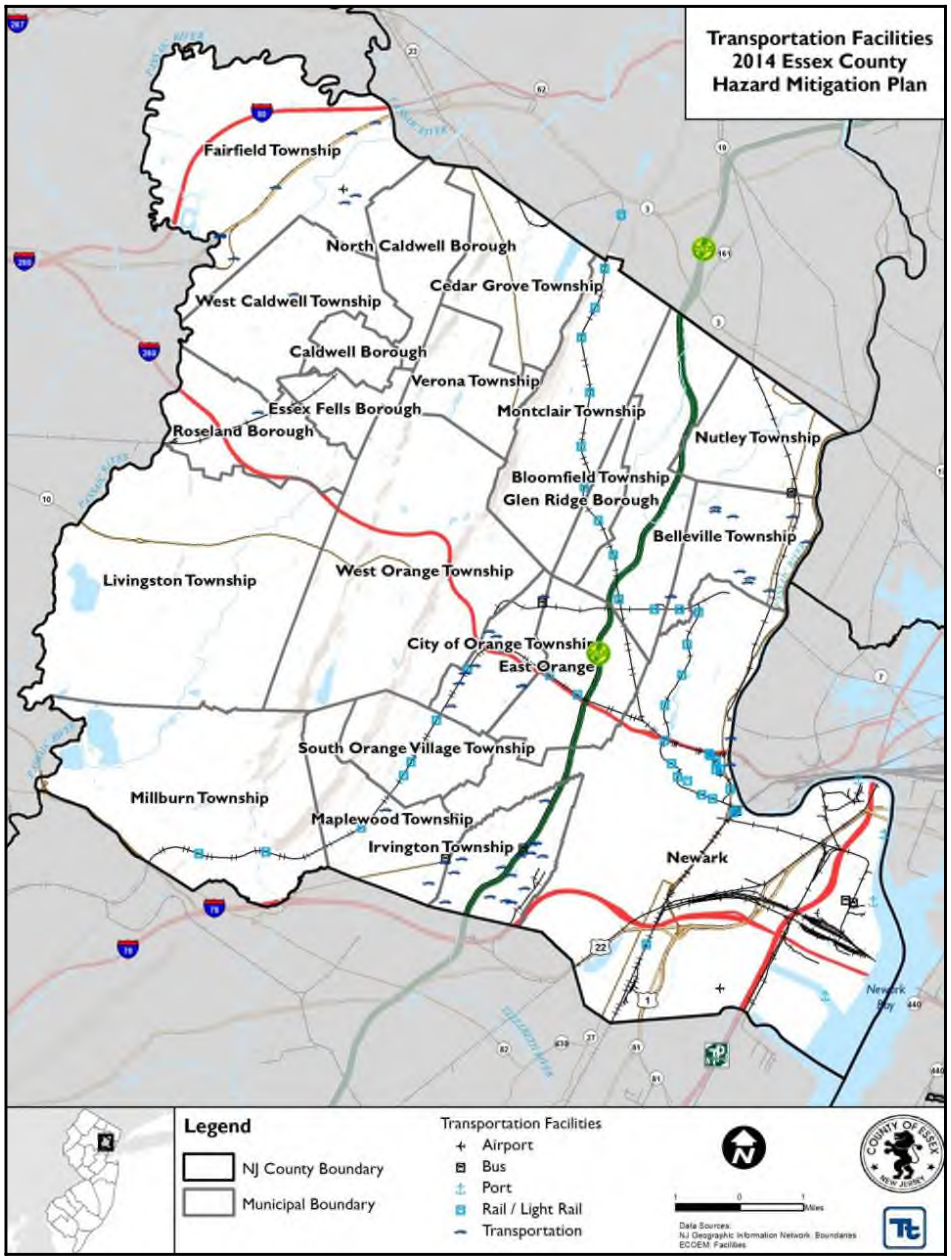
Owners and operators of manufacturing, and select non-manufacturing companies, having the equivalent of 10 or more full-time employees, and manufacturing, importing, processing or otherwise using toxic chemicals listed on the EPCRA Section 313 (TRI) list in quantities that exceed specified thresholds, are required to annually report their releases of these chemicals for the previous year. Approximately 500 New Jersey companies are required to file federal Toxic Chemical Release Inventory (TRI) forms. TRI Form R requires the listing of environmental releases, on-site waste management and off-site transfers while the simplified Form A Certification Statement requires the listing of the chemical only. These companies are also required to submit to NJDEP the Release and Pollution Prevention Report (RPPR) listing the quantities of environmental release, on-site waste management, waste transfer, and chemical throughput information. Most of these facilities are also subject to Pollution Prevention Planning Requirements and, therefore, required to report pollution prevention progress information on the RPPR (NJDEP 2011).

The NJDEP maintains a list of Known Contaminated Sites of New Jersey (KCSNJ). It is an inventory that includes all sites in the State where contamination is known to exist. The remediation for these sites is currently active or pending in the NJDEP's Site Remediation Program (SRP). As of April 12, 2012, there are over 13,000 KCSNJ sites in New Jersey, with 1,294 of those sites in Essex County.

Hazardous Substances In-Transit

Incidents involving hazardous substances in transit can occur anywhere in the State. New Jersey has several major transportation corridors on which thousands of vehicles transporting hazardous substances travel daily. Major transportation routes include the Garden State Parkway; Atlantic City Expressway; Palisades Interstate Parkway; New Jersey Turnpike; Interstates I-280, I-95, I-295, I-195, I-80, I-78, and I-287; and Routes 1, 33, and 66. Table 5.19-1 outlines the number of miles of roadway per county in the State. In Essex County, the major transportation routes include: the Garden State Parkway; I-280; I-80; and I-78. In total, there is approximately 1,767 miles of roadway in the County. Figure 5.4.14-1 shows the major transportation routes in the County.

Figure 5.4.14-1. Major Transportation in Essex County

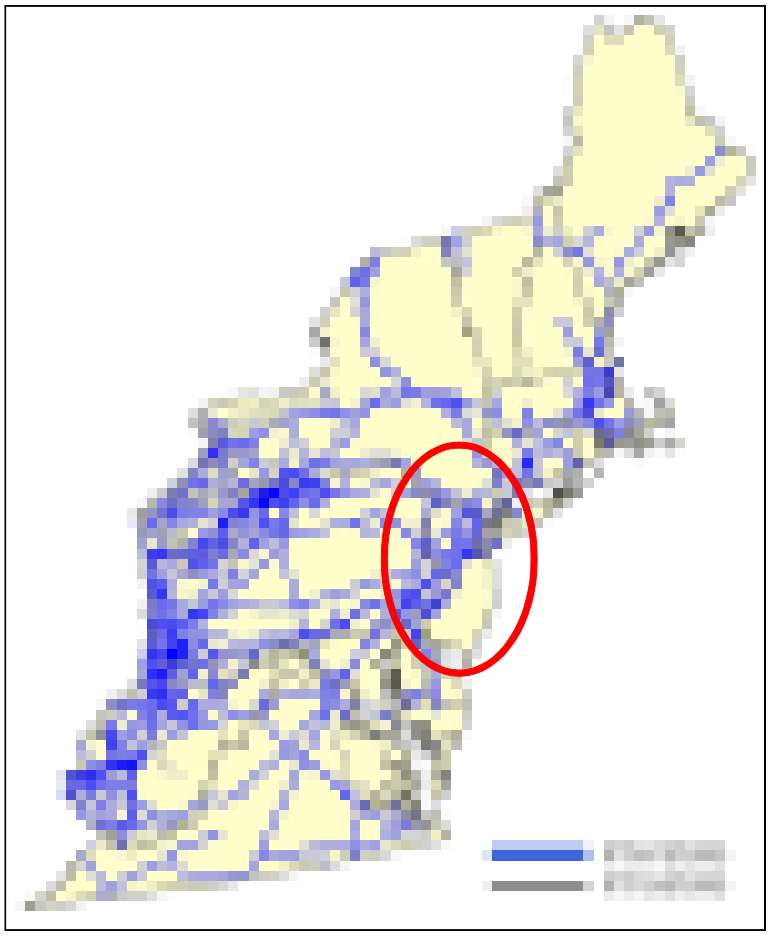


Source: NJGIN, ECOEM

Hazardous substances incidents may also occur along railways in Essex County. NJDOT has a vital interest in preserving and improving the rail freight part of its transportation network. Rail shipments allow cost-effective movement of goods with less stress on the State's highway system. Major commodities shipped by rail entail petrochemicals (including plastic pellets), construction materials, food products, raw materials, and finished goods for manufacturers. Of concern for this hazard are rail cars carrying hazardous substances. An accident or release could pose a public safety hazard to the community.

Hazardous substances can also be transported via pipeline across the State. New Jersey has an extensive network of natural gas and petroleum pipelines. Several of the petroleum pipelines originate in the Gulf Coast region (Colonial Pipeline and Buckeye Pipeline). Figure 5.4.14-2 shows the extent and locations of pipelines throughout the northeastern United States, with New Jersey highlighted.

Figure 5.4.14-2. Interstate Natural Gas Pipelines in the Northeast



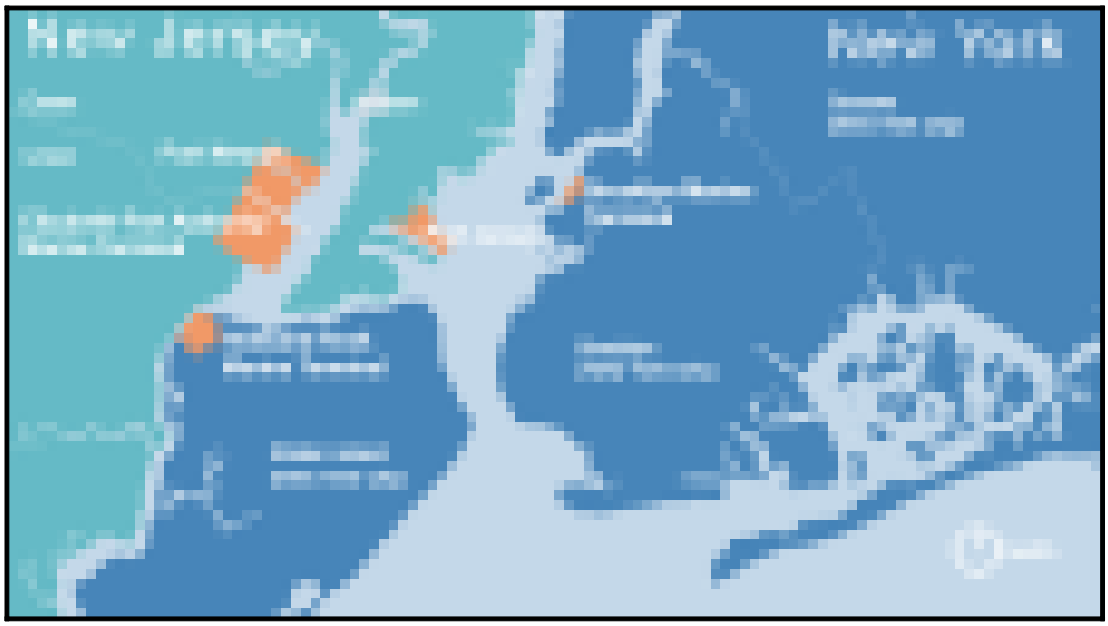
Source: US Energy Information Administration 2008

Hazardous Substances Offshore

Offshore hazardous substance incidents have the potential to affect New Jersey because of its vast coastline consisting of rivers, bays, and oceans. New Jersey is a vital link in marine transportation in the Northeast. The State has 14 ports, including the Port of New York and New Jersey, which are a critical link for shipping worldwide. The potential for a hazardous substances incident offshore is possible given the volume of shipping traffic around the State.

New Jersey features the Port of New York and New Jersey system, which includes the New Jersey Ports of Port Newark, Elizabeth-Port Authority Marine Terminal, and Port Jersey. The Port of New York and New Jersey is the gateway to one of the most concentrated and affluent consumer markets in the world. It is the largest port on the east coast, and the third-largest port in the nation. In 2010, the Port of New York and New Jersey handled 5.3 million loaded and unloaded 20-foot equivalent units (TEU), a 16% increase in total container traffic from 2009. Loaded containerized cargo volumes rose 12.6%, led by continued growth in trade with Asia and North Europe. The dollar value of all cargo that moved through the port exceeded $175 billion (Port Authority of New York and New Jersey 2013). The Port ships a variety of goods, many of which are hazardous. Figure 5.19-6 shows the location of the Port of New York and New Jersey. Port Newark is located in Essex County. Port Newark is managed by the Port Authority of New York and New Jersey (PANYNJ). The Port Newark Container Terminal (PNCT) is located in Port Newark and occupies 259 acres. It handles over 600,000 containers each year and is one of the largest infrastructure projects in New Jersey.

Figure 5.4.14-3. Port of New York and New Jersey



Source: Port Authority of New York and New Jersey 2013

Extent

The extent of a hazardous substance release will depend on whether it is from a fixed or mobile source, the size of impact, the toxicity and properties of the substance, duration of the release, and the environmental conditions (for example, wind and precipitation, terrain, etc.).

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

With a hazardous substance release, whether accidental or intentional, several potentially exacerbating or mitigating circumstances will affect its severity or impact. Mitigating conditions are precautionary measures

taken in advance to reduce the impact of a release on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place measures protects people and property from the harmful effects of a hazardous substance release. Exacerbating conditions, characteristics that can enhance or magnify the effects of a hazardous substance release, include:

- Weather conditions, which affect how the hazard occurs and develops
- Micro-meteorological effects of buildings and terrain, which alters dispersion of hazardous substances on-compliance with applicable codes (such as building or fire codes)
- Maintenance failures (such as fire protection and containment features), which can substantially increase the damage to the facility itself and to surrounding buildings

As discussed earlier, the severity of the incident is dependent not only on the circumstances described above, but also with the type of substance released and the distance and related response time for emergency response teams. The areas with the closest proximity to the releases are generally at greatest risk; however, depending on the agent, a release can travel great distances or remain present in the environment for a long period of time (e.g. centuries to millennia).

The severity of offshore hazardous substances incidents will vary based on the amount of hazardous substance spilled, the location of the spill, and the prevailing currents. The effects of an accident can have a devastating impact on the environment. An example of the worst-case scenario was the Deepwater Horizon oil spill in 2010, which affected the gulf and the coastline from Texas to Florida and was one of the worst environmental disasters in the United States.

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with hazardous substance incidents throughout the State of 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.

Between 1954 and 2014, the State of New Jersey was not included in any FEMA declared disasters (DR) or emergencies (EM) related to hazardous substances incidents (FEMA 2014).

The U.S. Department of Transportation (USDOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) provides an incident report database for information on incidents throughout the U.S. The data is from the hazardous materials incident report. According to this database, between 2007 and 2014, there have been 255 incidents in Essex County (121 air; 127 highway; 5 rail) (PHMSA 2014). Hazardous substances incidents on-site or in-transit occur frequently across the State and in Essex County. These incidents are typically small, localized events. EPA maintains records of the amount of chemicals released at facilities each year. Between 2007 and 2012, Essex County had a total of 472,261 gallons released on-site and a total of 1,317,766 gallons released off-site (U.S. EPA 2014).

For this 2015 Plan Update, known hazardous substances incidents that have impacted Essex County between 2007 and 2014 are identified in Table 5.4.14-1. With hazardous substances incidents for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.14-1 may not include all events that have occurred in the County. Please see Section 9 for detailed information regarding impacts and losses to each municipality.

Table 5.4.14-1. Hazardous Substances Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
February 19, 2010	Fuel Oil Spill	N/A	N/A	A truck crash on Route 24 in Millburn Township caused a fuel spill. A tractor trailer without a trailer was found to have struck a guardrail, heavily damaging the left side of the vehicle. This damaged the fuel tank of the truck which resulted in a fuel spill. Lane closures were required during the cleanup. The Millburn Fire Department, NJDEP, NJDOT, and the Nutley hazmat team responded to the spill.
July 15, 2010	Chemical Explosion	N/A	N/A	A 400-gallon container filled with sulfuric acid exploded inside a Newark bio-diesel fuel processing plant on Passaic Street. The explosion seriously injured a nearby employee who was splashed with the chemical. Sixty firefighters and NJDEP officials responded to the plant. Responders spent nearly 2.5 hours trying to decontaminate the building. Approximately 100 to 200 gallons of the acid spilled and flooded the structure and HAZMAT teams were not able to fully neutralize the acid in the area until the evening. NJSP were forced to shut down water traffic in the Passaic River for approximately an hour.
January 25, 2011	Oil Truck Spill	N/A	N/A	An oil truck tipped over in Belleville Township on Valley Street while trying to get around parked cars on the street.
September 18, 2012	Diesel Spill	N/A	N/A	A large amount of diesel has spilled in a five block area in the City of South Orange. The fuel spill was located on the corner of Montrose and Vose Avenues.
October 11, 2012	Hydraulic Fluid Spill	N/A	N/A	A hydraulic fluid spill occurred at the corner of Grove and Bradford Avenues in Cedar Grove Township. The spill occurred when a truck lost its rear axle just shy of the intersection. The Cedar Grove Fire Department responded, as well as the Nutley Hazmat unit.
May 10, 2013	Diesel Fuel Spill	N/A	N/A	Up to 40 gallons of diesel spill spilled from a utility truck in Millburn Township after it collided with another vehicle. The Nutley hazmat team began cleaning up and the NJDEP took control of the cleanup later on.
September 6, 2013	Oil Spill	N/A	N/A	An overturned tractor trailer on Route 290 East in the Borough of Roseland leaked 7,000 gallons of raw sewage.
January 11, 2014	Diesel Fuel Spill	N/A	N/A	Caldwell Township police and fire departments responded to Caldwell College for reports of a diesel fuel spill. The fuel made its way into the Pinebrook Creek which flows down to Grover Cleveland Park.

Source: North American Hazmat Situations and Deployments Map 2014

Probability of Future Occurrences

Predicting future hazardous substance incidents in Essex County is difficult. They can occur at anytime and anywhere in the County. Incidents can be sudden without any warning or slowly develop. Small spills, both fixed site and in-transit, occur throughout the year and the probability for these events are high. The risk of major incidents in a given year is rare. Significant events occurring offshore are rather rare in New Jersey and in Essex County. However, with the port systems and waterways in Essex County, the possibility for an incident does exist.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for the release of hazardous substances in the County is considered 'frequent' (likely to occur within 25 years, as presented in Table 5.3-3).

It is estimated that the County will continue to experience direct and indirect impacts of hazardous substance incidents annually that may induce secondary hazards such as infrastructure deterioration or failure, water quality and supply concerns, and transportation delays, accidents and inconveniences.

Climate Change Impacts

Hazardous substance incidents are non-natural incidents; therefore, there are no implications for impacts from climate change.

5.4.14.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the hazardous substances hazard, all of Essex County is exposed to the hazard. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), are exposed and potentially vulnerable to the release of hazardous substances. The following text evaluates and estimates the potential impact of the hazardous substances hazard on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Overall, it is difficult to quantify potential losses of hazardous substances incidents due to the many variables and human elements. Human safety and welfare can become compromised from negative health effects of poisoning or exposure to toxic substances, fires, or explosions.

Data and Methodology

For this hazard, data was obtained from Essex County and the Planning Committee.

Impact on Life, Health and Safety

The U.S. EPA Hazardous Waste Report, which is a biennial report, collects data on the generation, management, and minimization of hazardous waste. This report provides detailed data on the generation of hazardous waste from large quantity generators and data on waste management practices from treatment, storage, and disposal facilities. This report lists 66 facilities in Essex County, with a majority of them located in the City of Newark.

Superfund is a program administered by the U.S. EPA to locate, investigate, and cleanup the worst hazardous waste sites throughout the U.S. Data from the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database indicated that Essex County has 58 Superfund sites located throughout the County, with a majority of the sites located in the City of Newark (U.S. EPA 2014).

Depending on the type and quantity of chemicals released and the weather conditions, an incident can affect larger areas that cross jurisdictional boundaries. When hazardous substances are released in the air, water or on land they may contaminate the environment and pose greater danger to human health. The general population may be exposed to a hazardous substances release through inhalation, ingestion or dermal exposure. Exposure may be either acute or chronic, depending upon the nature of the substance and extent of release and contamination.

Due to the location of these different hazardous substances and wastes sites in Essex County, the entire County is considered vulnerable to this hazard. Those particularly vulnerable to the effects of hazardous substances incidents are populations located along major transportation routes because of the quantities of chemicals transported on these major thoroughfares. Potential losses from hazardous substances incidences include

human health and life and property resources. These types of incidents can lead to injury, illnesses, and/or death from both the involved persons and those living in the impacted areas.

Impact on General Building Stock

Potential losses to the general building stock caused by a hazardous substances incident is difficult to quantify. The degree of damages to the general building stock depends on the scale of the incident. Potential losses may include inaccessibility, loss of service, contamination and/or potential structural and content losses if an explosion occurs.

Impact on Critical Facilities

Potential losses to critical facilities caused by a hazardous substances incident is difficult to quantify. Potential losses may include inaccessibility, loss of service, contamination and/or potential structural and content losses if an explosion occurs. Refer to Section 4 (County Profile) which summarizes the number and type of critical facilities in Essex County.

Impact on Economy

If a significant hazardous substances incident occurred, not only would life, safety, and building stock be at risk, but the economy of Essex County would be affected as well. A significant incident in an urban area may force businesses to close for an extended period of time because on contamination or direct damage caused by an explosion, if one occurred. The exact impact on the economy is difficult to determine, given the uncertain nature of the size and scope of incidents.

Hazardous substances incidents have the potential to lead to major transportation route closures to occur in Essex County. The closure of waterways, railroads, airports, and highways as a result of these incidents has the potential to impact the ability to deliver goods and services efficiently. Potential impacts may be local, regional, or statewide, depending on the magnitude of the event and the level of services disruptions.

Future Growth and Development

As discussed in Sections 4 and 9, areas targeted for future growth and development have been identified across Essex County. Any areas of growth could be potentially impacted by hazardous substances incidents because the entire County is exposed and vulnerable. An increase in development and population has the ability to increase the likelihood of a hazardous substance incident. Future migration to larger jurisdictions may also increase the likelihood of an incident. Please refer to the specific areas of development indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.

Effect of Climate Change on Vulnerability

Because a hazardous substance incident is human-caused hazard, no climate change impacts are associated with the hazard.

Change of Vulnerability

Overall, the County's vulnerability has not changed and the entire County will continue to be exposed and vulnerable to hazardous substances incidents.

Additional Data and Next Steps

For the Plan Update, any additional information regarding localized concerns and past impacts will be collected and analyzed. This data will be developed to support future revisions to the plan. Mitigation efforts could include building on existing New Jersey, Essex County, and local efforts.

5.4.15 Power Failure

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the power failure hazard in Essex County.

2015 Plan Update Changes

- For the 2015 Plan Update, the power failure hazard is a new hazard of concern for Essex County.
- The hazard profile includes a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the power failure hazard is discussed.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- The vulnerability assessment is new for the power failure hazard and directly follows the hazard profile.

5.4.15.1 Profile

Hazard Description

Power failure is defined as any interruption or loss of electrical service caused by disruption of power transmission caused by accident, sabotage, natural hazards, or equipment failure (also referred to as a loss of power or power outage). A significant power failure is defined as any incident of a long duration, which would require the involvement of the local and/or State emergency management organizations to coordinate provision of food, water, heating, cooling, and shelter.

Widespread power outages can occur without warning or as a result of a natural disaster. Generally warning times will be short in the case of technological failure, such as a fire at a sub-station, traffic accident, human error or terrorist attack. In cases where a power failure is caused by natural hazards, greater warning time is possible. For example, high wind events such as tornados and hurricanes often cause widespread power failure, and are often forecasted before they affect a community. Additionally, severe winter weather conditions such as ice storms, blizzards, and snowstorms often cause power failure. Incidents such as these often have plenty of warning time, thus power response crews can stage resources to prepare for power failure.

Power failures can cause secondary hazards and have an effect on the health of residents. One potential secondary hazard is chemical accidents that occur after power is restored to industrial facilities. Power interruptions at chemical handling plants are of particular concern because of the potential for a chemical spill during restart (EPA 2001). Chemical spills in turn can have significant health and environmental impacts.

Another secondary hazard that can result from power failure is a loss of communications capability by first responders, which may in turn have negative impacts on public safety. Backup systems such as amateur radio operators may be required during disaster to augment communications capabilities. Power outages can also lead to instances of civil disturbance, including looting.

Wastewater and potable water utility interruption may occur as a result of a power failure. These critical utilities are essential to community continuity and recovery. Their interruption of service may have cascading economic and environmental impacts.

Power failure can have vast secondary impacts on the health of the community. During periods of extreme heat or extreme cold, vulnerable populations such as the elderly and medically frail can be affected and are susceptible to hypothermia or heat stroke. Additionally, power failure can lead to food spoilage, which has negative impacts on public health.

Power failure may also lead to an increase in traffic accidents. Traffic accidents may increase because of the lack of traffic control devices such as stoplights and railroad crossing advisory signals. Power outages lasting a long duration will force law enforcement officials to man traffic control points to prevent accidents.

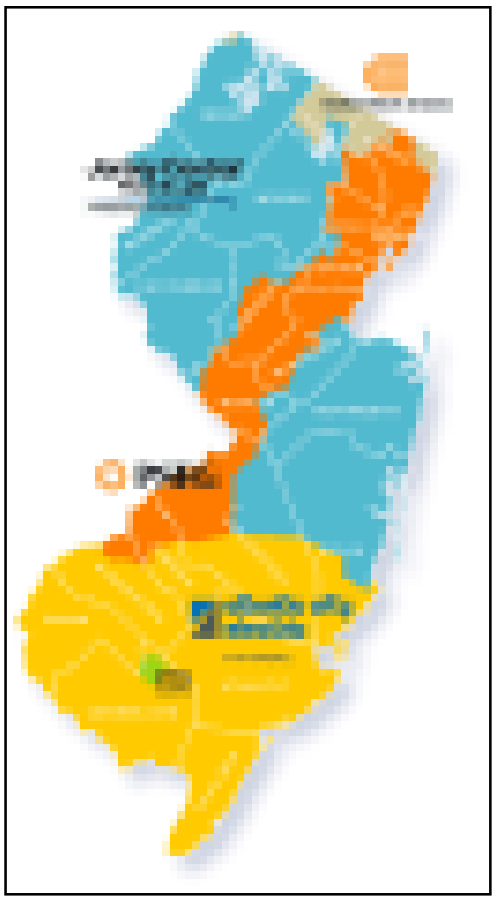
Location

Power failures in New Jersey are usually localized and are usually the result of a natural hazard event involving high winds or ice storms. New Jersey's power systems are overseen by the State of New Jersey Board of Public Utilities. Under New Jersey law, consumers can shop for electric suppliers through a variety of third-party vendors. While the *supply* portion of energy is open to competition, the *delivery* of electricity is limited geographically to the following service providers:

- Atlantic City Electric
- Jersey Central Power and Light (JCP&L)
- Rockland Electric Company
- Public Service Electric and Gas (PSE&G)

These service providers are responsible for maintaining power throughout their respective regions. Figure 5.4.15-1 shows the locations of electric service delivery providers across New Jersey. This figure indicates that PSE&G deliveries electricity to the majority of Essex County, while JCP&L deliveries electricity to the southwest corner of the County.

Figure 5.4.15-1. Electric Service Delivery Companies in New Jersey



Source: New Jersey Clean Energy Program 2013

Power failure is particularly problematic for homes that are heated with electricity. Widespread power outages during the winter months can directly impact vulnerable populations such as the elderly and medically frail. According to the 2007 – 2011 American Community Survey, 25,258 homes across Essex County are heated with electricity. This represents 9.1% of the total homes in the County.

Extent

The extent and severity of a power outage depends on the cause, location, duration, and time of year. It can range from a small, localized event to a countywide power outage. Impacts from an outage can be significant to the County and its residents. Power outages typically occur because of, or in combination with, other emergency or disaster incidents, such as severe weather and flooding, and can exacerbate such emergencies. It also depends on the electrical distribution system affected.

Power failures lead to the inability to use electric-powered equipment, such as: lighting; heating, ventilation, and air conditioning (HVAC) and necessary equipment; communication equipment (telephones, computers, etc.); fire and security systems; small appliances such as refrigerators, sterilizers, etc.; and medical equipment. This all can lead to food spoilage, loss of heating and cooling, basement flooding due to sump pump failure, and loss of water due to well pump failure.

Previous Occurrences and Losses

Many sources provided power outage information regarding previous occurrences and losses associated with events that caused outages throughout Essex County. With so many sources reviewed for the purpose of this Hazard Mitigation Plan (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.

Between 1954 and 2014, FEMA included the State of New Jersey in one power outage-related disaster (DR) or emergency (EM) declaration. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Essex County was included in this disaster.

For this 2015 Plan update, power outage events were summarized from 2007 to 2014. Table 5.4.15-1 includes power outage events that occurred between 2007 and 2014. With documentation for New Jersey and Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.15-1 may not include all events that have occurred throughout the County.

Table 5.4.15-1. Power Outage Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
March 12 – April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	Between March 12th and 15th, heavy rain fell across parts of New Jersey. A severe windstorm knocked out power to hundreds of thousands of customers primarily in southwestern Connecticut as well as parts of Westchester County and Long Island, in New York State, and New Jersey. The outage lasted as long as six days for some customers in the hardest-hit communities. In Essex County, rainfall totals ranged from 4.06 inches in Caldwell Township to 5.19 inches in Newark. Peak wind gusts ranged from 45 mph in Newark to 55 mph in Caldwell Township. Numerous trees were down in Maplewood and Millburn Townships and in the Village of South Orange. In Cedar Grove Township, 0.25 inch hail covered the ground temporarily. Between March 22nd and 23rd, heavy rain fell in Essex County, with totals ranging from 1.20 inches in Newark to 2.16 inches in West Orange Township. Between March 29th and March 31st, heavy rain fell in Essex County with totals ranging from 3.23 inches in Essex Fells Township to 3.97 inches in Verona Township. Peak wind gust of 43 mph was reported in Newark. As a result of this series of storms, many of the municipalities reported road closures due to flooding. Shelters were opened. In Roseland Borough, there was some residual damage to the footing of the Second Avenue culvert and at the head wall to the Locust Avenue culvert. West Caldwell Township reported damages to their fuel storage tank, wastewater pump station and the roof of the DPW building.
August 27-28, 2011	Hurricane Irene	DR-4021	Yes	Hurricane Irene moved north along the Atlantic Coast, making landfall near Cape Lookout, North Carolina, on August 27th. The hurricane moved back over open water before making landfall for a second time at Little Egg Inlet in New Jersey on August 28th. This was the first time since 1903 that a hurricane made landfall in New Jersey. Rain fell for an 18-hour period, with totals ranging from six to eight inches across New Jersey. Higher amounts were observed in southwestern, central, and northeastern New Jersey. The heavy rain from the storm caused record-breaking floods on many streams throughout the State. Thirty-nine of the 94 USGS gages with greater than or equal to 20 years of record, had record high peaks. Thirty-three gages experienced peaks equal to or greater than the 100-year recurrence interval. NWS climate site at Newark recorded 8.92 inches of rain. According to the New Jersey Board of Public Utilities (NJBPU), Hurricane Irene disrupted service to 1.9 million customers in the State. Residents were

Table 5.4.15-1. Power Outage Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				without power for as long as eight days after the storm. In Essex County, in West Orange Township, nearly 15 homes were damaged from fallen trees. Emergency crews responded to 120 calls and closed several streets. Rainfall totals ranged from 7.32 inches in Essex Fells to 9.96 inches in Orange; with 7.69 inches falling at Newark Airport which was the highest one-day total for Newark Airport. Peak wind gusts of 40 mph and 61 mph were recorded at Caldwell and Newark Airports, respectively. In Belleville, downed trees were reported on Watchung Avenue. Overall, the municipalities experienced flooding, downed trees, power outages, flooding, evacuations, and over $1.8 million in clean-up and other costs to the municipalities. The Passaic River gage at the Passaic Valley Sewage Commission recorded a peak stage of 7.11 feet, 0.64 feet higher than the previous peak of record on March 13, 2010.
October 29, 2011	Severe Storm	DR-4048	Yes	Rain began to fall in southern New Jersey early on October 29, 2011 and spread north. Some northern areas of the State saw the precipitation begin as snow and during the morning, the rain turned to snow in central and northern New Jersey. Moderate to heavy snow continued into the afternoon, mixing with sleet in lower elevations. Once the snow tapered off during the morning of October 30, 2011, New Jersey had experienced its largest October snowstorm since the late 18th century. Once several inches of snow had accumulated, tree branches and entire trees began to snap and crash onto homes, power lines and cars. By the end of the storm, over 600,000 customers lost power, with some remaining without power for over a week. In Essex County, snowfall totals ranged from 4.9 inches in Belleville Township to 8 inches in West Orange Township. In Verona Township, the wastewater treatment plant flooded and sustained damage to its system. Many municipalities reported road closures, loss of utilities, closed schools and debris removal. Several residents were evacuated from their homes in Roseland Borough. Shelters were open throughout the County as well. Overall, the County had over $1.5 million in clean-up costs and other expenses to the municipalities.
October 26 – November 8, 2012	Superstorm Sandy	DR-4048	Yes	As storm surge from Sandy was pushed into the New York and Raritan Bays, sea water piled up within the Hudson River and coastal waterways and wetlands of northeastern New Jersey, including Newark Bay, Passaic and Hackensack Rivers, Kill van Kull, and Arthur Kill. Mandatory evacuations of people living along the

Table 5.4.15-1. Power Outage Events in Essex County, 2007 to 2014

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
				coasts and rivers in Union, Essex, and Hudson Counties. Sandy resulted in one of the most significant power failure incidents in New Jersey. In total, the incident caused approximately 2.5 million customers across the State to lose power for an extended period of time, forcing many shelters to remain open several weeks. Power crews from across the country converged in the region to assist with power restoration efforts. Restoration efforts were hampered by the extent of the outages, and the sheer number of customers without power. In Essex County, inundations of four to six feet were measured across Newark Bay in Elizabeth and the area around Newark Airport. Storm tide at Newark was 11.6 feet with an estimated inundation (maximum depth of water on land) of 3.5 feet. The City of Newark had 7.65 inches of rainfall. Peak wind gusts ranged from 70 mph at Caldwell Airport to 78 mph at Newark Airport. In Fairfield, peak wind gusts measured at 72 mph and Reef Road flooded to Howard Street.. Overall, the municipalities of Essex County experienced flooding, power outages, evacuations, opening of shelters, and evacuations. The Passaic Valley Sewage Commission reported that the treatment plant in Newark was inundated with at five feet of water during the storm and 840 million gallons of untreated sewage flowed into the Newark Bay. Another three billion gallons of partially treated sewage was sent into the bay before secondary treatment was restored.
October 7, 2013	Strong Storms	N/A	N/A	A line of strong thunderstorms stretched from the New York-Canadian border to North Carolina and moved across New Jersey. This line of storms caused damage to the area and power outages. Approximately 10,000 customers were without power as a result of this storm. JCP&L reported 7,520 customers were without in Somerset and Morris Counties and PSE&G reported approximately 4,500 customers without in Bergen and Essex Counties.
January 13, 2014	Power Outage	N/A	N/A	A power outage left sections of the City of Newark and the Townships of Irvington and Maplewood in the dark. The power went out around 10pm on January 13th due to a problem at an electrical substation in Irvington Township. More than 15,000 customers were affected. Power was restored by 5am on January 14th.

Probability of Future Occurrences

While the probability of future power failure incidents in Essex County is difficult to predict, the historic record indicates that significant power failures have occurred as a result of high winds, lightning, winter weather, and technological failures. Data were not readily available on the frequency of smaller power outages across the County; however, it is reasonable to assume that power failure events of shorter duration will continue to occur in the future. In addition, future changes in climate may also impact the frequency and probability of future power failure occurrences.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for power outages in the County is considered 'frequent' (likely to occur within 25 years, as presented in Table 5.3-3).

Climate Change Impacts

Several implications for climate change are related to the power failure hazard. Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

The New Jersey Climate Adaptation Alliance is a network of policymakers, public and private-sector practitioners, academics, non-governmental organizations (NGO), and business leaders aligned to build climate change preparedness in the state of New Jersey. The Alliance is facilitated by Rutgers University, which provides science and technical support, facilitates the Alliance's operations and advances its recommendations. A document titled *Change in New Jersey: Trends and Projections* was developed to identify recommendations for State and local public policy that will be designed to enhance climate change preparedness and resilience in New Jersey (Rutgers 2013).

Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001-2010 (ONJSC, 2011). Winter temperatures across the Northeast have seen an increase in average temperature of 4 °F since 1970 (Northeast Climate Impacts Assessment [NECIA] 2007). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2013).

Both northern and southern New Jersey have become wetter over the past century. Northern New Jersey's 1971-2000 precipitation average was over five inches (12%) greater than the average from 1895-1970. Southern New Jersey became two inches (5%) wetter late in the 20th century (Office of New Jersey State Climatologist). Average annual precipitation is projected to increase in the region by 5% by the 2020s and up to 10% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New York City Panel on Climate Change [NPCC] 2009). In addition, heavy precipitation events have increased in the past 20 years.

Climatologists predict an increase in the number and intensity of severe weather events. More storms with higher winds will increase the chance that the power infrastructure will be impacted. Extreme temperatures are predicted to increase as well. During the hot summer months, the potential for power overload will increase as demand for power increases. Additionally, climatologists predict an increase in precipitation, which may lead to more winter weather thus causing additional power failures.

5.4.15.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For power outages, all of Essex County is exposed to this hazard of concern. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in Section 4 (County Profile), are exposed and potentially vulnerable. The following text evaluates and estimates the potential impact of power outages on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health, and safety of residents; (2) general building stock; (3) critical facilities; (4) economy; and (5) future growth and development
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Severe weather is often the cause of power outages. Snow, ice, high winds, and lightning can cause damage to the power grid infrastructure. Other causes of power outages include flooding, falling tree limbs, and vehicle accidents. Hazards resulting from power outages include temperature extremes inside buildings, unsafe drinking water, electrical shock from downed power lines, and carbon monoxide poisoning. In the event of a power outage, transformers and substations can be damaged. A power failure in one area can cause a cascading effect, damaging components in other parts of the electrical grid. Other utilities may also be impacted as a result of a power failure including potable water and wastewater plants. The low-income and elderly populations of Essex County are the most vulnerable to power outages.

Data and Methodology

At the time of this Plan, insufficient data is available to model the long-term potential impacts of power outages on Essex County. Over time, additional data will be collected to allow better analysis for this hazard. Available information and a preliminary assessment are provided below.

Impact on Life, Health and Safety

For the purposes of this HMP, the entire population in Essex County is vulnerable to power outage events. Refer to Section 4 for a summary of population statistics for the County. Power outage events have potential health impacts including injury and death. Other issues from power outages include food safety from lack of refrigeration and carbon monoxide poisoning from misuse of generators.

Individuals with medical needs are vulnerable to power failures, because medical equipment such as oxygen concentrators requires electricity to operate. The elderly are also vulnerable to the effects of power failure, as power failure has the potential to expose them to extreme heat or extreme cold. During power failure events, water purification systems may not be functioning. Further, populations on private wells will not have access to potable water. Many power outage events are caused by storm events that can lead to flooding. Without electricity, residents would be unable to pump water from their basements potentially causing structural and content damage to their homes.

Impact on General Building Stock

All of the building stock in the County is exposed to the power outage hazard. Refer to Section 4 which summarizes the building inventory in Essex County.

Impact on Critical Facilities

All critical facilities in the County are exposed to the power outage hazard. It is essential that critical facilities remain operational during natural hazard events. Backup power is recommended for critical facilities and infrastructure. Loss of power can have serious impacts on the health and welfare of residents, continuity of business, and the ability of public safety agencies to respond to emergencies.

Impact on Economy

During a power outage event, the County may experience losses because of an interruption of critical services. Further, increased costs such as providing shelters, and costs related to cooling and heating centers may be incurred. Extended power outages will require officials to shelter victims who require heat and power for activities of daily living.

A prolonged power failure in Essex County may impact the County's economy. The County possesses an extensive transportation network, including many rail and fixed route bus services, as well as demand responsive, ridesharing, and shuttle services (Essex County Transportation Plan 2008). Transportation systems available in Essex County include large, interconnected rail, roadway, and water transportation networks. Major highways accessible to Essex County includes the Garden State Parkway; New Jersey Turnpike; Interstates 78, 80, and 280; Routes 1-9, 21, 22, 23, 24, and 46; and the Eisenhower Parkway. Public roads have a total mileage of 1,673 miles; total interstate mileage is 27 miles; state highway mileage is 59 miles; county road mileage is 233 miles; and municipal road mileage of 1,330 miles. The County also has three of the nation's major transportation centers, which includes Newark Liberty International Airport, Port Newark, and Penn Station (Essex County 2014). All these systems and supporting resources provide services locally, regionally, nationally, and internationally. Disruption in any of these services would mean that many workers, residents, and travelers would not be able to go where needed.

Power interruptions can cause economic impacts stemming from lost income, spoiled food and other goods, costs to the owners/operators of the utility facilities, and costs to government and community service groups. FEMA's benefit-cost analysis methodology measures the loss of electrical service on a per-person-per-day-of-lost-service basis for the service area affected. For the electrical utility, the standard value is $131 per person per day (BCA module version 4.8).

Future Growth and Development

As discussed in Sections 4 and 9, areas targeted for future growth and development have been identified across Essex County. Any areas of growth could be potentially impacted by the power outage hazard because the entire County is exposed and vulnerable. Please refer to the specific areas of development indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.

Effect of Climate Change on Vulnerability

Several implications for climate change are related to the power failure hazard. Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

Climate Change in New Jersey: Trends and Projections describes changes in temperature, precipitation, and sea level rise. Each section of the report summarizes observed recent changes in climate in New Jersey. Observations are based on recorded climate data collected by the ONJSC and other institutions, and on other reports summarizing climate change in the northeastern United States. Each section also presents a synthesis of the most current projections for future climate changes based on climate science modeling and techniques.

The projections reflect potential average climate over a span of future years (2020, 2050, and 2080). The projections in the report illustrate the potential climate changes that could impact the northeastern United States based on future emissions scenarios (A2, A1B, and B1 – high, medium, and low scenarios). Each emissions scenario would result in a range of potential climate outcomes in the State (Rutgers 2013).

Climatologists predict an increase in the number and intensity of severe weather events. More storms with higher winds will increase the chance that the power infrastructure will be impacted. Extreme temperatures are predicted to increase as well. During the hot summer months, the potential for power overload will increase as demand for power increases. Additionally, climatologists predict an increase in precipitation, which may lead to more winter weather thus causing additional power failures.

Change of Vulnerability

Overall, the County's vulnerability has not changed and the entire County will continue to be exposed and vulnerable to the power outage events.

Additional Data and Next Steps

For future plan updates, the County can track data on power outage events, obtain additional information on past and future events, particularly in terms of any injuries, deaths, shelter needs, pipe freeze, and other impacts. This will help to identify any concerns or trends for which mitigation measures should be developed or refined. In time, quantitative modeling of estimated power outage events may be feasible as data is gathered and improved.

5.4.16 Terrorism

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the terrorism hazard in Essex County.

2015 Plan Update Changes

- The hazard profile includes a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the terrorism hazard is discussed.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- The vulnerability assessment directly follows the hazard profile.

5.4.16.1 Profile

Hazard Description

Terrorism is the use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber attacks (computer-based attacks); and the use of chemical, biological, nuclear, and radiological weapons (FEMA 2009).

The Federal Bureau of Investigation (FBI) and the New Jersey State Police partnered to combat domestic and international terrorism in 1985. The New Jersey Domestic Security Preparedness Act, signed into law on October 4, 2001, created the Domestic Security Preparedness Task Force as the State's cabinet-level body responsible for setting homeland security and counter-terrorism policy after September 11, 2001. The State Police established a Counter Terrorism Bureau (CTB) in 2003 and the New Jersey Regional Operations Intelligence Center (ROIC) was activated in 2005. The New Jersey Joint Terrorism Task Force (JTTF) North Unit, also known as the Newark JTTF, covers most of the State, while the Philadelphia JTTF covers the Camden area. The U.S. attorney chairs an Anti-Terrorism Advisory Council (ATAC) in Newark (Washington Post 2014).

All county prosecutors are required to designate a Counter-Terrorism Coordinator in their respective counties. The Counter-Terrorism Coordinator is the primary link between all law enforcement agencies in the county and the New Jersey Office of Homeland Security and Preparedness (OHSP). The Essex County Counter-Terrorism Coordinator has obtained the necessary clearances in order to receive classified homeland security briefings from the FBI and the U.S. Department of Homeland Security (Essex County Prosecutor's Office 2010).

In addition to the Counter-Terrorism Coordinator, who also serves as the Chief Assistant Prosecutor in charge of the Homicide, VIPER and Arson Units, the Homeland Security Unit is staffed by a Risk Mitigation Planer, who performs vulnerability assessments at the numerous critical infrastructures in the County (Essex County Prosecutor's Office 2010).

The Counter-Terrorism Coordinator also oversees the operations of the Essex County Rapid Deployment Team (RDT), consisting of over 100 sworn law enforcement officers from all law enforcement agencies in the County. The RDT serves as "force-multiplier" capable of deploying quickly to assist other law enforcement agencies in matters of civil disorder, crowd control, infrastructure protection, and natural disaster relief (Essex County Prosecutor's Office 2010). Various types of terrorism are discussed in the sections below.

Armed Attacks and Assassinations

Armed attacks include raids and ambushes. Assassinations are the killing of a selected victim, usually by bombings or small arms. Drive-by shootings is a common technique employed by unsophisticated or loosely organized terrorist groups. Historically, terrorists have assassinated specific individuals for psychological effect.

Arson and Firebombing

Incendiary devices are inexpensive and easy to hide. Arson and firebombings are easily conducted by terrorist groups that may not be as well organized, equipped, or trained as a major terrorist organization. An act of arson or firebombing against a utility, hotel, government building, or industrial center portrays an image to the public that the ruling government is incapable of maintaining order.

Bioterrorism

Bioterrorism refers to the intentional release of toxic biological agents to harm and terrorize civilians, in the name of a political or other cause. The United States Centers for Disease Control and Prevention (CDC) has classified the viruses, bacteria, and toxins that could be used in an attack. Category A Biological Diseases are those most likely to do the most damage. They include:

- Anthrax (Bacillus anthracis)
- Botulism (Clostridium botulinum toxin)
- The Plague (Yersinia pestis)
- Smallpox (Variola major)
- Tularemia (Francisella tularensis)
- Hemorrahagic Fever, due to Ebola Virus or Marburg Virus

Bombings

Bombings are the most common type of terrorist act. Typically, improvised explosive devices are inexpensive and easy to make. Modern devices are smaller and harder to detect, and contain very destructive capabilities. Terrorists such as those responsible for this bombing can use materials that are readily available to the average consumer to construct a bomb.

Cyber Terrorism

Cyber terrorists use information technology to attack civilians and draw attention to the terrorists' cause. This may mean that they use information technology, such as computer systems or telecommunications, as a tool to orchestrate a traditional attack. More often, cyber terrorism refers to an attack on information technology itself in a way that would radically disrupt networked services. For example, cyber terrorists could disable networked emergency systems or hack into networks housing critical financial information. There is wide disagreement over the extent of the existing threat by cyber terrorists. A full discussion of cyber terrorism is presented in Section 5.4.12 (Cyber Attack).

Ecoterrorism

Ecoterrorism is a recently coined term describing violence in the interests of environmentalism. In general, environmental extremists sabotage property to inflict economic damage on industries, businesses, or persons perceived as harming animals or the natural environment. Targets of ecoterrorist attacks have included fur companies, logging companies, and animal research laboratories.

Hijackings and Skyjackings

Hijacking is the seizure by force of a surface vehicle, its passengers, and/or its cargo. Skyjacking is the taking of an aircraft, which creates a mobile, hostage barricade situation; provides terrorists with hostages from many nations; and draws heavy media attention. Skyjacking also provides mobility for the terrorists to relocate the aircraft to a country that supports their cause and provides them with a human shield, making retaliation difficult.

Kidnappings and Hostage-Takings

Terrorists use kidnapping and hostage-taking to establish a bargaining position and to elicit publicity. Kidnapping is one of the most difficult acts for a terrorist group to accomplish, but, if a kidnapping is successful, it can gain terrorists money, release of jailed comrades, and publicity for an extended period. Hostage-taking involves the seizure of a facility or location and the taking of hostages present in that facility. Unlike a kidnapping, hostage-taking provokes a confrontation with authorities. It forces authorities to either make dramatic decisions or to comply with the terrorist's demands. It is overt and designed to attract and hold media attention. The terrorists' intended target is the audience affected by the hostage's confinement, not the hostage.

Nuclear Terrorism

Nuclear terrorism refers to a number of different ways nuclear materials might be exploited as a terrorist tactic. These include attacking nuclear facilities, purchasing nuclear weapons, or building nuclear weapons or otherwise finding ways to disperse radioactive materials.

Location

Terrorist attacks can occur anywhere; however, the State of New Jersey is a particularly attractive target of a potential terrorist activity because of its dense population and location relative to major urban areas. The State also houses the busiest commuter rail system in the United States, as well as the headquarters of major corporations in economically vital sectors such as the financial and pharmaceutical industries.

Additional targets in New Jersey include the State's critical infrastructure such as utilities, roadways, bridges, tunnels, hospitals, schools, civic centers, and other high-profile venues such as Met Life Stadium and the Prudential Center (City of Newark). The link between New Jersey Transit and New York City also makes this transportation system a target for terrorists. In Essex County, transportation systems available include large, interconnected rail, roadway, and water transportation networks. Major highways accessible to Essex County includes the Garden State Parkway; New Jersey Turnpike; Interstates 78, 80, and 280; Routes 1-9, 21, 22, 23, 24, and 46; and the Eisenhower Parkway. Public roads have a total mileage of 1,673 miles; total interstate mileage is 27 miles; state highway mileage is 59 miles; county road mileage is 233 miles; and municipal road mileage of 1,330 miles. The County also has three of the nation's major transportation centers, which includes Newark Liberty International Airport, Port Newark, and Penn Station (Essex County 2014).

Jersey City/Newark is one of the 64 urban metropolitan areas that have been designated by the federal government as "high-threat, high-density" with regard to acts of terrorism (Washington Post 2014).

Extent

Any acts of terrorism can occur anywhere at any time of day. The National Terrorism Advisory System (NTAS) communicates information about terrorist threats by providing detailed information to the public, government agencies, first responders, airports and other transportation hubs, and the private sector. When there is a threat, an NTAS Alert will be announced by the Secretary of Homeland Security and will be shared

with the public. It may include specific information about the nature of the threat, including the geographic region, mode of transportation, or critical infrastructure potentially affected, as well as steps that individuals and communities can take to protect themselves and help prevent, mitigate or respond to the threat. The alert indicates whether the threat is elevated or imminent. Elevated threats are when there is no specific information about the timing or location. Imminent threats are when it is believed the threat is impending or very soon. The alerts will be posted online and released to the news media for distribution. The United States Department of Homeland Security (USDHS) will also distribute alerts through its social media channels (USDHS 2013).

The effect of a terrorism event can vary depending on the type of attack and the magnitude of the event or events. A terrorism event can cause public fear regarding the use of mass transportation or leaving their homes in the event of a biological or nuclear attack. Communication systems, both public and private, can fail because of an overwhelming amount of usage or damage to its infrastructure. Healthcare facilities can become quickly inundated and must be prepared to triage injured patients, handle mass casualties, and conduct decontamination operations.

There is often very little if any warning time that a terrorist attack is about to occur. It is possible, however, to thwart terrorist attacks through aggressive intelligence monitoring and monitoring of individuals who exhibit radical tendencies. Some terrorist attacks may show warning signs that an incident may occur, such as a suspicious package left unattended. Local, state, and federal officials as well as the general public are responsible for recognizing the warning signs of terrorism incidents and for taking appropriate actions to mitigate against possible attacks. In New Jersey, the coordination, direction, and control of all law enforcement personnel and resources fall under the purview of the Attorney General. Additionally, the New Jersey Office of Homeland Security and Preparedness administers, coordinates, leads, and supervises New Jersey's counter-terrorism efforts.

In New Jersey, the NJOEM, New Jersey Office of Homeland Security and Preparedness (OHSP), and the Regional Operations Intelligence Center (ROIC) have introduced NJ Alert, a mass text and email emergency notification system. During an emergency, NJ Alert assists these agencies in delivering emergency messages to the public through their handheld devices or computers, in addition to the Emergency Alert Systems and Amber Alert (NJEOM 2009).

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with terrorist events throughout the State of 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.

Between 1954 and 2014, FEMA issued a disaster (DR) or emergency (EM) declaration for the State of New Jersey for one terrorism-related, in which Essex County was included.

For this 2015 Plan Update, known terrorist events that may have impacted Essex County between 2007 and 2014 are identifiable in Table 5.4.2. No terrorist events were identified to have occurred within in the County during this timeframe; however, with the County's close proximity to New York City, the County has the potential to be impacted by these events. Therefore, Table 5.4.16-1 includes events that have occurred outside of Essex County.

Table 5.4.16-1. Terrorism Events in New Jersey and Surrounding Area

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Essex County Designated?	Description
October 26, 2007	Bombing	N/A	N/A	A pair of improvised explosive devices was thrown at the Mexican Consulate in New York City. The fake grenades were filled with black powder and detonated by fuses, causing very minor damage.
March 6, 2008	Bombing	N/A	N/A	A homemade bomb damaged a recruiting station in Times Square, New York.
May 25, 2009	Bombing	N/A	N/A	A 17-year-old set off a crude explosive on the Upper East Side of Manhattan, which shattered windows and destroyed a bench.
May 1, 2010	Bombing	N/A	N/A	In Times Square, New York City, an individual attempted to detonate a bomb in a vehicle. The device did not detonate.

Source: NJ State HMP 2014
N/A Not Applicable; Not Available

Probability of Future Occurrences

While the potential for future terrorism incidents in Essex County is difficult to predict, the combination of past incidents and potential terrorist targets make a terrorism incident possible. Efforts from local, state, and federal officials must be coordinated to prevent future terrorist incidents from occurring. However, despite the best efforts of these entities, the reality is that a terrorist attack may occur in Essex County or the surrounding areas.

In Section 5.3, the identified hazards of concern for Essex County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for terrorism events in the County is considered 'frequent' (likely to occur within 25 years, as presented in Table 5.3-3).

Climate Change Impacts

Because terrorism is a human-caused hazard, no climate change impacts are associated with the hazard.

5.4.16.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For terrorism events, all of Essex County is considered exposed to this hazard of concern. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County profile, are exposed and potentially vulnerable. The following text evaluates and estimates the potential impact of terrorist attacks on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

The entire County is exposed to terrorism events. Because it is difficult to predict the particular target of these events, assessing vulnerability to the hazard is also difficult. The entire County and building stock is exposed to a terrorist attack.

Data and Methodology

At the time of this Plan, insufficient data is available to model the long-term potential impacts of terrorism events on Essex County. Over time, additional data will be collected to allow better analysis for this hazard. Available information and a preliminary assessment are provided below.

Impact on Life, Health and Safety

For the purposes of this HMP, the entire population in Essex County is exposed to terrorism events. However, because terrorists typically prefer to impact the greatest number of individuals in a given location, it can be inferred that individuals living in highly populated areas will have a greater exposure to terrorist incidents than those living in rural areas. Refer to Section 4 for a summary of population statistics for the County. Large-scale incidents have the potential to kill or injury many residents in the immediate vicinity of the attack, and they may also affect people located a distance from the initial event.

Impact on General Building Stock

All of the building stock in the County is exposed to the terrorism hazard. Accessibility, design, availability to roof access, driveways underneath buildings, unmonitored areas, and the proximity of structures to transportation routes, underground pipelines, and the potential for a terrorist to strike any structure randomly, makes all buildings in the County exposed and vulnerable to this hazard. Refer to Section 4 which summarizes the building inventory in Essex County.

Impact on Critical Facilities

Critical facilities are exposed to terrorist attacks, particularly because of the impact that an attack has on these types of facilities. Dams, power stations, and tunnels are all examples of critical infrastructure and facilities that are vulnerable. Additionally, communications systems, first-responder stations, and emergency operations centers are all vulnerable to terrorist attacks. Disrupting one of these facilities or destroying critical

infrastructure would have devastating, cascading impacts on Essex County. All critical facilities in the County are exposed to the terrorism hazard.

Impact on Economy

Measuring the economic impact of a terrorist attack on Essex County is difficult. The initial impact can be measured in immediate costs such as costs related to responding to the event, and those associated with the immediate loss of productivity due to closed businesses. The fuller economic impact includes long-term costs such as terrorism mitigation activities.

Future Growth and Development

As discussed in Sections 4 and 9, areas targeted for future growth and development have been identified across Essex County. Any areas of growth could be potentially impacted by the power outage hazard because the entire County is exposed and vulnerable. Please refer to the specific areas of development indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.

Effect of Climate Change on Vulnerability

Because terrorism events are human-caused, no climate change impacts are associated with the hazard.

Change of Vulnerability

Overall, the County's vulnerability has not changed and the entire County will continue to be exposed and vulnerable to terrorism events.

Additional Data and Next Steps

For the Plan Update, any additional information regarding localized concerns and past impacts will be collected and analyzed. This data will be developed to support future revisions to the plan. Mitigation efforts could include building on existing New Jersey, Essex County, and local efforts.

5.4.17 Transportation Failure

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the transportation hazards in Essex County.

2015 Plan Update Changes

- For the 2015 Plan Update, the transportation failure hazard includes vehicular accidents, aviation accidents, railway failures and accidents, and roadway and bridge failures. This differs from the 2008 County HMP which profiled bridge failure and roadway failure and had them as individual profiles.
- The hazard profile includes a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the transportation failure hazard is discussed.
- Previous occurrences were updated with events that occurred between 2007 and 2014.
- The vulnerability assessment directly follows the hazard profile.

5.4.17.1 Profile

Hazard Description

Disasters that can result from hazards having an element of human intent, negligence, error or technological failure are called man-made hazards. DMA 2000 does not require the consideration of man-made hazards, as these are often already considered by other planning efforts. However, man-made hazards can be included in HMPs and as deemed appropriate by the Planning Committee. As identified by Essex County, transportation failure was evaluated for this plan update. This includes vehicular accidents, aviation accidents, railway accidents, bridge failures, and roadway failures, and flood vulnerable roadways.

Essex County is located adjacent to New York City and along the major transportation routes connecting the New York and Philadelphia metropolitan areas. Port Newark is also located within the County. Traffic flow through the County is critical to economic prosperity in the entire region (Essex County HMP 2007). The County possesses an extensive transportation network, including many rail and fixed route bus services, as well as demand responsive, ridesharing, and shuttle services (Essex County Transportation Plan 2008).

The majority of fixed route service in Essex County is provided by New Jersey Transit (NJ Transit). There are 46 bus and light rail routes and two commuter rail lines. Private carriers mostly serve trips to New York City, although there are at least three privately operate local bus routes. NJ Transit operates commuter rail, light rail, and bus service in Essex County. Commuter rail service is provided on the Morris and Essex Rail Line and on the Boonton Line. Morris and Essex service operates to Hoboken Terminal and New York Penn Station with stops in Essex County at Newark Broad Street and eight other stations on the Morristown Line. Rail service is also provided to Hoboken on the Boonton Line from six stations in northern Essex County (Essex County Transportation Plan 2008).

NJ Transit provides 46 bus routes and one light rail route in the County; 30 of which serve downtown Newark. Seven are crosstown routes or feeders to the City subway's northern terminal. Three others provide service from northern Essex County to New York City. The remainder primarily provides service into other counties from Essex County municipalities (Essex County Transportation Plan 2008).

Transportation systems available in Essex County include large, interconnected rail, roadway, and water transportation networks. Major highways accessible to Essex County includes the Garden State Parkway; New Jersey Turnpike; Interstates 78, 80, and 280; Routes 1-9, 21, 22, 23, 24, and 46; and the Eisenhower Parkway.

Public roads have a total mileage of 1,673 miles; total interstate mileage is 27 miles; state highway mileage is 59 miles; county road mileage is 233 miles; and municipal road mileage of 1,330 miles. The County also has three of the nation's major transportation centers, which includes Newark Liberty International Airport, Port Newark, and Penn Station (Essex County 2014). All these systems and supporting resources provide services locally, regionally, nationally, and internationally.

Vehicular Accidents

A vehicular accident is a road traffic incident that usually involves one road vehicle colliding with another vehicle or other road user, such as an animal or a stationary roadside object. A vehicular accident may result in injury, property damage or possibly fatalities. Many factors contribute to vehicular accidents, including: equipment failure, poor road conditions, weather, traffic volume, and driver behavior.

Aviation Accidents

According to the International Civil Aviation Organization, an aviation accident is an occurrence with the operation of an aircraft which takes place between the time a person boards the aircraft with the intention of flight to the time the person has disembarked the aircraft. There are three different occurrences that determine an aviation accident: a person is fatally or seriously injured; the aircraft sustains damage or structural failure; or the aircraft is missing or completely inaccessible. An aviation incident is an occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation (International Civil Aviation Organization, 2001).

Railway Failures and Accidents

Freight, commuter, and subway lines are all located in Essex County. These lines may fail due to weakening joints, erosion, and unstable rails that can cause train-car collisions and derailment. Subway breakdowns may occur as a result of aging machinery.

Rail transportation's underground and aboveground rails are vulnerable to weather-related events as well. Flooding from coastal storms and heavy precipitation events can impact underground rails, while strong winds can impact aboveground rails by derailing rail cars. Extreme temperatures can affect railroad tracks by causing the steel to shrink during extreme cold and buckle during extreme heat events (NYC HMP 2014).

An at-grade railroad crossing is an intersection where a public highway, road, street, or private roadway crosses one or more railroad tracks at grade, or at the same ground surface level. These crossings are marked by crossbucks, stop signs, or other signals, and may be identified by a U.S. DOT inventory number (49 CFR 218.93).

Roadway and Bridge Failures

Bridges, tunnels and roads are all make up a part of the transportation network in Essex County. All of which are vulnerable to deterioration from use and climate. The following provides information regarding bridge and roadway failures.

Bridge Failures

Bridge components are subject to cracking, rusting, ground subsidence, and corrosion caused by exposure to water, vibration, ozone, dust, dirt, chemicals in salt products, and gasoline (NYC HMP 2014).

Bridge failure generally results in a more severe impact as compared to non-bridge roadway failures. Failure of bridges may also adversely impact the feature it was designed to cross (another roadway, body of water, rail line, etc.). In Essex County, when considering all stream and river crossing, crossing of rail over roadways and

vice versa, crossing of roadway over roadway, and pedestrian crossings , there are hundreds of bridges within the County (Essex County HMP 2007).

Roadway Failures

Roadway failures occur frequently and include long-term structural fatigue, overweight traffic, accidents, fuel or hazardous material discharges, or acts of terrorism. During roadway closures, traffic is disrupted and depends on the type of roadway failure (Essex County HMP 2007). Roadways are typically less likely to fail than bridges; however, subsurface conditions such as sinkholes or collapsed sewers can undermine streets. For example, retaining walls are critical to the structural integrity of roadways and a failure of the wall can close roads and/or cause major traffic disruptions (NYC HMP 2014).

Flood Vulnerable Roadways

A flood vulnerable roadway is any public road that has a history of being covered by enough water in a manner that the road surface, markings and edges are not visible to the operator of a vehicle, cyclist or a pedestrian. These conditions can be caused by stream/river flooding, poor drainage along roadways or normal surface runoff. Water on the roadway can be either standing or moving and could also leave debris such as gravel, leaves and sticks on the roadway. Duration of the flooding event can vary from minutes to days (Fifth Planning District Commission, 1999).

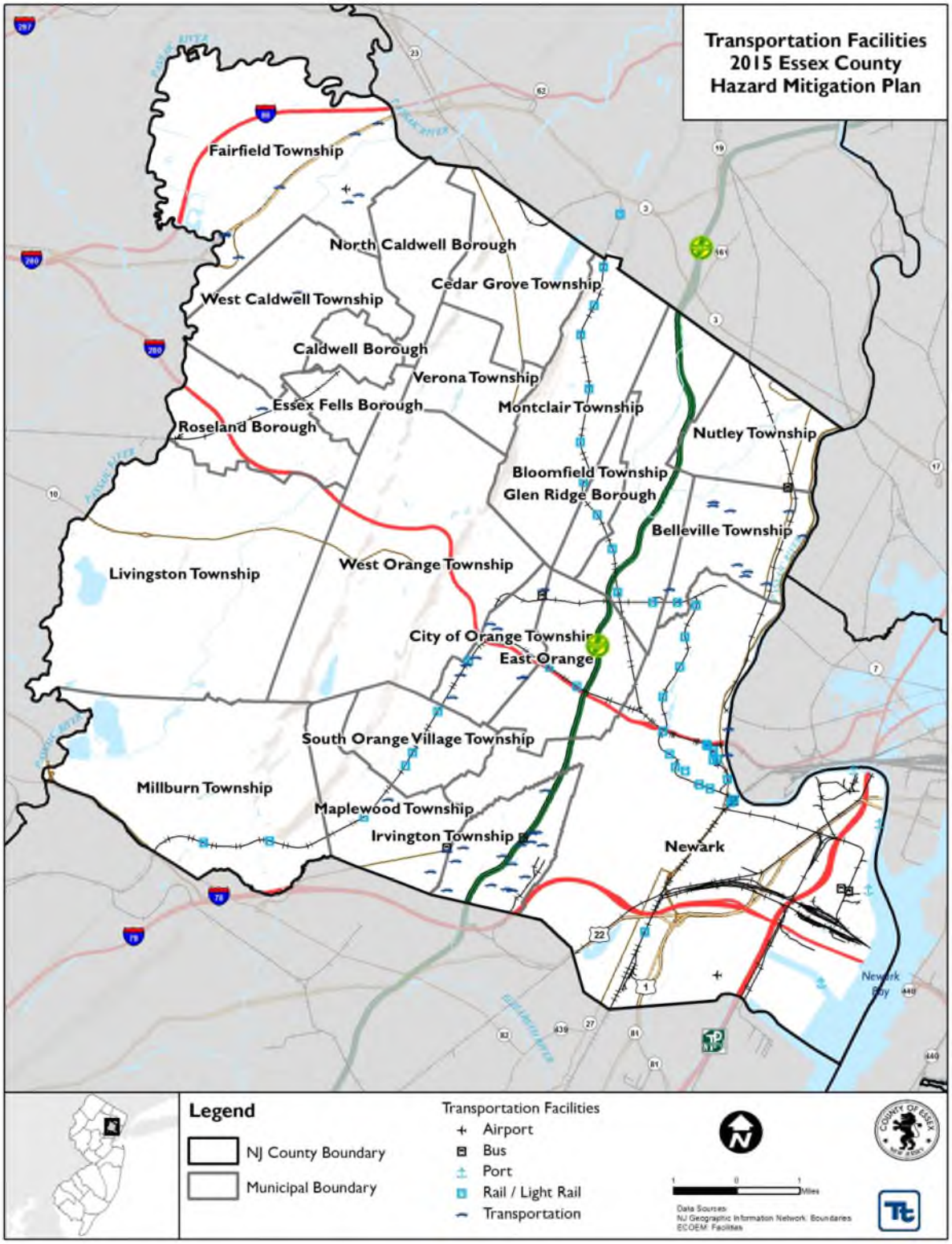
Location

Essex County is located in the northeast portion of New Jersey. It is bordered to the north by Passaic County; to the east by Bergen and Hudson Counties; to the south by Union County; and to the west by Morris County. The County is part of the New York metropolitan area and is the second densest county in New Jersey. The City of Newark is the largest municipality in New Jersey, in population. The Borough of Caldwell is the smallest municipality in terms of land area and Essex Fells has the lowest population in the County. Generally, the eastern portion of Essex County is considered a more mature, urban area, while the western part of the County is more of a suburban area.

Essex County is full of transit infrastructure, especially in the eastern parts of the County. Transit is available in the form of rail, light rail, bus, and paratransit (shuttle). NJ TRANSIT is the primary transit provider in Essex County and operates a bus and rail hub at Newark Penn Station, as well as the Newark Light Rail (subway) that links Penn Station with Broad Street Station and Bloomfield (Essex County Comprehensive Transportation Plan 2013).

Figure 5.4.17-1 illustrates the transportation facilities and major roadways located in Essex County.

Figure 5.4.17-1. Transportation Facilities and Roadways in Essex County



Source: ECOEM

Vehicular Accidents

A vehicular accident can occur on any traveled roadway in Essex County. Areas of particular concern include areas of roads that are difficult to navigate, conducive to accidents, historically accident-prone, adjacent to water bodies, and pass through populated or highly traveled areas.

The County-owned radial roads, including Bloomfield Avenue, Springfield Avenue, Clinton Avenue, and South Orange Avenue, all serve both local and regional travel, including travel to and from New York City. These roads become very congested, especially in areas of high pedestrian activity, which often results the pedestrian mobility and safety and hazardous conditions for bicycles (Essex County Comprehensive Transportation Plan [ECCTP] 2013).

The roadways in Essex County consist of various functional classes and allows for travel between residential areas and the commercial/business establishments throughout the County. Major state roadways include the Garden State Parkway; I-280; I-80; and I-78. In addition to these major roadways, numerous state and county routes are present throughout Essex County as well. In total, there is approximately 1,767 miles of roadway in the County (ECCTP 2013).

Aviation Accidents

With Newark International Airport and Port Newark located within Essex County, the County is a major national transportation hub with an extensive network of rail, highway, air and sea transportation and it is home to one of the world's largest containerized shipping ports (Essex County Division of Planning 2014).

Newark Liberty International Airport is located in the southeast part of the County and is one of the three major airports in the New York metropolitan area. It is operated by the Port Authority of New York & New Jersey (PANYNJ). Additionally, the Port Authority operates the Port Newark-Elizabeth Marine Terminal in Essex County, which is the largest port facility on the east coast and the third largest in the U.S. This port is located on the Newark Bay and serves as the principal container ship facility for goods entering and leaving the New York-New Jersey area (ECCTP 2013).

The second airport located in Essex County is the Essex County Airport CDW (ECA), also known as Caldwell Airport. It is located entirely in the Township of Fairfield and is owned and operated by Essex County Improvement Authority (ECIA). The ECIA is governed by a seven member Board of Commissioners appointed by the County Executive with the consent and approval of the Essex County Board of Chosen Freeholders. The Essex County Airport is a general aviation facility whose campus is located on approximately 278 acres of land. It is located 20 miles west of New York City and 10 miles west of Teterboro Airport. This airport is easily accessible from State Highways 23, 46, 80, 280, and 287. Public transportation to the airport is available via NJ TRANSIT bus service and from the PANYNJ in New York City (ECCTP 2013).

Railway Failures and Accidents

The responsibilities for public crossings at grade are shared between the railroad and the road/highway agency. The railroad is responsible for the crossing surface between the out ends of the railroad ties, for the installation of the crossbuck signs where no signals are present, and for the operation and maintenance of the railroad crossing signals and associated control circuitry. The road or highway agency is responsible for warning and regulatory signs on the approaches to the crossing, for pavement markings and for the street or highway approaches outside the end of the railroad ties (West Virginia Department of Transportation, Date Unknown).

Essex County has approximately 26 miles of railroad track and 21 railroad stations, including Newark Penn Station, which is the hub for Amtrak service. The Port Authority Trans Hudson (PATH) system is a subsidiary

of the Port Authority of New York and New Jersey. This heavy rail rapid transit system is the country's 7th largest subway system. It serves as the primary transit link between New York City and urban and suburban communities in New Jersey and handles 250,000 passengers each day (ECCTP 2013).

Amtrak is a federally-owned railroad that provides inter-city passenger service to Newark Penn Station, serving more than 680,000 passengers, and Newark International Airport, serving more than 127,000 passengers. The Northeast Corridor Line runs between Washington D.C. and Boston and services other major east coast cities such as New Haven, New York City, Trenton, Philadelphia, and Baltimore (ECCTP 2013).

There are five NJ TRANSIT commuter lines that travel through Essex County: Northeast Corridor, Raritan Valley Line, Morris and Essex Lines, Montclair-Boonton Line, and North Jersey Coast Line. There are a total of 21 NJ TRANSIT stations located in Essex County. Newark Penn Station is an important multi-modal transportation hub that serves the Northeast Corridor, the Raritan Valley line, PATH, as well as numerous NJ TRANSIT bus routes. These stations have eight tracks, with seven of them on one level and the other track for PATH service on an upper level (ECCTP 2013).

The Conrail Lehigh Line is a main east/west route serving the region and one of the busiest rail lines in the U.S. In the City of Newark, the railroad enters Oak Island yard, the largest classification yard in New Jersey, and then continues across Newark Bay to Jersey City. West of the Oak Island yard, the Lehigh connecting track links the Lehigh Line with the Passaic & Harsimus Line which runs to the intermodal terminals in Kearney and North Bergen (ECCTP 2013).

The Chemical Coast Secondary is a major north/south rail line and serves Port Newark/Elizabeth and the intermodal terminal serving the Port Newark Container Terminal (PNCT) at Portside Yard. A new flyover connection between PNCT 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 which serve the intermodal transfer activities in Brills Yard and various industries along Doremus Avenue (ECCTP 2013).

Roadway and Bridge Failures

Bridge Failures

Essex County's transportation network includes operation and maintenance of four swing bridges over the Passaic River, provides maintenance of 131 stationary bridges and 230 culverts. The bridges and culverts represent critical nodes that allow traffic to efficiently navigate the County's diverse topography (ECCTP 2013).

Roadway Failures

See the vehicular accident section for a summary of roadways in Essex County.

Flood Vulnerable Roadways

According to FEMA, flood hazard areas are defined as areas that are shown to be inundated by a flood of a given magnitude on a map. These areas are determined using statistical analyses of records of riverflow, storm tides, and rainfall; information obtained through consultation with the community; floodplain topographic surveys; and hydrologic and hydraulic analyses. Flood hazard areas are delineated on FEMA's Flood Insurance Rate Maps (FIRM), which are official maps of a community on which the Federal Insurance and Mitigation Administration has indicated both the Special Flood Hazard Areas (SFHA) and the risk premium zones applicable to the community.

In addition to FIRM, FEMA also provides FISs for entire counties and individual jurisdictions. These studies are narrative reports of countywide flood hazards, including descriptions of the flood areas studied and the engineered methods used, principal flood problems, flood protection measures and graphic profiles of the flood sources (FEMA, Date Unknown). A countywide FIS for Essex County has been completed and discusses the principal flood problems in Essex County including flood vulnerable roadways (FEMA FIS, 2007). See the Flood Hazard section (5.4.6) for more information.

Extent

Vehicular Accidents

There is no warning time for vehicular accidents. Contributing factors for these accidents are typically associated with the driver, vehicle and the environment. Factors associated with the driver include: error, speeding, experience, and blood-alcohol level. Factors associated with the vehicle include: type, condition, and center of gravity. Environmental factors include: quality of the infrastructure, weather, and obstacles. The majority of vehicular accidents are attributed to the driver. Vehicular accidents can have severe effects on those directly involved, as well as effects to others not directly involved. Other effects may include: severe traffic delays, lost sales to businesses, delayed commodity shipments, and increased insurance costs (Cova and Conger, 2003).

Aviation Accidents

Approximately 80-percent of all aviation accidents occur shortly before or during take-off and landing. These are usually said to have been caused by human error. Mid-flight accidents are rare but not unheard of. A survey was conducted on 1,843 plane crashes that occurred between 1950 and 2006. The survey showed that of those 1,843 plane crashes, 53-percent were due to pilot (human) error; 21-percent due to mechanical failure; 11-percent due to weather; eight-percent due to other human error (lack of communication, improper maintenance); 6-percent due to sabotage and terrorism; and 1-percent due to other causes (Krasner, 2009).

Aviation accidents are often devastating incidents that may result in serious injuries or fatalities. The Federal Aviation Administration (FAA) and the National Transportation Safety Board (NTSB) are the agencies responsible for monitoring air travel and investigation accidents. Some of the most common causes of aviation accidents occur as a result of the violation of FAA and NTSB regulations. Some other causes of accidents include, but are not limited to:

- Pilot or flight crew errors – Pilot errors are the number one cause of aviation accidents and account for the highest number of fatalities. Pilots have the responsibility to transport passengers safely from one place to another and follow the FAA and NTSB regulations to better ensure passenger safety. If a pilot or flight crew makes an error, an accident may occur.
- Faulty equipment – Faulty aircraft equipment and/or mechanical features are another common cause of an aviation accident.
- Aircraft design flaws – The manufacturer of an aircraft is responsible for an aviation accident if the structural design is flawed and results in an accident.
- Failure to properly fuel or maintain the aircraft – If any regulations and safety standards set by the FAA or NTSB are violated, an accident may occur.
- Negligence of Federal Air Traffic Controllers – The failure of air traffic controllers to properly monitor the airways is another cause of aviation accidents (Aviation Law News, Date Unknown).

Railway Failures and Accidents

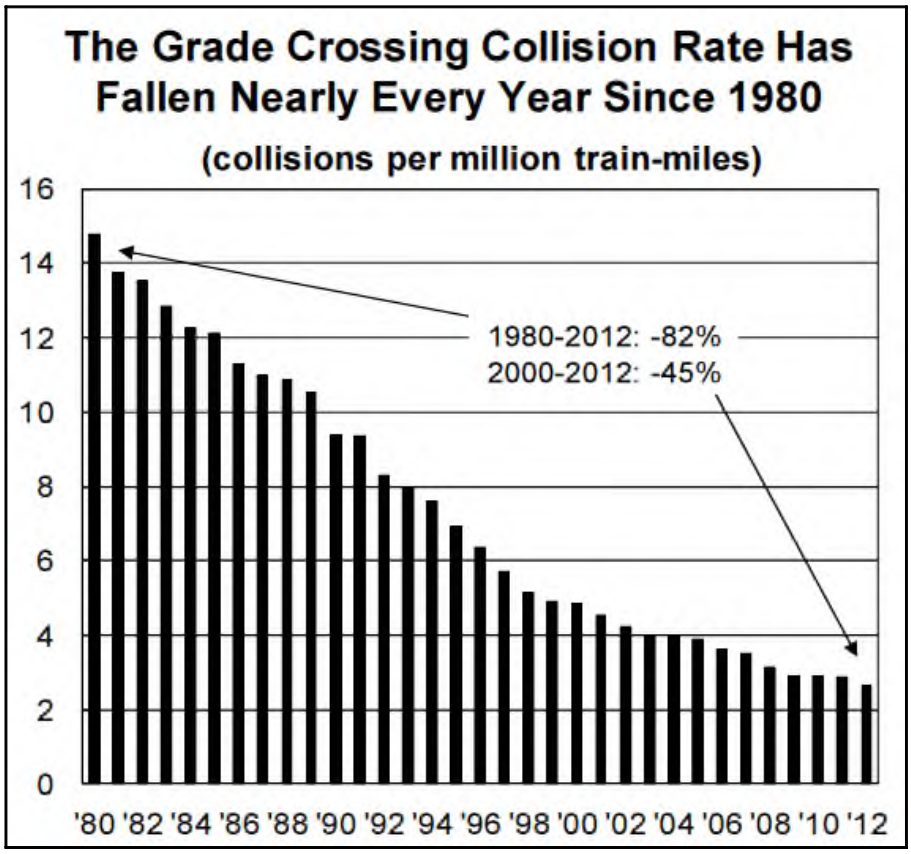
Accidents involving trains and pedestrians or motor vehicles are very severe. A motorist is 30-times more likely to die in a collision with a train than any other type of motor vehicle accident (West Virginia Department of Transportation, Date Unknown).

As of 2009, there are approximately 136,041 public at-grade crossings in the U.S. In 2009, there were 1,896 incidents at public highway-rail crossings in the U.S. that resulted in 247 deaths and 705 injuries. Also in 2009, 431 people were killed and 343 people were injured while trespassing on railroad rights-of-way and property (U.S. Department of Transportation – Federal Highway Administration Date Unknown).

For most local road officials, at-grade railroad crossings are the most common exposure to railroads. Such crossings are often a nuisance for both highway and railroad officials. Railroad crossings are a conflict point between two different transportation systems, which have different operating characteristics and different needs (Association of American Railroads, 2012).

Between 1980 and 2012, the number of grade-crossing collisions fell 82% (Figure 5.4.5-1). Injuries associated with collision fell 76% and fatalities fell 72%. Since 2000, the declines have been 44%, 24%, and 45%, respectively, indicating that grade crossing safety continues to improve. The grade crossing collision rate has fallen nearly every year since 1980; from 1980 to 2012, it fell 82% (Association of American Railroads 2013). According to the Federal Railroad Administration, as of 2014, there are 407 highway-rail crossings in Essex County.

Figure 5.4.17-2. Highway/At-Grade Railroad Crossing Collision Rate, 1980 through 2012



Source: Association of American Railroads 2013

Roadway and Bridge Failures

The severity of roadway and bridge failures in Essex County depends on the size and criticality of affected networks, their location, the number of people directly impact, and the secondary impacts to essential services and the economy. A failure's severity can range from localized occurrence to a system-wide incident (New York City HMP 2014).

Flood Vulnerable Roadways

See Section 5.4.6 (Flood) for detailed information on the extent for flood and flood vulnerable roadways.

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with transportation failure events throughout the State 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 2007 Plan did not discuss specific transportation failure events that occurred in Essex County. For this 2015 Plan update, winter storm events were summarized from 2007 to 2014. Table 5.4.17-1 includes flooding events and FEMA disaster declarations that occurred between 2007 and 2014. With transportation failure documentation for Essex County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.17-1 may not include all events that have occurred throughout the County. The State of New Jersey was not included in any FEMA disaster (DR) or emergency (EM) declarations in regards to transportation failure events.

Table 5.4.17-1 . Transportation Failure Incidents in Essex County, 2007 to 2014

Date	Type	Description
2007 to 2014	Vehicular Accidents	Between 2007 and 2014, as reported by NJDOT, there were over 175,000 vehicular accidents in Essex County.
June 26, 2007	Highway/Railroad Collision	A highway user stopped at the crossing at the Benton Harbor Station in Newark, proceeded, and was struck by a train. No injuries or fatalities reported.
August 14, 2007	Highway/Railroad Collision	A driver of a van struck a train at the crossing of Frelinghuysen Avenue in Newark (Hunter Station). The driver fled the scene. No injuries or fatalities reported.
October 16, 2007	Highway/Railroad Collision	A truck driver was traveling south on Corbin Street and was in the process of making a right hand turn into the Newark Station when an intermodal train hit the chassis of the truck. One injury was reported from this accident.
May 16, 2008	Aviation Accident	At the Essex County Airport in Caldwell, a pilot stated that after landing on a wet runway, the airplane veered to the right and struck a sign. This caused substantial damage to the right wing of the plane. No injuries or fatalities reported.
April 2, 2009	Aviation Accident	A pilot experienced a loss of brake pressure and directional control at Newark Airport. He struck a fence post that resulted in substantial damage to the left wing. No injuries or fatalities reported.
May 31, 2009	Aviation Accident	During a landing in Caldwell, an aircraft drifted to the left side of the runway prior to touchdown which damaged the plane. No injuries or fatalities reported.
December 28, 2009	Highway/Railroad Collision	A truck made a left turn onto Winans Avenue in Irvington and failed to yield for crossing lights following another truck into the crossing. The truck was driving on the wrong side of the road. No injuries or fatalities reported.
April 5, 2010	Aviation Accident	A plane experienced a left engine fan cowl separation during takeoff at Newark Airport. No injuries or fatalities reported.
July 5, 2010	Aviation Accident	At the Essex County Airport, a plane crashed during a landing. The plane was destroyed by impact forces and a post-crash fire. The accident resulted in three fatalities.
January 5, 2011	Highway/Railroad Collision	A trespasser was struck and killed by a westbound train at the Jerome Place crossing in Montclair. The trespasser jumped in front of the train.
January 7, 2011	Highway/Railroad Collision	A highway user struck a tank car at the crossing on Ferry Street in Newark and fled the scene. One injury was reported from this accident.
February 26, 2011	Highway/Railroad Collision	FO52 crew struck a highway user on Tyler Street in Newark that was stopped on the crossing. No injuries or fatalities reported.
March 29, 2011	Highway/Railroad Collision	A train struck a highway user on Tyler Street in Newark that did not stop at the crossing. No injuries or fatalities reported.
September 21, 2011	Highway/Railroad Collision	A vehicle did not stop at the railroad crossing and struck by a train in Newark at Tyler Street and Coastwise. The driver fled the scene. No injuries or fatalities reported.
November 3, 2011	Highway/Railroad Collision	A vehicle failed to stop at the Tyler Street crossing in Newark and was struck by a train. No injuries or fatalities reported.

Table 5.4.17-1 . Transportation Failure Incidents in Essex County, 2007 to 2014

Date	Type	Description
November 10, 2011	Highway/Railroad Collision	A driver of a tractor trailer tried to beat a train across the tracks at the west end of Garden in Newark and was struck by the train. No injuries or fatalities reported.
February 18, 2012	Aviation Accident	A pilot lost directional control during a crosswind landing, which caused the plant to depart to the left of the runway and striking a taxiway sign in Caldwell. No injuries or fatalities reported.
February 22, 2012	Highway/Railroad Collision	A truck struck a train while trying to beat the train at the Export/Tyler Street crossing in Newark. No injuries or fatalities reported.
July 20, 2012	Highway/Railroad Collision	A train struck a tractor trailer at the Wilson Avenue crossing in Newark. No injuries or fatalities reported.
December 28, 2012	Highway/Railroad Collision	A vehicle failed to stop at the Garden Crossing in Newark and was struck by a train. No injuries or fatalities reported.
2013	Railroad Accident	In 2013, there were 130 accidents/incidents in Essex County. Five of those were train accidents; six were highway-rail crossing incidents; and 119 were other incidents.
March 27, 2013	Highway/Railroad Collision	A train struck a vehicle at the Tyler Street crossing in Port Newark. No injuries or fatalities reported.
May 1, 2013	Aviation Accident	Two aircrafts taxiing at Newark Airport struck one another, causing minor damage to the one plane and substantial damage to the other. No injuries or fatalities were reported.
May 13, 2013	Highway/Railroad Collision	A train struck a vehicle at the Doremus Avenue crossing in Newark. No injuries or fatalities reported.
May 18, 2013	Aviation Accident	During landing at Newark Airport, the left main landing gear failed to lower and locked. This caused the airplane to have substantial damage; however, no injuries or fatalities were reported.
June 24, 2013	Highway/Railroad Collision	A truck cut in front of the FO04 at it was crossing a private crossing at the Port Newark Terminal. No injuries or fatalities reported.
July 9, 2013	Highway/Railroad Collision	An unidentified trailer that failed to stop at the conrail crossing in Newark was struck by a train. No injuries or fatalities reported.
August 20, 2013	Highway/Railroad Collision	A train struck a vehicle at the Tyler Street crossing in Newark. No injuries or fatalities reported.
November 14, 2013	Highway/Railroad Collision	A train struck a truck that failed to stop at the Tyler Street crossing in Newark. No injuries or fatalities reported.
January 22, 2014	Highway/Railroad Collision	At the Newark Station, a train struck a truck that was stopped on the tracks. The driver was not in the truck at time of the accident. No injuries or fatalities reported.
January 25, 2014	Highway/Railroad Collision	At Port Newark, FO15 was shoving east on the south side lead when a customer's truck failed to yield on private grade. No injuries or fatalities reported.
February 17, 2014	Aviation Accident	During landing in Caldwell, a plane's nose gear struck a snowbank off of the runway. This caused substantial damage to the

Table 5.4.17-1 . Transportation Failure Incidents in Essex County, 2007 to 2014

Date	Type	Description
		plane. The pilot had minor injuries.
February 27, 2014	Highway/Railroad Collision	At Port Newark, a train struck a truck that tried to get by the train at the crossing. No injuries or fatalities reported.

Source: Federal Railroad Administration 2014, NTSB 2014; NJDOT 2014; Federal Railroad Administration 2014

Probability of Future Occurrences

Transportation hazards are impossible to accurately predict; however, areas prone to these hazards can be located and quantified through analysis of historical records and plotted on a County base map. Certain characteristics that together cause these hazards or increase the vulnerability of these hazards can be outlined and areas that may be prone are identifiable.

In Section 5.3, 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 Planning Committee, the probability of occurrence for transportations hazards in the County is considered 'frequent' (likely to occur within 25 years, as presented in Table 5.3-3).

Climate Change Impacts

Because transportation failure is a human-caused hazard, no climate change impacts are associated with the hazard. See Section 5.4.6 (Flood) for climate change impacts on flooding for flood-vulnerable roadways.

5.4.17.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For transportation failures, the entirety of Essex County has been identified as the hazard area. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County profile, are vulnerable. The following text evaluates and estimates the potential impact of transportation failures on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Change of vulnerability as compared to that presented in the 2008 Essex County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Transportation systems available in Essex County include major highways, local roads, railroads, public transportation, and airports. Hazards associated with transportation can either be created by natural hazards impacting the roadways or rail systems, the material being transported, or created by the transportation medium itself.

There are heavily trafficked roadways (parkways and secondary roads) used by automobiles and trucks through the County; some of which experience frequent flooding. These roads are used by residents, commuters and for transporting all types of materials, including hazardous materials. Hazardous materials in transit include substances or materials determined to be capable of posing an unreasonable risk to health, safety or property when transported. These routes traverse residential neighborhoods, making the nearby residential population and environment vulnerable. A major accident in each of these transportation systems is possible and could impact the County (minimal to severe).

Data and Methodology

For this hazard, data was obtained from Essex County and the Planning Committee.

Impact on Life, Health and Safety

Transit-dependent populations in Essex County include those over 65 and older, disabled, low-income, automobile availability, and unemployment. Persons aged 65 and older are often public transit riders because they are either unable or unwilling to drive. Disabled persons are also another group who depend on public transit. Some disabilities prevent people from driving, making them more dependent on public transit or paratransit. Low-income persons often depend on public transportation because they cannot afford other means of transportation (Essex County Transportation Plan 2008).

Potential losses from transportation hazards include human health and life, property and natural resources. Vehicular accidents, flooded roadways, aviation accidents and accidents involving trains, all may result in injury or death to drivers/passengers on the road, the public in the immediate vicinity and emergency services personnel. The number of people exposed depends on population density, both by day and night, and on the proportions located indoors and outdoors.

Impact on General Building Stock

Potential losses to the general building stock caused by a transportation failure incident are difficult to quantify. The degree of damages depends on the type and scale of incident. Potential losses include inaccessibility, loss of service, and potential structural and content losses of a building.

Impact on Critical Facilities

Many Essex County residents depend on transportation to get to work, bring their children to child care facilities, hospitals and senior centers, and to reach other key destinations (Essex County Transportation Plan 2008). Loss of roadway use and public transportation services would affect thousands of commuters, employment, day-to-day operations within the County, and delivery of critical municipal and emergency services. Disruption of one or more of these modes of transportation can lead to the congestion of another, and not only impact the County but the State and region as a whole. Refer to Section 4 (County Profile) which summarizes the number and type of critical facilities in Essex County.

Impact on Economy

Due to insufficient data, a full loss estimate was not completed for the transportation hazard. Loss of roadway use and public transportation services would affect thousands of commuters, employment, day-to-day operations within the County, and delivery of critical municipal and emergency services. Key economic contributors in Essex County include: Port of Newark/Elizabeth and Newark Liberty International Airport. The Port assists the County's major economic engine and provides living-wage employment. The Airport employs nearly 24,000 people and contributes to $19 billion in economic activity to the metropolitan area. Disruption of one or more of these modes of transportation can lead to the congestion of another, and not only impact the County and region as a whole.

Future Growth and Development

As discussed in Sections 4 and 9, areas targeted for future growth and development have been identified across Essex County. Any areas of growth could be potentially impacted by transportation incidents because the entire County is exposed and vulnerable. An increase in development and population has the ability to increase the likelihood of transportation failure incidents. Future migration to larger jurisdictions may also increase the likelihood of an incident. Please refer to the specific areas of development indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.

Effect of Climate Change on Vulnerability

Because transportation failure is a human-caused hazard, no climate change impacts are associated with the hazard. See Section 5.4.6 (Flood) for climate change impacts on flooding for flood-vulnerable roadways.

Change of Vulnerability

Overall, the County's vulnerability has not changed and the entire County will continue to be exposed and vulnerable to transportation failure incidents.

Additional Data and Next Steps

Based on limited data regarding the probability and potential impact of this hazard, a quantitative loss estimate was not completed for this HMP Update. With time, the County can work with appropriate agencies to collect additional data to support mitigation planning and consideration of potential risks and prioritization of mitigation measures for this hazard.

It is recognized that the County needs to compile and maintain data regarding specific concerns and past losses for this hazard. Such data should include specific information regarding the damage/loss of life/property/infrastructure, and any data on the potential/actual cost and logistics of responding to such an event (i.e., location of road closures, map detours, traffic counts, duration of closures and detours; costs to respond, etc.). This data will be included in future revisions of the HMP and can be used to support future mitigation grant efforts (i.e., benefit cost analyses).

Studying traffic and potential transportation accident patterns could provide information on the vulnerability of specific road segments and nearby populations. By keeping a record of these frequently transported materials, preparatory measures can be made should a release occur.

SECTION 6 MITIGATION STRATEGY

This section presents mitigation actions for Essex County to reduce potential exposure and losses identified as concerns in the Risk Assessment portion of this HMP update. The Planning Committee reviewed the Risk Assessment to identify and develop these mitigation actions, which are presented herein.

This section includes:

1) Background and Past Mitigation Accomplishments
2) General Mitigation Planning Approach
3) Review and Update of Mitigation Goals and Objectives
4) Capability Assessment
5) Mitigation Strategy Development and Update

Hazard mitigation reduces the potential impacts of, and costs associated with, emergency and disaster-related events. Mitigation actions address a range of impacts, including impacts on the population, property, the economy, and the environment.

Mitigation actions can include activities such as: revisions to land-use planning, training and education, and structural and nonstructural safety measures.

2015 Plan Update Changes

- The 2008 HMP mitigation strategy was presented in Section 8. For the 2015 update, the mitigation strategy is presented in Section 6.
- The mission statement and goals were updated and objectives were developed to align with the County and State's current mitigation priorities.
- A Strengths, Weaknesses, Opportunities and Threats (SWOT) exercise was conducted concurrent with the Strategic Recovery Planning Report (Phase I) for Essex County and summarized in this section.
- The 2008 HMP capability assessment section was presented in Section 7. For the 2015 update, the capability assessment was expanded and presented in Section 6, and Volume 2 Section 9.
- The mitigation strategy evaluation and prioritization methodology was updated and expanded.

6.1 Background and Past Mitigation Accomplishments

In accordance with DMA 2000 requirements, a discussion regarding past mitigation activities and an overview of past efforts is provided as a foundation for understanding the mitigation goals, objectives, and activities outlined in this HMP. The County, through previous and ongoing hazard mitigation activities, has demonstrated that it is pro-active in protecting its physical assets and citizens against losses from natural and human-caused hazards. Examples of previous and ongoing actions, projects and capabilities include the following:

- The County facilitated the development of the original Essex County Hazard Mitigation Plan, completed and approved by FEMA in 2008, which included 21 of the 22 municipalities. The current planning process is also being led by the County which includes participation of all 22 municipalities.
- Essex County is currently in the process of preparing a Strategic Recovery Planning Report (SRPR) as part of the New Jersey Department of Community Affairs Post Sandy Planning Assistance Grant Program.
- Essex County Department of Public Works coordinates with the New Jersey Department of Transportation to rehabilitate County-owned bridges. Two of the five bridges identified have been rebuilt to date.
- Essex County performed dam enhancements at the dam in Verona Park.
- Over a three-year period, Essex County Office of Emergency Management (ECOEM) has trained and certified first responders (police, fire, emergency medical and public works), government officials and

the private sector throughout Essex County in such courses as Weapons of Mass Destruction (WMD), Awareness and Operations, HazMat Awareness and Operations, Counter-Terrorism Awareness and Incident Command System (ICS).

- In addition to training, ECOEM has acquired and distributed vast quantities of emergency equipment and protective gear to each of Essex County's 22 municipal governments.
- ECOEM conducts numerous exercises and participates in drills throughout the state. These exercises assist in training and testing the capabilities of county and municipal resources dealing with such events as terrorist attacks, hazardous materials (HazMat) incidents and points of distribution (POD) for medicine, food and water following a possible pandemic incident.
- ECOEM has acquired federal and state funding for a new communications tower to improve connections among local, state and federal agencies and to eliminate communication "dead spots" in Essex County. Portable light towers, generators, communication interoperability switches and evacuation signs have also been acquired and shared with our municipal partners.
- ECOEM also trains volunteers in the municipalities through its Community Emergency Response Team (CERT) and Auxiliary Police Training Programs.
- Municipalities have actively participated in available mitigation grant funding opportunities to implement mitigation projects. Details on these projects are presented in Section 9 of this HMP.
- Municipalities have incorporated hazard mitigation into their daily operations and planning mechanisms. A summary of current and future plan integration activities are presented in Section 7 as well as in each municipality's annex in Section 9 of this HMP.

These past and ongoing activities have contributed to the County's understanding of its hazard preparedness and future mitigation activity needs, costs, and benefits. These efforts provide a foundation for the Planning Committee to use in developing this HMP.

6.2 General Mitigation Planning Approach

The overall approach used to update the County and local hazard mitigation strategies are based on FEMA and State of New Jersey regulations and guidance regarding local mitigation plan development, including:

- DMA 2000 regulations, specifically 44 CFR 201.6 (local mitigation planning)
- FEMA "Local Mitigation Planning Handbook", March 2013
- FEMA "Integrating Hazard Mitigation into Local Planning", March 2013
- Identifying Mitigation Actions and Implementing Strategies (FEMA 386-3)
- FEMA Mitigation Ideas (January 2013)

The mitigation strategy update approach includes the following steps that are further detailed in later sections of this section:

- Review and update mitigation goals and objectives
- Identify mitigation capabilities, and evaluate their capacity and effectiveness to mitigate and manage hazard risk
- Identify progress on previous county and local mitigation strategies
- Develop updated county and local mitigation strategies
- Prepare an implementation strategy, including the prioritization of projects and initiatives in the updated mitigation strategy.

6.3 Review and Update of Mitigation Goals and Objectives

This section documents the efforts to update the guiding principle (mission statement), and hazard mitigation goals and objectives established to reduce or avoid long-term vulnerabilities to the identified hazards.

FEMA defines ***Goals*** as general guidelines that explain what should be achieved. Goals are usually broad, long-term, policy statements, and represent a global vision.

FEMA defines ***Objectives*** as strategies or implementation steps to attain mitigation goals. Unlike goals, objectives are specific and measurable, where feasible.

FEMA defines ***Mitigation Actions*** as specific actions that help to achieve the mitigation goals and objectives.

6.3.1 Mission Statement

Per FEMA guidance (386-1), a mission statement or guiding principle describes the overall duty and purpose of the planning process, and serves to identify the principle message of the plan. It focuses or constrains the range of goals and objectives identified. This is not a goal because it does not describe outcomes. Essex County's mission statement is broad in scope, and provides a direction for the HMP.

During the 2008 Essex County hazard mitigation planning process, the Planning Committee developed a mission statement. As part of the 2015 update process, the Essex County Hazard Mitigation Steering Committee reviewed the mission statement and elected to revise it, as:

Through strategic planning, partnerships and collaboration, identify and reduce the vulnerability to natural and human caused hazards in order to protect the health, safety, quality of life, environment, and economy of all people and all communities within Essex County.

6.3.2 Goals and Objectives

According to CFR 201.6(c)(3)(i): "The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards." For the purposes of this HMP update, goals are defined as follows:

Goals are general guidelines that explain what is to be achieved. They are usually broad, long-term, policy-type statements and represent global visions. Goals help define the benefits that the HMP is trying to achieve. The success of the HMP, once implemented, should be measured by the degree to which its goals have been met (that is, by the actual benefits in terms of hazard mitigation).

The 2008 goals and objectives were reviewed by the Steering Committee in November 2013 in consideration of the hazard events and losses since the 2008 plan, the updated hazard profiles and vulnerability assessment, the goals and objectives established in the updated State HMP, county and local risk management plans, as well as direct input on how the Steering Committee (representing the County and participating municipalities) recognized the need to move forward to best manage their hazard risk. Through facilitated discussion and brainstorming, it was decided to revise all of the HMP goals. In essence, the 2008 goals remain as a part of the 2014 goals and new objectives for the County; however the goals were made more broad and objectives were added (new to this HMP update) to provide a more specific course of action to meet the goals.

The following are the updated goals for the 2014 Essex County HMP update:

1. Protect Life
2. Protect Property
3. Increase public preparedness and awareness
4. Develop and maintain an understanding of risks from hazards
5. Enhance County and local mitigation capabilities to reduce hazard vulnerabilities
6. Support continuity of operations pre-, during, and post- hazard events

Essex County HMP goals are compatible with the needs and goals expressed in other available community planning documents as well as the NJ State HMP. Each goal has a number of corresponding objectives that further define the specific actions or implementation steps. Achievement of these goals will define the effectiveness of a mitigation strategy. The goals also are used to help establish priorities.

New to the Essex County HMP are objectives. For the purposes of this HMP update, objectives are defined as follows:

Objectives are short-term aims which, when combined, form a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

In November 2013 the Steering Committee met to discuss the existing mission statement and goals. At that meeting, objectives were also developed through brainstorming and discussion. The Steering Committee then formally approved at the December 2013 Steering Committee meeting. The objectives were developed by the Steering Committee through its knowledge of the local area, review of past efforts, findings of the risk assessment, qualitative evaluations, and identification of mitigation options. The objectives are used to 1) measure the success of the HMP once implemented, and 2) to help prioritize identified mitigation actions.

Table 6-1 presents Essex County's goals and objectives for their Hazard Mitigation Plan. Although an objective is listed with each goal, the objectives were developed to meet multiple goals as demonstrated in Table 6-2.

Table 6-1. Essex County Hazard Mitigation Plan Goals and Objectives

Goal	Objective
Goal 1: Protect life	1.1: Improve warning and emergency communications systems
	1.2: Reduce the impacts of hazards on people, property and vulnerable populations
	1.3: Strengthen County and local planning, building codes, ordinances and enforcement
Goal 2: Protect property	2.1: Protect critical facilities
	2.2: Reduce repetitive and severe repetitive losses
	2.3: Protect environmental resources that serve a natural hazard mitigation function
	2.4: Encourage cost-effective and environmentally-sound development and land use
Goal 3: Increase public preparedness and awareness	3.1: Improve public awareness of hazards and the risks they pose
	3.2: Improve hazard information data bases and maps and increase accessibility to those resources
	3.3: Enhance stakeholder education and training
Goal 4: Develop and maintain an understanding of risks from hazards	4.1: Review and incorporate updated hazard data into the County Hazard Mitigation Plan and other county and local planning mechanisms
	4.2: Increase support for the development of local mitigation planning and projects
	4.3: Incorporate new State and FEMA guidance, rules and regulations into the Plan
Goal 5: Enhance county and local mitigation capabilities to reduce hazard vulnerabilities	5.1: Monitor the progress of on-going mitigation activities within the county
	5.2: Encourage and support additional related training and education of public officials
	5.3: Encourage the formation of partnerships to leverage and share mitigation resources
	5.4: Integrate the County Hazard Mitigation Plan with other County, regional and local planning initiatives
Goal 6: Support continuity of operations pre-, during and post- hazard events	6.1: Ensure continuity of operations of essential county government services
	6.2: Increase resiliency by facilitating rapid disaster recovery
	6.3: Support and encourage the implementation of alternative energy sources

Table 6-2. Essex County Hazard Mitigation Plan Objectives

Obj. #	Objective Statement	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6
1.1	Improve warning and emergency communications systems	X	X				X
1.2	Reduce the impacts of hazards on people, property and vulnerable populations	X	X				X
1.3	Strengthen County and local planning, building codes, ordinances and enforcement	X	X				
2.1	Protect critical facilities	X	X				
2.2	Reduce repetitive and severe repetitive losses	X	X			X	
2.3	Protect environmental resources that serve a natural hazard mitigation function	X	X				
2.4	Encourage cost-effective and environmentally-sound development and land use		X			X	
3.1	Improve public awareness of hazards and the risks they pose	X	X	X			
3.2	Improve hazard information data bases and maps and increase accessibility to those resources	X	X	X	X	X	X
3.3	Enhance stakeholder education and training			X		X	
4.1	Review and incorporate updated hazard data into the County Hazard Mitigation Plan and other county and local planning mechanisms				X	X	
4.2	Increase support for the development of local mitigation planning and projects		X		X	X	
4.3	Incorporate new State and FEMA guidance, rules and regulations into the Plan		X		X	X	
5.1	Monitor the progress of on-going mitigation activities within the county	X	X		X	X	
5.2	Encourage and support additional related training and education of public officials	X	X			X	
5.3	Encourage the formation of partnerships to leverage and share mitigation resources				X	X	
5.4	Integrate the County Hazard Mitigation Plan with other County, regional and local planning initiatives				X	X	
6.1	Ensure continuity of operations of essential county government services	X				X	X
6.2	Increase resiliency by facilitating rapid disaster recovery	X					X
6.3	Support and encourage the implementation of alternative energy sources						X

6.4 Capability Assessment

According to FEMA 386-3, a capability assessment is an inventory of a community's missions, programs and policies; and an analysis of its capacity to carry them out. This assessment is an integral part of the planning process. The assessment process enables identification, review and analysis of local and state programs, policies, regulations, funding and practices currently in place that may either facilitate or hinder mitigation.

During the original planning process, the 2008 Planning Committee discussed their current capabilities to address potential hazard events.

For the 2014 HMP update, the County and all municipalities identified and assessed their capabilities in the areas of planning and regulatory, administrative and technical, and fiscal. Capability assessment worksheets, modeled after Worksheet 4.1 in the FEMA "Local Mitigation Planning Handbook", were distributed and completed by the County and each municipality. By completing the worksheets, the County and each municipality learned how or whether they would be able to implement certain mitigation actions by determining the following:

- Limitations that may exist on undertaking actions;
- The range of local and/or state administrative, programmatic, regulatory, financial and technical resources available to assist in implementing their mitigation actions;
- Action is currently outside the scope of capabilities;
- Types of mitigation actions that may be technically, legally (regulatory) administratively, politically or fiscally challenging or infeasible;
- Opportunities to enhance local capabilities to support long term mitigation and risk reduction.

During the 2014 HMP update process, all participating jurisdictions were tasked with developing their capability assessment, paying particular attention to evaluating the effectiveness of these capabilities in supporting hazard mitigation, and identifying opportunities to enhance local capabilities.

County and municipal capabilities in the areas of planning and regulatory, administrative and technical, and fiscal may be found in the Capability Assessment section of their jurisdictional annexes in Section 9. Further, within each annex participating jurisdictions have identified how they have integrated hazard risk management into their existing planning, regulatory and operational/administrative framework ("integration capabilities"), and how they intend to promote this integration ("integration actions"). A further summary of these continued efforts to develop and promote a comprehensive and holistic approach to hazard risk management and mitigation is presented in Section 7.

6.4.1 Summary of Plans, Programs, and Resources Available to Support Mitigation

A summary of the various Federal, State, County and local planning and regulatory programs available to promote and support mitigation and risk reduction in Essex County are presented below. The legal and regulatory capability was evaluated by surveying each participating jurisdiction regarding the policies, programs and capabilities in place. These policies, programs and capabilities are described in detail for each jurisdiction in Sections 9.1 through 9.23.

National Flood Insurance Program (NFIP)

The U.S. Congress established the NFIP with the passage of the National Flood Insurance Act of 1968 [FEMA's 2002 National Flood Insurance Program (NFIP): Program Description]. 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.

There are three components to the NFIP: flood insurance, floodplain management and flood hazard mapping. Communities participate in the NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities. Community participation in the NFIP is voluntary. Flood insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. Flood damage in the U.S. is reduced by nearly $1 billion each year through communities implementing sound floodplain management requirements and property owners purchasing flood insurance. Additionally, buildings constructed in compliance with NFIP building standards suffer approximately 80% less damage annually than those not built in compliance (FEMA, 2008).

All jurisdictions in Essex County participate in the NFIP. As of March 31, 2014, there were 4,419 NFIP policyholders in Essex County. There have been 3,642 claims made, totaling over $107 million for damages to structures and contents. There are 304 NFIP Repetitive Loss (RL) properties, and 104 NFIP Severe Repetitive Loss (SRL) properties in the County. Further details on the County's flood vulnerability may be found in the flood hazard profile in Section 5.4.6.

NFIP Community Rating System (CRS)

As an additional component of the NFIP, the Community Rating System (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 (FEMA, 2012).

Currently, three communities in Essex County participate in CRS, specifically the Townships of Bloomfield, Fairfield and Montclair. The Townships of Bloomfield and Montclair are currently identified as "rescinded" with CRS ratings of 10 (no discount). The Township of Fairfield is currently identified as "current" with a CRS rating of 6 [20% discount in the special flood hazard area (SFHA) and 10% in non-SFHA].

Municipalities and the County as a whole could expect significant cost savings on premiums if enrolled in the CRS program. During the 2014 HMP update, several communities are now considering joining the CRS program.

Strategic Recovery Planning Report (SRPR)

The New Jersey Department of Community Affairs (NJDCA) has established a Post Sandy Planning Assistance Grant Program. The purpose of this program is to support long range planning for community redevelopment in the municipalities and counties sustaining damage from Superstorm Sandy.

Essex County is currently in the process of preparing the SRPR. The SRPR has been closely coordinated with the Essex County Hazard Mitigation Plan Update. The spatial analysis conducted for the Hazard Mitigation Plan appears in the SRPR for the flood, storm surge, and sea level rise hazards. In addition, the County mitigation actions are listed in the SRPR as well as the mitigation action types by municipality. A more detailed land use analysis was conducted for the SRPR. For example, an exposure analysis was completed to assess the vulnerability of the residential and non-residential land uses with in the County to flooding. This has been included in the Hazard Mitigation Plan in the appropriate hazard profiles.

Comprehensive Transportation Plan

The County adopted a Complete Streets Policy in 2012 and focused its attention on a Comprehensive Transportation Plan, which was completed in 2013. In 2014 the County obtained a Local Capacity Grant from Together North Jersey to compile a Complete Streets Plan to implement the Policy by integrating Complete Streets recommendations of the Comprehensive Transportation Plan into its land use regulations and design standards.

Capital Improvement Plans

Capital Improvement Plans outline capital spending and investments necessary for public improvements. Many municipalities in Essex County have Capital Improvement Plans. These plans and budgets have been and may continue to be used to fund mitigation projects and demonstrate integration into daily operations. Refer to Section 9.2 through 9.23 for further details.

Land Use Planning Policy

State of New Jersey Municipal Land Use Law L.1975, c. 291, s. 1, eff. Aug. 1, 1976, is the legislative foundation for the land use process, including decisions by Planning Boards and Zoning Boards of Adjustment, in the State of New Jersey. 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.

Every municipal agency shall adopt and may amend reasonable rules and regulations, not inconsistent 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. The Municipal Land Use Law requires that each municipality prepare a comprehensive plan, or master plan, and update that plan every 6 years. All municipalities in Essex County have Master Plans. The Maser Plans were reviewed and consulted when developing the goals and objectives of the HMP update, as well as updating each community's mitigation strategy.

There are opportunities for coordination with the County's Hazard Mitigation Plan recommendations and action items. Integrating mitigation into Master Plans provides another opportunity to reduce future risk. In addition, several municipalities created new mitigation actions to use the County HMP as a guide when updating their Master Plans. Refer to Section 7.2 (Plan Maintenance – Integration of Mitigation Plan Through Existing Programs) and Sections 9.2 through 9.23 for this and other plan integration mitigation actions.

Floodplain Management Policy

New Jersey State Law Flood Hazard Area Control Act (NJSA 58:16A-52): The Act and regulations attempt to minimize damage to life and property from flooding caused by development within fluvial and tidal flood hazard areas, to preserve the quality of surface waters, and to protect the wildlife and vegetation that exist within and depend upon such areas for sustenance and habitat. While it does not require local adoption, as it is enforced by the NJDEP, the floodplain ordinances of each municipality need to be reviewed to be in compliance with this new regulation.

Building Codes Policy

Uniform Construction Code (Uniform Construction Code Act of 1975[UCC]) requires all jurisdictions to have current land use master plans, zoning, and other land development ordinances. 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.

Building codes mandate best practices and technology, much of which is designed to reduce or prevent damage from occurring when structures are under stress. New Jersey State Law requires that all municipalities adopt ordinances that follow the UCC. In January 2013, the State established by emergency rule the best available data from FEMA's latest flood maps, plus one foot of freeboard, as the general rebuilding standard to adapt to changing flood hazard risks and corresponding federal flood insurance rates.

Zoning and subdivision ordinances are useful tools to restrict development in hazard-prone areas. All municipalities indicated through their Capability Assessment that they have zoning and subdivision ordinances.

Growth Management Policy

Land preservation and recreation comprise one of the cornerstones of New Jersey's smart growth policy. The New Jersey Statewide Comprehensive Outdoor 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.

Through the Green Acres Program, Open Space Tax Program, State Development and Redevelopment Plan, and the State Planning Act, New Jersey has enhanced the traditionally limited role of county land use planning and control. The state also provides tools for municipalities when preparing their master plans and better opportunity for a comprehensive approach to planning so not to harm or be in conflict with neighboring municipalities' plans.

The Borough of Roseland and the Township of Verona indicate they address growth management in their Master Plan. The following municipalities indicated they have Growth Management Plans or ordinances in their Capability Assessment Survey: Belleville, Essex Fells, Millburn, and North Caldwell.

Critical Area Protection Policy

Green Acres Program; Blue Acres Program; Historical Preservation Program; Farmland Preservation; Wetlands Act of 1970 (N.J.S.A. 13:9A); Soil and Erosion and Sediment Control Act (N.J.S.A. 4:24); Highlands Water Protection and Planning Act (N.J.S.A. 13:20-1).

These programs provide funding for the State, municipalities, and counties to purchase land for open-space preservation and recreation. The Wetlands Act of 1970 (N.J.S.A. 13:9A) provide rules and regulations governing development in wetland areas of New Jersey. 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. The Highlands Act calls for a prohibition on development on steep slopes defined in the Act.

Several municipalities indicated they have a special purpose ordinance to address steep slopes. Refer to Sections 9.2 through 9.23 for additional details.

Emergency Management Plan

According to State Police Directive 101, each County and municipality shall prepare, adopt and maintain an Emergency Operation Plan that meets the requirements of the State Emergency Operations Plan guidelines and checklist. The plan describes the hazards faced by the jurisdiction as well as the jurisdictions capabilities,

needs, demands and emergency management structure. Essex County and each municipality have an Emergency Operations Plan.

6.4.2 Administrative and Technical Capabilities –Local

Administrative and technical capability to develop and implement mitigation projects, programs and policies was evaluated by surveying each participating jurisdiction regarding their personnel resources and technical knowledge and expertise. These capabilities are not uniform across the County and vary from jurisdiction to jurisdiction. The responses from each municipality are provided in Sections 9.2 through 9.23. An overview of the County's administrative and technical capabilities is presented below.

Essex County Office of Emergency Management

The Essex County Office of Emergency Management (ECOEM) continuously updates the County's Emergency Operation Plan (EOP). The plan is an all-hazard approach to any natural or man-made disaster. Every municipality is also mandated to have an EOP. The plan identifies existing vulnerabilities and incorporates extensive planning in order to mitigate the impact of a disaster on lives, property and other assets prior to, during and in the aftermath of a catastrophic incident. Should a disaster strike Essex County, this planning insures that continuity of government and continuity of operations will continue unimpeded.

Over a three-year period, ECOEM has trained and certified first responders (police, fire, emergency medical and public works), government officials and the private sector throughout Essex County in such courses as Weapons of Mass Destruction (WMD), Awareness and Operations, HazMat Awareness and Operations, Counter-Terrorism Awareness and Incident Command System (ICS). These courses better prepare the responder to deal with almost any type of incident.

In addition to training, ECOEM has acquired and distributed vast quantities of emergency equipment and protective gear to each of Essex County's 22 municipal governments.

ECOEM conducts numerous exercises and participates in drills throughout the state. These exercises assist in training and test the capabilities in dealing with such events as possible terrorist attacks, hazardous materials (HazMat) incidents and a point of distribution (POD) for medicine, food and water following a possible pandemic incident.

ECOEM has acquired federal and state funding for a new communications tower to improve connections among local, state and federal agencies and to eliminate communication "dead spots" in Essex County. Portable light towers, generators, communication interoperability switches and evacuation signs have also been acquired and shared with our municipal partners.

ECOEM also trains volunteers in the municipalities through its Community Emergency Response Team (CERT) and Auxiliary Police Training Programs.

Essex County Department of Public Works

The Essex County Department of Public Works maintains public infrastructure, and ensures a healthy, safe and natural environment. They are committed to providing efficient and effective high quality customer service to the citizens and visitors of Essex County. The Department consists of six divisions responsible for a variety of activities. These range from the construction and maintenance of roads and highways in the unincorporated areas of the county, to the management of the region's public facilities.

Essex County Department of Public Works – Division of Planning

The Division of Planning operates under the auspices of the Department of Public Works. 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. The Division of Planning includes the operations of the Essex County Planning Board, Essex County Construction Board of Appeals, and the Essex County Transportation Advisory Board. The Division of Planning is leading the County SRPR discussed earlier in this section.

Essex County Utilities Authority

The Essex County Utilities Authority (ECUA) is responsible for developing and managing the County's solid waste disposal system. This includes managing an up-to-date list of approved Solid Waste and Recycling Facilities operating within the County.

The Solid Waste Management Plan (SWMP) is the agenda-setting document for the County. It is based upon the rules and regulations set forth in New Jersey's Statewide Solid Waste Management Plan. Essex County's SWMP was updated in 2006 to reflect a renewed commitment to recycling as a solid waste solution.

As such, the County's goal is to increase the enforcement of recycling requirements in commercial establishments and multi-family housing developments in order to increase the County recycling rate to the 50% municipal solid waste (MSW) level mandated by the State of New Jersey.

By making these commitments, Essex County is relying upon its residents and each of the 22 municipal recycling coordinators to increase the level of recycle materials and lower the amount of materials that end up in the landfill.

The ECUA provides training programs for the recycling coordinators and will continue the pioneering efforts of Household Hazardous Waste (HHW) and Computer & Electronics collection and recycling days for all residents.

Economic Development Corporation of Essex County

The Economic Development Corporation of Essex County is a private, not for profit corporation established to promote economic development in the county and provide technical and financial assistance to existing and start-up businesses.

6.4.3 Administrative and Technical Capabilities – State and Regional

Local mitigation is further supported by county, regional, state and federal administrative and technical capabilities, including the following state and regional programs.

New Jersey State Police – Office of Emergency Management (NJOEM)

The Governor of New Jersey has the overall responsibility for Emergency Management activities in the State. The Superintendent of the New Jersey State Police is the State Director of the New Jersey Office of Emergency Management (NJOEM). On behalf of the Governor, all activities and departments are coordinated, directed, and controlled from the NJOEM, Emergency Operations Center.

The State Director of Emergency Management supervises, directs, and appoints deputies and/or assistants to control the daily activities of NJOEM. The function and staffing of NJOEM is with the approval of the Attorney General. The State Hazard Mitigation Officer is the representative of State government acting as the primary point of contact with FEMA, other federal agencies, and county and local units of government in the

planning and implementation of pre- and post-disaster mitigation programs and activities required under the Stafford Act. Currently, the New Jersey State Hazard Mitigation Officer is Acting Sergeant First Class Michael Gallagher of NJOEM.

Recovery Bureau

The Chief of the Recovery Bureau supervises the Mitigation, Public Assistance, and Finance Units. The Mitigation Unit undertakes hazard mitigation planning and the review of mitigation projects in advance of potential disasters, and is also activated during and immediately after disasters to evaluate existing and proposed mitigation measures in the affected areas.

The Public Assistance Unit accepts and reviews applications for funds for emergency work submitted by local individuals, households, and businesses, as well as from local governments during and immediately after a disaster. The 2013 reorganization of the Bureau added a dedicated Finance Unit to support the fiscal functions of both the Public Assistance and Mitigation Units. The Finance Unit ensures timely reimbursements and fiduciary responsibility.

Mitigation Unit

The Mitigation Unit, within the Emergency Management Section, has the mission of enhancing State, county, and municipal risk reduction through the development and implementation of mitigation strategies. Hazard mitigation, by definition, is any sustained action that prevents or reduces the loss of property or human life from recurring hazards. The Mitigation Unit accomplishes this task by implementing and administering several grant-based programs in conjunction with FEMA.

Preparedness Bureau

The Preparedness Unit in the Preparedness Bureau is responsible for disseminating preparedness information in advance of a disaster or potential disaster. The Preparedness Unit maintains an extensive library of natural disaster preparedness and recovery information on its Family and Community Emergency Preparedness website, accessible at www.nj.gov/njoem or www.njsp.org/njoem. The disaster preparedness and recovery information featured prominently on the New Jersey State Police and NJOEM website home pages is a critical part of New Jersey's efforts to protect public health and safety and to minimize loss of life and property in the event of a disaster.

Hazard Mitigation Administrative Plan

In the event that an active disaster declaration has necessitated a FEMA-approved HMGP Administrative Plan, the plan is reviewed to ensure compliance with the prevailing guidance and to set forth the administrative procedures, organization, and requirements for administering the HMGP in New Jersey. The HMGP Administrative Plan details the process for prioritizing post-disaster mitigation funding of local mitigation projects.

Governor's Office of Recovery and Rebuilding

A number of federal and State programs support hazard mitigation in New Jersey. The Governor's Office of Recovery and Rebuilding (GORR) was established to lead the recovery efforts after Superstorm Sandy. The GORR taps the institutional knowledge and bandwidth of New Jersey state agencies in recovering from Superstorm Sandy. The working group structure developed by Governor Christie's recovery team is designed to complement the federal long-term recovery structure, allowing the State to efficiently identify federal resources and coordinate New Jersey's recovery.

New Jersey Department of Environmental Protection

Bureau of Dam Safety & Flood Control

The Bureau of Dam Safety & Flood Control leads the State's efforts as the State NFIP Coordinator and Community Rating System (CRS) support. In addition, the section's responsibilities include the funding of construction and operation of federal-state-local flood control mitigation projects throughout the state. The section has also taken a lead role on the development and adoption of NJ Flood Hazard Area mapping, as well as an active partnership with FEMA on their FEMA Map Modernization Program efforts. The Bureau provides assistance to communities participating in the NFIP and interested in joining CRS thru the NJDEP Community Assistance Program Unit.

Division of Water Supply and Geoscience

The Division of Water Supply and Geoscience (Water Supply) works to ensure 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. In addition, Water Supply staff act in a support role during an emergency situation to provide technical assistance, as needed to re-establish safe and adequate public water supplies.

Water Supply staff provides technical assistance to assist water systems during water supply emergencies and to address routine non-compliance from significant deficiencies or poor water quality test results. The Drinking Water State Revolving Fund (DWSRF) program assists water systems in financing the cost of infrastructure through the use of federal and New Jersey Infrastructure Trust funds. Additionally, Water Supply provides operator licensing and training support as well as financial assistance through the DWSRF program.

Water Resource Management

The Water Pollution Management Element is responsible for protecting New Jersey's surface and ground waters from pollution caused by improperly treated wastewater and its residuals. This is accomplished primarily through the implementation of the New Jersey Pollutant Discharge Elimination System (NJPDES) permit program. This includes publicly owned treatment facilities (e.g. sanitary sewerage plants) and privately owned facilities (e.g. industrial facilities) as well as facilities that discharge stormwater (e.g. municipalities and highway agencies) and stormwater related to development. The NJPDES program also regulates discharges to ground water (e.g. septic systems) and the proper management of any residuals that are generated as part of the treatment process. The varied ownership of infrastructure components is often a complicating factor in the regulation of these entities (e.g. ownership of a treatment facility by a public entity and sewer mains by a different municipal entity). The total universe of NJPDES permits includes over 7500 permits. The Programs engineering and environmental specialist staff provide technical assistance in the development, interpretation and implementation of permit conditions.

Through their Capability Assessment, all municipalities indicated they have stormwater management ordinances. Numerous new mitigation actions were identified to address stormwater and drainage. Refer to Sections 9.1 through 9.23 for further details.

New Jersey Coastal Management Program

The New Jersey Shore Protection Program was created to provide for the protection of life and property along the coastline, to preserve vital coastal resources, and to maintain safe and navigable waterways throughout

New Jersey. The Bureau of Coastal Engineering, which operates under the Office of Engineering and Construction within the New Jersey Department of Environmental Protection's (NJDEP) Natural and Historic Resources Group, is responsible for administering beach nourishment, shore protection, and coastal dredging throughout the State. The Bureau also maintains the State's aid to navigation; provides 24-hour operation of the Raritan Bayshore Floodgate; and conducts storm surveys, damage assessments, and emergency repairs for coastal storms that impact New Jersey (NJDEP 2012a).

The New Jersey Coastal Management Program (CMP), an extension of the NJDEP, is the lead for issues related to coastal erosion across the State. The CMP's mission is to ensure that coastal resources and ecosystems are maintained and to enhance the sustainability of coastal communities in the State. The CMP's central component is the Coastal Management Office. The Coastal Management Office is part of the Commissioner's Office of Policy and administers the planning and enhancement measures of the CMP. The Office is responsible for developing long-term projects related to coastal sustainability. The Office also advises the CMP on related policies and works with municipal, state, and federal partners on coastal erosion projects and grant funding opportunities (NJDEP 2012b).

In addition to the activities of the CMP, the NJDEP's Bureau Coastal Engineering also plays a role in the prevention of and response to coastal erosion. The Bureau of Engineering, in cooperation with the U.S. Army Corps of Engineers (USACE) provides beach nourishment and re-nourishment projects along the New Jersey Coastline. Beach nourishment involves replacing sand that has been eroded from natural sediment movement or as a result of a storm (NJDEP 2012b).

In order to ensure the prompt and coordinated acquisition of easements or other interests in real property necessary to facilitate the timely completion of a comprehensive system of Flood Hazard Risk Reduction Measures, as directed by the Governor under Executive Order (EO) 140, the NJDEP Commissioner established the Office of Flood Hazard Risk Reduction Measures ("the Office"). The Office is headed by a director, appointed by the NJDEP Commissioner. The Office is a single State entity responsible for the rapid acquisition of property vital to the post-Sandy reconstruction efforts. The Office will lead and coordinate the efforts of the NJDEP to acquire the necessary interests in real property to undertake Flood Hazard Risk Reduction Measures and shall perform such other duties as the NJDEP Commissioner may from time-to-time prescribe. No municipality, county or other agency or political subdivision shall enact or enforce any order, rule, regulation, ordinance, or resolution which will or might in any way conflict with any of the provisions of EO 140.

New Jersey Geological and Water Survey

Evaluates geologic, hydrogeologic and water quality data to manage and protect water resources, to identify natural hazards and contaminants, and to provide mineral resources including offshore sands for beach nourishment. Information provided by the survey includes GIS data and maps of geology, topography, groundwater and aquifer recharge. In addition the data tracks 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. Equivalent of three work days is available to counties and/or municipalities upon written or electronic request to the State Geologist.

New Jersey Department of the State - Office of Planning Advocacy (OPA) – Business Action Center

Supports and coordinates planning throughout NJ to protect the environment, mitigate development hazards and guide future growth into compact, mixed use development and redevelopment while fostering a robust long-term economy. The Office implements the goals of the State Development and Redevelopment Plan to

achieve comprehensive, long term planning; and integrates that planning with programmatic and regulatory land use decisions at all levels of government and the private sector.

Rutgers University

Office of the New Jersey's State Climatologist

The ONJSC generates and archives climate data. Generated data are from the NJ Weather and Climate Network (NJWxNet), an assemblage of 55 automated weather stations situated throughout NJ. A decade or more of hourly observations are available from some of the stations, while others have shorter records. Since fall 2012 observations are available on a five-minute basis.

Along with these records, ONJSC archives or has ready access to National Weather Service (NWS) Cooperative Weather Station data. These are daily observations from several dozen stations at any given time over the past century plus. Individual stations have as many as 120 years of data; others have come and gone since the late 19th century. Another source of generated data is the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS), which includes daily observations of rain and snow from as many as several hundred volunteers throughout NJ.

New Jersey Climate Adaptation Alliance

The New Jersey Climate Adaptation Alliance was formed in response to a diverse group of stakeholders who came together on November 29, 2011 at Rutgers University to participate in the conference "Preparing NJ for Climate Change: A Workshop for Decision-Makers".

The Alliance focuses on climate change preparedness for New Jersey in key impact sectors (public health; watersheds, rivers and coastal communities; built infrastructure; agriculture; and natural resources) through:

- Conducting outreach and education of the general public and targeted sectoral leaders;
- Developing recommendations for state and local actions through collaboration with policymakers at the state, federal and local levels;
- Undertaking demonstration and pilot projects in partnership with the private sector, local governments, non-governmental organizations, and others;
- Identifying science, research and data needs; and
- Developing capacity for implementation of preparedness measures and documentation of best practices (Rutgers University 2014).

NJADAPT is a collaborative effort of scientists and data managers in academia, government, the private sector and NGO community who have developed a strategic plan for a New Jersey platform to host and apply climate science impacts and data. NJADAPT includes a flood exposure profile for community discussions about hazard impacts; NJ Flood Mapper which is a tool for flooding hazards and sea level rise; and Getting to Resilience, a tool used to help communities reduce vulnerability and increase preparedness. NJADAPT can be accessed at http://www.njadapt.org/

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers has been working with NJDEP to mitigate flooding in Essex County.

Rahway River Basin

Since 1999 NJDEP has been working with the U.S. Army Corps of Engineers to identify solutions to flooding from the Rahway River Basin which impacts portions of Essex County. The Rahway River Basin Flood Risk Management Feasibility Study was released to the public in March 2014 with mitigation alternatives identified. At the time of this HMP update, the alternatives are still being discussed.

Passaic River Basin

The U.S. Army Corps of Engineers and the New Jersey Department of Environmental Protection are partnered to carry out the Passaic River Basin General Re-evaluation Study to determine the best flood risk management alternative to help communities throughout the Passaic River Basin. The re-evaluation is one of the 15 recommendations made by New Jersey Governor Chris Christie's Passaic River Flood Advisory Commission. The study was kicked off in June 2012 by the signing of a Feasibility Cost-Sharing Agreement (FCSA) between the Corps of Engineers and the New Jersey Department of Environmental Protection. At the time of this HMP update, the Passaic River Basin Flood Risk Management General Re-evaluation Study Preliminary Alternative Analysis Report has been completed and is now available to the public.

Joseph G. Minish Passaic River Waterfront Park and Historic Area

The Joseph G. Minish Passaic River Waterfront Park and Historic Area is located along the west bank of the Passaic River between Bridge and Brill Streets in the City of Newark. This reach of the River is eroded, deteriorated, and environmentally degraded due to past commercial and industrial use and flooding (USACE 2014). The project is comprised of three phases:

- Phase I – 6,000 linear feet of new bulkhead, 3,200 linear feet of restored riverbank, and creation of wetlands
- Phase II – 9,200 foot waterfront walkway
- Phase III - park facilities, plaza, and landscaping (USACE 2014)

The project will reduce erosion and provide environmental restoration, recreation, and economic development benefits. The final Design Memorandum and Environmental Assessment were completed in May 1996. The Project Cooperation Agreement (PCA) for Phase I was executed with the NJDEP in May 1999. The first construction contract for the bulkhead at Center Street was completed in September 2000. A second construction contract for the bulkhead from Center Street to Penn Station was completed in March 2003. The third construction contract for the steel bulkhead from Jersey Street to Jackson Street and site clearing of the wetlands restoration site was completed in June 2006. The fourth construction contract was awarded in January 2008 to construct the concrete cap on the steel bulkhead from Jersey Street to Jackson Street which was completed in November 2010. Design of the next construction contract was being worked on for bulkhead work from Lombardy Street to past Rector Street when the project area was struck by Hurricane Sandy. A limited re-evaluation report is being undertaken with funds received under the P.L. 113-2, The Disaster Relief Appropriations Act, 2013. The draft is expected by the end of the year (USACE 2014).

Peckman River Basin, New Jersey

The Peckman River Basin is located in Essex and Passaic Counties. The Peckman River is a tributary to the Passaic River and originates in the Township of West Orange and flows northeasterly through Verona, Cedar Grove, and Little Falls to its confluence with the Passaic River in West Paterson. Extensive development in this Basin has resulted in damages from flooding and ecosystem degradation. The Peckman River Basin experiences frequent flooding from intense thunderstorms and heavy rain events. These storms can deposit large amounts of precipitation in the watershed, producing significant runoff, which quickly surpasses the

capacity of the river channel, and bridge and culvert openings. Significant degradation of the ecology of the Basin has occurred as a result of extensive erosion at specific locations along the Peckman River. The development of the watershed has reduced the water-holding capacity of the landscape and altered the natural flow dynamics within the river system. As a result, the habitat suitability and ecological complexity of the River have been moderately impaired (USACE 2014).

A favorable reconnaissance report was completed in July 2001. The report recommended a feasibility study to develop alternatives for flood damage reduction and ecosystem restoration in the Peckman River Basin. On March 14, 2002, a Feasibility Cost Sharing Agreement was executed between the USACE and the NJDEP. A draft feasibility report is expected to be completed by July 2015 (USACE 2014).

6.4.4 Fiscal Capabilities

Mitigation project and initiative development and implementation are largely or entirely dependent on available funding. The ability of the County and municipalities to fund mitigation projects was also evaluated by surveying each participating jurisdiction. In addition, the financial resources used in the past and currently available were also captured. The responses from each jurisdiction are provided in Sections 9.1 through 9.23.

In summary, Essex County has been able to fund mitigation projects though existing local budgets, local appropriations (including referendums and bonding), and through a myriad of Federal and State loan and grant programs. All plan participants will continue to pursue Federal and State financial resources to fund mitigation projects in the future. Funding programs and resources were provided as part of the March 2014 mitigation strategy workshops to assist the participants in identifying available funding sources. An overview of federal and state mitigation funding resources is presented below. Additional funding resources may be found in the 2014 State of New Jersey Hazard Mitigation Plan.

Federal Hazard Mitigation Funding Opportunities

Federal mitigation grant funding is available to all communities with a current hazard mitigation plan (this plan); however most of these grants require a “local share” in the range of 10-25% of the total grant amount. The FEMA mitigation grant programs are described below.

Hazard Mitigation Grant Program (HMGP)

The HMGP is a post-disaster mitigation program. It is made available to states by FEMA after each Federal disaster declaration. The HMGP can provide up to 75% funding for hazard mitigation measures. The HMGP can be used to fund cost-effective projects that will protect public or private property in an area covered by a federal disaster declaration or that will reduce the likely damage from future disasters. Examples of projects include acquisition and demolition of structures in hazard prone areas, flood-proofing or elevation to reduce future damage, minor structural improvements and development of state or local standards. Projects must fit into an overall mitigation strategy for the area identified as part of a local planning effort. All applicants must have a FEMA-approved Hazard Mitigation Plan (this plan).

Applicants who are eligible for the HMGP are state and local governments, certain nonprofit organizations or institutions that perform essential government services, and Indian tribes and authorized tribal organizations. Individuals or homeowners cannot apply directly for the HMGP; a local government must apply on their behalf. NJOEM serves as the grantee and program administrator for HMGP.

Flood Mitigation Assistance (FMA) Program

The FMA combines the previous Repetitive Flood Claims and Severe Repetitive Loss Grants into one grant program. The FMA provides funding to assist states and communities in implementing measures to reduce or

eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. The FMA is funded annually; no federal disaster declaration is required. Only NFIP insured homes and businesses are eligible for mitigation in this program. Funding for FMA is very limited and, as with the HMGP, individuals cannot apply directly for the program. Applications must come from local governments or other eligible organizations. The federal cost share for an FMA project is 75%. At least 25% of the total eligible costs must be provided by a non-federal source. Of this 25%, no more than half can be provided as in-kind contributions from third parties. At minimum, a FEMA-approved local flood mitigation plan is required before a project can be approved. The FMA funds are distributed from FEMA to the State. NJOEM serves as the grantee and program administrator for FMA.

Pre-Disaster Mitigation (PDM) Program

The PDM program is an annually funded, nationwide, competitive grant program. No disaster declaration is required. Federal funds will cover 75% of a project's cost up to $3 million. As with the HMGP and FMA, a FEMA-approved local Hazard Mitigation Plan is required to be approved for funding under the PDM program.

Federal and State Disaster and Recovery Assistance Programs

Following a disaster, various types of assistance may be made available by local, state and federal governments. The types and levels of disaster assistance depend on the severity of the damage and the declarations that result from the disaster event. Among the general types of assistance that may be provided should the President of the United States declare the event a major disaster are the following:

Individual Assistance (IA)

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 may 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 may borrow up to $200,000 to repair or replace real estate, $40,000 to cover losses to personal property and an additional 20% for mitigation. For businesses, loans may 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, private universities, etc. are also eligible. An Economic Injury Disaster Loan provides necessary working capital until normal operations resume after a physical disaster. These loans are restricted, by law, to small businesses only.

Public Assistance (PA)

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.

Small-Business Administration (SBA) Loans

Small Business Administration (SBA) provides low-interest disaster loans to homeowners, renters, business 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 may apply for up to $200,000 to replace or repair their primary residence. Renters and homeowners may borrow up to $40,000 to replace or repair personal property-such as clothing, furniture, cars,

and appliances – damaged or destroyed in a disaster. Physical disaster loans of up to $2 million are available to qualified businesses or most private nonprofit organizations.

Department of Homeland Security

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. The FY 2013 HSGP supports core capabilities across the five mission area of Prevention, Protection, Mitigation, Response, and Recovery based on allowable cost. HSGP is comprised of three interconnected grant programs including the State Homeland Security Program (SHSP), Urban Areas Security Initiative (UASI), and the Operation Stonegarden (OPSG). Together, these grant programs fund a range of preparedness activities, including planning, organization, equipment purchase, training, exercises, and management and administration.

Community Development Block Grants (CDBG)

CDBG are federal funds intended to provide low and moderate-income households with viable communities, including decent housing, as 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, planning, and administration. Public improvements may 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 may 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.

Community Development Block Grants (CDBG)-DR

The National Disaster Resilience Competition will make $1 billion available to communities that have been struck by natural disasters in recent years. The competition will promote risk assessment and planning and will fund the implementation of innovative resilience projects to better prepare communities for future storms and other extreme events. Funding for the competition is from the Community Development Block Grant disaster recovery (CDBG-DR) appropriation provided by the Disaster Relief Appropriations Act, 2013 (PL 113-2).

Federal Highway Administration - Emergency Relief

The Federal Highway Administration Emergency Relief is a grant program that may be used for repair or reconstruction of Federal-aid highways and roads on Federal lands which have suffered serious damage as a result of a disaster.

Federal Transit Administration - Emergency Relief

The Federal Transit Authority 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. Department of Transportation and directly allocated to MTA and Port Authority. This transportation-specific fund was created as an alternative to FEMA PA.

Homeownership Repair and Rebuilding Fund

The Homeownership Repair and Rebuilding Fund provides grants of up to an additional $10,000 to eligible homeowners who have already qualified for FEMA housing assistance's maximum grant ($31,900) and will not receive other assistance from private insurance or government agencies that would duplicate the grant's funding.

U.S. Economic Development Administration

The U.S. Economic Development Administration (USEDA) is an agency of the U.S. Department of Commerce that supports regional economic development in communities around the country. It provides funding to support comprehensive planning and makes strategic investments that foster employment creation and attract private investment in economically distressed areas of the United States. Through its Public Works Program USEDA invests in key public infrastructure, such as in traditional public works projects, including water and sewer systems improvements, expansion of port and harbor facilities, brownfields, multitenant manufacturing and other facilities, business and industrial parks, business incubator facilities, redevelopment technology-based facilities, telecommunications and development facilities. Through its Economic Adjustment Program, USEDA administers its Revolving Loan Fund (RLF) Program, which supplies small businesses and entrepreneurs with the gap financing needed to start or expand their business, in areas that have experienced or are under threat of serious structural damage to the underlying economic base.

New Jersey Environmental Infrastructure Trust

The New Jersey Environmental Infrastructure Trust (NJEIT) is an independent State financing authority that provides low-interest rate loans to qualified borrowers in New Jersey for water quality and infrastructure projects. The NJEIT, partnering with NJDEP, offers short-term financing (bridge loans) and long-term disaster-recovery loan assistance.

New Jersey Economic Development Authority

The New Jersey Economic Development Authority (NJEDA) is an independent State agency that provides tax incentives to foster development and employment growth and retention, financing for small and mid-sized businesses, revitalizes communities through redevelopment initiatives, and supports entrepreneurial development by providing access to training and mentoring programs. With its large portfolio of some 30 varied programs and services, NJEDA can assist businesses, non-profits and developers to access capital, including tax-exempt and taxable bond financing, loans, loan guarantees, and business and tax incentives.

New Jersey Redevelopment Authority

The New Jersey Redevelopment Authority (NJRA) is an independent State financing authority committed exclusively to the redevelopment of New Jersey's urban areas. NJRA offers several financing resources including site acquisition funding, predevelopment assistance, several development assistance resources and technical assistance.

New Jersey Housing and Mortgage Finance Agency

The New Jersey Housing and Mortgage Finance Agency (NJHMFA) is an independent State financing authority that provides affordable home ownership and housing opportunities for New Jersey residents by funding affordable home mortgages for first-time home buyers, promoting construction and rehabilitation of rental housing, and encouraging mixed-income owner-occupied housing growth. HMFA provides low-interest financing and administers Low Income Housing Tax Credits for the State of New Jersey's low and moderate income communities.

New Jersey Department of Community Affairs

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. DCA 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-DR funding recipient for the State of New Jersey.

New Jersey Green Acres Program

Today, New Jersey has the largest preservation program in the nation for a geographic area of this size. It is financed with Garden State Preservation Trust funds through three partnering agencies:1) the Green Acres Program, a division of the Department of Environmental Protection to preserve natural lands and recreational parks; 2) the Farmland Preservation Program administered by the independent State Agriculture Development Committee to acquire the development rights on privately owned farmland; and 3) Historic Preservation Program administered by the independent New Jersey Historic Trust to provide matching grants to save important historic buildings. The Green Acres Program acquisition funds are used for the acquisition of repetitive loss and severe repetitive loss structures.

6.5 Mitigation Strategy Development and Update

As required by FEMA, the County and participating municipalities completed a comprehensive evaluation of the mitigation strategies and actions from the 2008 HMP and reported on the status of each. Their update may be found in each jurisdictional annex (Section 9). In addition, the County and participating municipalities were provided the opportunity to include new strategies or actions to include in the 2014 HMP Update. New actions were prioritized to ensure they are cost-effective, environmentally sound, and technically feasible using the methodology outlined below.

6.5.1 Strengths, Weaknesses, Opportunities, and Threats (SWOT)

As part of the SRPR planning process that took place concurrent with the County HMP update, an evaluation of the County's strengths, weaknesses, obstacles and opportunities was conducted. The details of this evaluation may be found in the SRPR however the following summarizes the major findings.

Strengths

- Home of New Jersey's largest city, Newark, which hosts one of the largest port facilities in the United States, as well as the international airport (Newark Liberty) in New Jersey.
- Essex County is rich in educational resources, with many of its municipalities hosting colleges or universities
- Essex County is a major transportation hub for the region.

Weaknesses

- Most of the County's road network leads to downtown Newark. However portions of the downtown and most of the City's industrial areas around the port and Newark Liberty International Airport are now in a flood hazard area.
- Along with the transportation and shipping infrastructure being vulnerable to storm events such as Sandy, the rail and power infrastructure is also vulnerable in its concentration in areas that are now considered flood hazard areas.

Opportunities

- Improved stormwater management in flood prone areas
- Provide redundant power sources

- Strategic replacement of street trees damaged by Sandy to avoid conflict with overhead wires
- Incorporation of new criteria for sites proposed for County facilities that avoids flood prone areas or requires suitable resilient design techniques.
- Incorporation of new criteria for prioritizing improvements to County and State roads, bridges, transit and freight facilities to emphasize evacuation routes and minimize exposure of rail rolling stock to flood damage.

Threats

- Bridge infrastructure is aging
- Regional facilities vulnerable to flooding and storm surge
- Additional 'threats' are fully captured in Section 5 of this HMP under the Vulnerability Assessments for each hazard of concern.

As a whole, plan participants were aware of the County's strengths and weaknesses. Plan participants reviewed the results of the vulnerability assessment and considered historic losses as well as potential future losses when developing their mitigation strategy discussed below. For further details on municipal mitigation actions, please refer to Volume II, Section 9.

6.5.2 Update of Municipal Mitigation Strategies

To evaluate progress on local mitigation actions, each municipality with actions in previous DMA 2000 or related plans, including those who participated in the 2008 FEMA-approved Essex County HMP, was provided with a Mitigation Action Plan Review Worksheet. Each worksheet was pre-populated with those actions identified for their jurisdiction in the prior HMP. For each action, municipalities were asked to indicate the status of each action ("No Progress/Unknown," "In Progress/Not Yet Complete," "Continuous," "Completed," "Discontinued"), and provide review comments on each. Municipalities were requested to quantify the extent of progress, and provide reasons for the level progress or why actions were discontinued. Each jurisdictional annex provides a table identifying their prior mitigation strategy, the status of those actions and initiatives, and their disposition within their updated strategy.

Local mitigation actions identified as "Complete", and those actions identified as "Discontinued," have been removed from the updated strategies. Those local actions that municipalities identified as "No Progress/Unknown," "In Progress/Not Yet Complete," as well as certain actions/initiatives identified as "Continuous," have been carried forward in their local updated mitigation strategies. Municipalities were asked to provide further details on these projects to help better define the projects, identify benefits and costs, and improve implementation.

Certain continuous or ongoing strategies represent programs that are, or since the 2008 plan have become, fully integrated into the normal operational and administrative framework of the community. Such programs and initiatives have been identified within the Capabilities section of each annex, and removed from the updated mitigation strategy.

In March 2014, the County and contract consultant held three days of Mitigation Action Workshops. The goals of these workshops were to 1) evaluate progress on previously identified mitigation actions from the 2008 HMP; 2) review and evaluate a comprehensive range of mitigation strategies for consideration; 3) provide the tools and guide the municipalities on identifying and prioritizing selected mitigation actions and 4) discuss integration of mitigation activities into daily operations. All municipalities attended these small-scale workshops which began the development of their jurisdictional annexes.

All participating municipalities were provided capture tools ("Mitigation Action Worksheet") to further assist in assessing the risk, evaluating potential actions/projects (qualitative alternatives analysis), and identifying actions for implementation.

The County and municipalities identified projects that have been submitted to NJOEM for grant funding, including projects for which Letters of Intent (LOI) and grant applications have been submitted under the Hurricane Sandy Hazard Mitigation Grant Program. In general, LOI/application-based projects submitted directly by the communities are identified within their updated mitigation strategies. Communities may also have included other LOI/application-based projects submitted by special-purpose districts (e.g. fire or school districts), local utilities, and hospitals and health care entities.

From March to August 2014, members of the Planning Committee and the planning consultant worked directly with each community (phone, email, local support meetings) to assist with the development and update of their annex and include mitigation strategies, focusing on identifying well-defined, implementable projects with a careful consideration of benefits (risk reduction, losses avoided), costs, and possible funding sources (including mitigation grant programs).

As new additional potential mitigation actions, projects or initiatives became evident during the plan update process, including as part of the risk assessment update and as identified through the public and stakeholder outreach process (see Section 3), communities were made aware of these either through direct communication (local meetings, email, phone) or via their draft municipal annexes.

To help support the selection of an appropriate, risk-based mitigation strategy, each annex provides a summary of hazard vulnerabilities identified during the plan update process, either directly by municipal representatives, through review of available county and local plans and reports, and through the hazard profiling and vulnerability assessment process.

Concerted efforts were made to assure that municipalities develop updated mitigation strategies that included activities and initiatives covering the range of mitigation action types described in recent FEMA planning guidance (FEMA "Local Mitigation Planning Handbook" March 2013), specifically:

- ***Local Plans and Regulations*** - These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.
- ***Structure and Infrastructure Projects*** - These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.
- ***Natural Systems Protection*** **-** These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.
- ***Education and Awareness Programs*** **-** These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as the National Flood Insurance Program and Community Rating System, StormReady (NOAA) and Firewise (NFPA) Communities.

In consideration of federal and state mitigation guidance, the Planning Committee recognized that all municipalities would benefit from the inclusion of certain mitigation initiatives. These include initiatives to address vulnerable public and private properties, including RL and SRL properties; initiatives to support continued and enhanced participation in the NFIP; improved public education and awareness programs; and initiatives to support countywide and regional efforts to build greater local mitigation capabilities.

During June 2014, a second mitigation strategy workshop conducted by the planning consultant and NJOEM was held for all participating jurisdictions to support the identification, evaluation and prioritization of local mitigation strategies, as well as how to present and document this process within the plan. The following significant modifications to the mitigation strategy identification, update and documentation process were made:

- An overarching effort has been made to better focus local mitigation strategies to clearly defined, readily actionable projects and initiatives that meet the definition or characteristics of mitigation.
- Per NJOEM's advice, broadly defined mitigation objectives were maintained if the community felt it were appropriate to ensure eligibility in the future. For example, if a community has numerous repetitive loss properties however specific projects/property-owner interest is not solidified at this time, a general action was maintained to ensure future eligibility.
- Certain continuous or ongoing strategies that represent programs that are, or since the 2008 plan have become, fully integrated into the normal operational and administrative framework of the community have been identified within the Capabilities section of each annex, and removed from the updated mitigation strategy.
- Where applicable, mitigation projects have been documented with an Action Worksheet, based on FEMA's Action Worksheet templates and within recent guidance documents. These Action Worksheets and Prioritization tables appear at the end of each jurisdiction's annex.

Overall a comprehensive-range of specific mitigation initiatives were considered by each plan participant to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected. Table 6-3 lists the common mitigation actions identified across a majority of the communities.

Table 6-3. Comprehensive Range of Mitigation Actions

Municipality	Acquisitions & Elevations	Drainage / Stormwater	Education & Awareness	Continuity of Operations/ Critical Facility Support	Natural Systems Protection	Structure & Infrastructure	Local Plans & Regulations
Belleville, Township of	X	X	X	X	X	X	X
Bloomfield, Township of	X	X	X	X	X	X	X
Caldwell, Borough of		X	X	X	X		X
Cedar Grove, Township of			X	X			
East Orange, City of		X	X	X	X		X
Essex Fells, Borough of	X		X	X	X		
Fairfield, Township of	X		X	X		X	X
Glen Ridge, Borough of	X		X	X		X	X
Irvington, Township of	X	X		X	X	X	
Livingston, Township of	X	X	X	X	X	X	X
Maplewood, Township of	X	X		X	X	X	X
Millburn, Township of	X	X	X	X	X	X	X
Montclair, Township of	X	X	X	X	X	X	X
Newark, City of	X	X	X	X	X	X	X
North Caldwell, Borough of	X	X		X		X	X
Nutley, Township of	X	X	X	X	X	X	X
Orange Township, City of	X			X		X	X
Roseland, Borough of	X	X		X	X	X	X
South Orange Village, Township of	X	X	X	X	X	X	X
Verona, Township of	X	X		X		X	X
West Caldwell, Township of	X		X	X	X	X	
West Orange, Township of	X	X	X	X	X	X	X

6.5.3 Update of County Mitigation Strategies

The update of the county-level mitigation strategies was very similar to the municipal update. It included a review of progress on the actions/initiatives identified in the 2008 HMP, using a process similar to that used to review municipal mitigation strategy progress. The County, through their various department representatives, was provided with a Mitigation Action Plan Review Worksheet identifying all of the county-level actions/initiatives from the 2008 plan. For each action, relevant county representatives were asked to indicate the status of each action ("No Progress/Unknown," "In Progress/Not Yet Complete," "Continuous," "Completed," "Discontinued"), and provide review comments on each.

Projects/initiatives identified as "Complete," as well as though actions identified as "Discontinued," have been removed from this HMP update. Those actions the county has identified as "No Progress/Unknown," "In Progress/Not Yet Complete," or "Continuous" have been carried forward in the County's updated mitigation strategy.

Throughout the course of the HMP update process, additional regional and county-level mitigation actions have been identified. These were identified through:

- Review of the results and findings of the updated risk assessment;
- Review of the findings of the SWOT
- Review of available regional and county plans, reports and studies;
- Direct input from county departments, including:
    - ECOEM
    - Sheriff Department
    - Department of Public Works
    - Division of Planning
    - Division of Roads and Bridges
- Public and stakeholder input

6.5.4 Mitigation Strategy Evaluation and Prioritization

Section 201.c.3.iii of 44 CFR requires an action plan describing how the actions identified will be prioritized. Recent FEMA planning guidance (March 2013) identifies a modified STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) mitigation action evaluation methodology that uses a set of 10 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 particular mitigation action.

Based on this guidance, the Steering and Planning Committees have developed and applied an action evaluation and prioritization methodology which includes an expanded set of 14 criteria to include the consideration of cost-effectiveness, availability of funding, anticipated timeline, and if the action addresses multiple hazards.

The 14 evaluation/prioritization criteria used in the 2015 update process are:

1) Life Safety – How effective will the action be at protecting lives and preventing injuries?
2) Property Protection – How significant will the action be at eliminating or reducing damage to structures and infrastructure?
3) Cost-Effectiveness – Are the costs to implement the project or initiative commensurate with the benefits achieved?

4) Technical – Is the mitigation action technically feasible? Is it a long-term solution? Eliminate actions that, from a technical standpoint, will not meet the goals.
5) Political – Is there overall public support for the mitigation action? Is there the political will to support it?
6) Legal – Does the municipality have the authority to implement the action?
7) Fiscal - Can the project 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?
8) Environmental – What are the potential environmental impacts of the action? Will it comply with environmental regulations?
9) Social – Will the proposed action adversely affect one segment of the population? Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?
10) Administrative – Does the jurisdiction have the personnel and administrative capabilities to implement the action and maintain it or will outside help be necessary?
11) Multi-hazard – Does the action reduce the risk to multiple hazards?
12) Timeline - Can the action be completed in less than 5 years (within our planning horizon)?
13) Local Champion – Is there a strong advocate for the action or project among the jurisdiction's staff, governing body, or committees that will support the action's implementation?
14) Other Local Objectives – Does the action advance other local objectives, such as capital improvements, economic development, environmental quality, or open space preservation? Does it support the policies of other plans and programs?

Participating jurisdictions were asked to use these criteria to assist them in evaluating and prioritizing all mitigation actions identified in the 2015 update (previously identified actions that were carried forward and new mitigation actions). Specifically, for each mitigation action, the jurisdictions were asked to assign a numeric rank (-1, 0, or 1) for each of the 14 evaluation criteria, defined as follows:

- 1 = Highly effective or feasible
- 0 = Neutral
- -1 = Ineffective or not feasible

Further, jurisdictions were asked to provide a brief summary of the rationale behind the numeric rankings assigned, as applicable. The numerical results of this exercise were then used by each jurisdiction to help prioritize the action or strategy as "Low", "Medium," or "High." While this provided a consistent, systematic methodology to support the evaluation and prioritization of mitigation actions, jurisdictions may have additional considerations that could influence their overall prioritization of mitigation actions.

For the 2014 HMP update there has been an effort to develop more clearly defined and action-oriented mitigation strategies. These local strategies include projects and initiatives that have been well-vetted, and are seen by the community as the most effective approaches to advance their local mitigation goals and objectives within their capabilities. As such, many of the initiatives in the updated mitigation strategy were ranked as "High" or "Medium" priority, as reflective of the community's clear intent to implement, available resources not-withstanding. In general, initiatives that would have had "low" priority rankings were appropriately screened out during the local action evaluation process.

6.5.5 Benefit/Cost Review

Section 201.6.c.3iii of 44CFR requires the prioritization of the action plan to emphasize the extent to which benefits are maximized according to a cost/benefit review of the proposed projects and their associated costs. Stated otherwise, cost-effectiveness is one of the criteria that must be applied during the evaluation and prioritization of all actions comprising the overall mitigation strategy.

The benefit/cost review applied in for the evaluation and prioritization of projects and initiatives in this HMP update process was qualitative; that is, it does not include the level of detail required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) grant program. For all actions identified in the local strategies, jurisdictions have identified both the costs and benefits associated with project, action or initiative.

Costs are the total cost for the action or project, and may include administrative costs, construction costs (including engineering, design and permitting), and maintenance costs.

Benefits are the savings from losses avoided attributed to the implementation of the project, and may include life-safety, structure and infrastructure damages, loss of service or function, and economic and environmental damage and losses.

When available, jurisdictions were asked to identify the actual or estimated dollar value for project costs and associated benefits. Having defined costs and benefits allows a direct comparison of benefits versus costs, and a quantitative evaluation of project cost-effectiveness. Often, however, numerical costs and/or benefits have not been identified, or may be impossible to quantitatively assess.

For the purposes of this planning process, jurisdictions were tasked with evaluating project cost-effectiveness with both costs and benefits assigned to "High", "Medium" and "Low" ratings. Where quantitative estimates of costs and benefits were available, ratings/ranges were defined as:

- Low = < $10,000
- Medium = $10,000 to $100,000
- High = > $100,000

Where quantitative estimates of costs and/or benefits were not available, qualitative ratings using the following definitions were used:

Table 6-4. Qualitative Cost and Benefit Ratings

Costs	
High	Existing funding levels are not adequate to cover the costs of the proposed project, and implementation would require an increase in revenue through an alternative source (e.g., bonds, grants, and fee increases).
Medium	The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
Low	The project could be funded under the existing budget. The project is part of or can be part of an existing, ongoing program.
Benefits	
High	Project will have an immediate impact on the reduction of risk exposure to life and property.
Medium	Project will have a long-term impact on the reduction of risk exposure to life and property or will provide an immediate reduction in the risk exposure to property.
Low	Long-term benefits of the project are difficult to quantify in the short term.

Using this approach, projects with positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) are considered cost-beneficial and are prioritized accordingly.

For some of the Essex County initiatives identified, the Planning Committee may seek financial assistance under FEMA's HMGP or Hazard Mitigation Assistance (HMA) programs. These programs require detailed benefit/cost analysis as part of the application process. These analyses will be performed when funding applications are prepared, using the FEMA BCA model process. The Planning Committee is committed to implementing mitigation strategies with benefits that exceed costs. For projects not seeking financial assistance from grant programs that require this sort of analysis, the Planning Committee reserves the right to define "benefits" according to parameters that meet its needs and the goals and objectives of this HMP.

Section 7. Plan Maintenance Procedures

This section describes the system that Essex County and all participating jurisdictions have established to monitor, evaluate, and update the mitigation plan; implement the mitigation plan through existing programs; and solicit continued public involvement for plan maintenance.

2015 Plan Update Changes

- The 2008 HMP 'Plan Maintenance Procedures' was presented in Section 9. For the 2015 HMP update, it is presented in Section 7.

7.1 Monitoring, Evaluating, and Updating the Plan

The procedures for monitoring, evaluating, and updating the plan are provided below.

The Essex County Sheriff's Department, Office of Emergency Management will remain the County's Hazard Mitigation Coordinator, to provide leadership and continuity for plan maintenance to ensure the over-arching, long term goals of the plan are addressed.

Each participating jurisdiction will maintain a representative on the Planning Committee who shall fulfill the monitoring, evaluation and updating responsibilities identified in this Section. Table 7-1 identifies the representation of the Planning Committee as of the date of this plan as indicated in each of the annexes in Section 9. It is recognized that individual commitments change over time, and it shall be the responsibility of each jurisdiction and its representatives to inform the HMP Coordinator of any changes in representation. The HMP Coordinator will strive to keep the committee makeup as a uniform representation of planning partners and stakeholders within the planning area.

Table 7-1. Mitigation Planning Committee

Organization	Name	Title	POC	Alternate POC
Essex County	Edward Esposito	Lieutenant, Essex County Sheriff's Office, Office of Emergency Management	X	
	Sanjeev Varghese	Public Works Director and County Engineer		X
Township of Belleville	George Pedalino	OEM Coordinator	X	
	Tom Herits	Town Engineer		X
Township of Bloomfield	Fred Menzel	OEM Coordinator	X	X
	Paul Lasek	Township Engineer		
Borough of Caldwell	Paul M. Carelli	Borough Administrator	X	
	Anthony Grenci	OEM Coordinator		X
Township of Cedar Grove	Jeffrey McElroy	OEM Coordinator/PO	X	
	John D'Ascensio	Deputy Emergency Management Coordinator		X
City of East Orange	R.David Williams	OEM Coordinator	X	
	Samrah Jones	EOFD		X
Borough of Essex Fells	Donald Allen	Dep. Coordinator/Lt	X	
	John Schmunk	Sergeant		X
Township of	William Smith	OEM Coordinator	X	

Organization	Name	Title	POC	Alternate POC
Fairfield	Lawrence Gonnallo	Engineer		X
Borough of Glen Ridge	Michael J. Rohal, P.E., P.P	Borough Administrator/Engineer	X	
	Michael Zichelli, AICP, P.P.	Deputy Administrator/Director of Planning		X
Township of Irvington	DC Randy Wuest	Deputy Fire Chief	X	
	Gary Shumlich	Fire Chief		X
Township of Livingston	Chief Craig Handschuch	Police Chief/OEM Coordinator	X	
	Chief Christopher Mullin	Fire Chief/Dep.OEM Coordinator		X
Township of Maplewood	Joseph Manning	Business Administrator-Administration	X	
	Michael Dingelstedt	Fire Chief/Fire Department		X
Township of Millburn	Robert Echavarria	Battalion Fire Chief	X	
	Michael Roberts	Fire Chief, Deputy OEM Coordinator		X
Township of Montclair	Kimberli Craft, P.E.	Township Engineer/Community Services	X	
	Tom Diveny	Deputy Chief/Fire Dept.		X
City of Newark	Mehdi Mohammadish	Director of Engineering Dept.	X	
	Andrea Adebowale	Acting Director of Water & Sewer Dept.		X
Borough of North Caldwell	John D'Ascensio	OEM Coordinator	X	
	Frank Zichelli	Engineer/Engineering DPW		X
Township of Nutley	Salvatore Ferraro	Engineering/Department of Public Works	X	
	Thomas Nicolette	OEM Coordinator		X
City of Orange Township	John Wade	Deputy OEM Coordinator	X	
	Raymond Wingfield	OEM Coordinator		X
Borough of Roseland	John Matheis	OEM Coordinator	X	
	Gary Schall	Supt. Public Works		X
Township of South Orange Village	Alex Torpey	Village President	X	
	Adam D.Loehner	Deputy Village Administrator		X
Township of Verona	Jeff Hayes	Director OEM, IT & Admin	X	
	Dough Huber	Police Chief, Deputy OEM		X
Township of West Caldwell	Larry Peter	Emergency Management	X	
	John Medina	Emergency Management		X
Township of West Orange	Fire Chief Peter F.Smeraldo, Jr.	OEM Coordinator	X	
	Deputy Chief Paul Wannemacher	Deputy OEM Coordinator		X

Notes: POC = Point of Contact

7.1.1 Monitoring

The Planning Committee shall be responsible for monitoring progress on, and evaluating the effectiveness of, the HMP, and documenting annual progress. Each year, beginning one year after plan development, County and local Planning Committee representatives will collect and process information from the departments, agencies and organizations involved in implementing mitigation projects or activities identified in their jurisdictional annexes (Volume II, Section 9) of this HMP, by contacting persons responsible for initiating and/or overseeing the mitigation projects.

To standardize and facilitate collection of progress data and information on specific mitigation actions, the Essex County OEM will develop a progress matrix that will be distributed to the Planning Committee members prior to the scheduled annual Planning Committee meeting. FEMA guidance worksheets and the progress matrix are provided in Appendix F. This information shall be provided to the HMP Coordinator prior to the annual Planning Committee meeting to be held approximately one year from the date of local adoption of this update, and successively thereafter.

The information that Planning Committee representatives shall be expected to document, as needed and appropriate include:

- Any grant applications filed on behalf of any of the participating jurisdictions
- Hazard events and losses occurring in their jurisdiction,
- Progress on the implementation of mitigation actions, including efforts to obtain outside funding,
- Obstacles or impediments to implementation of actions,
- Additional mitigation actions believed to be appropriate and feasible,
- Public and stakeholder input.

7.1.2 Evaluating

The evaluation of the HMP is an assessment of whether the planning process and actions have been effective, if the HMP goals are being reached, and whether changes are needed. The HMP will be evaluated on an annual basis to determine the effectiveness of the programs, and to reflect changes that may affect mitigation priorities or available funding.

The status of the HMP will be discussed and documented at an annual plan review meeting of the Planning Committee, to be held approximately one year from the date of local adoption of this update, and successively thereafter. At least two weeks before the annual plan review meeting, the HMP Coordinator will advise Planning Committee members of the meeting date, agenda and expectations of the members.

The HMP Coordinator will be responsible for calling and coordinating the annual plan review meeting, and assessing progress toward meeting plan goals and objectives. These evaluations will assess whether:

- Goals and objectives address current and expected conditions.
- The nature or magnitude of the risks has changed.
- Current resources are appropriate for implementing the HMP and if different or additional resources are now available.
- Actions were cost effective.
- Schedules and budgets are feasible.
- Implementation problems, such as technical, political, legal or coordination issues with other agencies are presents.
- Outcomes have occurred as expected.
- Changes in County or municipal resources impacted plan implementation (e.g., funding, personnel, and equipment)
- New agencies/departments/staff should be included, including other local governments as defined under 44 CFR 201.6.

Specifically, the Planning Committee will review the mitigation goals, objectives, and activities using performance based indicators, including:

- New agencies/departments
- Project completion
- Under/over spending
- Achievement of the goals and objectives
- Resource allocation
- Timeframes
- Budgets
- Lead/support agency commitment
- Resources
- Feasibility

Finally, the Planning Committee will evaluate, support and complement how other programs and policies have conflicted or augmented planned or implemented measures, and shall identify policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions (see the "Implementation of Mitigation Plan through Existing Programs" subsection later in this Section). Other plans, programs and policies can include those that address:

- Economic Development
- Environmental Preservation
- Historic Preservation
- Redevelopment
- Health and/or safety
- Parks and Recreation
- Land use/zoning
- Public Education and Outreach
- Transportation
- Redevelopment Plans (e.g., Brownfields)

The Planning Committee may refer to the evaluation forms, Worksheets #2 and #4 in the FEMA 386-4 guidance document, to assist in the evaluation process (Appendix F).

The HMP Coordinator shall be responsible for preparing an Annual HMP Progress Report, based on the provided local annual progress reports from each participant, information presented at the annual Planning Committee meeting, and other information as appropriate and relevant. These annual reports will provide data for the 5-year update of this HMP and will assist in pinpointing implementation challenges. By monitoring the implementation of the HMP on an annual basis, the Planning Committee will be able to assess which projects are completed, which are no longer feasible, and what projects may require additional funding.

This report shall apply to all planning partners, and as such, shall be developed according to an agreed format and with adequate allowance for input and comment of each planning partner prior to completion and submission to the State Hazard Mitigation Officer. Each planning partner will be responsible for providing this report to its governing body for their review. During the annual Planning Committee meeting, the planning partners shall establish a schedule for the draft development, review, comment, amendment and submission of the Annual HMP Progress Report to NJOEM.

The Annual HMP Progress Report shall be posted on the Essex County Sheriff Hazard Mitigation Plan website (http://hmp.essexsheriff.com/) to keep the public apprised of the plan's implementation. For communities who may choose to join or recertify themselves in the NFIP Community Rating System (CRS) program, this report will also be provided to each CRS participating community in order to meet annual CRS recertification requirements. To meet this recertification timeline, the Planning Committee will strive to complete the review process and prepare an Annual HMP Progress Report by the end of the month in which the plan is approved by FEMA.

7.1.3 Updating

44 CFR 201.6.d.3 requires that local hazard mitigation plans be reviewed, revised as appropriate, and resubmitted for approval in order to remain eligible for benefits awarded under DMA 2000. It is the intent of the Essex County HMP Planning Committee to update this plan on a five-year cycle from the date of initial plan adoption.

To facilitate the update process, the HMP Coordinator, with support of the Planning Committee, shall use the second annual Planning Committe meeting to develop and commence the implementation of a detailed plan update program. The HMP Coordinator shall invite representatives from NJOEM to this meeting to provide guidance on HMP update procedures. This program shall, at a minimum, establish who shall be responsible for managing and completing the HMP update effort, what needs to be included in the updated HMP, and a detailed timeline with milestones to assure that the update is completed according to regulatory requirements.

At this meeting, the Planning Committee shall determine what resources will be needed to complete the update including applying for funding to support the update. The HMP Coordinator shall be responsible for assuring that needed resources are secured.

Following each five-year update of the mitigation plan, the updated plan will be distributed for public comment. After all comments are addressed, the HMP will be revised and distributed to all planning group members and the New Jersey State Hazard Mitigation Officer.

7.2 Implementation of Mitigation Plan Through Existing Programs

Participating jurisdictions have provided a detailed listing of related programs, through which mitigation planning may be implemented, in the local capability assessments provided in each jurisdictional annex (Volume II, Section 9).

It is the intention of the Planning Committee and participating jurisdictions to incorporate mitigation planning as an integral component of daily government operations. Planning Committee members will work with local government officials to integrate the newly adopted hazard mitigation goals and actions into the general operations of government and partner organizations. Further, the sample adoption resolution (Appendix A) includes a resolution item stating the intent of the local governing body to incorporate mitigation planning as an integral component of government and partner operations. By doing so, the Planning Committee anticipates that:

1. Hazard mitigation planning will be formally recognized as an integral part of overall emergency management efforts;
2. The Hazard Mitigation Plan and Comprehensive and Emergency Management Plans will become mutually supportive documents that work in concert to meet the goals and needs of County residents; and
3. Duplication of effort can be minimized.

The information on hazard, risk, vulnerability and mitigation contained in this HMP is based on the best science and technology available at the time of the HMP's preparation. It is recognized by all participating jurisdictions that this information can be invaluable in making decisions under other planning programs, such as comprehensive, capital improvement, and emergency management plans. Table 7-2 below provides a summary of where participating jurisdictions have incorporated hazard mitigation into their existing processes and programs.

During the annual plan evaluation process, the Planning Committee will identify additional policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions, and include these findings and recommendations in the Annual HMP Progress Report.

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
Essex County	According to the Department of Public Works, future capital improvement projects will be evaluated to determine if they meet hazard mitigation goals and objectives. When developing upcoming transportation improvement programs, hazard mitigation actions will be funded as budget allows. The Essex County Department of Public Works, under which the Division of Planning, Engineering, Buildings and Grounds, Roads and Bridges and Environmental Affairs resides, participated in the SRPR. As a part of the SRPR, the following planning initiatives were identified which have also been included in the County's mitigation strategy (Refer to Table 9.1-7 actions Essex-26 to 31). 1. Pursue Sandy Recovery Planning Assistance Grant from the NJDCA. 2. Post Disaster Recovery Capital Improvement Plan - Develop a five year plan for capital projects directly linked to recovery, mitigation or preparedness. 3. Community Resiliency Element – Update the County Master Plan with a Community Resiliency Element that reviews the Land Use Plan Element and development standards against the vulnerability issues outlined in this SRPR and adopt as a Master Plan Element. 4. Update Land Development Regulations - Review zoning and land use regulations against the vulnerability issues outlined in this SRPR and develop amendments to anticipate necessary changes to height, bulk and setback requirements needed to improve resiliency based on recommendations in the Community Resiliency Element. 5. Neighborhood Plans- Develop specific strategic plans for neighborhoods most severely impacted by Sandy, including the "Island" neighborhood in the Ironbound and impacted neighborhoods in Fairfield Township. 6. Permit Process- Quality Improvement - Review existing permitting procedures to determine improvements for fast-tracking/streamlining for expediting projects directly related to recovery or mitigation and that are consistent with adopted Design Standards. 7. Design Standards (integrating elevated structures into community design character) - Develop design standards to address the visual impact of mitigation measures such as elevating bulkheads, elevating buildings on foundations or pilings, etc. Such design standards might include requirements for skirting exposed pilings, parking under the lowest habitable floor, using exterior decking to stagger stairways to elevated first floor levels, etc. 8. The long term impacts of future sea level rise should be projected and studied for Newark Bay and the tidal portions of the Passaic River.
Belleville (T)	**Stormwater:** The Township currently has a stormwater management ordinance. The Township's ordinances and flood protection measures are available on their website. **Master Plan:** The 2009 Township of Belleville Master Plan is the legal roadmap to planning for appropriate and safe land development. The following goals are relevant to hazard mitigation: • To enable environmental quality to be addressed in all pending developments by applying strict performance standards to all pending developments according to the site plan ordinance. • To encourage storm water management controls for all new developments. The HMP will be used as a guide to include hazard mitigation for the next Master Plan update (new mitigation action Belleville-12).
Bloomfield (T)	**Master Plan (2012):** According to the Township's Master Plan in November 2001 the Township approved a dedicated open space

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
	tax of one cent per hundred dollars assessed value to provide a steady source of funding to acquire property or easements in the Township for the purposes of recreation, passive recreation and water quality protection. The Open Space Trust Fund Committee was created in 2003. In 2004, the Open Space Trust Fund Committee in partnership with the Morris Land Conservancy compiled an Open Space and Recreation Plan (OSRP) to serve as a guide for the acquisition and maintenance of land for open space and recreational purposes, and increase the Township's resident's quality of life and maintain Bloomfield as a desirable community. One of the goals is to 'identify and protect flood hazard areas, especially steep slope areas, to reduce flooding damage and streambank erosion. The Township has identified the following mitigation actions that align with the goals of the OSRP. For further details refer to Table 9.3-12 and the mitigation action worksheets: • Bloomfield-6: Acquire properties along the west bank of the Third River on Lion Gate Drive • Bloomfield-8: Bank stabilization of the Second and Third Rivers and WigWam Brook The Township is currently updating its Master Plan and mitigation ideas are currently being discussed. **Ordinances:** The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Bloomfield website at http://www.bloomfieldtwpnj.com for further information. **Outreach:** The Township's website includes an emergency management page with information on personal disaster kids; alerts and information from PSE&G regarding upcoming storm events and potential interruption of service; and tips. The website also has a web link to NJ-Alert which is a service that provides state-wide email alerts on weather and more. **Funding:** As indicated in Section 9.3, mitigation projects will be considered as part of the capital improvement budget.
Caldwell (B)	**Day to Day Operations/Outreach:** On the Borough's official website, their main page informs the public that they have implemented a new Emergency Notification system to notify residents of updates and emergencies and how to sign up. The Caldwell Police have a Facebook page as a way to communicate and update residents. **Planning:** The Borough receives drinking water from sources within the Highlands Region. In accordance with Resolution No. 2-60 adopted February 19, 2013, the Borough strongly supports the goals, policies and objectives of the 2004 Highlands Water Protection and Planning Act and the Highlands Regional Master Plan. The Borough will continue to integrate mitigation into their operations.
Cedar Grove (T)	**Plans:** Currently the Township has a stormwater management plan and a stormwater management ordinance. **Outreach:** The Township participates in on the West Paterson-Cedar Grove-Little Falls Passaic Valley Flood Control Board in an effort to manage the surface water of the Passaic River and the Peckman River basins. On the Township's website is information on how to sign up for Nixle Alert System to stay informed on public safety and community information. The Township has identified a new mitigation action to develop and implement an enhanced all-hazards, public outreach

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
	/ education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. Refer to mitigation action Cedar Grove-2 in Section 9.5, Table 9.5-10. The Township established an Environmental Commission for the protection, development or use of natural resources, including water resources, within the Township. **Ordinances/Permitting:** The Township has their ordinances and flood protection measures available on their website. During the permit review process, the Township considers hazards such as flood hazard zones and has hazard-resistant construction materials in their projects. Please visit the Township of Cedar Grove website at http://www.cedargrovenj.org/site for further information.
East Orange (C)	**Master Plan:** The City's Master Plan considers hazard areas as part of the Land Use Element. A goal of the Master Plan is to 'Promote sound land use planning in areas where flooding occurs by limiting impervious cover, providing best management practices, and stormwater management controls.' One of the Land Use and Zoning objectives of the City's Master Plan is 'To improve range, quality and cost-effectiveness of community services and facilities.' To assist with achieving this goal, the City identified critical facilities that are in need of backup power to ensure continuity of operations: Fire Stations 2, 3, 5 and the City Garage. These actions are listed in Table 9.6-10. One of the Community Facilities, Recreation and Open Space objectives identified is to address flooding issues through routine maintenance and upgrading of the stormwater system. The City has identified a new mitigation action (East Orange-7) to evaluate stormwater capacity City wide and develop mitigation actions to address flooding issues. Refer to Table 9.6-10. As part of the City's Element X – Action Plan in their Comprehensive Master Plan, the City identifies the following actions: • Incorporate Stormwater Management Plan recommendations for best management practices and zoning revisions as part of any zoning ordinance revision. • Address flooding in Ward 5 The City has their ordinances and flood protection measures available on their website. Please visit the City of East Orange website at http://www.eastorange-nj.gov for further information.
Essex Fells (B)	**Day-to-Day Operations:** The Borough maintains a Twitter account to update residents on events. The Borough of Essex Fells recognized the need for flood plain management and, in April 1977, a preliminary ordinance was adopted at a Planning Board meeting. This ordinance defines the flood hazard area as specified on the Special Flood Hazard Area Map prepared by FEMA. Chapter 141: Flood Damage Prevention was adopted by the Mayor and Council of the Borough of Essex Fells, December 18, 1979, by Ordinance No. 79-455 (Ch. 15.16 of the 1992 Code) and amended in its entirety June 5, 2007, by Ordinance No. 2007-829 (FEMA FIS 2014). In July 2013, the Planning Board initiated Master Plan updates, which include incorporating the current environmental and stormwater management elements into the Master Plan (FEMA FIS 2014). **Ordinances:** The Borough has their ordinances and flood protection measures available on their website. Please visit the Borough of

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
	Essex Fells website at http://www.essexfellsboro.com for further information. The Borough will continue to integrate mitigation into their operations.
Fairfield (T)	**CRS:** The Township is a participant in CRS and is currently a class rating 6. **Public Outreach:** On the Township's website there is a link to Swift911, a notification system so residents may receive important information from the Town during times of natural hazard events. **Flood Mitigation:** With approximately 70% of property and structures in the Township of Fairfield located in SHFAs the community encourages residents to explore flood protection measures such as drainage maintenance and improvements, wet and dry flood proofing and elevating (FEMA FIS 2014). **Ordinances:** The Township ordinance restricts construction in floodplain areas in accordance with FEMA's land-use regulation requirements (FEMA FIS 2014). The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Fairfield website at http://www.fairfieldnj.org/index.html for further information **Community Resilience:** The Township will establish a community resilience committee/advisor. In addition, the Township will work with the local school district and assist with identifying joint mitigation projects. Please refer to Section 9.8, Table 9.8-11 which summarizes the proposed mitigation actions for this update.
Glen Ridge (B)	**Master Plan:** The Borough of Glen Ridge has a Comprehensive Master Plan which is the legal roadmap to planning for appropriate and safe land development. One of their general planning objectives is 'To secure safety from fire, flood, panic and other natural and manmade disasters.' The hazard mitigation plan will be used to guide the addition of hazard information for inclusion in the next Master Plan update. Refer to new action Glen Ridge-11 in Section 9.9. **Ordinances:** The Borough has their ordinances and flood protection measures available on their website. Please visit the Borough of Glen Ridge website at http://www.glenridgenj.org/index.html for further information (FEMA FIS 2014). **Municipal Budget:** The Borough will pursue adding mitigation project funding to their municipal/operating budget. **Community Resilience:** The Borough would like to establish a community resilience committee/advisor. **Outreach:** In terms of outreach, the Borough would like to increase their outreach to include the following: 1) Conduct outreach on hazards, 2) Provide/attend training on grant application preparation; and 3) reach out to colleges/universities for technical assistance with natural hazard mitigation activities.
Irvington (T)	**Outreach:** In accordance with the Township's Flood Control Commission (Chapter 17), the municipal council agrees to participate in the creation and operations of the Elizabeth River Flood Control Commission. **Planning:** The Township's Stream Corridor Management Plan, Capital Improvement Plan, Water Management Plan and Economic Development Plans are under development. According to the Township, their Continuity of Operations (COOP) Plan integrates

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
	hazard mitigation. The Township is essentially fully developed so that development activities are, for the most part, limited to infill development and the Township's planning and land use mechanisms operate in a more efficient manner than the County Hazard Mitigation Plan. The regulatory horizon that the Township is faced with, such as Stormwater Act requirements, flood zone regulations, and assorted associated mandatory state regulatory actions, impose a much larger burden upon the Township than the County Hazard Mitigation Plan. **Capital Improvement:** In the past, the Township has funded mitigation projects through their capital improvement budget. In an effort to further enhance the integration of hazard mitigation into their day-to-day operations, the Township will include a line-time in their capital improvement budget for mitigation projects. The Township has their ordinances and flood protection measures available on their website.
Livingston (T)	**Special Purpose Ordinances:** It is the intention of this municipality to incorporate mitigation planning as an integral component of daily municipal operations. Currently, the Township has the following special purpose ordinances: • Riparian zone protection • Steep slope protection • Log surface drainage permit According to the preliminary 2014 FEMA FIS, the Township of Livingston established regulations to prevent flooding problems along the Passaic River. The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Livingston website at http://www.livingstonnj.org for further information (FEMA FIS 2014). **Master Plan:** The Township's 2011 Master Plan is their legal roadmap to planning for appropriate and safe land development. Their objectives include the following which contain hazard mitigation components: • To secure safety from fire, flood and other natural or man-made disasters. • To promote the conservation of open space through the protection of forests, woodlands, wetlands, floodplains, marsh and aquifer recharge areas, stream corridors, steep slopes and valuable natural resources; to prevent degradation of the environment through improper use of land; and, to prevent negative environmental impact upon property adjacent to property being developed. To prevent negatively impacting properties adjacent to rivers/streams, the Township proposes to conduct regular stream clearing and restoration to reduce flooding and streambank erosion that is impacting private residents. Refer to Section 9.11, new mitigation action Livingston-2. These meets the Master Plan objective noted above. In addition, the general recommendations for change in the Land Use Element includes rezoning a site located in the flood hazard area

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
	of the Passaic River and preserving the wetland and flood hazard areas as open space. **Stormwater:** In an effort to reduce stormwater runoff and stormwater flooding, the Township will evaluate all new development to reduce stormwater runoff. In addition, the Township will develop and implement an easement and culvert cleaning plan. Refer to their new mitigation actions Livingston-7 and Livingston-8 in Section 9.11.
Maplewood (T)	**Master Plan:** The Township has a Master Plan which is the legal roadmap to planning for appropriate and safe land development. According to their Master Plan, the Township is at the forefront on municipal sustainability efforts and community green initiatives. Maplewood was one of the first municipalities in the State to receive 'Sustainable Jersey' certification. A number of other local plans and studies have also been completed that consider hazard mitigation: • Maplewood Climate Initiative Action Plan (June 2007) • Drainage/Flood Mitigation Improvements Study for four study areas (February 2009) • Rahway River Corridor Study (June 2010) A Rahway River Basin Flood Risk Management Feasibility Study is currently in progress being led by the U.S. Army Corps of Engineers. The U.S. Army Corps of Engineers is partnering with the New Jersey State Department of Environmental Protection to identify various flood risk management alternatives for communities along the Rahway River Basin, with a specific emphasis on the cities of Rahway and Cranford. The alternatives are currently undergoing economic analysis, comparing the amount of risk management provided to each alternative's associated costs. The Township's website has a page dedicated to studies and plans developed organized by year: http://www.twp.maplewood.nj.us/index.aspx?NID=100 The Township currently considers hazard areas including flood zones prior to land use changes or development permitting. The Township restricts development in the floodplain and along stream corridors. The Township will consider safe growth practices for the next Master Plan update. In addition, the Township will use the HMP as a guide when updating municipal ordinances.
Millburn (T)	Millburn Township has a history of environmental awareness, planning and regulation through its commissions, committees, master plan and municipal codes. The summary below briefly touches upon how the Township integrates mitigation into their day-to-day operations. **Plans:** The Township's Master Plan, available on their Township website, is the legal roadmap to planning for appropriate and safe land development. Millburn Township completed its last comprehensive master plan in 1991. Reexamination reports of the master plan and development regulations were subsequently prepared in 1997, 2002, and 2008. The 1991 Municipal Master Plan contains multiple elements that set goals and objectives relative to land use, historic preservation, recreation and conservation, traffic circulation, and recycling. The 2008 Master Plan Reexamination lists the goals and objectives which include a hazard mitigation component: 'To prohibit development of areas inappropriate for development, such as flood plains, water reserves, wetlands and other environmentally

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
	sensitive area.' The Environmental Resources Inventory (ERI) was created for Millburn Township with the support of the Association of New Jersey Environmental Commissions (ANJEC) to objectively identify and describe the natural resources, cultural conditions, environmental features, and concerns within the community. This document summarizes the general goals the Township considers for the following: habitats and wildlife; air quality; water quality; environmental education; land use and sustainability. There are sections dedicated to discussing the regulations and local ordinances relative to steep slopes, wetlands and floodplains. According to the ERI, the Stormwater Management Plan for Millburn (April 2005) contains information on the strategy against stormwater-related impacts. The Township established an ordinance that requires all proposed major development to comply with New Jersey's soil and erosion and sediment control standards, as well as the erosion control, groundwater recharge, stormwater runoff quantity, and stormwater quality standards, in accordance with the Municipal Stormwater Regulation Program. The Township is in support of the current study being performed by the US Army Corps of Engineers of the entire Rahway River Basin. The study has, so far, identified ten (10) alternative solutions to relieve flooding in towns along the river, and has narrowed that to four (4) that provide a positive B/C ratio. **Codes, Ordinances and Regulations:** The Development Regulations and Zoning Ordinance were adopted by the Township Committee on December 18, 1984 by Ordinance No. 1838-84. ARTICLE 7 - FLOOD DAMAGE PREVENTION [Ord. 2197-02; amended in entirety by Ord. 2287-07]. A development permit must be obtained prior to commencement of any construction or development in special flood hazard areas. All new construction and substantial improvements must comply with the general provisions and standards set forth within the ordinance. According to Article 7, Section 706 (Riparian Zone) of the Township's Development Regulations and Zoning Ordinance (Ordinance No. 1838-34; adopted December 18, 1984 and amended through December 31, 2010), the Township Committee acknowledges that riparian lands adjacent to streams, lakes, or other surface water bodies that are adequately vegetated provide an important environmental protection and water resource management benefit. No construction, development, use, activity, or encroachment is permitted in a riparian zone unless the effects of such development are accompanied by preparation, approval, and implementation of a Riparian Zone Management Plan. The plan must be approved by the Township Engineer, in coordination with the Environmental Commission. The Township has an ordinance that limits the development on pieces of property that have a slope greater than 15 (as per Article 6, Section 608 (Protection of Steep Slope Areas) of the Township's Development Regulations and Zoning Ordinance (Ordinance No. 1838-34; adopted December 18, 1984 and amended through December 31, 2010). All site plans and major subdivisions must incorporate soil erosion and sediment control plans developed in accordance with the requirements of the Soil Erosion and Sediment Control Act. The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Millburn website at http://twp.millburn.nj.us for further information (FEMA FIS 2014).

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
	Outreach and Partnering with Schools: According to the ERI, Aquafest is an interactive water education program presented annually to grades two (2) through five (5) at a Millburn Township public elementary school. The program is run by the Millburn Township EC in partnership with the Millburn High School Environmental Club. Aquafest is recognized as New Jersey's first educational program in compliance with Stormwater Phase II regulations. **Planned Integration Activities:** The Township continues to pursue integrating mitigation into day-to-day operations. The Township's Continuity of Operations Plan (COOP) and Fire Plan do not integrate the HMP; however the Township will use the HMP as a guide for the next COOP and Fire Plan update. The Township is also interested in conducting outreach on natural and human-caused hazards. Below is a summary of mitigation actions identified as part of this planning effort to continue the integration. Please refer to Table 9.13-11 and the mitigation action worksheets located at the end of this annex for more details on each mitigation action: • Participate in Firewise • Participate in the Community Rating System • Participate in StormReady to educate the public on how to prepare for hazards and disasters • Improve stormwater drainage capacities including stormwater pumping capacity at South Mountain – identified as a need in the Township's ERI • Conduct additional flood planning by modeling a 50-year event along the east and west branches of the Rahway River.
Montclair (T)	**Public Outreach:** Currently the Township conducts public outreach program to inform citizens on hazards. The Township's Health Educator consistently puts messages in local media (Township Website, newspaper, watercooler, baristanet, cable TV) for outreach regarding weather-related events, disease outbreaks, emergency planning, etc. **Master Plan:** The Township is currently updating elements of their Master Plan. The Master Plan is the roadmap to planning for appropriate and safe land development. The Township will use the HMP as a guide when updating their Master Plan and incorporate findings as appropriate. Refer to the new action Montclair-12 in Table 9.14-11. The Township has a Stormwater Management Plan, an element to their Master Plan (April 2005). The Stormwater Management Plan was adopted by the Planning Board in April 2005 and establishes stormwater goals for the Township, provides design and performance standards for stormwater, and proposes ordinance changes for nonstructural stormwater management strategies. This Plan discusses localized flooding in the Township due to undersized culverts and debris in streams. The Township's updated mitigation strategy includes several drainage improvement projects. Please refer to mitigation initiatives Montclair-1, Montclair-4, Montclair-5 in Table 9.14-11 and their associated mitigation action worksheets at the end of this annex for additional details on these projects. **Proposed Actions:** To further integrate hazard mitigation into daily operations, the Township will consider mitigation actions when allocating funding from their municipal/operating and capital improvement budget. In addition, the Township has identified a new mitigation action to develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. Refer to Section 9.14, mitigation action Montclair-7.

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
	The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Montclair website at http://www.montclairnjusa.org for further information (FEMA FIS 2014).
Newark (C)	**Master Plan:** In the City of Newark's most recent planning undertakings, City Master Plan, Sustainability Action Plan, Emergency Operations Plan and a Local Energy Assurance Plan, appointed and elected officials have incorporated the identification of hazards in our community (industrial, residential and commercial) and developed actionable mitigation activities/policy decisions to ensure the safety and well-being of Newark residents and our business community. These planning initiatives focus particularly on improving the City's ability to manage flooding in the most vulnerable and environmentally sensitive areas in the City, protecting critical infrastructure assets and incorporating best practices to reduce energy use/supply while improving operation efficiency/dexterity. The implementation of the updates to our municipal zoning/permitting procedures is currently a work in progress which is contingent upon the adoption of amendments to Federal/State laws and the ability to secure funding. The City's Master Plan is the legal roadmap to planning for appropriate and safe land development. According to the City's Master Plan, Newark's capacity to absorb and reuse stormwater with "green infrastructure" has greatly expanded. Scaled-up tree planting, the replacement of pavement with pervious surfaces, and new pocket parks and community gardens all help mitigate flooding and reduce combined sewer overflows. A lack of pervious surfaces and inadequate drainage facilities has been identified in the City's Master Plan as issues that contribute to street level and basement flooding. One of the objectives of the City's Master Plan is the following in their Utilities and Infrastructure element: *'Maintain sewer infrastructure in an adequate state of repair; reduce the frequency and mitigate the impact of street-level flooding on residents and businesses; and over the long term, improve the health of the Passaic River and Newark Bay.'* The City has identified several stormwater improvement projects in their updated mitigation strategy. Please refer to Section 9.15 for details on each action. The inhabitants of the City of Newark depend on the usual warnings issued through radio, television, and local newspapers for information concerning possible flooding conditions (FEMA FIS 2014). The City has proposed a public outreach strategy as described as new mitigation action Newark-28 in Table 9.15-12. **Budgets:** The City will consider mitigation project funding as part of their municipal/operating and capital improvement budgets. **Ordinances:** The City has their ordinances and flood protection measures available on their website. Please visit the City of Newark website at http://www.ci.newark.nj.us for further information (FEMA FIS 2014).
North Caldwell (B)	**Master Plan:** The Borough has a Master Plan which is the legal roadmap to planning for appropriate and safe land development. The Borough Zoning Code includes sections that control development in flood prone areas and excessive slope areas. The Borough Code also includes a Stormwater Controls section to regulate the impact of new construction on stormwater quality and flooding. **Budgets:** The Borough currently has a line item for mitigation project funding in their capital improvement budget and has integrated mitigation into their Continuity of Operations Plan. In the future, the Borough will consider adding a line item for mitigation project

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
	funding to their municipal operating budget. **Ordinances:** The Borough has their ordinances and flood protection measures available on their website. Please visit the Borough of North Caldwell website at http://northcaldwell.org for further information (FEMA FIS 2014).
Nutley (T)	**Master Plan:** The Township's Master Plan (December 2012) considers hazard areas as part of the Land Use Element. The Conservation Plan and Green Plan Master Plan Elements acknowledge the impacts of global climate changes, a significant increase in cost of energy and the potentially environmentally destructive nature of our carbon footprint. The Passaic and Third Rivers and their tributaries are important natural features of Nutley's landscape and provide needed drainage for the community, as well as scenic views and habitat areas. The Master Plan recognizes the need to manage the Passaic River on a regional basis. Specific areas are identified as having local flooding problems and therefore development is limited in these areas: Passaic Avenue/Rutgers Place; Kingsland Street/Bloomfield Avenue; Bloomfield Avenue/Mountainview Avenue; and Franklin Avenue/ Harrison Street. The Township has identified a new mitigation action, Nutley-17 in Table 9.17-12 below to mitigate flooding on Passaic Avenue and Rutgers Place; an area identified in their Master Plan as subject to flooding. Proper stormwater management contributes to improved water quality and the preservation of floodplains maintains the natural paths for stormwater to flow. In 2005, the Township adopted a Stormwater Management Element of the Master Plan. It was updated in 2008. The Plan provides a strategy for Nutley to plan for and manage increased runoff associated with development and changes in land use. The Township has identified a new mitigation action (Nutley-12) to review and update Township ordinances pertaining to stormwater and floodplain management. **Building and Zoning Ordinances:** Prior to land use, zoning changes or development permitting, the Township reviews the hazard mitigation plan to ensure consistent and compatible land use. The permit review process includes addressing hazards and the Township recommends the incorporation of hazard-resistant construction standards into the design and location of projects. Further, the Township's rezoning procedures recognize hazard areas as limits on zoning changes. **FEMA NFIP:** The Township is currently in the process of updating/modifying the following ordinances to meet current FEMA flood map updates: Cumulative Substantial Damage; Freeboard; and Floodplain Management Plan. The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Nutley's website at http://www.nutleynj.org for further information (FEMA FIS 2014). In the next five years, the Township will consider enforcing codes and standards beyond the minimum FEMA and State requirements to reduce risk further. Further, the Township is interested in joining the Community Rating System and attending workshops regarding this topic (see new mitigation action Nutley-19 in Table 9.17-12.

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
	Budgets: The Township has funded mitigation projects through their operating and capital improvement budgets in the past. The Township will look at the hazard mitigation actions documented in this HMP update when allocating funding in the future. **Day-to-Day Operations:** The Township will consider having a community resilience committee or advisor in the future. **Training:** The Township offers training on the following: best practices for mitigation; grant applications; hazard identification and conducts outreach on hazards of concern. The Township works closely with the local school district.
Orange Township (T)	**Master Plan:** The City has a Master Plan which is the legal roadmap to planning for appropriate and safe land development. The City has no mitigation element in its Master Plan. The hazard mitigation plan will be used to guide the addition of hazard information for inclusion in the next Master Plan update.
Roseland (B)	**Master Plan:** The Borough has incorporated flood protection and stormwater management measures with the Master Plan, and subsequent re-examination reports, and land development ordinances. These municipal provisions reference NJDEP and FEMA regulations and standards. The Land Use Ordinances are implemented during the review of Land Development applications and building permit acquisitions. The Township has their ordinances and flood protection measures available on their website. Please visit the Borough of Roseland's website at http://www.roselandnj.org for further information (FEMA FIS 2014). The Borough will consider hazard mitigation projects identified in this HMP when constructing upcoming operating and capital improvement budgets.
South Orange Village (T)	**Master Plan:** The Township of South Orange Village has a Master Plan which is the legal roadmap to planning for appropriate and safe land development. In addition, the Township has a Smart Growth Plan. The Smart Growth Plan considers the locations of floodplains and steep slopes and discusses them in text. Further projects are considered and discussed for flood control and flood storage. During this planning process, the Township was in the process of soliciting proposals for the preparation of a new Master Plan which is expected to address planning and land use mechanisms. The Township will be using the hazard mitigation plan as a guide when updating their Master Plan. Please refer to Table 9.20-10 regarding additional details. **Ordinances:** The Township has their ordinances and flood protection measures available on their website. Please visit the Township of South Orange Village's website at http://www.southorange.org for further information (FEMA FIS 2014). **Outreach:** The Township will develop a public outreach program to inform citizens of hazards as an additional way to integrate mitigation into day-to-day operations. Refer to their new mitigation action in Section 9.20, Table 9.20-10.
Verona (T)	**Day-to-Day Operations:** To prevent flooding, the Township of Verona regularly cleans brooks, streams, and tributaries to the Peckman River. Catch basins and storm sewers are checked during heavy rains to prevent debris from entering watercourses. On an annual basis, Peckman River is cleared of trees, large debris, and shoal material as needed (FEMA FIS 2014). The Township has an Environmental Commission and Shade Tree Commission established.

Table 7-2. Incorporation into Existing & Future Planning Mechanisms

Municipality	Ongoing or Proposed Integration Actions
	Master Plan: The Township has a Master Plan which is the legal roadmap to planning for appropriate and safe land development. The 2009 Master Plan & Reexamination Report's Section 4 (Environmental Features) discusses flood-prone areas in the Township. Currently the Township considers hazard zones prior to land use, zoning changes and development permitting. The Township will use the HMP as a guide during rezoning procedures. The Township will also use the HMP as a guide when updating their transportation plan to limit access to hazard areas. Refer to their mitigation strategy (Section 9.21) for further details. **Ordinances:** The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Verona's website at http://www.veronanj.org for further information (FEMA FIS 2014).
West Caldwell (T)	Due to the severity of recent events, mitigation has become a priority in the Township. Currently, the Township limits development in high hazard areas, incorporates hazard resistant construction standards into the design and location of projects, and prior to land use zoning or development permitting, hazard areas are considered. It is not considered in many decisions and will become more evident in zoning/permitting procedures in the future. More ways to incorporate mitigation into day-to-day operations will be evaluated. For example, the Township would like to pursue more information about becoming a certified Firewise Community due to the potential for forest fires in the community. Refer to Table 9.22-10 action West Caldwell-20. In addition, the Township will look at mitigation actions when allocating funds from the municipal operating budget in the future.
West Orange (T)	**Past Mitigation Actions**: The Township utilizes mitigation funds to implement mitigation actions. The Township will continue to do so in the future, as appropriate. Past mitigation projects that were funded under Township budget to include: Nestro Road, Midro Way, Wayfair Drive, and Rosemont Terrace. **Ordinances:** The Township has proposed two new ordinances: Sprinkler and Stand pipe identification light and Installation of Knox boxes on new and existing commercial buildings. Same will protect first responder and structures. The Township has their ordinances and flood protection measures available on their website. **Public Outreach:** To continue implementing mitigation in day-to-day operations, the Township will develop a public outreach program to educate on hazards. Refer to action West Orange-13 in the Township's mitigation strategy (Section 9.23).

7.3 Continued Public Involvement

Essex County and participating jurisdictions are committed to the continued involvement of the public in the hazard mitigation process. Therefore, this Plan update will be posted on-line (http://hmp.essexsheriff.com/), for review.

In addition, public outreach and dissemination of the Plan will/may include :

- Links to the plan on municipal websites of each jurisdiction with capability.
- Utilization of existing social media outlets (Facebook, Twitter) to inform the public of flood hazards and severe storm events. Educate the public via the jurisdictional websites on how these applications can be used in an emergency situation.
- Development of annual articles or workshops on natural hazards to educate the public and keep them aware of their dangers.

Planning Committee representatives and the Essex County HMP Coordinator will be responsible for receiving, tracking, and filing public comments regarding this HMP. Contact information for the County is included in the Point of Contact information at the end of the Executive Summary of this document.

The public will have an opportunity to comment on the HMP via the hazard mitigation website at any time. The HMP Coordinator will maintain this website, posting new information and maintaining an active link to collect public comments.

The public can also provide input at the annual review meeting for the HMP and during the next 5-year plan update. The HMP Coordinator is responsible for coordinating the HMP evaluation portion of the meeting, soliciting feedback, collecting and reviewing the comments, and ensuring their incorporation in the five-year plan update as appropriate. Additional meetings may also be held as deemed necessary by the planning group. The purpose of these meeting would be to provide the public an opportunity to express concerns, opinions, and ideas about the mitigation plan.

The Planning Committee representatives shall be responsible to assure that:

- Public comment and input on the plan, and hazard mitigation in general, are recorded and addressed, as appropriate.
- Appropriate links to the Hazard Mitigation Plan website (http://hmp.essexsheriff.com/) are included on municipal websites.
- Public notices are made as appropriate to inform the public of the availability of the HMP, particularly during HMP update cycles.

The HMP Coordinator shall be responsible to assure that:

- Public and stakeholder comment and input on the HMP, and hazard mitigation in general, are recorded and addressed, as appropriate.
- The HMP website is maintained and updated as appropriate.
- Public notices, including media releases, are made as appropriate to inform the public of the availability of the HMP particularly during plan update cycles.
- Information collected will be efficiently incorporated in the HMP update.

ESSEX COUNTY ALL HAZARD MITIGATION PLAN

2015 Update

Volume II

Prepared for:

Essex County Sheriff's Office

Essex County Office of Emergency Management

Sheriff Armando B. Fontoura, OEM Coordinator

Prepared by:

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1000 The American Road | Morris Plains, New Jersey

Essex County
All Hazard Mitigation Plan Update

Volume II

JANUARY 2015

Prepared for:

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Prepared by:

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Project 103S2942

SECTION 8. PLANNING PARTNERSHIP

2015 Plan Update Changes

- This is a new section to Essex County's HMP.

8.1 BACKGROUND

Section 201.6.a (4) of Chapter 44 of the Code of Federal Regulations (44CFR) states: "Multi-jurisdictional plans (e.g. watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan." The Federal Emergency Management Agency (FEMA) and New Jersey Office of Emergency Management (NJOEM) both encourage multi-jurisdictional planning. Therefore, in the preparation of the Essex County All Hazard Mitigation Plan (HMP), a planning partnership was formed to pursue grant funding for the plan and to meet requirements of the federal Disaster Mitigation Act of 2000 (DMA) for as many eligible local governments in Essex County as possible.

The DMA defines a local government as follows: "Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity."

8.1.1 Initial Solicitation and Letters of Intent

Essex County solicited the participation of all cities, townships and boroughs in the County at the commencement of this project. All municipalities interested signed a "Letter of Intent" and/or a resolution committing their participation and resources to the development of the Essex County All Hazard Mitigation Plan update. Table 8-1 lists those jurisdictions that elected to participate in the 2015 Essex County All Hazard Mitigation Plan update process, and have met the minimum requirements of participation as established by the County and Steering Committee.

Table 8-1. Participating Jurisdictions in Essex County

Townships	
Belleville	Millburn
Bloomfield	Montclair
Cedar Grove	Nutley
Fairfield	South Orange
Irvington	Verona
Livingston	West Caldwell
Maplewood	West Orange
Boroughs	**Cities**
Caldwell	East Orange
Essex Fells	Orange
Glen Ridge	Newark
North Caldwell	**County**
Roseland	Essex County

8.1.2 Planning Partner Expectations

The Planning Committee agreed to the following list of expectations:

- Review 2008 HMP goals and re-establish HMP Update goals and objectives;
- Establish a timeline for completion of the HMP;
- Ensure that the HMP meets the requirements of DMA 2000 and FEMA and NJOEM guidance;
- Solicit and encourage the participation of regional agencies, a range of stakeholders, and citizens in the HMP development process;
- Assist in gathering information for inclusion in the HMP, including the use of previously developed reports and data;
- Organize and oversee the public involvement process and support outreach efforts in the community;
- Develop, revise, adopt, and maintain Volume I of the HMP in its entirety and the local jurisdictional annex in Volume II.

8.1.3 Jurisdiction Annex Templates

New to the Essex County HMP update is a two-volume format, including jursidicitonal annexes for each participating jurisdiction. While the local annex format is designed to document and assure local compliance with the DMA 2000 regulations, its greater purpose and function includes:

- Providing a locally-relevant synthesis of the overall mitigation plan that can be readily presented, distributed, and maintained;
- Facilitating local understanding of the community's risk to natural hazards;
- Facilitating local understanding of the community's capabilities to manage natural hazard risk, including opportunities to improve those capabilities;
- Facilitating local understanding of the efforts the community has taken, and plans to take, to reduce their natural hazard risk;
- Facilitating the implementation of mitigation strategies, including the development of grant applications;
- Providing a framework by which the community can continue to capture relevant data and information for future plan updates.

It is recognized that each jurisdiction's annex is a "living" document, and will continue to be improved as resources permit. As such, its design is intended to promote and accommodate continued efforts to maintain the currency and improve the effectiveness of the annex as the key tool, reference and guiding document by which the jurisdiction will implement hazard mitigation locally. The following provides a description of the various elements of the jurisdictional annex.

Section 9.X.1: Hazard Mitigation Plan Points of Contact: Identifies the hazard mitigation planning primary and alternate(s) contacts, identified by the jurisdiction as of August 8, 2014.

Section 9.X.2: Community Profile: Provides an overview and profile of the jurisdiction, including an identification of areas of known and anticipated future development and the vulnerability of those areas to the hazards of concern.

Section 9.X.3: Natural Hazard Event History Specific to the Jurisdiction: Identifies hazard events that have caused significant impacts within the jurisdiction, including a summary characterization of those impacts as identified by the jurisdiction since the 2008 HMP. The documentation of events and losses is critical to supporting the identification and justification of appropriate mitigation actions, including providing critical

data for benefit-cost analysis. It is recognized that this "inventory" of events and losses is a work-in-progress, and may continue to be improved as resources permit. As such, the lack of data or information for a specific event does not necessarily mean that the jurisdiction did not suffer significant losses during that event.

Section 9.X.4: Hazard Vulnerabilities and Ranking: The Essex County HMP update identifies and characterizes the broad range of hazards that pose risk to the entire planning area; however each jurisdiction has differing degrees of risk exposure and vulnerability aside from the whole. The local risk ranking serves to identify each jurisdiction's degree of risk to each hazard as it pertains to them, supporting the appropriate selection and prioritization of initiatives that will reduce the highest levels of risk for each community.

Full data and information on the hazards of concern, the methodology used to develop the vulnerability assessments, and the results of those assessments that serve as the basis of these local risk rankings may be found in Section 5.

- National Flood Insurance Program (NFIP) Summary: Provides NFIP summary statistics for the jurisdiction.
- Critical Facilities: Identifies potential flood losses to critical facilities in the jurisdiction, based on the flood vulnerability assessment process presented in Section 5.
- Other Vulnerabilities Identified by the Jurisdiction: Presents other specific hazard vulnerabilities as identified by the jurisdiction.

Section 9.X.5: Capability Assessment: This subsection provides an inventory and evaluation of the jurisdiction's tools, mechanisms and resources available to support hazard mitigation and natural hazard risk reduction. Within the municipal annexes, the jurisdiction's planning and regulatory, administrative and technical, and fiscal capabilities are presented, respectively. Further, within the municipal annexes the municipality's level of participation in state and federal programs designed to promote and incentivize local risk reduction efforts.

National Flood Insurance Program (NFIP): This subsection documents the NFIP as implemented within the jurisdiction. This summary was based on surveys prepared by, and/or interviews conducted with, the NFIP Floodplain Administrators for each NFIP-participating community in the County. This subsection also identifies actions to enhance implementation and enforcement of the NFIP within the community.

Integration of Hazard Mitigation into Existing Planning Mechanisms: This subsection identifies how the jurisdiction has integrated hazard risk management into their existing planning, regulatory and operational/administrative framework ("integration capabilities"), and/or how they intend to promote this integration ("integration actions"). Further information regarding Federal, State and local capabilities may be found in the Capability Assessment portion of Section 6.

Section 9.X.6: Mitigation Strategy and Prioritization

Past Mitigation Initiative Status: Where applicable, a review of progress on the jurisdiction's prior mitigation strategy is presented, identifying the disposition of each prior action, project or initiative in the jurisdiction's updated mitigation strategy. Other completed or on-going mitigation activities that were not specifically part of a prior local mitigation strategy may be included in this sub-section as well.

Proposed Mitigation Strategy: A summary table is presented of the jurisdiction's updated mitigation strategy. As indicated, applicable mitigation actions, projects and initiatives are further documented on an Action Worksheet which provides details on the project identification, evaluation, prioritization and implementation process. These Action Worksheets are included at the end of the annex. In addition, a summary of the local

mitigation strategy prioritization process discussed in Section 6 is presented in tabular format as well as an expanded version following the Action Worksheets.

Section 9.X.7: Future Needs to Better Understand Risk/Vulnerability: This subsection provides each jurisdiction the opportunity to identify any further needs to more fully understand their risk and/or vulnerability to the hazards of concern identified.

Section 9.X.8: Hazard Area Extent and Location: Each annex includes two maps illustrating identified hazard zones, critical facilities, and areas of NFIP Repetitive Loss/Severe Repetitive Loss (RL/SRL). Further, these maps show areas of known or anticipated future development, as available and provided by the jurisdiction.

Workshops and additional meetings (via in person, email and/or teleconference) to complete the jurisdictional annexes were held with the Planning Committee throughout the planning process. In summary, all participating communities and the County completed the planning partner expectations and annex-preparation process. Details regarding these meetings are described further in Sections 3 (Planning Process) and 6 (Mitigation Strategy). Completed jurisdictional annexes are presented in Section 9.

9.0 ANNEXES

2015 Plan Update Changes

- This is a new section to Essex County's HMP.

Section 201.6.a(4) of Chapter 44 of the Code of Federal Regulations (44CFR) states: "Multi-jurisdictional plans (e.g. watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan." One component of each participating jurisdiction's involvement in the planning process of this HMP was to prepare an annex that focuses specifically on the natural hazards facing their community and the mitigation actions they propose to reduce their exposure and losses to these hazards.

Essex County and each participating jurisdiction completed an annex that outlines the following information: natural hazard event history, risk ranking, capabilities, progress on past mitigation actions and an updated mitigation strategy specific to the County or that jurisdiction. Once complete, the County and each participating jurisdiction reviewed and approved their final annex prior to submission to the NJOEM and the FEMA Region 2. The approval of their annex is presented on the sign-off sheets located in this section. Each jurisdiction's annex itself may be found in Sections 9.1 through 9.23.

County Annex Review Sign-Off Sheet

Essex County

County Executive

Joseph D. Vincenzo, Jr. — Name | Signature | 10/27/14 — Date

County Sheriff/OEM Coordinator

Armando B. Fontoura — Name | Signature | 10/27/14 — Date

Deputy OEM Coordinator

Kevin J. Ryan — Name | Signature | 10/27/14 — Date

County Administrator

Ralph J. Caballero — Name / Title | Signature | 10/28/14 — Date

County Engineer and Floodplain Administrator

DAVID ANTONIO — Name / Title | Signature | 10/29/14 — Date

County Planner

SANJEEV VARGHESE — Name / Title | Signature | 10/29/14 — Date

Director of Roads and Bridges

WILLIAM J. CLARK — Name / Title | Signature | 10/28/14 — Date

Director of Homeland Security

GAREY CHIN — Name / Title | Signature | 10/28/14 — Date

GIS Specialist

DARREN MARSHALL, Sgt — Name / Title | Signature | 10/27/14 — Date

Parks Director

DAN SALVANTE — Name / Title | Signature | 10/28/14 — Date

County Annex Review Sign-Off Sheet

Essex County

Public Information

Name / Title	Signature	Date
EDWARD ESPOSITO, LT.		10/28/14

Jurisdictional Annex Review Sign-Off Sheet

Township of Belleville

MUNICIPALITY NAME

Management
Kevin Esposito, Township Manager

Name | Signature | 10/23/14 Date

Engineer
Thomas Herits, Township Engineer

Name | Signature | 10/27/14 Date

Fiscal/CFO
Rich Mondelli

Name | Signature | 10/23/14 Date

Building Code Official
Frank DeLorenzo, Constuction Code Official

Name / Title | Signature | 10-27-14 Date

Floodplain Administrator
Frank DeLorenzo

Name / Title | Signature | 10-27-14 Date

Emergency Manager
George Pedalino, OEM Coordinator

Name / Title | Signature | 10-28-14 Date

Land Use Planner
John Maddon

Name / Title | Signature | 10-27-14 Date

Public Works Director
William Gilbert, DPW Director

Name / Title | Signature | 10/27/14 Date

Police Department
Joseph Rotonda, Police Chief

Name / Title | Signature | 10/27/14 Date

Fire Department

Robert Caruso, Fire Chief

Name / Title | Signature | 10/29/14 Date

Jurisdictional Annex Review Sign-Off Sheet

Township of Bloomfield

MUNICIPALITY NAME

Management

Mayor/Administrator

TED M. EHRENBURG — Name | Signature | Date 11/5/14

Engineer

Name | Paul D. Lasek, Twp. Engineer — Signature | Date 11/5/14

Fiscal/CFO

Robert Renna — Name | Signature | Date 11/5/14

Building Code Official

Name / Title | Signature | Date 11-12-14

Floodplain Administrator

Paul D. Lasek / Twp Engineer — Name / Title | Signature | Date 11/5/14

Emergency Manager

Robert Mengel OEM coordinator — Name / Title | Signature | Date 11/6/14

Land Use Planner

ANTHONY MAROCCI / ZONING OFFICER — Name / Title | Signature | Date 11/12/14

Public Works Director

Anthony Nesto - Director Public Works — Name / Title | Signature | Date 11-7-14

Police Department

SAMUEL DeMAO P.D. — Name / Title | Signature | Date 11-10-14

Fire Department

Joseph McCarthy Fire Chief — Name / Title | Signature | Date 11/10/14

Jurisdictional Annex Review Sign-Off Sheet

Caldwell

MUNICIPALITY NAME

Management

Mayor/Administrator

PAUL M. CARELLI B.A. — Name

Paul M Carelli — Signature

11-17-14 — Date

Engineer

Glenn M. Beckmeyer, P.E. — Name

Signature

11/17/14 — Date

Fiscal/CFO

CHRISTOPHER BATTAGLIA — Name

CBattaglia — Signature

2014-11-17 — Date

Building Code Official

Paul Milani / Building Code Official — Name / Title

Signature

11-18-14 — Date

Floodplain Administrator

Paul Milani / Floodplain Admin. — Name / Title

Signature

11-18-14 — Date

Emergency Manager

Anthony Grasso Coordinator — Name / Title

Signature

11-18-14 — Date

Land Use Planner

Name / Title

Signature

Date

Public Works Director

MARIO BIFALCO CPWM — Name / Title

Signature

11-17-14 — Date

Police Department

James H. Bonfiorno Chief of Police — Name / Title

Signature

11/17/14 — Date

Fire Department

Gary Ganzamelli Chief Fire — Name / Title

Signature

11-17-14 — Date

Township of Cedar Grove
MUNICIPALITY NAME

Management
Mayor/Administrator

Name	Signature	Date
E. Romeo Longo		11/17/14

Engineer

Name	Signature	Date
Alex Palumbo		11/17/14

Fiscal/CFO

Nme	Signature	Date
William Homa		11/17/14

Building Code Official

Name / Title	Signature	Date
John D'Ascensio		11/17/14

Floodplain Administrator

Name / Title	Signature	Date
Alex Palumbo		11/17/14

Emergency Manager

Name / Title	Signature	Date
Jeffrey McElroy		11-17-14

Land Use Planner

Name / Title	Signature	Date
Thomas Tucci		11-17-2014

Public Works Director

Name / Title	Signature	Date
Alex Palumbo		11/17/14

Police Department

Name / Title	Signature	Date
Richard Vanderstreet		11-17-14

Fire Department

Name / Title	Signature	Date
James Zaccaria		11-17-14

East Orange

MUNICIPALITY NAME

Management

City Administrator

Name	Signature	Date
William Senande	William Senande	11/21/14

Engineer

Name	Signature	Date
N/A		

Fiscal/CFO

Name	Signature	Date
N/A		

Building Code Official

Name / Title	Signature	Date
LORA A. RAHEEM		11/18/2014

Floodplain Administrator

Name / Title	Signature	Date

Emergency Management Coordinator

Name / Title	Signature	Date
Coordinator		11/18/2014

Public Works Director

Name / Title	Signature	Date
Christopher Coke, Director		11/18/14

Borough of Essex Fells

MUNICIPALITY NAME

Management

Mayor/Administrator

Name	Signature	Date
Francine T. Pasenchic		11/24/2014

Engineer

Name	Signature	Date

Fiscal/CFO

Name	Signature	Date

Building Code Official

Name / Title	Signature	Date
CARL Thurnell		11/25/14

Floodplain Administrator

Name / Title	Signature	Date

Emergency Manager

Name / Title	Signature	Date

Land Use Planner

Name / Title	Signature	Date

Public Works Director

Name / Title	Signature	Date
Roger Kerr Supt DPW		11-24-2014

Police Department

Name / Title	Signature	Date
VINCENT A. KULIK · CHIEF		11-18-2014

Fire Department

Name / Title	Signature	Date

Jurisdictional Annex Review Sign-Off Sheet

Township of Fairfield

MUNICIPALITY NAME

Management

Mayor/Administrator

Name	Signature	Date
JOSEPH CATENARO		11/18/14

Engineer

Name	Signature	Date
Lawrence Gonnello		11/10/14

Fiscal/CFO

Name	Signature	Date
JOHN McCluskey		11/18/14

Building Code Official

Name / Title	Signature	Date
PHILIP CHEFF		11-10-14

Floodplain Administrator

Name / Title	Signature	Date
PHILIP CHEFF		11-10-14

Emergency Manager

Name / Title	Signature	Date
William Smith		11-7-14

Land Use Planner

Name / Title	Signature	Date

Public Works Director

Name / Title	Signature	Date
Robert Payne		11-21-14

Police Department

Name / Title	Signature	Date
ANTHONY MANNA		11-17-14

Fire Department

Name / Title	Signature	Date
Andrew Williams		11/17/14

Jurisdictional Annex Review Sign-Off Sheet

Borough of Glen Ridge
MUNICIPALITY NAME

Management ***Administrator*** *Michael J. Rohal* Name	Michael J Rohal Signature	October 21, 2014 Date
Engineer *Michael J. Rohal, P.E., P.P.* Name	Michael J Rohal Signature	October 21, 2014 Date
Fiscal/CFO *Irene C.W. Wheat* Name	Irene C. W. Wheat Signature	October 21, 2014 Date
Building Code Official John Buonanno Construction/Building Official Name / Title	Signature	October 21, 2014 Date
Floodplain Administrator *Michael J. Rohal* *Borough Administrator/Engineer* Name / Title	Michael J Rohal Signature	October 21, 2014 Date
Emergency Manager *Michael J. Rohal, Borough Administrator/Engineer/Clerk/Q.P.A.* Name / Title	Michael J Rohal Signature	October 21, 2014 Date
Land Use Planner Michael P. Zichelli Deputy Administrator/Director of Planning Name / Title	Signature	October 21, 2014 Date
Public Works Director William R. Bartlett Public Works Supervisor Name / Title	William R Bartlett Signature	October 21, 2014 Date
Police Department Chief Sheila E. Byron-Lagattuta Name / Title	Sheila Byron-Lagattuta Signature	October 21, 2014 Date
Fire Department Chief John Herrmann	John Herrmann	October 21, 2014

Jurisdictional Annex Review Sign-Off Sheet
Township of Irvington
MUNICIPALITY NAME

Management

Mayor/Administrator

Mayor Tony Vauss — Tony Vauss, Mayor — Signature — 11/25/14 Date

Engineer

John A. Wiggins, P.E. — John A. Wiggins, P.E., Township Engineer — Signature — 11/18/14 Date

Fiscal/CFO

Faheem Ra'Oof — Faheem Ra'Oof, Director of Revenue and Finance — Signature — 11/18/14 Date

Building Code Official

Ted Gaveen, Director of Building Housing — Name / Title — Signature — 11/25/14 Date

Floodplain Administrator

John A. Wiggins, P.E. — John A. Wiggins, P.E., Township Engineer — Signature — 11/18/14 Date

Emergency Manager

Mayor Tony Vauss — Name / Title — Signature — 11/25/14 Date

Land Use Planner

Wayne Bradley — Wayne Bradley, Director of Planning and Community Development — Signature — 11/19/14 Date

Public Works Director

J. Holley — Jamel Holley, Director of Public Works — Signature — 11/18/14 Date

Police Department

Tracy Bowers — Tracy Bowers, Director of Police — Signature — 11/25/14 Date

Fire Department

John F. Brown — ~~Randy Wcust, Acting Fire Chief~~ John F. Brown, Director — Signature — 11/25/14 Date

Jurisdictional Annex Review Sign-Off Sheet

Township of Livingston
MUNICIPALITY NAME

Management

~~Mayor~~/Administrator

Name	Signature	Date
Michele Meade	[signature]	10/31/2014

Engineer

Name	Signature	Date
Richard Calb. Jr.	[signature]	11/3/14

Fiscal/CFO

Name	Signature	Date
William Nadolny	[signature]	10/23/14

Building Code Official

Name / Title	Signature	Date
Martin J. Chiarolanzio Construction Official	[signature]	10/23/14

Floodplain Administrator

Name / Title	Signature	Date
Richard Calb. Jr Town Engineer	[signature]	11/3/14

Emergency Manager

Name / Title	Signature	Date
Craig M. Handschuch OEM Coordinator	[signature]	10-23-2014

Land Use Planner

Name / Title	Signature	Date
Jackie Hollis Land Use Administrator	[signature]	11/7/14

Public Works Director

Name / Title	Signature	Date
Michael Anello	[signature]	10/22/14

Police Department

Name / Title	Signature	Date
Craig M. Handschuch Police Chief	[signature]	10-23-2014

Fire Department

Name / Title	Signature	Date
Christopher C. Mullin Fire Chief	[signature]	10/22/14

_____Jurisdictional Annex Review Sign-Off Sheet

Township of Maplewood

MUNICIPALITY NAME

Management

Mayor/Administrator

Joseph F. MANNING — Name | Joseph F. Manning — Signature | 11-21-14 — Date

Engineer

THOMAS MALANASI — Name | Signature | 11/21/14 — Date

Fiscal/CFO

JUAN URIBE — Name | Signature | 11/21/14 — Date

Building Code Official

Robert J. MITTERMAIER — Name / Title | Signature | 11/12/14 — Date

Floodplain Administrator

THOMAS MALANASI — Name / Title | Signature | 11/21/14 — Date

Emergency Manager

Joseph F. MANNING OEM COORDINATOR — Name / Title | Joseph F. Manning — Signature | 11-21-14 — Date

Land Use Planner

N/A — Name / Title | Signature | Date

Public Works Director

Erik Burbank — Name / Title | Signature | 11-12-14 — Date

Police Department

Robert Cimino, Chief — Name / Title | Signature | 11/13/14 — Date

Fire Department

Michael R. Dingelstadt, Chief — Name / Title | Signature | 11/14/14 — Date

Jurisdictional Annex Review Sign-Off Sheet

Township of Millburn

MUNICIPALITY NAME

Management

Mayor/Administrator

TIMOTHY P GORDON — Name | Signature | 10·1·14 Date

Engineer

W. THOMAS WATKINSON — Name | Signature | 10·1·14 Date

Fiscal/CFO

Jason Gabloff — Name | Signature | 10·1·14 Date

Building Code Official

Jerry Eger / Building Sub Code Official — Name / Title | Signature | 10·1·14 Date

Floodplain Administrator

W. THOMAS WATKINSON — Name / Title | Signature | 10·1·14 Date

Emergency Manager

TIMOTHY P GORDON — Name / Title | Signature | 10·1·14 Date

Land Use Planner

Eileen Davitt / Zoning Ofcl — Name / Title | Signature | 10·1·14 Date

Public Works Director

JOHN BACE JR — Name / Title | Signature | 10·1·14 Date

Police Department

GREGORY G. WEBER Chief — Name / Title | Signature | 10·1·14 Date

Fire Department

J. Michael Roberts, Chief — Name / Title | Signature | 10·1·14 Date

Jurisdictional Annex Review Sign-Off Sheet

Montclair Township
MUNICIPALITY NAME

Management ~~*Mayor*~~/*Administrator* Timothy F. Stafford, Esq. Name	Signature	11/3/14 Date
Engineer Kimberli R. Craft, P.E. Name	Signature	10/31/14 Date
Fiscal/CFO Frank Mason Name	Signature	10/31/14 Date
Building Code Official Sam Souza/Code Official Name / Title	Signature	11/3/14 Date
Floodplain Administrator Kimberli R. Craft, P.E./ Township Engineer Name / Title	Signature	10/31/14 Date
Emergency Manager Kenneth Miscia/Capt. Police Dept and OEM Coordinator Name / Title	Signature	10/31/14 Date
Land Use Planner Janice Talley/ Director of Planning and Community Development Name / Title	Signature	10/31/14 Date
Public Works Director Stephen C. Wood, P.E./Director of Community Services Name / Title	Signature	10/31/14 Date
Police Department David Sabagh/Chief Name / Title	Signature	10/31/14 Date
Fire Department John Herrman/Chief Name / Title	Signature	10/31/14 Date

Jurisdictional Annex Review Sign-Off Sheet

NEWARK
MUNICIPALITY NAME

Management

Mayor/Administrator

Name	Signature	Date
RAS J. BARAKA		11/18/14

Engineer

Name	Signature	Date
Phillip Scott	Phillip Scott	11-21-14

Fiscal/CFO

Name	Signature	Date
Danielle A. Smith	Danielle A. Smith	11/21/14

Building Code Official

Name / Title	Signature	Date
NEIL MULTGANG	NEIL MULTGANG CONSTRUCTION OFFICIAL	11-20-14

Floodplain Administrator

Name / Title	Signature	Date
Mehdi Mohammadzadeh Flood Administrator		11/20/14

Emergency Manager

Name / Title	Signature	Date
Dorian Herrell Director		11/19/14

Land Use Planner

Name / Title	Signature	Date
DAMON RICH		11/18/14

Public Works Director

Name / Title	Signature	Date
Patrick Council		11/17/14

Police Department

Name / Title	Signature	Date
Eugene Venable Police Director		11/17/14

Fire Department

Name / Title	Signature	Date
JAMES W. STEWART, FIRE DIRECTOR		11/18/14

Jurisdictional Annex Review Sign-Off Sheet

BOROUGH OF NORTH CALDWELL

Management

Mayor

Joseph H. Alessi, Mayor — Signature — Date: 10-23-14

Engineer

Frank Zichelli — Signature — Date: 10-24-14

Fiscal/CFO

Richard Mondelli — Signature — Date: 10-24-14

Building Code Official

Len Mendola/Construction Offical — Signature — Date: 10/24/14

Floodplain Administrator

Len Mendola/Construction Offical — Signature — Date: 10/24/14

Emergency Manager

John D'Ascensio/OEM Coordinator — Signature — Date: 10/24/14

Land Use Planner

Frank Zichelli/Borough Engineer — Signature — Date: 10-24-14

Public Works Director

Frank Zichelli/Borough Engineer — Signature — Date: 10-24-14

Police Department

Mark Deuer/Police Chief — Signature — Date: 10/23/14

Fire Department

John D'Ascensio/Fire Chief — Signature — Date: 10/24/14

Jurisdictional Annex Review Sign-Off Sheet

Nutley Township
MUNICIPALITY NAME

Management

Mayor/Administrator

Name	Signature	Date
Alphonse Petracco	Alphonse Petracco	11/21/14

Engineer

Name	Signature	Date
Todd Hay	Todd Hay	11/21/14

Fiscal/CFO

Name	Signature	Date
Rosemary Costa	Rosemary Costa	11/21/14

Building Code Official

Name / Title	Signature	Date
Dave Berry	David Berry	11/2/14

Floodplain Administrator

Name / Title	Signature	Date
Dominic Ferry	[signature]	11/21/14

Emergency Manager

Name / Title	Signature	Date
Thomas Nicolitte OEM Coor.	[signature]	11/21/14

Land Use Planner

Name / Title	Signature	Date
Joseph P. Scarpelli	[signature]	11/21/14

Public Works Director

Name / Title	Signature	Date
Joseph P. Scarpelli	[signature]	11/21/14

Police Department

Name / Title	Signature	Date
Chief Tom STRUMOLO	T. S[signature]	11/21/14

Fire Department

Name / Title	Signature	Date
Deputy Chief Paul Cafone	Paul Cafone	11/21/14

Jurisdictional Annex Review Sign-Off Sheet

_____BOROUGH OF ROSELAND_____
MUNICIPALITY NAME

Management

Mayor/Administrator

Name	Signature	Date
RALPH J. TANGO, JR		11/18/14

Engineer

Name	Signature	Date
Maureen Chumacas	Maureen Chumacas	11-19-14

Fiscal/CFO

Name	Signature	Date
MAUREEN CHUMACAS	Maureen Chumacas	11-19-14

Building Code Official

Name / Title	Signature	Date
TOM JACOBSEN CONSTRUCTION OFFICAL	Tom Jacobsen	11/13/14

Floodplain Administrator

Name / Title	Signature	Date
TOM JACOBSEN	Tom Jacobsen	11/13/14

Emergency Manager

Name / Title	Signature	Date
JOHN MATHERS COORDINATOR		11/18/14

Land Use Planner

Name / Title	Signature	Date
DAVID G. ROBERTS, AICP/PP PLANNING CONSULTANT		11-14-14

Public Works Director

Name / Title	Signature	Date
Gary Schal SUPT. DPW		11-13-14

Police Department

Name / Title	Signature	Date
CAPT.		11/19/14

Fire Department

Name / Title	Signature	Date
William Yates - Fire chief		11/18/14

Jurisdictional Annex Review Sign-Off Sheet

Township of South Orange Village
MUNICIPALITY NAME

Management
Mayor/Administrator
Barry R. Lewis, Jr., Administrator

Name | Signature | 10/30/14 Date

Engineer
Salvatore Renda, Engineer

Name | Signature | 10/31/2014 Date

Fiscal/CFO
Christopher Battaglia, CFO

Name | Signature | 2014-10-31 Date

Building Code Official
Anthony Grenci, Dir. Building/Code

Name / Title | Signature | 10/31/2014 Date

Floodplain Administrator
Salvatore Renda, Engineer

Name / Title | Signature | 10/31/2014 Date

Emergency Manager
OEM Dir

Name / Title | Signature | 11/4/14 Date

Land Use Planner

Name / Title | Signature | 11/13/14 Date

Public Works Director
Thomas Michetti, Dir. DPW

Name / Title | Signature | 10/31/14 Date

Police Department
James Chelel, Police Chief

Name / Title | Signature | 10/31/14 Date

Fire Department
Glenn Savage, Fire Chief

Name / Title | Signature | 11/6/14 Date

Jurisdictional Annex Review Sign-Off Sheet

Township of Verona
MUNICIPALITY NAME

Management
Mayor/Administrator

Name | Signature | Date

Engineer

Name | Signature | Date

Fiscal/CFO

Name | Signature | Date

Building Code Official

Tom JACOBSEN CONSTRUCTION OFFICIAL | Tom Jacobsen | 10/30/14
Name / Title | Signature | Date

Floodplain Administrator

Name / Title | Signature | Date

Emergency Manager

JEFF Hayes DIR OEM-IT-ADMIN | J Hayes | 10-15-2014
Name / Title | Signature | Date

Land Use Planner

Name / Title | Signature | Date

Public Works Director

Chuck Molinaro Jr | | 10-30-2014
Name / Title | Signature | Date

Police Department

| | | 11-10-14
Name / Title | Signature | Date

Fire Department

Name / Title | Signature | Date

TOWNSHIP OF WEST ORANGE

Management

Mayor/Administrator

Robert D. Parisi — Name | Signature | 8.22.14 — Date

Engineer

LEONARD R. LEPORE — Name | Signature | AUG. 22, 2014 — Date

Fiscal/CFO

JOHN GROSS — Name | Signature | 8/18/14 — Date

Building Code Official

Thomas Tracey — Name / Title | Signature | 8-25-14 — Date

Floodplain Administrator

LEONARD R. LEPORE — Name / Title | Signature | AUG. 22, 2014 — Date

Emergency Manager

PETER F SMERALDO JR
OEM COORDINATOR — Name / Title | Signature | 9/8/2014 — Date

Land Use Planner

Name / Title | Signature | Date

Public Works Director

LEONARD R. LEPORE — Name / Title | Signature | AUG. 22, 2014 — Date

Police Department

Matthew Feulc — Name / Title | Signature | 8/25/14 — Date

Fire Department

PETER F SMERALDO JR
FIRE Chief — Name / Title | Signature | 9/8/2014 — Date

TOWNSHIP OF WEST ORANGE

Management
Mayor/Administrator

Name | Signature | Date

Engineer

Name | Signature | Date

Fiscal/CFO

Name | Signature | Date

Building Code Official

Name / Title | Signature | Date

Floodplain Administrator

Name / Title | Signature | Date

Emergency Manager

Name / Title | Signature | Date

Land Use Planner

Paul Grygiel/Acting Planning Director | | August 18, 2014
Name / Title | Signature | Date

Public Works Director

Name / Title | Signature | Date

Police Department

Name / Title | Signature | Date

Fire Department

Name / Title | Signature | Date

9.1 Essex County

This section presents the jurisdictional annex for the Essex County.

9.1.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Lieutenant Edward Esposito, Essex County Sheriff's Office Office of Emergency Management 560 Northfield Avenue, West Orange, NJ 07052 973-324-9750	Sanjeev Varghese, Public Works Director and County Engineer 900 Bloomfield Avenue, Verona, NJ 07044 973-226-8500 X2660

9.1.2 County Profile

Please refer to Section 4, Volume I of this Plan for details on Essex County's population, location, climate, history, growth and development.

9.1.3 Natural Hazard Event History Specific to Essex County

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. A more detailed summary is provided

9.1.4 Natural Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for Essex County.

Table 9.1-1. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV: $1,900,000	Occasional	14	Medium
Coastal Storm	Category 1 SLOSH: $1,428,179,599 Category 2 SLOSH: $2,866,714,899 Category 3 SLOSH: $3,669,653,532 Category 4 SLOSH: $3,956,393,832	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $83,620,111 2,500-year MRP: $1,499,108,556	Occasional	18	Medium
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $991,391,949	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $263,957,200	Occasional	12	Low
Severe Storm	100-Year MRP: $59,018,325 500-year MRP: $360,441,467 Annualized: $4,705,755	Frequent	48	High
Winter Storm	1% GBS: $501,083,553	Frequent	54	High

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
	5% GBS: $2,505,417,763			
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $114,544,200	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. *Building damage ratio estimates based on FEMA 386-2 (August 2001)*
b. *The valuation of general building stock and loss estimates was based on custom inventory for the County.*
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20
c. *Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

9.1.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to Essex County.

Table 9.1-2. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Enforcement Authority	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	State of NJ	NJAC 5:23-3, 14
Zoning Ordinance	Municipalities	
Subdivision Ordinance	County Planning Department	Subdivision Review Regulations 1997
NFIP Flood Damage Prevention Ordinance	Municipalities	
Cumulative Substantial Damages	Municipalities	
Freeboard	Municipalities	
Growth Management	County Department of Public Works	Essex County Comprehensive Transportation Plan April 2014
Floodplain Management / Basin Plan	NJDEP	Executive Order 11988
Stormwater Management Plan/Ordinance	NJDEP	NJDEP Rule N.J.A.C. 7:8
Comprehensive Plan / Master Plan/ General Plan	Municipalities	
Capital Improvements Plan	Engineering Department of Public Works	Developed annually
Site Plan Review Requirements	County Planning Board	Site-Plan Review April 1997
Open Space Plan	County Department of Parks	April 2003
Stream Corridor Management Plan	N/A	
Watershed Management or Protection Plan	N/A	
Economic Development Plan	Economic Development Corporation	The Economic Development Corporation of Essex County is a private, not for profit corporation established to promote economic development in the county and provide technical and financial assistance to existing and start-up businesses
Comprehensive Emergency Management Plan		
Emergency Response Plan	Essex OEM	July 13, 2013
Post Disaster Recovery Plan	N/A	
Post Disaster Recovery Ordinance	N/A	
Real Estate Disclosure Requirement	N/A	

Table 9.1-2. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Enforcement Authority	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]	Essex OEM	County Traffic Diversion Plan

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to Essex County.

Table 9.1-3. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	County Engineering Department
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineering inspectors and licensed engineers
Planners or engineers with an understanding of natural hazards	Y	Engineering and Planning Departments
NFIP Floodplain Administrator	N	
Surveyor(s)	Y	Engineering has surveyors
Personnel skilled or trained in "GIS" applications	Y	Essex Sheriff's GIS Department
Scientist familiar with natural hazards in the county.	N	
Emergency Manager	Y	Essex County Sheriff's Office of Emergency Management
Grant Writer(s)	Y	Administrator's Office
Staff with expertise or training in benefit/cost analysis	N	
Professionals trained in conducting damage assessments	Y	Essex County Sheriff's Office of Emergency Management

Fiscal Capability

The table below summarizes financial resources available to Essex County.

Table 9.1-4. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community Development Block Grants (CDBG)	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for specific purposes	Yes
User fees for water, sewer, gas or electric service	No
Impact Fees for homebuyers or developers of new development/homes	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	No
Mitigation grant programs	Yes
Other	Yes, State and Federal Transportation and Homeland Security Funding

Community Classifications

The table below summarizes classifications for community program available to Essex County.

Table 9.1-5. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	N/A	
Building Code Effectiveness Grading Schedule (BCEGS)	N/A	
Public Protection	N/A	
Storm Ready	NP	
Firewise	NP	

N/A = Not applicable. NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

Additional Capabilities

Please see additional capabilities described in the *'Integration of Hazard Mitigation into Existing and Future Planning Mechanisms'* section below.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

It is the intention of this County to incorporate hazard mitigation planning and natural hazard risk reduction as an integral component of the County's administrative, regulatory and operational framework. A summary of how the County currently integrates hazard mitigation into daily operations is presented below. In addition, the County identified specific integration activities that will be incorporated into procedures and are included in their updated mitigation strategy.

Essex County Strategic Recovery Planning Report (SRPR): The New Jersey Department of Community Affairs (NJDCA) has established a Post Sandy Planning Assistance Grant Program. The purpose of this program is to support long range planning for community redevelopment in the municipalities and counties

sustaining damage from Superstorm Sandy. Essex County is currently in the process of preparing the SRPR. The SRPR has been closely coordinated with the Essex County Hazard Mitigation Plan Update. The spatial analysis conducted for the Hazard Mitigation Plan appears in the SRPR for the flood, storm surge, and sea level rise hazards. In addition, the County mitigation actions are listed in the SRPR as well as the mitigation action types by municipality. A more detailed land use analysis was conducted for the SRPR. For example, an exposure analysis was completed to assess the vulnerability of the residential and non-residential land uses with in the County to flooding. This has been included in the Hazard Mitigation Plan in the appropriate hazard profiles.

Land Use Planning: The Planning Department supports all aspects of local planning and seeks to integrate consideration in natural hazard risk and support mitigation project identification and implementation through its planning programs, resources and Office of Emergency Management.

Integration of Improved Hazard Information into Existing Emergency Management Plans: The County continues to develop, enhance and implement existing emergency response plans to utilize new and developing technology/information as it becomes available. As per this plan, the County critical facility inventory was updated and new facilities were added via geo-coding to have one spatial data set for future analysis.

Public Education/Outreach Programs/Training: Essex County has regularly scheduled meetings with Emergency Managers from each community. Training for all municipalities and colleges are provided for all community emergency response teams within the County. In addition, the County has organized instructor-led training from utility companies regarding generator safety for LEPC members. LEPC meetings include agency representatives from public, private, utilities, non-profits, educational institutions.

The Sheriff and NJOEM receive invitations and are on the agenda to speak at public, private and not-for-profit meetings and events including the Ironbound Recovery group and Lower Passaic Valley Conservancy Group. The Sheriff's Office and Community Affairs attend meetings to present information regarding mitigation, response, resource availability, grant programs and flood map updates at County and municipal events. In addition, the County distributes informational brochures (e.g., Are You Ready?, Go Kit information etc.). Recent event examples include Government Day in Millburn, Swing Night in Nutley, Emergency Vehicle Day in Glen Ridge, the Annual Police Expo in Livingston.

The Essex County Sherriff's Department has a website that is regularly updated to inform the public. In addition, it has a page dedicated to the Hazard Mitigation Plan.

There is coastal evacuation route display along roadways in the County.

The County Sheriff's Office at the County Police Academy trains the Auxiliary Police (volunteer police at the municipal level).

Future Planning Mechanisms: According to the Department of Public Works, future capital improvement projects will be evaluated to determine if they meet hazard mitigation goals and objectives. When developing upcoming transportation improvement programs, hazard mitigation actions will be funded as budget allows.

The Essex County Department of Public Works, under which the Division of Planning, Engineering, Buildings and Grounds, Roads and Bridges and Environmental Affairs resides, participated in the SRPR. As a part of the SRPR, the following planning initiatives were identified some of which have also been included in the County's mitigation strategy (Refer to Table 9.1-7 actions Essex-21 to Essex-26).

1. Pursue Sandy Recovery Planning Assistance Grant from the NJDCA.
2. Post Disaster Recovery Capital Improvement Plan - Develop a five year plan for capital projects directly linked to recovery, mitigation or preparedness.

3. Community Resiliency Element – Update the County Master Plan with a Community Resiliency Element that reviews the Land Use Plan Element and development standards against the vulnerability issues outlined in this SRPR and adopt as a Master Plan Element.
4. Update Land Development Regulations - Review zoning and land use regulations against the vulnerability issues outlined in this SRPR and develop amendments to anticipate necessary changes to height, bulk and setback requirements needed to improve resiliency based on recommendations in the Community Resiliency Element.
5. Neighborhood Plans- Develop specific strategic plans for neighborhoods most severely impacted by Sandy, including the "Island" neighborhood in the Ironbound and impacted neighborhoods in Fairfield Township.
6. Permit Process- Quality Improvement - Review existing permitting procedures to determine improvements for fast-tracking/streamlining for expediting projects directly related to recovery or mitigation and that are consistent with adopted Design Standards.
7. Design Standards (integrating elevated structures into community design character) - Develop design standards to address the visual impact of mitigation measures such as elevating bulkheads, elevating buildings on foundations or pilings, etc. Such design standards might include requirements for skirting exposed pilings, parking under the lowest habitable floor, using exterior decking to stagger stairways to elevated first floor levels, etc.
8. The long term impacts of future sea level rise should be projected and studied for Newark Bay and the tidal portions of the Passaic River.

9.1.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

According to the 2007 Plan's FEMA crosswalk, actions that were proposed to be undertaken by Essex County were included within the jurisdiction where the county agency action is to occur. For the 2015 plan update, all previous county actions and their status are listed in the table below.

Table 9.1-6. Past Mitigation Initiative Status

Description	Status	Review Comments
Bridges in Belleville - Pedestrian and Vehicular	Discontinued	Due to lack of funding there has been no progress on this mitigation action. This action will not be carried forward into the 2015 Mitigation Plan. Initiatives Essex-5 and Essex-6 identifies bridges the county has identified for mitigation.
Repair bridge into Senior Recreational Center (Belleville, Old Mill St.)	Evaluation in Progress	Developer of Senior Housing Project evaluating the main bridge into the site. Applied for funding to rehab of 2nd River bridge at senior center. Awaiting confirmation of grant. This action will be carried forward into the 2015 Mitigation Plan (Essex-5).
Bridge projects - Five vulnerable bridges have been identified. It is the intent and purpose of this project to rehabilitate the remaining bridges requiring structural work.	Continuous	Two of the five bridges have been rebuilt. These projects are within the jurisdiction of Essex County. Seeking funding for remaining bridges with Essex County and NJDOT. This action will be carried forward into the 2015 Mitigation Plan (Essex-6).
Further identify roadway flooding between municipalities.	No Progress	Due to lack of County funding there has been no progress on this mitigation action. This action will be carried forward into the 2015 Mitigation Plan (Essex-8 through 10).
Flooding – Millburn JFK Parkway and mall area	No Progress; Continuous	Due to lack of County funding there has been no progress on this mitigation action. This action will be carried forward into the 2015 Mitigation Plan (Essex-8).
Millburn Ave. bridge	Complete	Completed by Essex County Department of Public Works. Since this action has been completed, it will not be carried forward into the 2015 Mitigation Plan.
Third River study	Discontinued	Township of Nutley's engineer consultant performed hydrological and hydraulic study of Third River with regard to key historical flood areas to determine impacts to flood prone structures. As a result of study, the Township applied and received FEMA/NJOEM Mitigation grant (RFP and FMA) to acquire and demolish three properties along the Third River. Project completed in 2013. Based on study, the Township is pursuing additional FEMA/NJOEM Mitigation grant opportunities in identified areas. The County will not include this initiative in the County annex.
Bridges over river need to be elevated and several need of repair	Discontinued	Township of Nutley continues to work on repairing and raising its orphan bridges over the

Table 9.1-6. Past Mitigation Initiative Status

Description	Status	Review Comments
		Third River. This action will not be carried forward into the County annex.
Train bridges need to be repaired	Discontinued	Due to lack of County funding there has been no progress on this mitigation action. This action will not be carried forward into the County annex.
Dredging of Third River	Discontinued	The County has not provided any funding for this initiative. This action will not be carried forward into the County annex.
Impassable roadways during storm events – Bloomfield Ave and Mt Prospect Ave which are County roadways.	Continuous	Due to lack of funding, no progress has been made on this initiative. This initiative will be carried forward into the County annex (Essex-9).
Stream culvert work in residential areas storm water run-off– Eagle Rock Reservation area including Afterglow Ave. and Ravine Rd and flooding of Cole Rd.	No Progress, Continuous	No progress has been made with this initiative due to lack of funding. This initiative will be carried forward into the County annex (Essex-10).
Linden Ave. bridge repair.	Completed	Essex County rebuilt the bridge and completed this project. Since this action has been completed, it will not be carried forward into the 2015 Mitigation Plan.
Possible dam failure at Verona Park.	Completed	Essex County performed dam enhancements required and completed this project. Since this action has been completed, it will not be carried forward into the 2015 Mitigation Plan.
Mitigate Forest Avenue streams against flooding.	No Progress	Due to lack of County funding there has been no progress on this mitigation action. This action will not be carried forward into the County annex.
Passaic Avenue and Bloomfield Avenue are both evacuation routes impacted by flooding.	No Progress	Due to lack of County funding there has been no progress on this mitigation action. This action will be carried forward into the County annex (Essex-11).

Proposed Hazard Mitigation Initiatives for the Plan Update

The County participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.1-7 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.1-8 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.1-7. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS
Essex-1	Support and obtain backup power and alternative energy sources to ensure continuity of operations. Sites currently identified: 1. Essex County K9/Bomb building 2. DPW building generator 3. Essex County Patrol Division Headquarters generator (Newark) 4. Essex County OEM Storage/Crime Scene Facility (Orange) generator 5. Essex County DPW/Fleet Headquarters generator 6. DPW/Roads and Bridges Headquarters (Cedar Grove) 7. Catholic Charities of the Archdiocese of Newark shelter	Existing	All	2.1 6.1	Essex County Sheriff's Office	High	High $1,347,177	HMGP	Short	High	SIP	PP
Essex-2	Essex County Traffic Control Transfer Switch generator	Existing	All	2.1 6.1	Essex County Sheriff's Office	High	High $100,000	HMGP	Short	High	SIP	PP
Essex-3	Newark AIDS Consortium, INC. Broadway House: Newark AIDS Consortium INC. Broadway House for Continuing Care generator	Existing	All	2.1 6.1	Newark City, Essex County Sheriff's Office	High	High $250,000	HMGP	Short	High	SIP	PP
Essex-4	Seton Hall University: Seton Hall University generator project	Existing	All	2.1 6.1	Seton Hall University, Essex County Sheriff's Office	High	High $865,000	HMGP	Short	High	SIP	PP
Essex-5 (OLD)	Repair bridge into Senior Recreational Center (Belleville Old Mill St.) (Old initiative)	Existing	All	1.2 2.1	County Engineering Office	High	High	HMGP	Short	Low	SIP	PP

Table 9.1-7. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS
Essex-6 (OLD)	Rehabilitate bridges requiring structural work. Five vulnerable county bridges have been identified at this time. Center Street Bridge in Nutley; Hoover Ave Bridge in Bloomfield; Cherry Hill Bridge in Millburn; Dougall Street Bridge in West Caldwell; Lyons Ave Bridge in Irvington (Old initiative)	Existing	Flood	1.2 2.1	County Engineering Office	High	High $7 million	Federal, State Grant opportunities	Long Term DOF	Medium	SIP	PP
Essex-7 (OLD)	Utilize the recommendations of the Strategic Recovery Planning Report to further identify roadway flooding upon county roadways and to develop future mitigation actions to address those issues (Old initiative)	Existing	Flood	1.2 2.1	County Engineering Office	High	High	Federal, State grant opportunities HMGP, PDM	Long Term DOF	Medium	SIP	PP
Essex-8 (OLD)	Enlarge drainage system on JFK Parkway in Millburn. JFK is a county owned roadway as well as an evacuation route. (Old initiative)	Existing	Flood	1.2	County Engineers Office	High	High	Federal, State Grant Opportunities	Long Term DOF	Medium	SIP	PP
Essex-9 (OLD)	Enlarge drainage system on Bloomfield Ave in Verona. Bloomfield Ave is a county owned roadway as well as an evacuation route. (Old initiative)	Existing	Flood	1.2	County Engineers Office	High	High	Federal, State Grant Opportunities	Long Term DOF	Medium	SIP	PP
Essex-10 (OLD)	Stream culvert work in residential areas storm water run-off– Eagle Rock Reservation area including Afterglow Ave. and Ravine Rd and flooding of Cole Rd. (Old initiative)	N/A	Flood	1.2 2.2 2.3	County Engineers Office	High	High	Federal, State Grant Opportunities HMGP, PDM	Long Term DOF	Medium	NSP	PP

Table 9.1-7. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS
Essex-11 (OLD)	Conduct a study to evaluate drainage systems on roadways to reduce the impacts of flooding. Areas identified to date: Passaic Avenue and Bloomfield Avenue in Verona which are both evacuation routes (Old initiative)	N/A	Flood	1.2 2.1	County Engineers Office	High	High	Federal, State Grant Opportunities HMGP, PDM	Long Term DOF	Medium	SIP	PP
Essex-12	Purchase three 525 gallon potable water trailers	N/A	Wildfire Drought Severe Weather	1.2 6.2	Essex County Sheriff's OEM	High	High	Federal, State grants	Short Term DOF	Medium	SIP	PP
Essex-13	Provide redundant methods for Voice/Data transmissions 4G wireless broadband at DPW Headquarters.	N/A	All	1.1 1.2 6.1	Sheriff's Communication Bureau	High	High	Federal, State grants	Short Term DOF	Medium	SIP	PP
Essex-14	Purchase 4 digital sign boards with variable message capability	N/A	All	1.1 1.2 6.1	Essex County Sheriff's OEM and County Engineering	High	High	Federal, State Grant Opportunities HMGP	Short Term DOF	Medium	SIP	PP
Essex-15	Purchase portable flood wall which will be deployed prior to a flooding event to protect critical county facilities	Existing	Flood	1.2 2.1 6.1	County Engineering, County OEM	High	High	Federal, State Grant Opportunities HMGP, PDM	Short Term DOF	High	SIP	PP
Essex-16	Install quick-connects for emergency generators at nine County fueling stations	Existing	All	1.2 2.1 6.1	County Engineering	High	Medium	Federal, State Grant Opportunities, HMGP, PDM	Short Term DOF	High	SIP	PP
Essex-17	Install a County-Wide emergency alert system	Both	All	1.1 1.2	Essex Sheriff's Office of Emergency Management	High	High $300,000	Federal, State Grant Opportunities, HMGP, PDM Homeland Security Grants	Short Term DOF	Medium	EAP	ES
Essex-18	Conduct a functional exercise related to school safety	NA	All	1.2 5.2	Essex Sheriff's Office	High	Medium	Homeland Security Grants	Short Term DOF	Medium	EAP	ES

Table 9.1-7. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS
Essex-19	Administratively and financially support installing flood control measures in flood zone areas to protect critical facilities (i.e., levees, trenches, sump pump systems) or obtain equipment to address short-term needs (i.e., pumps) These facilities include the following at this time: 1. County Detention Facility in Newark 2. Passaic Valley Sewerage Commission	Existing	Flood, Coastal Storm, Severe Weather	1.2 2.2	Essex Sheriff's Office of Emergency Management; PVSC	Medium	Medium	Federal, State Grant Opportunities HMGP, PDM	Short Term DOF	High	SIP	PP
Essex-20	Pursue Sandy Recovery Planning Assistance Grant from NJ Department of Community Affairs	NA	All	All	Division of Planning	High	Low	NJ DCA	Short Term DOF	High	LPR	PR
Essex-21	Develop a five year plan for capital projects directly linked to recovery, mitigation or preparedness	Both	All	1.3 2.4 4.1 4.2 5.4	Division of Planning	High	Low	NJ DCA; County	Short Term DOF	High	LPR	PR
Essex-22	Update the County Master Plan with a Community Resiliency Element that reviews the Land Use Plan Element and development standards against the vulnerability issues outlined in this SRPR and adopt as a Master Plan Element.	Both	All	1.3 2.4 4.1 4.2 5.4	Division of Planning	High	Low	NJ DCA; County	Short Term DOF	High	LPR	PR
Essex-23	Review zoning and land use regulations against the vulnerability issues outlined in this SRPR and develop amendments to anticipate necessary changes to height, bulk and setback requirements needed to improve resiliency based on recommendations in the Community Resiliency Element	Both	All	1.3 2.4 4.1 4.2 5.4	Division of Planning	High	Low	NJ DCA; County	Short Term DOF	High	LPR	PR

Table 9.1-7. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS
Essex-24	Develop specific strategic plans for neighborhoods most severely impacted by Sandy, including the "Island" neighborhood in the Ironbound and impacted neighborhoods in Fairfield Township	Both	All	1.3 2.4 4.1 4.2 5.4	Division of Planning	High	Low	NJ DCA; County	Short Term DOF	High	LPR	PR
Essex-25	Review existing permitting procedures to determine improvements for fast-tracking/streamlining for expediting projects directly related to recovery or mitigation and that are consistent with adopted Design Standards	Both	All	1.3 2.4 4.1 4.2 5.4	Division of Planning	High	Low	NJ DCA; County	Short Term DOF	High	LPR	PR
Essex-26	Develop design standards to address the visual impact of mitigation measures such as elevating bulkheads, elevating buildings on foundations or pilings, etc. Such design standards might include requirements for skirting exposed pilings, parking under the lowest habitable floor, using exterior decking to stagger stairways to elevated first floor levels, etc.	Both	All	1.3 2.4 4.1 4.2 5.4	Division of Planning	High	Low	NJ DCA; County	Short Term DOF	High	LPR	PR
Essex-27	Develop a County Multi-jurisdiction Wildfire Preparedness Plan. Identify updated drafting locations in the reservation to ensure accessibility for pump trucks.	N/A	Wildfire	1.3 2.4 4.1 4.2 5.4	County OEM and Fire Coordinator	Medium	Medium	HMGP, PDM, Wildland Urban Interface Community Fire Assistance, Capital Funding	Long Term DOF	High	LPR	PR
Essex-28	Purchase a wildfire "brush truck" to combat wildfires within County	N/A	Wildfire	1.2 2.1 6.1	County OEM and Fire Coordinator	High	High	Federal Fire Grant Programs	Long Term DOF	High	NRP	ES

Table 9.1-7. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS
Essex-29	Provide continued education, training and exercise opportunities to first responders and other local officials regarding floodplain management, natural and human-caused hazards and the Community Rating System.	N/A	All	3.1 3.3 5.2	County OEM	High	Medium	County, State and Federal sources	Short Term	Medium	EAP	PR
Essex-30	Adopt new County roof standards to mitigate natural hazards	New	All	1.3	Division of Planning	High	Low	County	Short Term	Medium	LPR	PR
Essex-31	Revise County development standards which are used when evaluating private development along County roads to include more resilient building standards.	New	All	1.3	Division of Planning	High	Low	County	Short Term	Medium	LPR	PR
Essex-32	Construct new Passaic River bridge crossing in the Newark area to relief currently over-burdened bridges and provide additional traffic redundancy in case of another hazard	New	All	1.2 6.1	County DWP	High	High	County, State and Federal Sources	Long Term DOF	Medium	SIP	PP
Essex-33	Acquire additional high water vehicles that will permit ingress/egress of essential personnel and supplies during disasters	Both	All	1.2 6.1	County OEM and Department of Corrections	High	High	County, State and Federal Sources	Long Term DOF	Medium	SIP	ES
Essex-34	Retrofit the County Dispatch Communications Center in Newark for flood and high winds.	Existing	Flood, Severe Weather, Coastal Storm	1.2 6.1	County OEM	High	High	HMGP, Capital funding, Forfeiture Funds	Short Term DOF	High	SIP	ES, PP

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV Community Assistance Visit
CRS Community Rating System
DPW Department of Public Works
FEMA Federal Emergency Management Agency
FPA Floodplain Administrator
HMA Hazard Mitigation Assistance

N/A *Not applicable*
NFIP *National Flood Insurance Program*
NJDEP *New Jersey Department of Environmental Protection*
NJOEM *New Jersey Office of Emergency Management*
OEM *Office of Emergency Management*

Potential FEMA HMA Funding Sources:
FMA *Flood Mitigation Assistance Grant Program*
HMGP *Hazard Mitigation Grant Program*
PDM *Pre-Disaster Mitigation Grant Program*
RFC *Repetitive Flood Claims Grant Program*
SRL *Severe Repetitive Loss Grant Program*

Timeline:
Short *1 to 5 years*
Long Term *5 years or greater*
OG *On-going program*
DOF *Depending on funding*

Costs:
Where actual project costs have been reasonably estimated:
Low *< $10,000*
Medium *$10,000 to $100,000*
High *> $100,000*

Where actual project costs cannot reasonably be established at this time:
Low *Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium *Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High *Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:
Low= *< $10,000*
Medium *$10,000 to $100,000*
High *> $100,000*

Where numerical project benefits cannot reasonably be established at this time:
Low *Long-term benefits of the project are difficult to quantify in the short term.*
Medium *Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High *Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*

- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.1-8. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Essex-1	Support and obtain backup power and alternative energy sources to ensure continuity of operations.	1	1	1	1	1	1	1	0	1	1	1	1	1	0	12	High
Essex-2	Essex County Traffic Control Transfer Switch generator	1	1	1	1	1	1	1	0	1	1	1	1	1	0	12	High
Essex-3	Newark AIDS Consortium, INC. Broadway House: Newark AIDS Consortium INC. Broadway House for Continuing Care generator	1	1	1	1	1	1	1	0	1	1	1	1	1	0	12	High
Essex-4	Seton Hall University: Seton Hall University generator project	1	1	1	1	1	1	1	0	1	1	1	1	1	0	12	High
Essex-5 (OLD)	Repair bridge into Senior Recreational Center (Belleville Old Mill St.) (Old initiative)	1	1	0	0	0	0	-1	0	0	0	0	0	0	0	1	Low
Essex-6 (OLD)	Bridge projects - Five vulnerable bridges have been identified. It is the intent and purpose of this project to rehabilitate bridges requiring structural work. All bridges are county owned. Center Street Bridge in Nutley; Hoover Ave Bridge in Bloomfield; Cherry Hill Bridge in Millburn; Dougall Street Bridge in West Caldwell; Lyons Ave Bridge in Irvington (Old initiative)	1	1	1	1	1	1	0	0	1	1	0	0	1	0	9	Medium
Essex-7 (OLD)	Further identify Roadway flooding between municipalities. (Old initiative)	1	1	1	1	1	1	0	1	0	1	0	0	1	0	9	Medium
Essex-8	Enlarge Drainage system on	1	1	1	1	1	1	0	1	0	1	0	0	1	0	9	Medium

Table 9.1-8. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
(OLD)	JFK Parkway in Millburn. JFK is a county owned roadway as well as an evacuation route. (Old initiative)																
Essex-9 (OLD)	Enlarge Drainage system on Bloomfield Ave in Verona. Bloomfield Ave is a county owned roadway as well as an evacuation route. (Old initiative)	1	1	1	1	1	1	0	1	0	1	0	0	1	0	9	Medium
Essex-10 (OLD)	Stream culvert work in residential areas storm water run-off– Eagle Rock Reservation area including Afterglow Ave. and Ravine Rd and flooding of Cole Rd. (Old initiative)	1	1	1	1	1	1	0	1	0	1	0	0	1	0	9	Medium
Essex-11 (OLD)	Reduce the impacts of flooding on Passaic Avenue and Bloomfield Avenue in Verona as are both evacuation routes (Old initiative)	1	1	1	1	1	1	0	1	0	1	0	0	1	0	9	Medium
Essex-12	Purchase three 525 gallon potable water trailers	1	0	1	0	1	1	1	0	1	1	1	1	1	0	10	Medium
Essex-13	Provide redundant methods for Voice/Data transmissions 4G wireless broadband at DPW Headquarters.	1	0	1	0	1	1	1	0	1	1	1	1	1	0	10	Medium
Essex-14	Purchase 4 digital sign boards with variable message capability	1	0	1	0	1	1	1	0	1	1	1	1	1	0	10	Medium
Essex-15	Purchase portable flood wall which will be deployed prior to a flooding event to protect critical county facilities	1	1	1	1	1	1	0	1	1	1	0	0	1	0	10	High
Essex-16	Install quick-connects for	1	1	1	1	1	1	0	1	1	1	0	0	1	0	10	High

Table 9.1-8. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
	emergency generators at nine County fueling stations																
Essex-17	County-wide emergency alert system	1	1	1	1	1	1	0	0	1	1	1	0	0	1	10	Medium
Essex-18	Conduct a functional exercise related to school safety	1	0	1	0	1	1	0	0	1	1	0	1	1	1	9	Medium
Essex-19	Obtain equipment (pumps) to remove water from critical facilities.	1	1	1	1	1	1	0	0	1	1	1	1	1	1	12	High
Essex-20	Pursue Sandy Recovery Planning Assistance Grant from NJ Department of Community Affairs	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Essex-21	Develop a five year plan for capital projects directly linked to recovery, mitigation or preparedness	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Essex-22	Update the County Master Plan with a Community Resiliency Element that reviews the Land Use Plan Element and development standards against the vulnerability issues outlined in this SRPR and adopt as a Master Plan Element.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Essex-23	Review zoning and land use regulations against the vulnerability issues outlined in this SRPR and develop amendments to anticipate necessary changes to height, bulk and setback requirements needed to improve resiliency based on recommendations in the Community Resiliency Element	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High

Table 9.1-8. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Essex-24	Develop specific strategic plans for neighborhoods most severely impacted by Sandy, including the "Island" neighborhood in the Ironbound and impacted neighborhoods in Fairfield Township	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Essex-25	Review existing permitting procedures to determine improvements for fast-tracking/streamlining for expediting projects directly related to recovery or mitigation and that are consistent with adopted Design Standards	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Essex-26	Develop design standards to address the visual impact of mitigation measures such as elevating bulkheads, elevating buildings on foundations or pilings, etc. Such design standards might include requirements for skirting exposed pilings, parking under the lowest habitable floor, using exterior decking to stagger stairways to elevated first floor levels, etc.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Essex-27	Develop a County Multi-jurisdiction Wildfire Preparedness Plan	1	1	1	1	1	1	0	1	1	0	0	0	1	1	10	High
Essex-28	Purchase a wildfire "brush truck" to combat wildfires within County	1	1	1	1	1	1	0	1	1	0	0	0	1	1	10	High
Essex-29	Provide continued education, training and exercise opportunities to first	1	1	1	1	1	1	0	0	1	0	1	0	0	1	9	Medium

Table 9.1-8. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
	responders and other local officials regarding floodplain management, natural and human-caused hazards and the Community Rating System.																
Essex-30	Adopt new County roof standards to mitigate natural hazards	1	1	1	1	0	1	0	0	0	0	1	0	1	0	7	Medium
Essex-31	Revise County development standards which are used when evaluating private development along County roads to include more resilient building standards.	1	1	1	1	0	1	0	0	0	0	1	0	1	0	7	Medium
Essex-32	Construct new Passaic River bridge crossing in the Newark area to relief currently over-burdened bridges and provide additional traffic redundancy in case of another hazard	1	1	1	1	0	1	0	1	1	1	1	0	1	0	9	Medium
Essex-33	Acquire additional high water vehicles that will permit ingress/egress of essential personnel and supplies during disasters	1	0	0	1	0	1	0	0	1	1	1	1	1	1	9	Medium
Essex-34	Retrofit the County Dispatch Communications Center in Newark for flood and high winds.	1	1	1	1	1	1	0	0	1	1	1	0	1	0	10	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.1.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.1.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Essex County that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Essex County has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.1.9 Additional Comments

None at this time.

Figure 9.1-1. Essex County Hazard Area Extent and Location Map 1

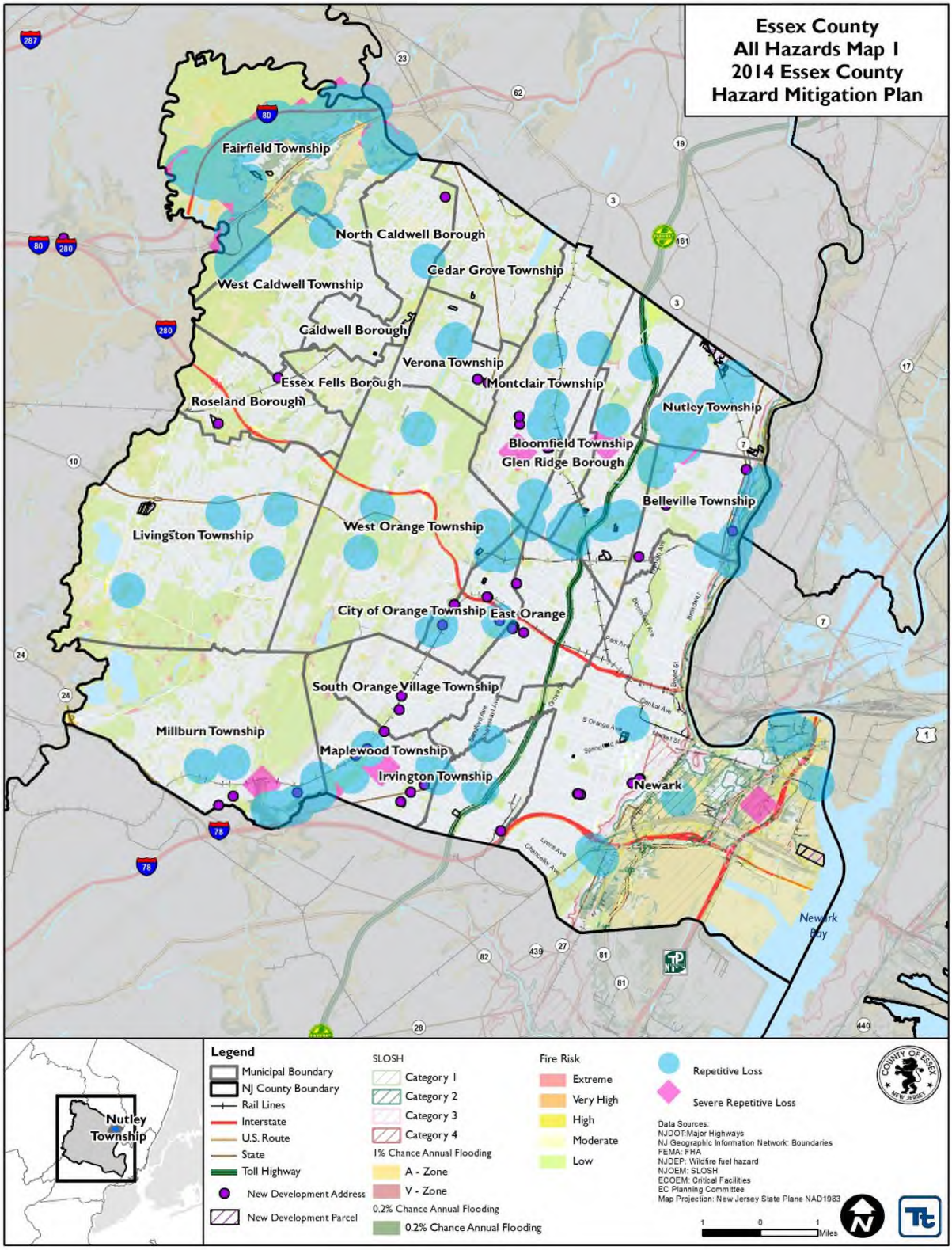
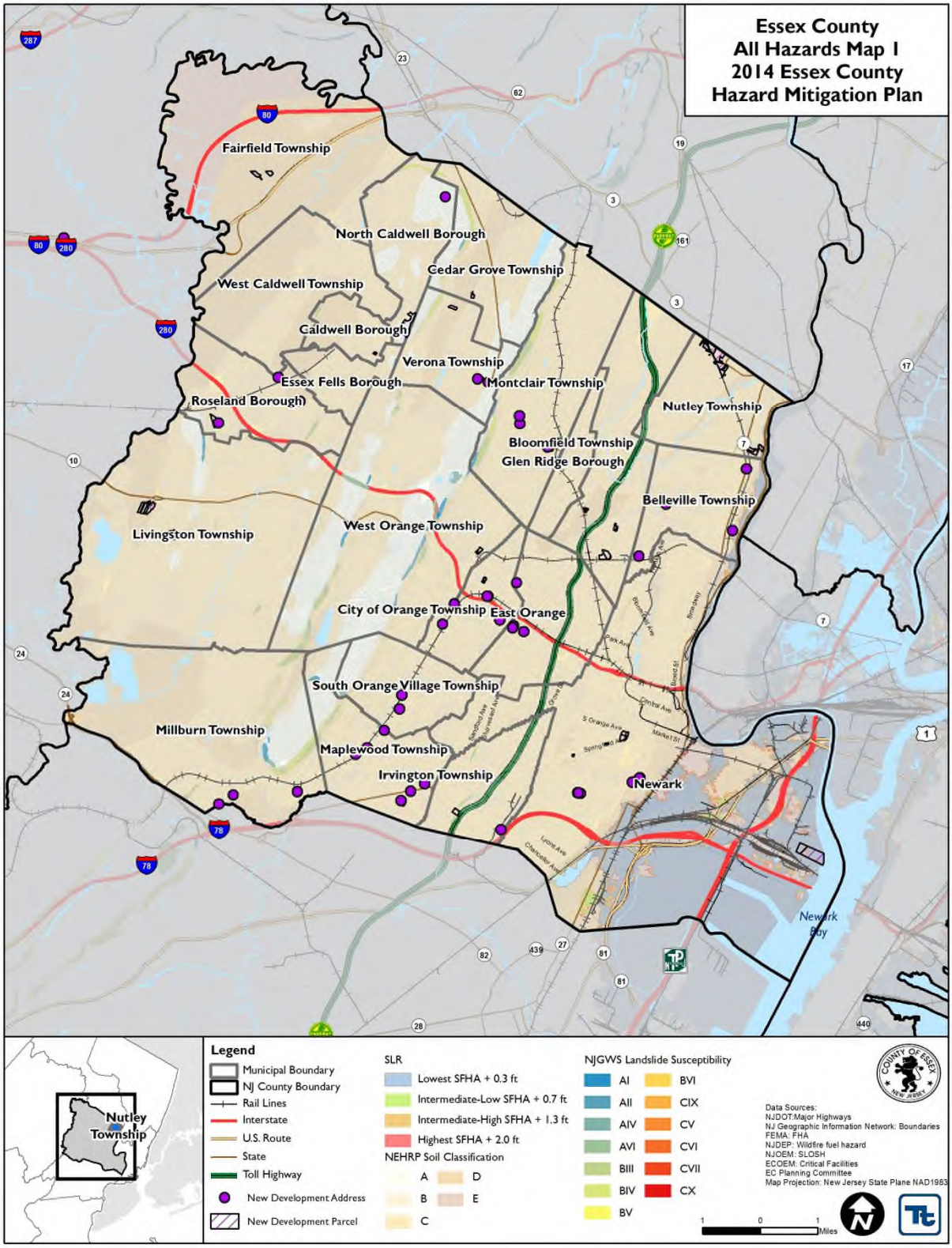


Figure 9.1-2. Essex County Hazard Area Extent and Location Map 2



Action Number: **Essex-1 (NEW/LOI)**
Mitigation Action/Initiative: Essex County K9 HQ

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of power to emergency services buildings
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase and install generators
	2. Do nothing
	3. Build new facilities with backup power source
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install generators at K9 and DPW buildings in Millburn
Action/Project Category	SIP
Goals/Objectives Met	2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Emergency Response functions
Estimated Cost	$150,000
Priority*	High
Plan for Implementation	
Responsible Organization	Essex County Sheriff's Office
Local Planning Mechanism	
Potential Funding Sources	HMGP
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex County-1 (NEW/LOI)**
Mitigation Action/Initiative: Essex County DPW/Fleet Headquarters generator

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of power to emergency services buildings
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase and install generator
	2. Do nothing
	3. Build new building with backup power capabilities
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install generator at County DPW Fleet Headquarters.
Action/Project Category	SIP
Goals/Objectives Met	2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Emergency response building functions
Estimated Cost	$350,000
Priority*	High
Plan for Implementation	
Responsible Organization	Essex County Sheriff's Office
Local Planning Mechanism	
Potential Funding Sources	HMGP
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-1 (NEW/LOI)**
Mitigation Action/Initiative: Essex County Patrol Division Headquarters generator

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of power to emergency services buildings
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase and install generator 2. Do nothing 3. Build new headquarters with backup power capabilities
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install generator at County Sheriffs Patrol Division Headquarters
Action/Project Category	SIP
Goals/Objectives Met	2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Emergency response functions
Estimated Cost	$150,000
Priority*	High
Plan for Implementation	
Responsible Organization	Essex County Sheriff's Office
Local Planning Mechanism	
Potential Funding Sources	HMGP
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-1 (NEW/LOI)**
Mitigation Action/Initiative: Essex County OEM Storage/Crime Scene Facility generator

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of power to emergency services buildings
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase and install generator 2. Do nothing 3. Build new building with backup power source
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install generator at OEM and Crime Scene facility
Action/Project Category	SIP
Goals/Objectives Met	2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Emergency services building functions
Estimated Cost	$300,000
Priority*	High
Plan for Implementation	
Responsible Organization	Essex County Sheriff's Office
Local Planning Mechanism	
Potential Funding Sources	HMGP
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-1 (NEW/LOI/PNP)**
Mitigation Action/Initiative: Catholic Charities of the Archdiocese of Newark: Generator for shelter

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of power to critical facility for sheltering
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase and install generator
	2. Do nothing
	3. Build a county designated shelter
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install generator for county critical shelter
Action/Project Category	SIP
Goals/Objectives Met	2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Loss of shelter functions
Estimated Cost	$113,017
Priority*	High
Plan for Implementation	
Responsible Organization	Newark City, Essex County Sheriff's Office
Local Planning Mechanism	
Potential Funding Sources	HMGP
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-1 (NEW/LOI)**
Mitigation Action/Initiative: Energy Allocation- generators

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of power to local critical facilities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase and install generators
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install generators at municipal critical facilities, DPW/Roads and Bridges Headquarters in Cedar Grove
Action/Project Category	SIP
Goals/Objectives Met	2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Emergency response and recovery building functions
Estimated Cost	$284,160
Priority*	High
Plan for Implementation	
Responsible Organization	Essex County Sheriff's Office
Local Planning Mechanism	
Potential Funding Sources	HMGP
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-1 (NEW/LOI)**
Mitigation Action/Initiative: Essex County

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Essex-2 (NEW/LOI)**

Mitigation Action/Initiative: Essex County Traffic Control Transfer Switch generator

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of power to critical facility
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase and install generator
	2. Do nothing
	3. Pay over time for manual traffic control
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install generator to allow traffic control devices to remain active during power loss.
Action/Project Category	SIP
Goals/Objectives Met	2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Traffic control devices will continue to function during power losses and manual control or intersections will not be needed.
Estimated Cost	$100,000
Priority*	High
Plan for Implementation	
Responsible Organization	Essex County Sheriff's Office
Local Planning Mechanism	
Potential Funding Sources	HMGP
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-2 (NEW/LOI)**

Mitigation Action/Initiative: Essex County Traffic Control Transfer Switch generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Essex-3 (NEW/LOI/PNP)**

Mitigation Action/Initiative: Newark AIDS Consortium, INC. Broadway House: Newark AIDS Consortium INC. Broadway House for Continuing Care generator

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of power to critical care facility
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase and install generator
	2. Do nothing
	3. Build capable facility to house residents during power outages
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install generator to critical care facility.
Action/Project Category	SIP
Goals/Objectives Met	2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Critical care functions to residents/patients
Estimated Cost	$250,000
Priority*	High
Plan for Implementation	
Responsible Organization	Newark City, Essex County Sheriff's Office
Local Planning Mechanism	
Potential Funding Sources	HMGP
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-3 (NEW/LOI/PNP)**

Mitigation Action/Initiative: Newark AIDS Consortium, INC. Broadway House: Newark AIDS Consortium INC. Broadway House for Continuing Care generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Essex-4 (NEW/LOI/PNP)**
Mitigation Action/Initiative: Seton Hall University: Seton Hall University generator project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of power to critical sheltering facility
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase and install generator
	2. Do nothing
	3. Build a county shelter
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install generator at critical sheltering facility
Action/Project Category	SIP
Goals/Objectives Met	2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Large scale sheltering capabilities
Estimated Cost	$865,000
Priority*	High
Plan for Implementation	
Responsible Organization	Seton Hall University, Essex County Sheriff's Office
Local Planning Mechanism	
Potential Funding Sources	HMGP
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-4 (NEW/LOI/PNP)**

Mitigation Action/Initiative: Seton Hall University: Seton Hall University generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Essex-5 (OLD)**
Mitigation Action/Initiative: Repair bridge into Senior Recreational Center

Assessing the Risk	
Hazard(s) addressed:	All
Specific problem being mitigated:	Evacuation Route in accessible
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Resurface bridge
	2. Do nothing
	3. Tear bridge down
Action/Project Intended for Implementation	
Description of Selected Action/Project	Repair bridge into Senior Recreational Center (Belleville Old Mill St.)
Action/Project Category	SIP
Goals/Objectives Met	1.2, 2.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Response and evacuation time
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	County Engineering Office
Local Planning Mechanism	
Potential Funding Sources	Federal, State and County transportation grants
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-5 (OLD)**

Mitigation Action/Initiative: Repair bridge into Senior Recreational Center

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	0	
Political	0	
Legal	0	
Fiscal	-1	
Environmental	0	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	1	
Priority (High/Med/Low)	Low	

Action Number: **Essex-6 (OLD)**
Mitigation Action/Initiative: Rehabilitate bridges requiring structural work.

Assessing the Risk	
Hazard(s) addressed:	Evacuation
Specific problem being mitigated:	Address structural deficiencies of all bridges
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Replace bridges
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Bridge projects - Five vulnerable bridges have been identified. It is the intent and purpose of this project to rehabilitate bridges requiring structural work. All bridges are county owned. Center Street Bridge in Nutley; Hoover Ave Bridge in Bloomfield; Cherry Hill Bridge in Millburn; Dougall Street Bridge in West Caldwell; Lyons Ave Bridge in Irvington
Action/Project Category	SIP
Goals/Objectives Met	1.2, 2.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Life Safety, traffic congestion
Estimated Cost	High - $7 million
Priority*	High
Plan for Implementation	
Responsible Organization	County Engineering Office
Local Planning Mechanism	
Potential Funding Sources	Federal, State Grant opportunities
Timeline for Completion	Long Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-6 (OLD)**

Mitigation Action/Initiative: Rehabilitate bridges requiring structural work.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	Medium	

Action Number: **Essex-7 (OLD)**

Mitigation Action/Initiative: Further identify roadway flooding between municipalities

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Roadway flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Identify roadway flooding and develop future mitigation actions to address
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Utilize the recommendations of the Strategic Recovery Planning Report to further identify roadway flooding upon county roadways and develop future mitigation actions to address those issues
Action/Project Category	SIP
Goals/Objectives Met	1.2, 2.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Roadways closures, police overtime, evacuation routes compromised.
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	County Engineering Office
Local Planning Mechanism	
Potential Funding Sources	Federal, State grant opportunities, HMGP, PDM
Timeline for Completion	Long Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-7 (OLD)**

Mitigation Action/Initiative: Further identify roadway flooding between municipalities

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	Medium	

Action Number: **Essex-8 (OLD)**
Mitigation Action/Initiative: Enlarge Drainage system on JFK Parkway

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Flooding of roadway
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Enlarge drainage system
	2. Do nothing
	3. Increase maintenance including equipment and personnel
Action/Project Intended for Implementation	
Description of Selected Action/Project	Enlarge Drainage system on JFK Parkway in Millburn. JFK is a county owned roadway as well as an evacuation route.
Action/Project Category	SIP
Goals/Objectives Met	1.2
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Roadway closings, Police and DPW overtime, evacuation routes compromised.
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	County Engineer's Office
Local Planning Mechanism	
Potential Funding Sources	Federal, State grant opportunities
Timeline for Completion	Long Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-8 (OLD)**

Mitigation Action/Initiative: Enlarge Drainage system on JFK Parkway

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	Medium	

Action Number: **Essex-9 (OLD)**
Mitigation Action/Initiative: Enlarge Drainage system on Bloomfield Ave

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Flooding of roadway
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	2. Enlarge drainage system
	2. Do nothing
	3. Increase maintenance including equipment and personnel
Action/Project Intended for Implementation	
Description of Selected Action/Project	Enlarge Drainage system on Bloomfield Ave in Verona. Bloomfield Ave is a county owned roadway as well as an evacuation route.
Action/Project Category	SIP
Goals/Objectives Met	1.2
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Roadway closings, Police and DPW overtime
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	County Engineer's Office
Local Planning Mechanism	
Potential Funding Sources	Federal, State grant opportunities
Timeline for Completion	Long Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-9 (OLD)**
Mitigation Action/Initiative: Enlarge Drainage system on Bloomfield Ave

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	Medium	

Action Number: **Essex-10 (OLD)**
Mitigation Action/Initiative: Stream culvert work in residential areas

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Flooding of Eagle Rock Reservation, and roadways
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Enlarge culverts
	2. Do nothing
	3. Maintenance
Action/Project Intended for Implementation	
Description of Selected Action/Project	Stream culvert work in residential areas storm water run-off– Eagle Rock Reservation area including Afterglow Ave. and Ravine Rd and flooding of Cole Rd.
Action/Project Category	NSP
Goals/Objectives Met	1.2, 2.2, 2.3
Applies to existing, future, or not applicable	N/A
Benefits (losses avoided)	Damage to landscape of reservation, Roadway closings, Police DPW overtime
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	County Engineer's Office
Local Planning Mechanism	
Potential Funding Sources	Federal, State grant opportunities, HMGP, PDM
Timeline for Completion	Long Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-10 (OLD)**

Mitigation Action/Initiative: Stream culvert work in residential areas

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	Medium	

Action Number: **Essex-11 (OLD)**

Mitigation Action/Initiative: Reduce the impacts of flooding on Passaic Avenue and Bloomfield Avenue

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Roadway flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Enlarge drainage system
	2. Do nothing
	3. Increase maintenance including equipment and personnel
Action/Project Intended for Implementation	
Description of Selected Action/Project	Reduce the impacts of flooding on Passaic Avenue and Bloomfield Avenue in Verona as are both evacuation routes
Action/Project Category	SIP
Goals/Objectives Met	1.2, 2.1
Applies to existing, future, or not applicable	N/A
Benefits (losses avoided)	Roadway closing, Police and DPW overtime
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	County Engineer's Office
Local Planning Mechanism	
Potential Funding Sources	Federal, State grant opportunities, HMGP, PDM
Timeline for Completion	Long Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-11 (OLD)**

Mitigation Action/Initiative: Reduce the impacts of flooding on Passaic Avenue and Bloomfield Avenue

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	Medium	

Action Number: **Essex-12**
Mitigation Action/Initiative: Potable water trailers

Assessing the Risk	
Hazard(s) addressed:	Drought, Severe Weather, Wildfire
Specific problem being mitigated:	Emergency water sources
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase potable water trailers
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase three 525-gallon potable water trailers
Action/Project Category	SIP
Goals/Objectives Met	1.2, 6.2
Applies to existing, future, or not applicable	N/A
Benefits (losses avoided)	Fire destruction and damage, mass decontamination capabilities
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Essex County Sheriff's OEM
Local Planning Mechanism	
Potential Funding Sources	Federal, State grants
Timeline for Completion	Short Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Essex-12**
Mitigation Action/Initiative: Potable water trailers

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	Medium	

Action Number: **Essex-13**
Mitigation Action/Initiative: Telecommunication Network Redundancy

Assessing the Risk	
Hazard(s) addressed:	All
Specific problem being mitigated:	Communications during emergency response and recovery
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase redundancies for voice and data transmissions
	2. Do nothing
	3. Purchase entire new communication system for county
Action/Project Intended for Implementation	
Description of Selected Action/Project	Provide redundant methods for Voice/Data transmissions 4G wireless broadband at DPW Headquarters.
Action/Project Category	SIP
Goals/Objectives Met	1.1, 1.2, 6.1
Applies to existing, future, or not applicable	N/A
Benefits (losses avoided)	Emergency response and recovery operations and efficiences
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Sheriff's Communication Bureau
Local Planning Mechanism	
Potential Funding Sources	Federal, State grants
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

**** Refer to results of Prioritization***

Action Number: **Essex-13**
Mitigation Action/Initiative: Telecommunication Network Redundancy

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	Medium	

Action Number: **Essex-14**
Mitigation Action/Initiative: County Roadway ITS- Driver Information Boards

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Traffic movements and flows hampering hazard mitigation efforts.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase digital sign board
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Network of digital sign boards with variable messages and traffic information so that drivers are given real time information on road closures, major incidents, emergency detours and other notices to direct them away from hazards/extreme congestion. Purchase 4 digital sign boards with variable message capability
Action/Project Category	SIP
Goals/Objectives Met	1.1, 1.2, 6.1
Applies to existing, future, or not applicable	N/A
Benefits (losses avoided)	Police and DPW overtime, increase in accidents and congestion
Estimated Cost	$3,000,000
Priority*	Medium
Plan for Implementation	
Responsible Organization	Essex County Sheriff's OEM and County Engineering
Local Planning Mechanism	
Potential Funding Sources	Federal, State Grant Opportunities HMGP
Timeline for Completion	Short Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

* ***Refer to results of Prioritization***

Action Number: **Essex14**

Mitigation Action/Initiative: County Roadway ITS- Driver Information Boards

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	Medium	

Action Number: **Essex-15**
Mitigation Action/Initiative: Portable Flood Walls

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Flooding Damage to Facilities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase portable floodwall
	2. Do nothing
	3. Elevate structures
Action/Project Intended for Implementation	
Description of Selected Action/Project	Proven portable flood wall technology can be deployed prior to flooding event occurring to protect critical County facilities from damage. Purchase portable flood wall which will be deployed prior to a flooding event.
Action/Project Category	SIP
Goals/Objectives Met	1.2, 2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Flooding of buildings, interior and content damage
Estimated Cost	$75,000.00
Priority*	Medium
Plan for Implementation	
Responsible Organization	County Engineering, County OEM
Local Planning Mechanism	SRPR
Potential Funding Sources	Federal, State Grant Opportunities, HMGP, PDM
Timeline for Completion	Short Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

**** Refer to results of Prioritization***

Action Number: **Essex-15**
Mitigation Action/Initiative: Portable Flood Walls

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	High	

Action Number: Essex-16

Mitigation Action/Initiative: County Fuel Station Quick Connect for Emergency Generators

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Interruption of fuel services at County fueling stations.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Install quick connects 2. Do nothing 3. Purchase 7 tanker trucks to maintain fuel access
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of quick-connects for emergency generators at the County's nine fueling stations.
Action/Project Category	SIP
Goals/Objectives Met	1.2, 2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Emergency response and recovery times
Estimated Cost	$100,000.00
Priority*	Medium
Plan for Implementation	
Responsible Organization	County Engineering
Local Planning Mechanism	
Potential Funding Sources	Federal, State grant opportunities, HMGP, PDM
Timeline for Completion	Short Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

**** Refer to results of Prioritization***

Action Number: Essex-16

Mitigation Action/Initiative: County Fuel Station Quick Connect for Emergency Generators

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Essex-17**
Mitigation Action/Initiative: Countywide Emergency Alert System

Assessing the Risk	
Hazard(s) addressed:	All
Specific problem being mitigated:	Public Safety
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Install a Countywide Emergency Alert System
	2. Do nothing
	3. Hire a contracted alert company
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install a countywide emergency alert system within the County Sheriff's Communication Center
Action/Project Category	SIP
Goals/Objectives Met	1.1, 1.2
Applies to existing, future, or not applicable	New
Benefits (losses avoided)	Increase public awareness of hazards during emergencies
Estimated Cost	$300,000
Priority*	High
Plan for Implementation	
Responsible Organization	Essex Sheriff's Office of Emergency Management
Local Planning Mechanism	
Potential Funding Sources	HMGP
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

**** Refer to results of Prioritization***

Action Number: Essex-17

Mitigation Action/Initiative: Countywide Emergency Alert System

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	0	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	Medium	

Action Number: **Essex-18**

Mitigation Action/Initiative: Conduct a functional exercise related to school safety

Assessing the Risk	
Hazard(s) addressed:	Terrorism
Specific problem being mitigated:	Preparedness for school safety issues
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Conduct a functional exercise
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Conduct a functional exercise related to school safety with emergency response entities and school officials
Action/Project Category	EAP
Goals/Objectives Met	1.2, 2.1, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Emergency response and recovery times
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	County OEM
Local Planning Mechanism	
Potential Funding Sources	Homeland Security Grants, UASI, County Budget
Timeline for Completion	Short Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

**** Refer to results of Prioritization***

Action Number: **Essex-18**
Mitigation Action/Initiative: Conduct a function exercise

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	High	

9.2 Township of Belleville

This section presents the jurisdictional annex for the Township of Belleville.

9.2.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
George Pedalino, OEM Coordinator 275 Franklin Ave., Belleville, NJ Phone: (973) 450-3374 E-mail: gpedalino@bellevillefiredept.org	Tom Herits, Township Engineer 152 Washington Ave., Belleville, NJ Phone: (973) 450-3414 E-mail: therits@maserconsulting.com

9.2.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of Belleville was 35,926.

Location

According to the U.S. Census Bureau, the Township has a total land area of 3.399 square miles, of which 3.34 square miles is land and 0.059 square miles is water.

Brief History

The Township of Belleville was formed as a township in 1839, with a population of only 500. It became a city in 1874 and again became a township in 1876. Belleville became a town in 1910 but reverted to township in 1981 to gain a larger share of federal revenue sharing funds.

Governing Body Format

The Township of Belleville has a council form of government.

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in 9.2.7 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.2-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Former Essex County Property	Mixed		570 Belleville Ave.		Recently Sold
Senior Citizen Housing	Residential		125 Franklin Ave.		In Progress
Former Roche Diagnostics	Mixed		11 Franklin Ave.	Contamination	In Progress
Liquid Carbonic	Mixed		666 Washington Ave.	Remediated	On Hold
Former School #1	Mixed		190 Cortland St.	SLOSH: Category 4	In Progress

** Only location-specific hazard zones or vulnerabilities identified.*

9.2.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.2-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
April 14-20, 2007	Severe Storms and Inland and Coastal Flooding	DR-1694	Yes	Over 200 residents had flooded basements in the Township. The entire length of Main Street was closed; Fairway Avenue was closed from Riverdale north to the dead end.
March 12 – April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	The Township had over $40,000 in costs and damages from this event.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	The Township had damages to its sewage pump and traffic signal. Total damages and costs were over $80,000.
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Damages and losses experienced during this event are discussed in further detail below in the section "Other Vulnerabilities Identified by Municipality".
October 29, 2011	Severe Storm	DR-4048	Yes	The Township experienced damages to pumps, vehicles, and downed trees. The downed trees caused loss of electricity and blocked streets. Overall, the Township had over $240,000 in damages and costs.
October 26 – November 8, 2012	Hurricane Sandy	EM-3354 DR-4086	Yes Yes	Damages and losses experienced during this event are discussed in further detail below in the section "Other Vulnerabilities Identified by Municipality".

9.2.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of Belleville. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for Township of Belleville.

Table 9.2-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV: $0	Occasional	14	Medium
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $90,475,600 Category 3 SLOSH: $141,072,600 Category 4 SLOSH: $145,864,900	Occasional	16	Medium
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $2,286,079 2,500-year MRP: $46,845,114	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $14,727,102	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $1,294,400	Occasional	12	Low
Severe Storm	100-Year MRP: $2,745,638 500-year MRP: $14,129,477 Annualized: $224,499	Frequent	48	High
Winter Storm	1% GBS: $17,807,909 5% GBS: $89,039,545	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $0	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. *Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of Belleville.

Table 9.2-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Belleville, Township of	138	159	$6,879,878.00	30	4	86	111	27

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.2-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundaries

	1% Annual Chance			0.2% Annual Chance		
Municipality	Commercial	School	Transportation	Commercial	School	Transportation
Belleville, Township of	1	1	1	1	2	1

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS) for Essex County, The Township of Belleville is subject to flooding from the Passaic River, the Second River, and the Third River. All three flooding sources flow in well-defined channels with flooding occurring in adjacent low-lying areas. Flooding is generally the result of heavy rainfall produced by hurricanes moving up the Atlantic coastline, large frontal storms from the west and south, and local thunderstorms. Frequent flooding is also known to occur along the Third River between Fairway Avenue and Joralemon Street (FEMA FIS 2014).

Historic floods occurred in 1902, 1903, 1936, and 1945. The 1903 flood had an estimated peak discharge of 39,800 cubic feet per second (cfs) and estimated 1% annual chance frequency at the confluence of the Passaic

River and Newark Bay. The floods inundated large areas, causing damage to buildings and disruption of transportation and utility lines (FEMA FIS 2014).

Additionally, the municipality has identified the following hazard problems and/or problem areas:

Flooding

The Township indicated that Fairway Avenue experiences flooding of the sanitary sewer pump station and of single-family and multi-family residences along the Avenue during flooding and major storm events. The residences and commercial buildings along Main Street also experience flooding during flooding and major storm events.

See the 'Hurricane' subsection of this for details regarding flooding from Hurricanes Sandy and Irene.

Hurricanes

In a span of 14 months, two powerful hurricanes barreled down on the Township of Belleville- Hurricanes Irene and Sandy. Damage was sustained to residential, commercial, and municipal property. Power outages and downed electrical wires resulted in fallen trees, the closing of the Route 7 Bridge and Route 21, and damage to storm water and wastewater treatment infrastructure. Power outages in some parts of the Township were not resolved for two weeks. Town Hall sustained damage to its roof.

Hurricane Irene

During Hurricane Irene, the Township experienced over $250,000 in damages and costs to the Township. The sewage pumping station on Fairway Avenue was damaged; there were damages to police vehicles and police records; and over 200 basements flooded and needed to be pumped out. There was one fatality on Main Street due to a drowning.

Numerous streets were evacuated in the Township, including the following: Main Street, Greylock Avenue, Roosevelt Avenue, and Little Street. A shelter was open for these residents for several days and was used by approximately 30 residents.

Flooding was widespread in the Township. It persisted for three days due to the tidal influence of the Passaic River. Main Street was closed its entire length due to tidal flooding. The strip mall on Main Street flooded as well; leaving 17 storefronts vacant. Several warehouses flooded in the Township, including Global Warehouse which lost over $40 million in products and is now vacant. Flooding also occurred on Fairway Avenue, Joralemon Street, and Riverdale Avenue. The bridge crossing the Third River (located between Celia Terrace and Plenge Drive) on Joralemon Street was closed due flooding.

Hurricane Sandy

During Hurricane Sandy, the Township experienced damages to its water mains and pressure regulators and to the roof of the town hall. Police records were also damaged. Main Street, Greylock Avenue, Roosevelt Avenue, and Little Street were all evacuated. A shelter was opened for one week until residents of the shelter were transferred to a county facility (Codey Arena). Approximately 40 residents utilized the shelter. Overall, the Township had over $1 million in damages (Township structures) and cleanup costs.

Flooding persisted for three days due to the tidal influence of the Passaic River. The strip mall along Main Street flooded; several warehouses flooded. The Route 7 bridge (Rutgers Street) located between Essex County and Bergen/Hudson County was closed due to flooding. Route 21 entrances and exits were closed and Route 21 South at the Newark border was closed, all due to flooding. Over 220 residential basements

throughout the Township flooded and were pumped out by the fire department and department of public works.

Other damages to the Township included severe damage to the electrical supply system. Approximately 90% of the Township was without power for several days; with some not completely resolved for two weeks. Numerous streets in Belleville were closed due to downed trees and power lines. A structure fire of a multi-family dwelling on Columbus Avenue was caused by high winds, causing the home's electrical service to come in contact with the aluminum siding.

9.2.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of Belleville.

Table 9.2-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y		Dept of Planning and Development	Chapter XXI, 9/14/2010
Zoning Ordinance	Y		Board of Adjustment Governing Body	Chapter XXIII, 6/12/2007
Subdivision Ordinance	Y		Planning Board Governing Body	Chapter XVIII Etseq, 4/27/1976
NFIP Flood Damage Prevention Ordinance	Y		Construction Code Official	Chapter XXII, 9/11/1979, Updated 5/22/2007
Cumulative Substantial Damages	Y		Construction Code Official	Chapter XXII, 9/11/1979, Updated 5/22/2009
Freeboard	Y		Construction Code Official	Chapter XXII, 9/11/1979, Updated 5/22/2009
Growth Management	Y		Planning Board Governing Body	Chapter XVIII Etseq, 4/27/1976
Floodplain Management / Basin Plan				
Stormwater Management Plan/Ordinance	Y		Planning Board	Chapter XXX, 5/8/2007
Comprehensive Plan / Master Plan/ General Plan	Y		Planning Board	12/14/1995, Updated 1/8/2009
Capital Improvements Plan				
Site Plan Review Requirements	Y		Planning Board	Chapter XX, 4/27/1976, Updated 4/10/1991
Open Space Plan	Y		State and County	Great Lawn of Old Essex County Isolation Hospital preserved
Stream Corridor Management Plan				
Watershed Management or Protection Plan				
Economic Development Plan				
Comprehensive Emergency Management Plan	Y		OEM	EOP, 2/26/2013
Emergency Response Plan	Y		OEM	EOP, 2/26/2013
Post Disaster Recovery Plan				

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Post Disaster Recovery Ordinance				
Real Estate Disclosure Requirement				
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]				

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of Belleville.

Table 9.2-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Engineering Department
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineering Department
Planners or engineers with an understanding of natural hazards	Y	Engineering Department
NFIP Floodplain Administrator	Y	Frank Delorenzo, Construction Code Official, Construction Department
Surveyor(s)	Y	Engineering Department
Personnel skilled or trained in "GIS" applications	Y	Engineering Department
Scientist familiar with natural hazards in the municipality.		
Emergency Manager	Y	Fire Department
Grant Writer(s)	Y	Township Manager's Office
Staff with expertise or training in benefit/cost analysis		
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the Township of Belleville.

Table 9.2-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes – Engineering Department
Capital Improvements Project Funding	Yes – Engineering Department
Authority to Levy Taxes for specific purposes	Yes – Tax Assessor
User fees for water, sewer, gas or electric service	Yes – Engineering Department
Impact Fees for homebuyers or developers of new development/homes	Yes – Engineering Department
Incur debt through general obligation bonds	Yes – Mayor/Council
Incur debt through special tax bonds	Yes – Mayor/Council
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	Yes – Engineering Department
Mitigation grant programs	No
Other	Yes – CDGB – Engineering Department

Community Classifications

The table below summarizes classifications for community program available to the Township of Belleville.

Table 9.2-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	N/A
Building Code Effectiveness Grading Schedule (BCEGS)		
Public Protection		
Storm Ready	NP	N/A
Firewise	NP	N/A

N/A = Not applicable. NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Frank Delorenzo, Construction Code Official

Flood Vulnerability Summary

Belleville Township does not currently maintain a list or inventory of flood-damaged properties or property owners who are interested in mitigation projects to correct storm damage. The Township supports the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable. Refer to mitigation action Belleville-11 in Table 9.2-11 below.

Resources

Current floodplain manager, Frank Delorenzo, is the sole individual responsible for floodplain management in Belleville Township. His responsibilities include permit reviews and inspections. Additional training and education (e.g., Certified Floodplain Management training and certification) on floodplain management would be welcomed by the current floodplain administrator as well as other municipal staff to increase their capabilities and knowledge in this field.

Compliance History

Belleville Township is currently in good standing in the NFIP. The current floodplain manager, Frank Delorenzo, has no knowledge of when the most recent Community Assistance Visit (CAV) took place. At this time, there is no need for a CAV.

Regulatory

Current floodplain management regulations and ordinances meet the minimum requirements set forth by FEMA and New Jersey. Additional local regulations and ordinances support the implementation of the NFIP within Belleville Township. The community has not expressed any interest in becoming a Community Rating System (CRS) community.

Community Rating System

The Township does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

Previous actions that are now on-going programs and capabilities are described below. Refer to Table 9.2-11 presented later in this annex.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

The Township currently has a stormwater management ordinance. The Township's ordinances and flood protection measures are available on their website. Please visit the Township of Belleville website at http://www.bellevillenj.org for further information.

The 2009 Township of Belleville Master Plan is the legal roadmap to planning for appropriate and safe land development. The following goals are relevant to hazard mitigation:

- To enable environmental quality to be addressed in all pending developments by applying strict performance standards to all pending developments according to the site plan ordinance.
- To encourage storm water management controls for all new developments.

The HMP will be used to guide to include hazard mitigation for the next Master Plan update. Please refer to Table 9.2-11, mitigation action Belleville-12 for additional details.

9.2.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.2-10. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Flood Study of Third River	In Progress; 5% completed,	Applied for funding to remediate problems with sanitary sewers during flooding events. Awaiting decision. This initiative will be carried over to the current mitigation strategy.
2: Neglected Rail Lines	Discontinued	Third party agencies are seeking funds to convert rail lines to trails. RR Bridge and siding at Franklin Av to be taken over by developer of senior housing. This initiative will not be carried over to the current mitigation strategy because other agencies are leading this effort.
3: Pedestrian/Vehicular Bridges – Joralemon St @ 3rd River; Mill St, Senior Citizens, Franklin Ave., Mill St., Union Ave., Bridge St., Washington Ave., Main St. @ 2nd River; RR Bridge @ Franklin Ave., Branch Brook Park; Pedestrian Bridges @ Branch Brook Park; Rt. 7 Bridge @ Passaic River	Discontinued	All bridges are owned and maintained by Essex County or the State of New Jersey. Therefore, this initiative will be not carried over by Belleville. Please refer to Essex County Annex. (Section 9.1)
4: Water Interconnect	100% completed	CDBG funding utilized.
5: PSE&G Transfer Station	In Progress; 20% completed, Discontinued	Projects involving the transfer stations are led by private utilities (PSE&G). The transfer stations in the Township are also being upgraded. Therefore, this initiative will not be carried over by the Township to the current mitigation strategy.
6: Clara Maass, Cerebral Palsy Center, Northwest Essex Community Health and Cancer Research Center	No Progress, Discontinued	The Township will have to confirm with these agencies as to the status of their projects. The 2007 HMP did not specify the projects at these locations. The Cancer Research Center has been permanently closed. This initiative will not be carried over to the current mitigation strategy.
7: Steep Slopes at Rutgers Ave. and Belleville Ave.	In Progress; 20% completed,	Private property owners are adding retaining walls as required for development. This initiative will be carried over to the current mitigation strategy.
8: NJ Transit Light Rail Line Maintenance Facility	No Progress, Discontinued	The Township will have to confirm with NJ Transit as to the status. This initiative will not be carried over to the current mitigation strategy as a Township-led action.
9: Dundee Dam Rehabilitation	Discontinued	Rehabilitation will have to be administered by the NJDEP. The Township does not have authority to lead this project. This initiative will not be carried over to the current mitigation strategy.
10: Bridge into Senior Recreational Center (Old Mill St.)	In Progress; 5% completed	Developer of Senior Housing Project evaluating the main bridge into the site. Applied to FEMA for funding to rehab of 2nd River bridge at senior center. Awaiting

Description	Status	Review Comments
		confirmation of grant. Essex County is the lead agency for this initiative; therefore, this initiative will be not carried over by Belleville. Please refer to Essex County Annex. (Section 9.1)
11: Communications	Discontinued	The Township will have to confirm with the private utility agencies as to the status of their communications projects. This initiative is not within the Township's authority to pursue and will not be carried over to the current mitigation strategy.
12: PSE&G and Transco Utilities	Discontinued	PSE&G is upgrading their electrical system in Belleville with overhead and underground wiring. Trees are currently being trimmed along the high voltage right of way. This initiative will not be carried over to the Township's current mitigation strategy because it is being led by the private utility company.
13: Belleville HS Flooding	Complete	The Township upgraded storm sewer system at the HS. This initiative has been completed.
14: Fire Protection Upgrades – Water Main Upgrades; Hydrant and Valve Replacement	In Progress; 75% completed	Inoperable hydrants and valves were replaced. Water mains were installed to bolster pressure in certain areas. CDBG funding in place to replace pressure regulators, insert valves, and replace additional hydrants. This initiative will be carried over to the current mitigation strategy.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The Township has identified the following mitigation projects/activities that have also been completed but were not identified in the previous mitigation strategy in the 2007 Plan:

- Fairway Avenue – backflow preventers on the sanitary sewer lines
- Main Street – check valves installed on the storm sewers
- The Township of Belleville, in cooperation with Essex County, participates in cleaning and removing debris from the Second and the Third Rivers (FEMA FIS 2014).

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.2-11 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.2-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.2-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Belleville-1 (NEW/LOI)	Belleville Township Fairway Avenue flood mitigation.	Existing	Flood	1.2	Engineering Department	High	High $219,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	Medium	SIP	SP
Belleville-2 (NEW/LOI)	Belleville Township shelter generators.	Existing	All	1.2 6.1	Office of Emergency Management	High	High $236,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Belleville-3 (NEW/LOI)	Belleville Township fire headquarters generator.	Existing	All	1.2 6.1	Office of Emergency Management	High	High $118,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Belleville-4 (NEW/LOI)	Belleville Township Town Hall and Public Works generator.	Existing	All	1.2 6.1	Office of Emergency Management	High	High $236,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Belleville-5 (NEW/AW)	Emergency services and emergency shelter generator	Existing	All	1.2 6.1	Engineering Department	High	High $236,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Belleville-6 (NEW/AW/ LOI)	Main Street flooding, entire length, Newark to Nutley borders	Existing	Flood	1.2	Engineering Department	High	High $190,000	Hazard mitigation grant (HMGP)	Short Term DOF	High	SIP	SP
Belleville-7 (OLD 1)	Flood Study of Third River to address problems with	Existing	Flood	1.2 2.2	County, Belleville,	High	High $100,000	Federal, State,	Long Term DOF	Medium	EAP	PE

Table 9.2-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	sanitary sewers during flood events. Funding has been applied for and pending award.			3.2	Nutley, Bloomfield Engineering and OEM			County Grant opportunities and External sources				
Belleville-9 (OLD 7)	Steep Slopes at Rutgers Ave. and Belleville Ave. – Private property owners are adding retaining walls as required for development.	Existing	Landslide	1.2	Township of Belleville	High	$200,000	External sources	DOF	High	SIP	PP
Belleville-10 (OLD 14)	Fire Protection Upgrades – Water Main Upgrades; Hydrant and Valve Replacement.	Existing	All	1.2. 6.1	Township of Belleville	High	$1,000,000	General revenue	DOF	High	SIP	ES
Belleville-11	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.											
	See above.	Existing	Flood, Coastal Storm, Severe Weather, Wildfire, Winter Storm	1.2 2.2	Township via NFIP FPA) with NJOEM, FEMA support	High	High	FEMA Mitigation Grant Programs and local budget (or property owner) for cost share	Long term DOF (specific project application and implementation)	High	SIP	PP
Belleville-12	Utilize the HMP to include hazard mitigation in the next Master Plan update.	Both	All	5.4	Township	High	Low	Local	Short	High	LPR	PR
Belleville-13	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. This program may include: • Providing general natural hazard risk, preparedness and mitigation, and related NFIP information in regular newsletter and mailings. • Including natural hazard risk and risk reduction information through social media channels and email blast systems. • Posting of flyers and other readily available NFIP informational materials at Town/Village hall or distributing at regular civic meetings. • Preparation, distribution and analysis of public surveys. • Developing/maintaining a natural hazard risk management webpage on the municipal website where information and mapping can be posted. • Enhance public outreach to residents in NFIP floodplain areas to inform of annual grant opportunities, etc. which may include periodic articles and handouts in the annual newsletter.											
	See above.	N/A	All Hazards	3.1	Supervisor's Office	Medium	Low	Municipal Budget; HMA	Short	High	EAP	PE

Table 9.2-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
								programs with local or county match				
Belleville-14	Continue the existing tree maintenance program	Existing	Severe Weather; Coastal Storm; Severe Winter Storm	1.2	Engineering and DPW, working with contractors and local utilities as needed	Medium – High (reduced risk of utility outages; life safety)	Medium	Local Budget	Short	Medium	NSP	NP
Belleville-15	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	N/A	All Hazards	5.3 5.4	Municipality with support from County, NJOEM, FEMA and surrounding communities	Medium	Low	Municipal Budget	Short Term	High	LPR	PR

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV *Community Assistance Visit*
CRS *Community Rating System*
DPW *Department of Public Works*
FEMA *Federal Emergency Management Agency*
FPA *Floodplain Administrator*
HMA *Hazard Mitigation Assistance*
N/A *Not applicable*
NFIP *National Flood Insurance Program*
NJDEP *New Jersey Department of Environmental Protection*
NJOEM *New Jersey Office of Emergency Management*
OEM *Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA *Flood Mitigation Assistance Grant Program*
HMGP *Hazard Mitigation Grant Program*
PDM *Pre-Disaster Mitigation Grant Program*
RFC *Repetitive Flood Claims Grant Program*
SRL *Severe Repetitive Loss Grant Program*

Timeline:

Short *1 to 5 years*
Long Term *5 years or greater*
OG *On-going program*
DOF *Depending on funding*

Costs:
Where actual project costs have been reasonably estimated:
Low *< $10,000*
Medium *$10,000 to $100,000*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:
Low= *< $10,000*

Costs:
High *> $100,000*

Where actual project costs cannot reasonably be established at this time:
Low *Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium *Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High *Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:
Medium *$10,000 to $100,000*
High *> $100,000*

Where numerical project benefits cannot reasonably be established at this time:
Low *Long-term benefits of the project are difficult to quantify in the short term.*
Medium *Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High *Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.2-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Belleville-1 (NEW/LOI)	Belleville Township Fairway Avenue flood mitigation.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Belleville-2 (NEW/LOI)	Belleville Township shelter generators.	1	0	1	1	1	1	0	1	1	1	1	1	1	1	12	High
Belleville-3 (NEW/LOI)	Belleville Township fire headquarters generator.	1	0	1	1	1	1	0	1	1	1	1	1	1	1	12	High
Belleville-4 (NEW/LOI)	Belleville Township Town Hall and Public Works generator.	1	0	1	1	1	1	0	1	1	1	1	1	1	1	12	High
Belleville-5 (NEW/AW)	Emergency services and emergency shelter generator	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Belleville-6 (NEW/AW/LOI)	Main Street flooding, entire length, Newark to Nutley borders	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Belleville-7 (OLD 1)	Flood Study of Third River	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Belleville-8 (OLD 4)	Water Interconnect	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Belleville-9 (OLD 7)	Steep Slopes at Rutgers Ave. and Belleville Ave.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Belleville-10 (OLD 14)	Fire Protection Upgrades – Water Main Upgrades; Hydrant and Valve Replacement.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Belleville-11	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.	1	1	1	1	0	0	0	0	1	0	1	0	0	1	7	High
Belleville-12	Utilize the HMP to include hazard mitigation in the next Master Plan	1	1	0	1	0	1	1	0	0	1	1	0	1	1	9	High

Table 9.2-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
	update.																
Belleville-13	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance.	1	1	1	1	1	1	1	0	0	1	1	1	0	1	11	High
Belleville-14	Continue the existing tree maintenance program	0	1	1	1	1	1	1	0	0	0	1	1	0	1	9	Medium
Belleville-15	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	1	1	0	0	1	1	0	0	0	1	1	1	1	1	9	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.2.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.2.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of Belleville that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of Belleville has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.2.9 Additional Comments

None at this time.

Figure 9.2-1. Township of Belleville Hazard Area Extent and Location Map 1

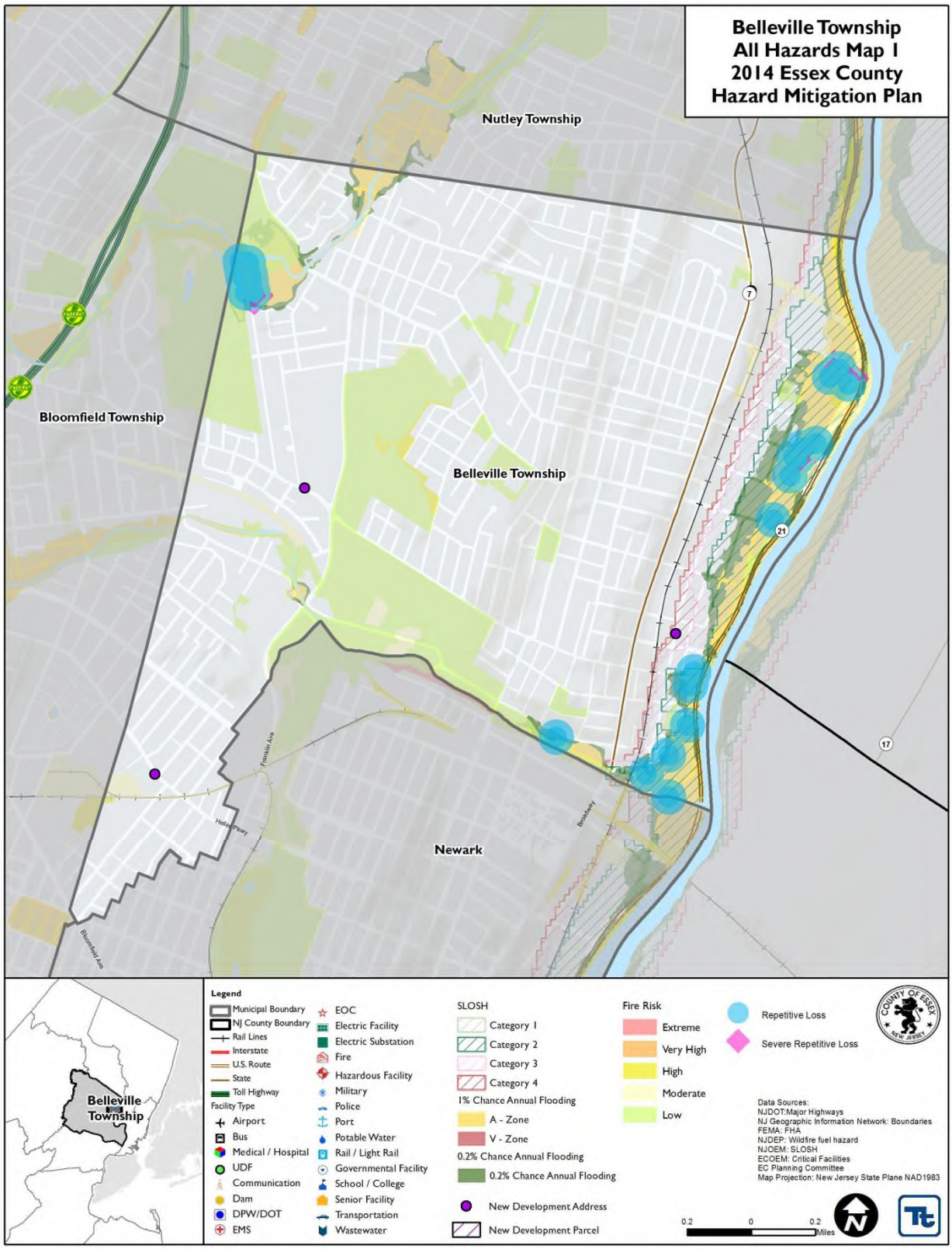
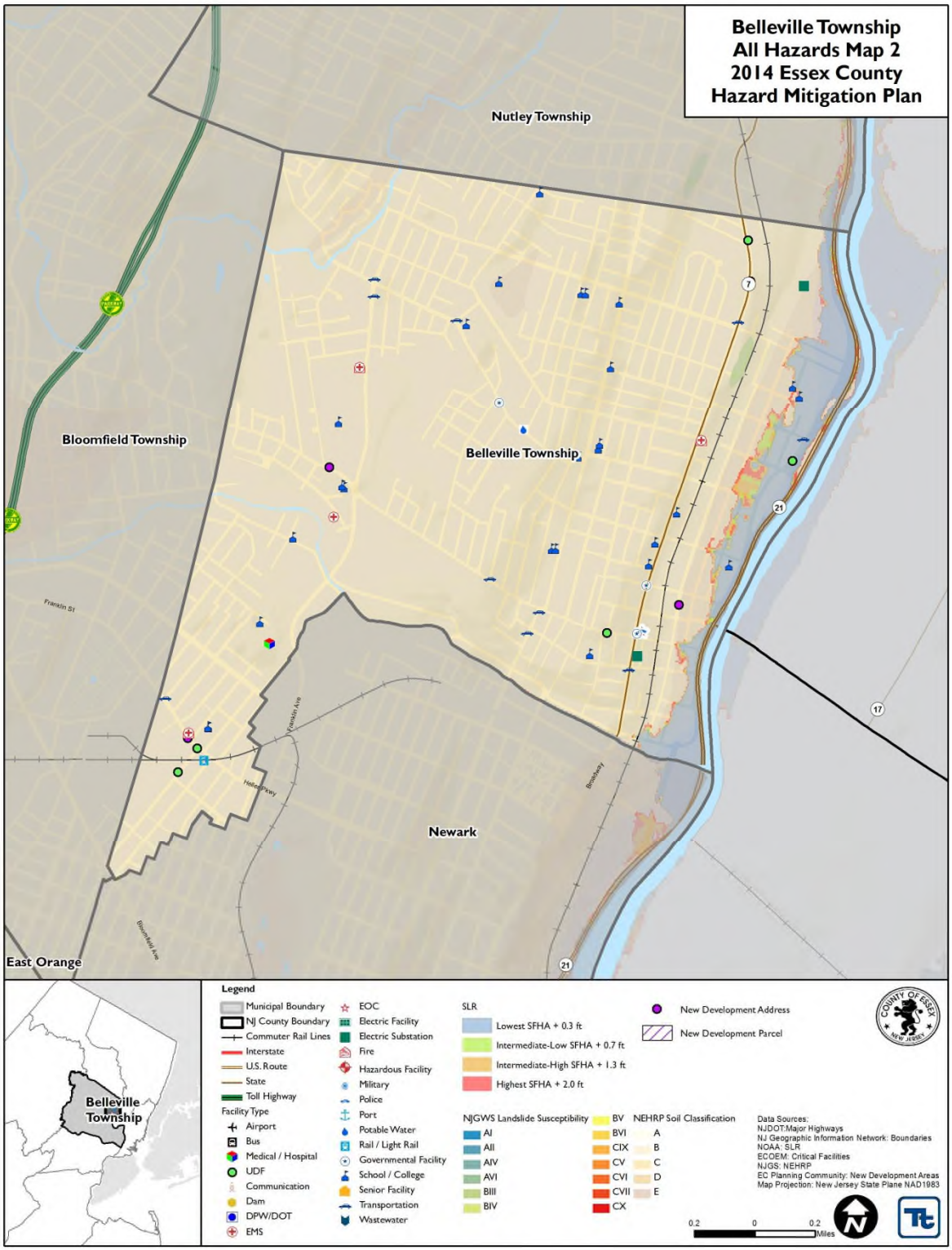


Figure 9.2-2. Township of Belleville Hazard Area Extent and Location Map 2



Action Number: **Belleville-1 (NEW/LOI)**

Mitigation Action/Initiative: Belleville Township Fairway Avenue flood mitigation

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Third River floods the Fairway Avenue neighborhood with as little as four inches of rainfall.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Dredge and stabilize a section of Third River and install manhole inserts and check valves in sanitary sewer lateral lines. Dangers associated with flooding and health concerns connected to contact with raw sewage will be decreased. This will mitigate both flooding and sewage backup for 30-40 homes, 250 condominium units, and an office building in the immediate vicinity.
Action/Project Category	**SIP**
Goals/Objectives Met	
Applies to existing, future, or not applicable	**Existing**
Benefits (losses avoided)	
Estimated Cost	$219,000
Priority*	
Plan for Implementation	
Responsible Organization	Township of Belleville, Township of Bloomfield
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, Municipal budget
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Belleville-1 (NEW/LOI)**

Mitigation Action/Initiative: Belleville Township Fairway Avenue flood mitigation

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Prevent raw sewage from entering structures, health issue.
Property Protection	1	Prevent raw sewage from entering structures, construction issue.
Cost-Effectiveness	1	Removes repeated cost of remediation due to raw sewage back ups.
Technical	1	Easily implemented, no technical issues.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	1	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This action will not adversely impact any segment of the population.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Belleville-2 (NEW/LOI)**

Mitigation Action/Initiative: Belleville Township shelter generators

Assessing the Risk	
Hazard(s) addressed:	Hurricane, Nor'easter, Severe Storm, Severe Winter Storm, Earthquake
Specific problem being mitigated:	Lack of backup power at Township facilities leaves vulnerable populations at risk.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Township property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Township does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Township Hall. • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Township. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Based on the amount of funding awarded, prioritization for generator projects would be determined for each facility. Installing generators would eradicate the issue of losing power and ensure continuity of municipal services.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$236,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Belleville
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, Township Budget

Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Belleville-2 (NEW/LOI)**

Mitigation Action/Initiative: Belleville Township shelter generators

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Belleville-3 (NEW/LOI)**

Mitigation Action/Initiative: Belleville Township fire headquarters generator

Assessing the Risk	
Hazard(s) addressed:	Hurricane, Nor'easter, Severe Winter Storm, Earthquake
Specific problem being mitigated:	Power has been lost 4 times in the past 10 years. This facility serves as the backup EOC and the secondary dispatch for the Police Department.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Township property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Township does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Township Hall. This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Township. Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Based on the amount of funding awarded, prioritization for generator projects would be determined for each facility. Installing generators would eradicate the issue of losing power and ensure continuity of municipal services.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$118,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Belleville
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, Township Budget
Timeline for Completion	

Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Bellevill-3 (NEW/LOI)**

Mitigation Action/Initiative: Belleville Township fire headquarters generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Belleville-4 (NEW/LOI)**

Mitigation Action/Initiative: Belleville Township Town Hall and Public Works generator

Assessing the Risk	
Hazard(s) addressed:	Hurricane, Nor'easter, Severe Storm, Severe Winter Storm, Earthquake
Specific problem being mitigated:	Power has been lost at the Town Hall 3 times in the last 10 years. This facility serves as the primary EOC, police headquarters, and hub of local administrative services.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Township property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Township does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Township Hall. • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Township. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Based on the amount of funding awarded, prioritization for generator projects would be determined for each facility. Installing generators would eradicate the issue of losing power and ensure continuity of municipal services.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$236,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Belleville
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, Township Budget

Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Belleville-4 (NEW/LOI)**

Mitigation Action/Initiative: Belleville Township Town Hall and Public Works generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Belleville-5 (NEW/AW)**

Mitigation Action/Initiative: Emergency services and emergency shelter generators

Assessing the Risk	
Hazard(s) addressed:	Power loss, loss of emergency services and shelter
Specific problem being mitigated:	Loss of power to critical infrastructure.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Solar panels/ Insufficient power supply
	2. Do nothing/ not acceptable
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install generators for critical infrastructure
Action/Project Category	SIP
Goals/Objectives Met	Protect life and property. Support operations.
Applies to existing, future, or not applicable	Applies to existing infrastructure.
Benefits (losses avoided)	Maintain emergency facilities and communications during power outages.
Estimated Cost	$580,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Belleville, Engineering Dept
Local Planning Mechanism	Engineering Dept
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, Township budget
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: Awaiting Hazard Mitigation Grant

Refer to prioritization table.

Action Number: **Belleville-5 (NEW/AW)**

Mitigation Action/Initiative: Emergency services and emergency shelter generators

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Allows emergency services to continue operations.
Property Protection	1	Allows emergency services to continue operations.
Cost-Effectiveness	1	Low cost project for substantial prevention of life and property.
Technical	1	Easily implemented.
Political	1	Township Administration fully supports the project.
Legal	1	Yes. Township owned.
Fiscal	1	Letter of Intent submitted for Hazard Mitigation Grant.
Environmental	1	Low carbon footprint natural gas generators.
Social	1	No negative impact to neighborhoods, voting districts.
Administrative	1	Project being administered by Engineering Dept.
Multi-Hazard	1	Will impact power loss caused by of wind , sleet, ice storms tree limb, terrorism
Timeline	1	Should be completed in less than one year.
Agency Champion	1	Mayor, Council, Engineering, and OEM
Other Community Objectives	1	Maintains law and order in the community.
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Belleville-6 (NEW/AW/LOI)**

Mitigation Action/Initiative: Main Street flooding, entire length, Newark to Nutley borders

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Main Street flooding caused by tidal influence of the Passaic River.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	Buyout properties/ Expense of project
	Raise the roadway/ expense of project
	Do nothing/ not acceptable
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install check valves/ back flow preventers in the storm sewer system. Length of Main St, 17 storm sewer outfalls to the Passaic River.
Action/Project Category	SIP
Goals/Objectives Met	Protect life and property.
Applies to existing, future, or not applicable	Installing to existing storm sewer system.
Benefits (losses avoided)	Prevent building and property damage. Prevent road damage and closures.
Estimated Cost	$190,000
Priority*	
Plan for Implementation	
Responsible Organization	Township of Belleville
Local Planning Mechanism	Engineering Dept.
Potential Funding Sources	Hazard Mitigation Grant HMGP
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: Grant awarded. NJEM HMGP Grant being completed.

Refer to prioritization table.

Action Number: **Belleville-6 (NEW/AW/LOI)**

Mitigation Action/Initiative: Main Street flooding, entire length, Newark to Nutley borders

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Prevent loss of life due to flooding. 1 fatality in 2011.
Property Protection	1	Prevent chronic flooding.
Cost-Effectiveness	1	Low cost project for substantial prevention of flood related damage.
Technical	1	Easily implemented.
Political	1	Township Administration fully supports the project.
Legal	1	Yes. Township owned.
Fiscal	1	Project being funded by Hazard Mitigation Grant.
Environmental	1	Keep polluted Passaic River water out of the Township.
Social	1	No negative impact to neighborhoods, voting districts, flooding will be reduced.
Administrative	1	Project being administered by Engineering Dept.
Multi-Hazard	1	Flooding and prevent pollution.
Timeline	1	Should be completed in less than one year.
Agency Champion	1	Mayor, Council, Engineering and OEM
Other Community Objectives	1	Several properties are vacant due frequent flooding.
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Belleville-7 (OLD 1)**

Mitigation Action/Initiative: Flood study of Third River

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Issues with sanitary sewers during flood events.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Flood Study of Third River to address problems with sanitary sewers during flood events. Funding has been applied for and pending award.
Action/Project Category	NSP, SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$100,000
Priority*	
Plan for Implementation	
Responsible Organization	County, Belleville, Nutley, Bloomfield
Local Planning Mechanism	
Potential Funding Sources	External sources
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Belleville-7 (OLD 1)**

Mitigation Action/Initiative: Flood study of Third River

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Prevent loss of life due to flooding.
Property Protection	1	Prevent chronic flooding.
Cost-Effectiveness	1	Low cost project for substantial prevention of flood related damage.
Technical	1	Easily implemented.
Political	1	Township Administration fully supports the project.
Legal	1	Municipality has the authority to conduct the study.
Fiscal	1	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	No negative impact.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	Flooding and prevent pollution.
Timeline	1	Can be completed in less than one year.
Agency Champion	1	Mayor, Council, Engineering and OEM
Other Community Objectives	1	Capital improvements to Recreation areas in the flood zone.
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Belleville-8 (OLD 4)**

Mitigation Action/Initiative: Water interconnect

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$300,000
Priority*	
Plan for Implementation	
Responsible Organization	Newark Water Department
Local Planning Mechanism	
Potential Funding Sources	External sources
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Belleville-8 (OLD 4)**

Mitigation Action/Initiative: Water interconnect

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Prevent loss of life by improving fire protection.
Property Protection	1	Prevent loss of property by improving fire protection.
Cost-Effectiveness	1	Low cost project for substantial improvement to water supply system.
Technical	1	Easily implemented.
Political	1	Township Administration fully supports the project.
Legal	1	Municipality has the authority to conduct the project.
Fiscal	1	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	No negative impact.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	Improves fire protection and potable water supply.
Timeline	1	Can be completed in less than one year.
Agency Champion	1	Mayor, Council, Engineering and OEM
Other Community Objectives	1	Spur economic development.
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Belleville-9 (OLD 7)**

Mitigation Action/Initiative: Steep slopes at Rutgers Ave. and Belleville Ave.

Assessing the Risk	
Hazard(s) addressed:	Landslide
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$200,000
Priority*	
Plan for Implementation	
Responsible Organization	Belleville
Local Planning Mechanism	
Potential Funding Sources	Existing sources
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Belleville-9 (OLD 7)**

Mitigation Action/Initiative: Steep slopes at Rutgers Ave. and Belleville Ave.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Prevent loss of life by improving slope stabilization.
Property Protection	1	Prevent loss of property by improving slope stabilization.
Cost-Effectiveness	1	Low cost project for substantial improvement to steep slope areas.
Technical	1	Easily implemented.
Political	1	Township Administration fully supports the project.
Legal	1	Township has the authority through construction permit process.
Fiscal	1	Project should be privately funded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	No negative impact.
Administrative	1	The Town has all administrative and technical resources necessary to issue permits for this project.
Multi-Hazard	1	Reduces damage to property and infrastructure.
Timeline	1	Ongoing through the construction permit process.
Agency Champion	1	Mayor, Council, Engineering and OEM
Other Community Objectives	1	Spur economic development.
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Belleville-10 (OLD 14)**

Mitigation Action/Initiative: Fire protection upgrades- water main upgrades, hydrant and valve replacement

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$1,000,000
Priority*	
Plan for Implementation	
Responsible Organization	Township of Belleville
Local Planning Mechanism	
Potential Funding Sources	General revenue
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Belleville-10 (OLD 14)**

Mitigation Action/Initiative: Fire protection upgrades- water main upgrades, hydrant and valve replacement

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Prevent loss of life by improving fire protection.
Property Protection	1	Prevent loss of property by improving fire protection.
Cost-Effectiveness	1	Low cost project for substantial improvement to water supply system.
Technical	1	Easily implemented.
Political	1	Township Administration fully supports the project.
Legal	1	Municipality has the authority to conduct the project.
Fiscal	1	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	No negative impact.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	Improves fire protection and potable water supply.
Timeline	1	Can be completed in one year.
Agency Champion	1	Mayor, Council, Engineering and OEM
Other Community Objectives	1	Spur economic development.
Total	14	
Priority (High/Med/Low)	High	

9.3 Township of Bloomfield

This section presents the jurisdictional annex for the Township of Bloomfield.

9.3.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Fred Menzel, OEM Coordinator 1 Municipal Plaza, Bloomfield, NJ 07003 973-418-2108 fmenzel@bloomfieldtwpnj.com	Tom Pelaia, Deputy OEM Coordinator 375 Franklin Street, Bloomfield, NJ 07003 973-332-2855 tbone1019@comcast.net

9.3.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of Bloomfield was 47,315.

Location

According to the U.S. Census Bureau, the Township has a total land area of 5.328 square miles, of which 5.304 square miles is land and 0.024 square miles is water.

Brief History

The Township of Bloomfield was incorporated as a Township in 1812. A local Presbyterian parish which was named for the Governor of New Jersey, Joseph Bloomfield, became the name of the Township. In 1831, a local engineer, Ephriam Beach, increased commerce to the area by designing the inclined planes of the Morris Canal (First Baptist Bloomfield, 2014).

Governing Body Format

In 1981, Bloomfield residents adopted the Township form of government (First Baptist Bloomfield, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in Section 9.3.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.3-1. Growth and Development

Property or Development Name	Type (e.g. Res., Comm.)	# of Units / Structures	Location (address and/or block/lot)	Known Hazard Zone(s)	Description/Status
192 Bloomfield, LLC	Mixed-Use	312 units	B: 64 L: 4	None	App/Rej.

Table 9.3-1. Growth and Development

Property or Development Name	Type (e.g. Res., Comm.)	# of Units / Structures	Location (address and/or block/lot)	Known Hazard Zone(s)	Description/Status
192 Bloomfield, LLC	Mixed-Use	312 units	B: 64 L: 1	Wildfire: Moderate	App/Rej.
Bloomfield College	Mixed-Use	100 Units/ 1 Structure	37-59 Broad St. 241/32	None	Nearing Completion
Bloomfield Greenways	Mixed-Use	200 Units/ 1 Structure	40-50 Broad St 250-266 Liberty St 243/25,28,30,31,32, 37,38	None	Planning Board
Glenwood Village	Mixed-Use	250 Units/3 Structures	Glenwood Ave/Lack-awanna Pl/Washington St All of Block 228	Residual Flooding	Under Construction
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 14	1% Flood: A Zone NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 24	1% Flood: A Zone NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 21	1% Flood: A Zone NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 1	1% Flood: A Zone NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 19	1% Flood: A Zone NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 28	NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 18	1% Flood: A Zone NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 29	NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 30	NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF	B: 228 L: 17	1% Flood: A Zone	N/A

Table 9.3-1. Growth and Development

Property or Development Name	Type (e.g. Res., Comm.)	# of Units / Structures	Location (address and/or block/lot)	Known Hazard Zone(s)	Description/Status
		Commercial		NEHRP: D	
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 16	1% Flood: A Zone NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 31	NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 15	1% Flood: A Zone NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 13	NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 11	NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 10	NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 33	NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 35	1% Flood: A Zone NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 27	1% Flood: A Zone NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 8	NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 7	NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF Commercial	B: 228 L: 4	NEHRP: D	N/A
Glenwood Village Redevelopment	Mixed-Use	224 units/60000 SF	B: 228 L: 5	NEHRP: D	N/A

Table 9.3-1. Growth and Development

Property or Development Name	Type (e.g. Res., Comm.)	# of Units / Structures	Location (address and/or block/lot)	Known Hazard Zone(s)	Description/Status
		Commercial			
Oakes Estates	Residential	340 Units	221-225 Belleville Ave 544/40	Residual Flooding	Planning Board
Parkway Lofts	Residential	160 Units	5 Lawrence ST 61/1	Residual Flooding	Completed 2014
Senior Housing	Residential	100 Units	390 Franklin St 311/13	None	Starting 6/2015
Urban Smart Growth	Residential	114 units	B: 335 L: 26	None	App/Rej.
Urban Smart Growth	Residential	114 units	B: 335 L: 30	None	App/Rej.

* Only location-specific hazard zones or vulnerabilities identified.

9.3.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.3-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
June 10, 2008	Severe Weathers	N/A	N/A	Roads closed, loss of utilities, schools closed, Police and Fire department overtime.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	Roads closed, loss of utilities, schools closed, Police and Fire department overtime. Cost approximately $132,128.
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Evacuation of residents from flooded streets, roads closed, loss of utilities, playground damage at Brookside Park, Watsessing School damage from flooding, Police and Fire department overtime. Cost approximately $179,319.
October 29, 2011	Severe Weather	DR-4048	Yes	Roads closed, loss of utilities, schools closed, Police and Fire department overtime, debris removal. Cost approximately$296,143.
October 26 – November 8, 2012	Superstorm Sandy	EM-3354 DR-4086	Yes Yes	Sheltering, roads closed, loss of utilities, schools closed, 14 residential properties had structural damage, Police and Fire department overtime, debris removal. Cost approximately $738,973.

9.3.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of Bloomfield. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for Township of Bloomfield.

Table 9.3-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $2,620,846 2,500-year MRP: $57,077,233	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $44,453,919	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $0	Rare	6	Low
Severe Weather	100-Year MRP: $3,675,465 500-year MRP: $19,198,214 Annualized: $272,593	Frequent	48	High
Winter Storm	1% GBS: $23,573,340 5% GBS: $117,866,700	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $0	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. *The valuation of general building stock and loss estimates was based on custom inventory for the municipality.*
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. *Loss estimates for the Severe Weather and severe winter storm hazards are structural values only and do not include the value of contents.*

d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*

e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of Bloomfield.

Table 9.3-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Bloomfield, Township of	427	335	$2,731,547.00	18	1	317	317	110

Source: FEMA, 2014

Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.

Note (2) Total building and content losses from the claims file provided by FEMA Region 2.

Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.3-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

Municipality	1%		0.2%	
	Commercial	School	Commercial	School
Township of Bloomfield	1	2	1	2

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS) for Essex County, the Township of Bloomfield is subject to flooding from the Passaic River and the Second River. The flooding along the streams within the corporate limits to attributed mainly to backwater created by inadequate storm drains and culverts, clogged bridges, or shallow stream beds. Most of the lands adjacent to the rivers in the Township are affected by flooding, with the exception of the Third River section between John F. Kennedy Drive and Maple Street, where natural high riverbeds combined with natural high grounds confine floodwater to the channel. There are several other areas throughout the Township that experience flooding due to inadequate storm drainage systems. Historic floods in the Township occurred in May 1968, August and September 1971, and February 1973 (FEMA FIS 2014).

Additionally, the Township identified the following hazard problems areas in the municipality:

- Flooding of the Second and Third Rivers, and the WigWam Brook. Damages to Brookside Park, Watsessing Park, and many structures around and near these rivers and streams.

9.3.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of Bloomfield.

Table 9.3-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	State/Local	Construction	CH. 149, June 1, 2009
Zoning Ordinance	Y	Local	Planning and Zoning	Ch. 149, 2009
Subdivision Ordinance	Y	Local	Planning and Zoning	Ch. 149, 2009
NFIP Flood Damage Prevention Ordinance	Y	Local	Engineering	Ch. 250, 2000
Cumulative Substantial Damages				
Freeboard				
Growth Management				
Floodplain Management / Basin Plan				
Stormwater Management Plan/Ordinance	Y	Local	Engineering	Ch. 494, 2010
Comprehensive Plan / Master Plan/ General Plan	Y	Local	Planning and Zoning	Ch. 149, 2012
Capital Improvements Plan	Y	Local	Finance	2013
Site Plan Review Requirements	Y	Local	Planning and Zoning	Ch. 149, 2012
Open Space Plan	Y	Local	Governing Body	Ch. 315, 2002
Stream Corridor Management Plan				
Watershed Management or Protection Plan				
Economic Development Plan				
Comprehensive Emergency Management Plan	Y	Local	OEM	State Police Directives, 2011
Emergency Response Plan	Y	Local	OEM	State Police Directives, 2011
Post Disaster Recovery Plan	Y	Local	OEM	State Police Directives, 2011
Post Disaster Recovery Ordinance				
Real Estate Disclosure Requirement				
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]				

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of Bloomfield.

Table 9.3-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Engineering
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineer
Planners or engineers with an understanding of natural hazards	Y	Contracted Engineer
NFIP Floodplain Administrator	Y	Engineer, Paul Lasek
Surveyor(s)	Y	Contracted Engineer
Personnel skilled or trained in "GIS" applications	N	
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Emergency Management
Grant Writer(s)	Y	Contracted Consultant
Staff with expertise or training in benefit/cost analysis	Y	Financial Officer
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the Township of Bloomfield.

Table 9.3-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes, Township CDBG Department
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for specific purposes	Yes, Governing Body
User fees for water, sewer, gas or electric service	Yes
Impact Fees for homebuyers or developers of new development/homes	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	No
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	
Mitigation grant programs	No
Other	

Community Classifications

The table below summarizes classifications for community program available to the Township of Bloomfield.

Table 9.3-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	10	Status - Rescinded
Building Code Effectiveness Grading Schedule (BCEGS)	NP	N/A
Public Protection	2B	11/2010
Storm Ready	NP	N/A
Firewise	NP	N/A

N/A = Not applicable. NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Paul Lasek, Township Engineer

Flood Vulnerability Summary

No flood vulnerability information was provided by the NFIP Floodplain Administrator. The responsibility of maintaining this information is that of either the Office of Emergency Management or Department of Public Works.

Resources

The responsibility of floodplain manager rests on both the Department of Engineering and Building Department. Personnel from both assist with the duties of floodplain management in Bloomfield Township. Chapter 250-14 of Bloomfield Township Code specifies the roles of the floodplain administrator.

Responsibilities include permit review, utilization of base flood and floodway data when reviewing compliance with Chapter 250-7 compliance, maintaining Elevation Certificates, alterations of watercourses, and interpret Flood Insurance Rate Map (FIRM) boundaries. Currently there are no barriers to running an effective floodplain management program in Bloomfield Township. Additional training and information on floodplain management would be welcomed.

Compliance History

Currently, Bloomfield Township is in good standing with the NFIP. At this time the current floodplain administrator is unsure when the most recent compliance audit was completed. There is no known reason for a Community Assistance Visit (CAV) at this time.

Regulatory

Currently floodplain management regulations meet both FEMA and New Jersey requirements. To ensure proper enforcement, Bloomfield Township relies on New Jersey Department of Environmental Protection (NJDEP) Floodplain Requirements and Section 494 of Bloomfield Township Code, Stormwater Control.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

The Township has not identified any previous actions that are now on-going programs and capabilities.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is presented below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

Master Plan (2012): According to the Township's Master Plan in November 2001 the Township approved a dedicated open space tax of one cent per hundred dollars assessed value to provide a steady source of funding to acquire property or easements in the Township for the purposes of recreation, passive recreation and water quality protection. The Open Space Trust Fund Committee was created in 2003.

In 2004, the Open Space Trust Fund Committee in partnership with the Morris Land Conservancy compiled an Open Space and Recreation Plan (OSRP) to serve as a guide for the acquisition and maintenance of land for open space and recreational purposes, and increase the Township's resident's quality of life and maintain Bloomfield as a desirable community. One of the goals is to 'identify and protect flood hazard areas, especially steep slope areas, to reduce flooding damage and streambank erosion.

The Township has identified the following mitigation actions that align with the goals of the OSRP. For further details refer to Table 9.3-12 and the mitigation action worksheets:

- Bloomfield-6: Acquire properties along the west bank of the Third River on Lion Gate Drive
- Bloomfield-8: Bank stabilization of the Second and Third Rivers and WigWam Brook

The Township is currently updating its Master Plan and mitigation ideas are currently being discussed.

Ordinances: The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Bloomfield website at http://www.bloomfieldtwpnj.com for further information.

Outreach: The Township's website includes an emergency management page with information on personal disaster kids; alerts and information from PSE&G regarding upcoming storm events and potential interruption of service; and tips. The website also has a web link to NJ-Alert which is a service that provides state-wide email alerts on weather and more.

Funding: As indicated in Table 9.3-12, mitigation projects will be considered as part of the capital improvement budget.

9.3.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.3-10. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Flood Study of Third River	Continuous	Awaiting additional funding. This initiative will be carried over to the current mitigation strategy.
2: Third River Bank Erosion	Continuous	This initiative will be carried over to the current mitigation strategy. A third party engineering firm will be contracted to complete the study. Funds will be dedicated in 2015
3: Repair to Toney's Brook Stream Bank Stabilization	Continuous	Awaiting additional funding. Township grant writers have been requested to seek out funding for this initiative. This initiative will be carried over to the current mitigation strategy.
4: Utility Substations	Discontinued	The Township does not have authority over PSE&G's substations however the Township will continue to follow-up with PSE&G on the status of the work to be done. This initiative will not be carried over to the current mitigation strategy.
5: Property buy-out	Continuous	Continuing talks amongst property owners on the west side of the Third River. This initiative will be carried over to the current mitigation strategy.
6: NJ Transit Rail Line	Discontinued	Redevelopment has begun. Architectural plans with new security initiatives being prepared at this time. The Township does not have authority over NJ Transit Rail Lines however the Township will continue to follow-up with NJ Transit on the status of this work. This initiative will not be carried over to the current mitigation strategy.
7: Install surveillance cameras around Township buildings	Completed	Completed in 2013. This initiative will not be carried over to the current mitigation strategy.
8: Update/Replace Police facilities	Completed	Communications Room has been rebuilt.

Table 9.3-10. Past Mitigation Initiative Status

Description	Status	Review Comments
9: Construction and relocation of a permanent DPW facility	Continuous	Township still investigating potential sites for the relocation of the DPW facility. This initiative will be carried over to the current mitigation strategy.
10: Upgrades to municipal building security – new doors, access cards, fire alarms, lighting, building surveillance, etc.	Completed	This initiative has been completed.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The Township has identified the following mitigation projects/activities that have also been completed but were not identified in the previous mitigation strategy in the 2007 Plan:

- Other than normal cleaning and removal of silt and debris from various bridges, there has been no major channel improvement work completed on the Third or Second Rivers in the Township of Bloomfield (FEMA FIS 2014).
- Interior drainage improvements such as repairs and maintenance have been made to reduce localized flooding conditions in the Township of Bloomfield (FEMA FIS 2014).

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.3-11 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.3-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.3-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Bloomfield-1 (NEW/LOI)	Obtain backup power for critical facilities including: generator for a primary shelter located at 84 Broad Street	Existing	Coastal Storm, Severe Weather, Severe Winter Storm, Earthquake	1.2 6.1	Township of Bloomfield OEM	High	Medium $65,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Bloomfield-2 (NEW/LOI)	Obtain backup power for critical facilities: generator for the Bloomfield fire house located at 124 East Passaic Ave	Existing	Coastal Storm, Severe Weather, Severe Winter Storm, Earthquake	1.2 6.1	Township of Bloomfield Fire Dept	High	Medium $55,000	FEMA Hazard Mitigation Grant Programs, Township budget	Short Term DOF	High	SIP	ES
Bloomfield-3 (OLD 1)	Flood Study of Third River.	N/A	Flood	1.2	Engineering	Medium	Medium $75,000	Federal, State Grant opportunities	Short Term DOF	Medium	NSP	PR
Bloomfield-4 (OLD 2)	Third River Bank Erosion: Construct a manmade structure to alleviate flooding	Existing	Flood	1.2	Engineering	Medium	Medium $100,000	FEMA Hazard Mitigation Grant Programs	Long Term DOF	Medium	SIP, NSP	SP
Bloomfield-5 (OLD 3)	Further stabilize the banks of Toney's Brook. Banks need to be further stabilized due to the flooding that has occurred in the past. At risk are the business in the Watsessing Park Area, Watsessing Park itself, and the residences in the area.	Existing	Flood	1.2 2.2	Engineering	High	High	FEMA Hazard Mitigation Grant Programs	Long Term DOF	Medium	NSP	NR
Bloomfield-6 (OLD 5)	Support the acquisition/elevation of flood-prone properties with priority to repetitive loss and severe repetitive loss structures, where applicable. For this plan update the following were identified as buy-outs: West Bank of Third River, Lion Gate	Existing	Flood	1.2 2.2	Engineering, Law, Administrator	High	High	FEMA Hazard Mitigation Grant Programs and homeowner	1 year	High	LPR, NSP, EAP	

Table 9.3-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	Drive.							matching funds; Open Space Trust Fund				
Bloomfield-7 (OLD 9)	Construction and relocation of a permanent DPW facility.	New	All Hazards	1.2 2.1 2.2 6.1	Engineering, Department of Public Works	High	High	FEMA Hazard Mitigation Grant Programs	Short Term DOF	High	SIP	SP
Bloomfield-8	Bank stabilization of the Second and Third Rivers and WigWam Brook	Existing	Flood	1.2 2.2	Engineering	High	High	FEMA Hazard Mitigation Grant Programs; Capital Improvement	Long Term DOF	Medium	NSP	NR
Bloomfield-9	Enlarge storm sewer system in Ampere Parkway east to Newark border.	Existing	Flood Severe Weather	1.2 2.2	Engineering and DPW	High	High	HMGP, PDM, FMA; Capital Improvement	Long Term DOF	Medium	SIP	SP
Bloomfield-10	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. This program will: • Providing general natural hazard risk, preparedness and mitigation, and related NFIP information in regular newsletter and mailings. • Including natural hazard risk and risk reduction information through social media channels and email blast systems. • Posting of flyers and other readily available NFIP informational materials at Town hall or distributing at regular civic meetings. • Preparation, distribution and analysis of public surveys. • Developing/maintaining a natural hazard risk management webpage on the municipal website where information and mapping can be posted. • Enhance public outreach to residents in NFIP floodplain areas to inform of annual grant opportunities, etc. which may include periodic articles and handouts in the annual newsletter. • Conduct Town Hall meetings with federal and state representatives • Develop an information booth at Township events such as street fairs etc.											
	See above.	N/A	All Hazards	3.1	OEM	Medium	Low	Municipal Budget; HMA programs with local or county match	Short	High	EAP	PE

Table 9.3-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Bloomfield-11	Develop and implement a post-event damage assessment program, including the following elements: • Conduct public outreach/education (see Public Education and Awareness Initiatives above) to inform property owners of the need to report property damage and obtain required permitting when making repairs. • Develop and organize local resources to conduct post-event damage assessments, including substantial damage determinations as warranted. • Develop an inventory (file system and/or database) of losses (incl. loss of service, property damage, economic losses, etc.) as reported to and/or identified by the Town/Village (e.g. building permit process).											
	See above.	Existing	Flood; Severe Weather; Severe Winter Storm; Coastal Storm	3.1 3.2 5.1	Engineering. Township FPA and Administrator	Medium	Low	Municipal Budget	Short	High	LPR, EAP	PE ES
Bloomfield-12	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.	N/A	Flood	1.3 3.2	Engineering. Township FPA and Administrator	Medium	Low	Municipal Budget	Short (year 1)	High	LPR, EAP	PR
Bloomfield-13	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).	N/A	Flood	1.3 3.2	Engineering and NFIP FPA	Low - Medium	Low	Municipal Budget	Short (year 1)	High	LPR	PR
Bloomfield-14	Have designated NFIP Floodplain Administrator (FPA), and other local officials who would benefit, become a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training such as FEMA Benefit-Cost Analysis	N/A	Flood	1.3 3.3 5.2	Engineering. Township FPA and Administrator	Medium	Low	Municipal Budget	Short (DOF)	High	EAP	PR

Table 9.3-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	(BCA) and Substantial Damage Estimation (SDE).											

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*
OEM	*Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Costs:

Where actual project costs have been reasonably estimated:

Low	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low	*Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium	*Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High	*Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not*

Benefits:

Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low	*Long-term benefits of the project are difficult to quantify in the short term.*
Medium	*Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High	*Project will have an immediate impact on the reduction of risk exposure to life and property.*

Costs: *Benefits:*

adequate to cover the costs of the proposed project.

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.3-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High/ Medium/ Low
Bloomfield-1 (NEW/LOI)	Bloomfield primary shelter generator.	1	0	1	1	1	1	0	1	1	1	1	1	1	1	12	High
Bloomfield-2 (NEW/LOI)	Bloomfield fire house generator.	1	0	1	1	1	1	0	1	1	1	1	1	1	1	12	High
Bloomfield-3 (OLD 1)	Flood Study of Third River.	1	1	1	1	1	0	0	1	1	1	1	1	1	1		High
Bloomfield-4 (OLD 2)	Third River Bank Erosion – construct a manmade structure to alleviate flooding	1	1	0	1	0	0	1	1	0	1	1	1	1	0	10	Medium
Bloomfield-5 (OLD 3)	Repair to Toney's Brook Stream Bank Stabilization.	1	1	1	1	0	0	1	1	0	1	1	1	0	0	9	Medium
Bloomfield-6 (OLD 5)	Property buy-out.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Bloomfield-7 (OLD 9)	Construction and relocation of a permanent DPW facility.	1	1	1	1	1	0	1	0	0	1	0	1	1	1	9	High
Bloomfield-8	Bank stabilization of the Second and Third Rivers and WigWam Brook	1	1	1	1	0	0	1	1	0	1	1	1	1	1	11	High
Bloomfield-9	Enlarge storm sewer system in Ampere Parkway east to Newark border.	1	1	1	1	1	0	1	1	0	0	1	0	1	0	8	Medium
Bloomfield-10	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program	1	1	0	0	0		1	1	1	0	0	1	1	0	7	Medium
Bloomfield-11	Develop and implement a post-event damage assessment program	1	1	1	1	1	0	0	0	1	1	1	0	1	0	9	Medium

Table 9.3-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High/ Medium/ Low
Bloomfield-12	Support participation in the NFIP Community Rating System (CRS) program	1	1	1	1	1	0	0		1	1	0	1	1	1	10	Medium1
Bloomfield-13	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS	1	1	0	0	1	0	0	1	1	1	0	0	0	0	6	Medium
Bloomfield 14	Have designated NFIP Floodplain Administrator (FPA), and other local officials who would benefit, become a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training	1	1	1	1	1	0	1	1	1	1	1	1	1	1	13	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.3.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.3.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of Bloomfield that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of Bloomfield has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.3.9 Additional Comments

None at this time.

Figure 9.3-1. Township of Bloomfield Hazard Area Extent and Location Map 1

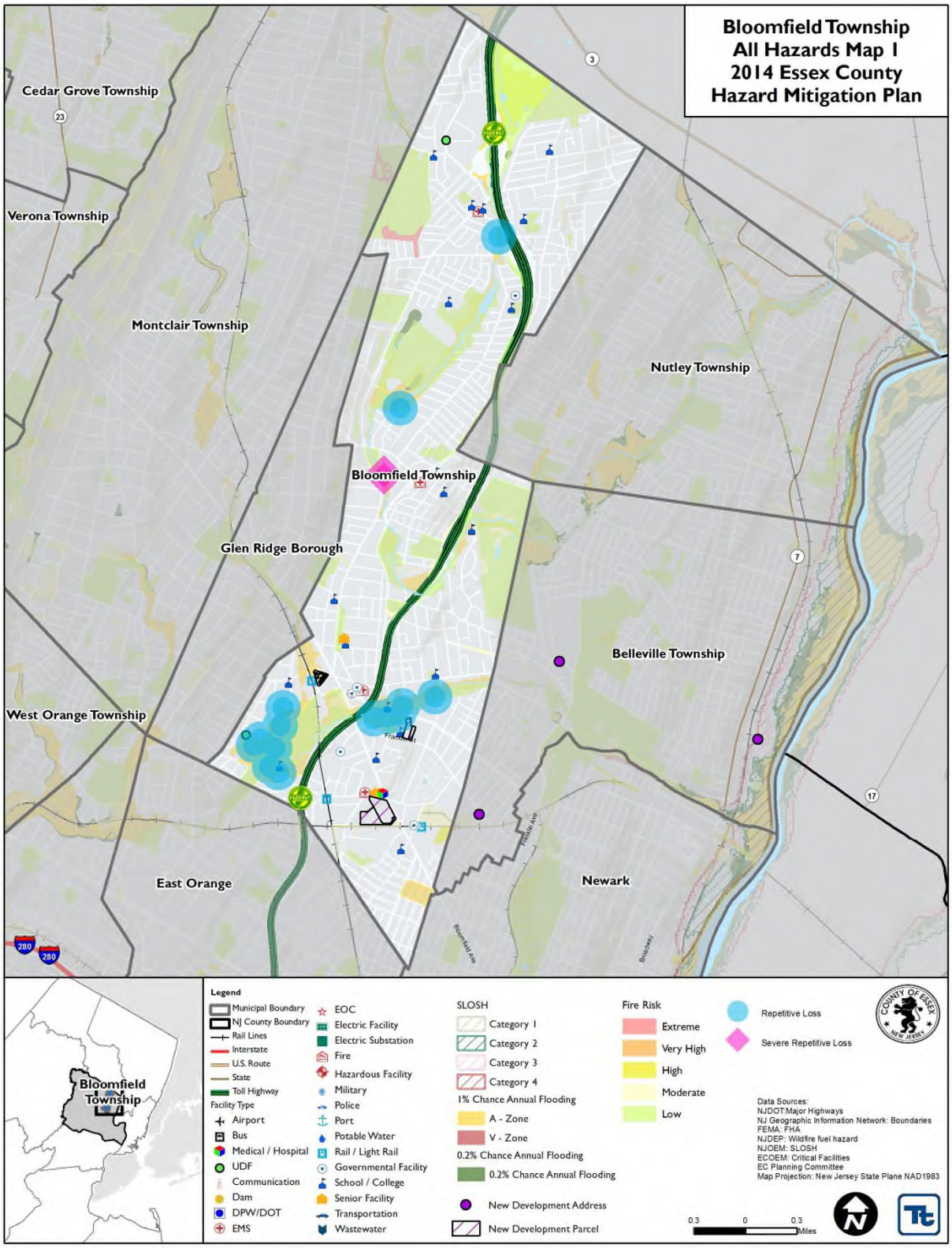
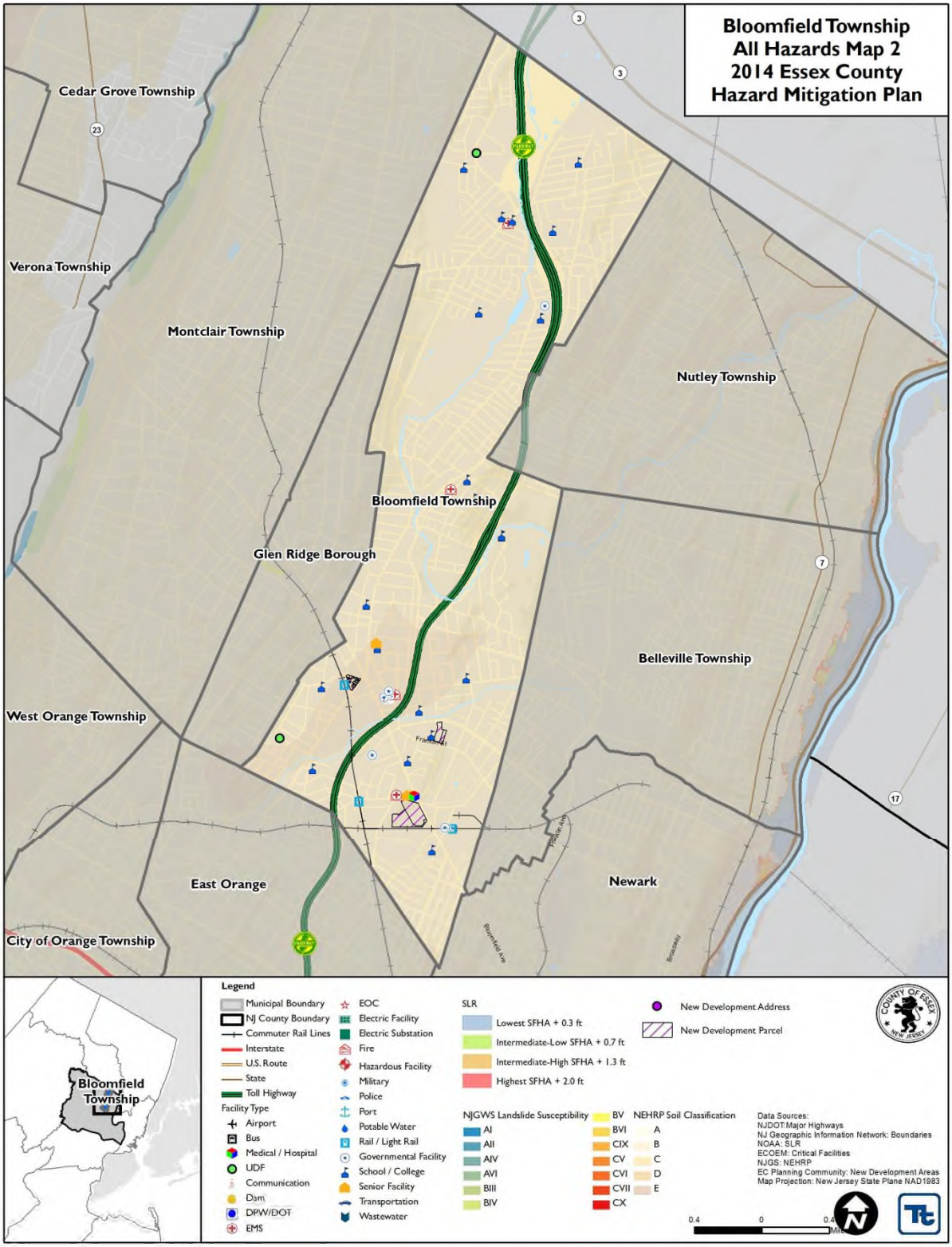


Figure 9.3-2. Township of Bloomfield Hazard Area Extent and Location Map 2



Action Number: **Bloomfield-1 (NEW/LOI)**

Mitigation Action/Initiative: Obtain generator for primary shelter

Assessing the Risk	
Hazard(s) addressed:	Coastal Storm, Severe Weather, Severe Winter Storm, Earthquake
Specific problem being mitigated:	Facility does not have backup power generation capabilities and is susceptible to losing power during storm events.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing Township maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Township property. 2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Township does not have the legal authority to bury the lines. 3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Township Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Township. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	This location is the primary shelter facility and does not have backup power, leaving displaced populations vulnerable. Township Municipal Cable TV Access Station also operates at this location and it is the primary form of communications during an emergency.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$65,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Bloomfield
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, Township Budget
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Bloomfield-1 (NEW/LOI)**

Mitigation Action/Initiative: Obtain generator for primary shelter

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Bloomfield-2 (NEW/LOI)**

Mitigation Action/Initiative: Obtain generator for the Bloomfield Fire House

Assessing the Risk	
Hazard(s) addressed:	Coastal Storm, Severe Weather, Severe Winter Storm, Earthquake
Specific problem being mitigated:	Facility houses 2 active fire companies and the transmission equipment for the Police and Fire station radio equipment. It is the highest point in the Township for antennas to connect to the equipment. The current generator is 25 years old and susceptible to failure.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing Township maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Township property. 2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Township does not have the legal authority to bury the lines. 3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Township Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Township. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installing a new generator will ensure continuity of services and protect communication for the Police and Fire departments.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$55,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Bloomfield
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, Township Budget
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Bloomfield-2 (NEW/LOI)**

Mitigation Action/Initiative: Obtain generator for the Bloomfield Fire House

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Bloomfield-4 (OLD 2)**
Mitigation Action/Initiative: Third River bank erosion

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Stabilize River Banks
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Stabilizing the bank of the river by installing protective measures to alleviate flooding in the area of the river
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Construct a manmade structure to alleviate flooding
Action/Project Category	NSP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	
Estimated Cost	$100,000
Priority*	Medium
Plan for Implementation	
Responsible Organization	Engineering
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Bloomfield-4 (OLD 2)**

Mitigation Action/Initiative: Third River bank erosion

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will protect Citizens from flooding.
Property Protection	1	Property will also be protected from damage to flooding.
Cost-Effectiveness	1	Will alleviate costs of repair in the future.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against flooding.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town will seek funding of the local match, if a grant were awarded.
Environmental	1	Environmental aspects will be dealt with on an as needed basis.
Social	1	This project benefits sectors of the community on the reviver bank.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within two years once funding is secured.
Agency Champion	1	The Town Engineer and is the lead for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to alleviate flooding in the community.
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Bloomfield-5 (OLD 3)**

Mitigation Action/Initiative: Repair to Toney's Brook stream bank stabilization

Assessing the Risk	
Hazard(s) addressed:	Flooding along the third river
Specific problem being mitigated:	Flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Stabilizing the bank of the river by installing protective measures to alleviate flooding in the area of the river
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Further stabilize the banks of Toney's Brook. Banks need to be further stabilized due to the flooding that has occurred in the past. At risk are the business in the Watsessing Park Area, Watsessing Park itself, and the residences in the area.
Action/Project Category	NSP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	
Estimated Cost	$150,000
Priority*	
Plan for Implementation	
Responsible Organization	Engineering
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Bloomfield-5 (OLD 3)**

Mitigation Action/Initiative: Repair to Toney's Brook stream bank stabilization

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will protect Citizens from flooding.
Property Protection	1	Property will also be protected from damage to flooding.
Cost-Effectiveness	1	Will alleviate costs of repair in the future.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against flooding.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	1	The town can/will seek funding of the local match if a grant were awarded.
Environmental	1	Environmental aspects will be dealt with on an as needed basis.
Social	1	This project benefits sectors of the community on the reviver bank.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within two years once funding is secured.
Agency Champion	1	The Town Engineer and is the lead for this critical project.
Other Community Objectives	0	This project supports the Town's commitment to alleviate flooding in the community.
Total	13	
Priority (High/Med/Low)	Medium	

Action Number: **Bloomfield-6 (OLD 5)**

Mitigation Action/Initiative: Property buy-out

Assessing the Risk	
Hazard(s) addressed:	Repeated repairs due to flooding
Specific problem being mitigated:	Flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase Property and make the area open Space
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Acquire properties along the west Bank of Third River, Lion Gate Drive.
Action/Project Category	LPR, NSP, EAP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$10,000,000
Priority*	
Plan for Implementation	
Responsible Organization	Engineering, Law, Administrator
Local Planning Mechanism	
Potential Funding Sources	Open Space Trust Fund
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Bloomfield-6 (OLD 5)**

Mitigation Action/Initiative: Property buy-out

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will protect Citizens from flooding.
Property Protection	0	Property will also be removed so the damages will be eliminated.
Cost-Effectiveness	1	Will alleviate costs of repair in the future.
Technical	1	There are no technical issues associated with the project.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	1	The town has funding of the local match if a grant were awarded.
Environmental	1	Environmental aspects will be dealt with on an as needed basis.
Social	1	This project benefits sectors of the community as a whole.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within two years once funding is secured.
Agency Champion	1	The Town Engineer and is the lead for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to alleviate flooding in the community.
Total	13	
Priority (High/Med/Low)	HIGH	

Action Number: **Bloomfield-7 (OLD 9)**

Mitigation Action/Initiative: Construction and relocation of permanent DPW facility

Assessing the Risk	
Hazard(s) addressed:	Eliminated the current facility which is in dire need of repair.
Specific problem being mitigated:	Provides a safe and clean workplace for DPW
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Build a new facility
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Design and construct a new facility
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	
Estimated Cost	$3,000,000
Priority*	
Plan for Implementation	
Responsible Organization	Engineering, Department of Public Works
Local Planning Mechanism	
Potential Funding Sources	Grants and HGMP1
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Bloomfield-7 (OLD 9)**

Mitigation Action/Initiative: Construction and relocation of permanent DPW facility

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Provides a safe working environment for the employees.
Property Protection	0	The building will be new with no problems to the site anticipated.
Cost-Effectiveness	1	Building will be new and more efficient.
Technical	0	There are no technical issues associated with the project, and with routine maintenance will provide long term protection.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	1	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	0	
Timeline	1	The project can be implemented within two years once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Bloomfield-8**

Mitigation Action/Initiative: Bank stabilization of the Second and Third Rivers and WigWam Brook

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Bank Overflows during flooding rains
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. To stabilize all banks on the Second River, Third Rivers and Wig Wam Brook
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Will stabilize and/or create new stabilizing banks on these waterways
Action/Project Category	NSP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	
Estimated Cost	$ 200,000
Priority*	
Plan for Implementation	
Responsible Organization	Engineering
Local Planning Mechanism	
Potential Funding Sources	Grants and Capital Improvement
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Bloomfield-8**
Mitigation Action/Initiative: Bank stabilization of the Second and Third Rivers and WigWam Brook

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will protect Citizens from flooding.
Property Protection	1	Property will also be protected from damage to flooding.
Cost-Effectiveness	1	Will alleviate costs of repair in the future.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against flooding.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	1	The town will seek funding of the local match if a grant were awarded.
Environmental	1	Environmental aspects will be dealt with on an as needed basis.
Social	1	This project benefits sectors of the community on the reviver bank.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within two years once funding is secured.
Agency Champion	1	The Town Engineer and is the lead for this critical project.
Other Community Objectives	0	This project supports the Town's commitment to alleviate flooding in the community.
Total	13	
Priority (High/Med/Low)	Medium	

Action Number: **Bloomfield-9**

Mitigation Action/Initiative: Enlarge storm sewer system in Ampere Parkway east to Newark border

Assessing the Risk	
Hazard(s) addressed:	Constant Flooding on the East side of Third Ward
Specific problem being mitigated:	Overflow Storm Sewer Flooding in the area
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Design a larger Storm Water Sewer System
	2. Enlarge and Construct a Storm Sewer System
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Update Storm Sewer System
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Limited or no flooding in the areas
Estimated Cost	$ 400,000
Priority*	
Plan for Implementation	
Responsible Organization	Engineering and DPW
Local Planning Mechanism	
Potential Funding Sources	Grants and Capital Improvement
Timeline for Completion	4 years
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Bloomfield-9**

Mitigation Action/Initiative: Enlarge storm sewer system in Ampere Parkway east to Newark border

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will protect Citizens from flooding.
Property Protection	1	Property will also be protected from damage to flooding.
Cost-Effectiveness	1	Will alleviate costs of repair in the future.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against flooding.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	1	The town will seek funding if the local match if a grant were awarded.
Environmental	1	Environmental aspects will be dealt with on an as needed basis.
Social	1	This project benefits sectors of the community on the reviver bank.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within two years once funding is secured.
Agency Champion	1	The Town Engineer and is the lead for this critical project.
Other Community Objectives	0	This project supports the Town's commitment to alleviate flooding in the community.
Total	13	
Priority (High/Med/Low)	Medium	

9.4 Borough of Caldwell

This section presents the jurisdictional annex for the Borough of Caldwell.

9.4.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Paul M. Carelli, Borough Administrator 1 Provost Square, Caldwell, NJ 07006 973-403-4634 pcarelli@caldwell-nj.com	Lisa O'Neill, Deputy Cleark 1 Provost Square, Caldwell, NJ 07006 973-403-4638 loneill@caldwell-nj.com

9.4.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Borough of Caldwell was 7,822.

Location

According to the U.S. Census Bureau, the Borough has a total land area of 1.167 square miles, of which 1.166 square miles is land and 0.001 square miles is water.

Brief History

The Caldwells were settled in the early 18th Century. The 22nd and 24th President of the United States, Grover Cleveland, was born in Caldwell. In 2010, *New Jersey Monthly* magazine ranked Caldwell the third best place to live in New Jersey (The Official Website of Caldwell, NJ, 2014).

Governing Body Format

The Borough of Caldwell operates under the borough form of government which consists of a Mayor and six-member Council. The Council is elected at-large every three years on a staggering basis with two seats coming up for election every year. The Mayor is elected every four years (The Official Website of Caldwell, NJ, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.4.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.4-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Brownstones at Caldwell	Residential	10 units / 2 structures	Central Avenue Block 28	ND	Approved for construction
Sisters of St. Dominic of Caldwell	Institutional	33 units	B: 64 L: 1	None	App.
Sisters of St. Dominic of Caldwell	Institutional	33 units	B: 64 L: 2	None	App.

* Only location-specific hazard zones or vulnerabilities identified.
Note: ND = Not determined because potential new development could not be located.

9.4.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.4-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	Overtime in Public Works and Police Departments. Exhausted road salt reserves and experienced vehicle breakdowns.
August 26 – September 5, 2011	Hurricane Irene	DR-4021	Yes	Experienced $61,145 in FEMA approved damages for municipal structures, overtime, debris removal, etc. $45,859 was awarded.
October 29, 2011	Severe Storm	DR-4048	Yes	Experienced $202,830 in FEMA approved damages for municipal structures, overtime, debris removal, etc. $115,812 was awarded.
October 26 – November 8, 2012	Superstorm Sandy	DR-4086	Yes	Experienced $206,185 in FEMA approved damages for municipal structures, overtime, debris removal, etc. As of 2014, only $25,634 has been awarded.

9.4.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Borough of Caldwell. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for Borough of Caldwell.

Table 9.4-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $1,047,692 2,500-year MRP: $17,553,808	Occasional	32	High
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $0	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $2,558,000	Occasional	12	Low
Severe Storm	100-Year MRP: $584,604 500-year MRP: $3,902,237 Annualized: $38,887	Frequent	48	High
Winter Storm	1% GBS: $4,731,124 5% GBS: $23,655,618	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $0	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.

High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. *Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Borough of Caldwell.

Table 9.4-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Caldwell, Borough of	1	1	$4,617.00	0	0	0	0	1

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The municipality does not have any critical facilities located in the 1% or 0.2% annual chance flood boundaries.

Other Vulnerabilities Identified by Municipality

The municipality has identified the following hazard problems and/or problem areas:

- The major area of concern is the stability of the Pine Brook bank. The area requiring bank stabilization is located on private property between Roseland Avenue and Grover Cleveland Park.

- Due to increased development in the Borough, stormwater runoff has impacted the Pine Brook that runs from the east side of the Borough and discharges into the Grover Cleveland Park. There is significant bank erosion in an area of a multi-story residential complex, as well as single family homes.

9.4.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Borough of Caldwell.

Table 9.4-5. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	State	Construction Official	
Zoning Ordinance	Y	Local	Zoning Official	Chapter 210, Adopted 6/24/1980
Subdivision Ordinance	Y	Local	Zoning Official	Chapter 210, Adopted 6/24/1980
NFIP Flood Damage Prevention Ordinance	N			
Cumulative Substantial Damage	N			
Freeboard	N			
Growth Management	N			
Floodplain Management / Basin Plan	N			
Stormwater Management Plan / Ordinance	Y	Local	Sewer Operator	Chapter 206, Adopted 3/7/2006
Capital Improvements Plan	Y	Local		Currently under development, Completion date set for 6/17/2014
Site Plan Review Requirements	Y	Local	Zoning Officials	Chapter 210, Adopted 6/24/1980
Open Space Plan	Y	Local	Planning Board	February 2007
Stream Corridor Management Plan	N			
Watershed Management or Protection Plan	N			
Economic Development Plan	N			
Comprehensive Emergency Management Plan	Y	Local	OEM	Caldwell Emergency Operations Plan, updated 2014
Emergency Response Plan	Y	Local	OEM	Caldwell Emergency Operations Plan, updated 2014
Post Disaster Recovery Plan	N			
Post Disaster Recovery Ordinance	N			

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Real Estate Disclosure Requirement	N			
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]	N			

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Borough of Caldwell.

Table 9.4-6. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Planning / Zoning Boards
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Planning / Zoning Boards; Construction Official
Planners or engineers with an understanding of natural hazards	Y	Borough Engineer
NFIP Floodplain Administrator	Y	Construction Official
Surveyor(s)	N	
Personnel skilled or trained in "GIS" applications	Y	Licensed water operator; Borough engineer; Borough has purchased GIS software
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Emergency Management Coordinator
Grant Writer(s)	N	Grant applications are currently written by staff
Staff with expertise or training in benefit/cost analysis	Y	Finance; Chief Financial Officer and Borough Administrator analyze costs
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the Borough of Caldwell.

Table 9.4-7. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Y – Administration
Capital Improvements Project Funding	Y – Administration/Finance
Authority to Levy Taxes for specific purposes	Y – Mayor and Council
User fees for water, sewer, gas or electric service	No Information
Impact Fees for homebuyers or developers of new development/homes	No Information
Incur debt through general obligation bonds	Y – Mayor and Council
Incur debt through special tax bonds	No Information
Incur debt through private activity bonds	No Information
Withhold public expenditures in hazard-prone areas	No Information

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Mitigation grant programs	Y – Administration, Borough Engineer, Mayor and Council
Other	

Community Classifications

The table below summarizes classifications for community program available to the Borough of Caldwell.

Table 9.4-8. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	
Building Code Effectiveness Grading Schedule (BCEGS)	NP	
Public Protection	NP	
Storm Ready	NP	
Firewise	NP	

NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Paul Milani, Construction Official

Flood Vulnerability Summary

The municipality does not maintain lists/inventories of properties that have been damaged by floods. During Hurricane Sandy and other events, structures in the Borough were not damaged and substantial damage estimates were not conducted.

Resources

The Construction Official is the sole person responsible for floodplain administration in the Borough. The floodplain administrator does not provide any NFIP administration services or functions. There are no barriers to running an effective floodplain management program; however, the Floodplain Administrator feels that he is not adequately supported and trained to fulfill his responsibilities. The Floodplain Administrator indicated that he would consider attending continuing education and/or certification training on floodplain management.

Compliance History

The Borough is in good standing with the NFIP; however, the Floodplain Administrator did not have information on the most recent compliance audit conducted in the Borough.

Regulatory

Currently, the Borough does not have floodplain management regulations and/or ordinances in place. The Borough does have a flood damage prevention ordinance (No. 1179-07) in effect which was adopted on June 12, 2007.

Community Rating System

The Borough does not participate in the Community Rating System (CRS) program. The Borough has considered joining the CRS program. There are no residential or commercial structures in the flood zones of the Borough. The existing flood zone (AE Zone) is located south of Brookside Avenue at the Grover Cleveland Park.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

Day to Day Operations/Outreach: On the Borough's official website, their main page informs the public that they have implemented a new Emergency Notification system to notify residents of updates and emergencies and how to sign up. The Caldwell Police have a Facebook page as a way to communicate and update residents.

Planning: The Borough receives drinking water from sources within the Highlands Region. In accordance with Resolution No. 2-60 adopted February 19, 2013, the Borough strongly supports the goals, policies and objectives of the 2004 Highlands Water Protection and Planning Act and the Highlands Regional Master Plan.

The Borough will continue to integrate mitigation into their operations.

9.4.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.4-9. Past Mitigation Initiative Status

Description	Status	Review Comments
Pine Brook culvert work study	Continuous	This initiative will be revised and included in the 2014 plan update as Pine Brook Bank Stabilization.
Calamus Brook study	Continuous	This initiative will continue to be an active initiative. Budget restraints have prevented the hiring of a contractor to complete the study.
Grover Brook study	Continuous	This initiative will continue to be an active initiative. Budget restraints have prevented the hiring of a contractor to complete the study.
Creation of extreme temperatures plan	Completed	The Township has identified the Caldwell Community Center as a public cooling and warming center. Notification of operation is made on municipal website and other modems in event of emergency.
Utility lines	Continuous	This initiative will be revised and included in the 2014 plan update as Water, Sewer, and Stormwater Study and includes video inspection of Stormwater and Sewer lines.
Mountain Ave. flooding study	Discontinued	This flood study will be incorporated into the Calamus Brook Study.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

None at this time.

Proposed Hazard Mitigation Initiatives for the Plan Update

The Borough of Caldwell participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Borough participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.4-11 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.4-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

The Borough has identified the following mitigation projects/activities that have been completed:

- The Borough continues to plan mitigation efforts regarding the bank stabilization of Pine Brook. Due to increased development in the Borough, stormwater runoff has impacted the Pine Brook that runs from the east side of the Borough and discharges into the Grover Cleveland Park. There is significant bank erosion in an area of a multi-story residential complex, as well as single family homes.

Table 9.4-9. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Caldwell-1 (NEW/LOI)	Caldwell CVFD and Caldwell Community Center generator.	Existing	All Hazards	1.2 6.1	Township Manager, Engineering	High	High $126,000	FEMA HMGP, Municipal Budget	Short Term DOF	High	SIP	ES
Caldwell-2 (NEW/LOI)	Caldwell Pine Brook flood control/bank stabilization project.	Existing	Flood	1.2 2.3	Engineering and Floodplain Administrator	High	High $4,200,000	Federal, State Grants, HMGP, FMA	Long Term DOF	High	SIP, NRP	SP
Caldwell-3 (NEW)	Conduct a Water, Sewer, and Stormwater Study and includes video inspection of Stormwater and Sewer lines	Existing	Flood Severe Storm	1.2 2.1 2.2	Engineering and Floodplain Administrator	High	Medium	Federal and State Grants	Short Term DOF	High	SIP	PR
Caldwell-4 (NEW)	Conduct Flood Studies of the Calamus and Gover Brook to include Mountain Avenue Flooding	N/A	Flood Severe Storm	1.2 2.2	Engineering and Floodplain Administrator	Medium	Medium	Federal and State Grants	Short Term DOF	Medium	SIP	PR
Caldwell-5 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness. This program will include: • Providing general natural hazard risk, preparedness and mitigation, and related NFIP information in regular newsletter and mailings. • Including natural hazard risk and risk reduction information through social media channels and email blast systems. • Posting of flyers and other readily available preparedness informational materials at Borough Hall or distributing at regular civic meetings.											
	See above.	N/A	All Hazards	3.1	Borough Administrator	Medium	Low	Municipal Budget; HMA programs with local or county match	Short	High	EAP	PE
Caldwell-6 (NEW)	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	N/A	All Hazards	5.3 5.4	Municipality with support from County, NJOEM, FEMA and surrounding communities	Medium	Low	Municipal Budget	Short Term	High	LPR	PR
Caldwell-7 (NEW)	The HMP will be used as a guide when the Borough reviews/updates their ordinances.	N/A	All Hazards	1.3 5.4	Borough Administrator, Council	Medium	Low	Municipal Budget	Short Term	Medium	LPR	PR

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	Community Assistance Visit
CRS	Community Rating System
DPW	Department of Public Works
FEMA	Federal Emergency Management Agency
FPA	Floodplain Administrator
HMA	Hazard Mitigation Assistance
N/A	Not applicable
NFIP	National Flood Insurance Program
NJDEP	New Jersey Department of Environmental Protection
NJOEM	New Jersey Office of Emergency Management
OEM	Office of Emergency Management

Potential FEMA HMA Funding Sources:

FMA	Flood Mitigation Assistance Grant Program
HMGP	Hazard Mitigation Grant Program
PDM	Pre-Disaster Mitigation Grant Program
RFC	Repetitive Flood Claims Grant Program
SRL	Severe Repetitive Loss Grant Program

Timeline:

Short	1 to 5 years
Long Term	5 years or greater
OG	On-going program
DOF	Depending on funding

Costs:

Where actual project costs have been reasonably estimated:

Low	< $10,000
Medium	$10,000 to $100,000
High	> $100,000

Where actual project costs cannot reasonably be established at this time:

Low	Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.
Medium	Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
High	Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.

Benefits:

Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	< $10,000
Medium	$10,000 to $100,000
High	> $100,000

Where numerical project benefits cannot reasonably be established at this time:

Low	Long-term benefits of the project are difficult to quantify in the short term.
Medium	Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.
High	Project will have an immediate impact on the reduction of risk exposure to life and property.

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.4-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Caldwell-1 (NEW/LOI)	Caldwell CVFD and Caldwell Community Center generator.	1	0	1	1	1	1	0	1	1	1	1	1	1	1	12	High
Caldwell-2 (NEW/LOI)	Caldwell Pine Brook flood control/bank stabilization project.	1	1	1	0	1	1	0	1	1	1	0	0	1	1	10	High
Caldwell-3 (NEW)	Conduct a water, Sewer, and Stormwater Study and includes video inspection of Stormwater and Sewer lines	1	1	1	1	1	1	0	1	0	1	1	0	1	1	11	High
Caldwell-4 (NEW)	Conduct Flood Studies of the Calamus and Gover Brook to include Mountain Avenue Flooding	0	1	1	0	1	1	0	1	0	1	1	0	0	1	8	Medium
Caldwell-5 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program	1	1	1	1	1	1	0	0	1	1	1	1	1	1	12	High
Caldwell-6 (NEW)	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	1	1	1	1	1	1	1	0	0	0	1	0	1	1	10	High
Caldwell-7 (NEW)	Use the HMP as a guide when the Borough reviews/updates their ordinances.	0	1	1	0	1	1	0	1	0	1	1	0	0	1	8	Medium

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.4.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.4.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Borough of Caldwell that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Borough of Caldwell has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.4.9 Additional Comments

None at this time.

Figure 9.4-1. Borough of Caldwell Hazard Area Extent and Location Map

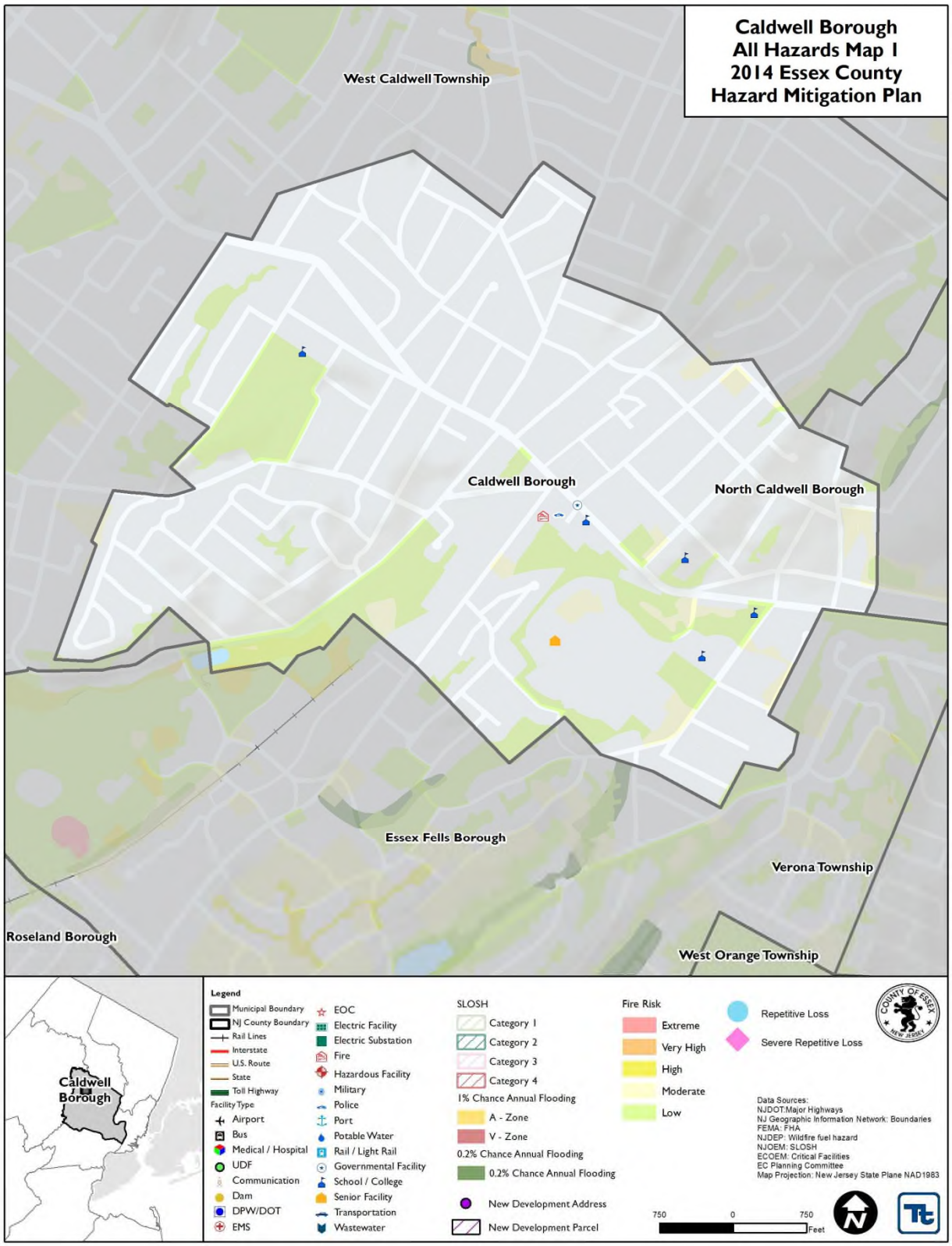
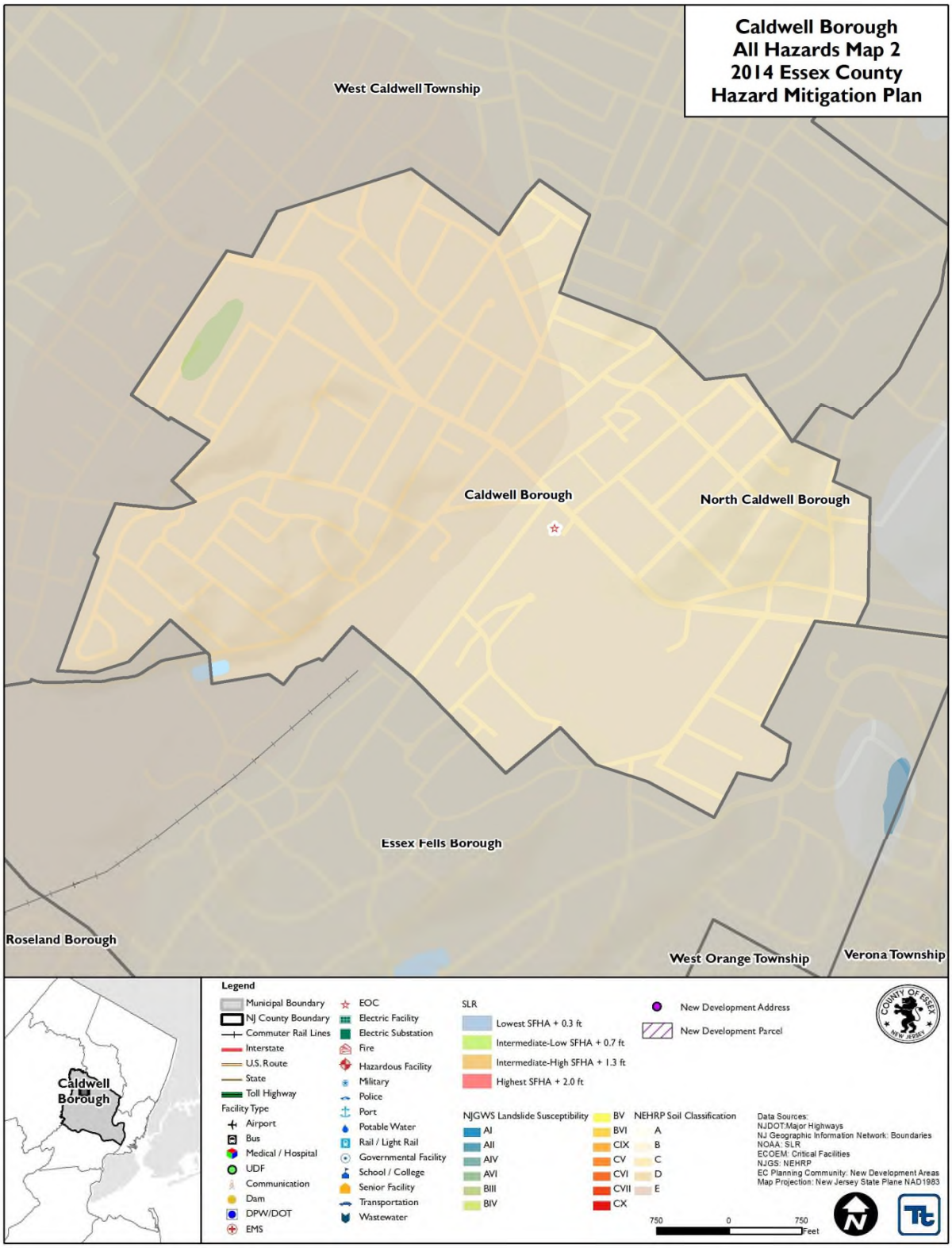


Figure 9.4-2. Borough of Caldwell Hazard Area Extent and Location Map 2



Action Number: **Caldwell-1 (NEW/LOI)**
Mitigation Action/Initiative: Caldwell CVFD and Caldwell Community Center generator

Assessing the Risk	
Hazard(s) addressed:	Hurricane, Nor'easter, Severe Storm, Severe Winter Storm, Earthquake
Specific problem being mitigated:	The current generator consistently fails.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installing a new generator will ensure continuity of services for the Fire Department as well as fully light and heat/cool the Community Center.
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$126,000
Priority*	High
Plan for Implementation	
Responsible Organization	Borough of Caldwell
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, Borough budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table

Action Number: **Caldwell-1 (NEW/LOI)**
Mitigation Action/Initiative: Caldwell CVFD and Caldwell Community Center generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Caldwell-2 (NEW/LOI)**
Mitigation Action/Initiative: Caldwell Pine Brook flood control/bank stabilization project

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Address sections of the eroded bank along Pine Brook at the top of Westville Avenue and runs behind six properties, and ends at a culvert feeding into a pond at Grover Cleveland Park.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Create Study and implement project
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Create a study to provide a plan of action for the issues faced at Pine Brook
Action/Project Category	SIP, NRP
Goals/Objectives Met	1.2; 2.3
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$4,200,000
Priority*	High
Plan for Implementation	
Responsible Organization	Engineering and Floodplain Administrator
Local Planning Mechanism	
Potential Funding Sources	HMGP, municipal budget
Timeline for Completion	Long Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table

Action Number: **Caldwell-2 (NEW/LOI)**
Mitigation Action/Initiative: Caldwell Pine Brook flood control/bank stabilization project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Caldwell-3**
Mitigation Action/Initiative: Conduct water, sewer and stormwater study and include video inspection of stormwater and sewer lines

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Flooding or roadways and stormwater back up
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Conduct study and inspection of stormwater and sewer lines
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Conduct water, sewer and stormwater study and include video inspection of stormwater and sewer lines
Action/Project Category	SIP
Goals/Objectives Met	1.2; 2.1; 2.2
Applies to existing and or new development, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Managed through the Borough Engineering Department
Local Planning Mechanism	
Potential Funding Sources	Federal and State grants
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table

Number: **Caldwell-3**
Mitigation Action/Initiative: Conduct water, sewer and stormwater study and include video inspection of stormwater and sewer lines

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

9.5 Township of Cedar Grove

This section presents the jurisdictional annex for the Township of Cedar Grove.

9.5.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Ptl. Jeffrey McElroy, Emergency Management Coordinator Cedar Grove Police 525 Pompton Ave., Cedar Grove, NJ 07009 Phone: (973) 239-4100 Ext. 262 E-mail: jmcelroy@cedargrovepd.org	John D'Ascensio, Deputy Emergency Management Coordinator 525 Pompton Ave., Cedar Grove, NJ 07009 Phone: (973) 239-1410 Ext. 246 E-mail: jderif@aol.com

9.5.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of Cedar Grove was 12,411.

Location

According to the U.S. Census Bureau, the Township has a total land area of 4.378 square miles, of which 4.252 square miles is land and 0.126 square miles is water.

Brief History

Cedar Grove became a Township in 1908. Cedar Grove started out as a small farming community. In 1985 the historic Morgan Farm was acquired by Cedar Grove (The Township of Cedar Grove, 2014).

Governing Body Format

Cedar Grove operates under the Council-Manager form of municipal government. There is a five-member town council who are elected at-large every four years (The Township of Cedar Grove, 2014).

Growth/Development Trends

Township of Cedar Grove did not note any major residential or commercial development, or major infrastructure development planned for the next 5 years in the municipality.

Table 9.5-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description/ Status
Grove Avenue LLC	Residential	24 units	B: 71 L: 2	Wildfire: High NEHRP: D	App/Rej.

* Only location-specific hazard zones or vulnerabilities identified.

9.5.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.5-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
March 12 – April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	Overtime and vehicles used for road closures and debris removal due to downed trees and power lines.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	Overtime and Vehicles used to clear snow, rock salt used.
August 26 – September 5, 2011	Hurricane Irene	DR-4021	Yes	Overtime and vehicles used for road closures and debris removal due to downed trees and power lines.
October 29, 2011	Severe Storm	DR-4048	Yes	Overtime and Vehicles used to clear snow, rock salt used.
October 26 – November 8, 2012	Hurricane Sandy	DR-4086	Yes	Overtime and vehicles used for road closures and debris removal due to downed trees and power lines.

9.5.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of Cedar Grove. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for Township of Cedar Grove.

Table 9.5-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $1,041,206 2,500-year MRP: $23,529,867	Occasional	22	Medium

Table 9.5-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $934,218	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $22,448,200	Occasional	12	Low
Severe Storm	100-Year MRP: $1,468,585 500-year MRP: $8,578,358 Annualized: $94,049	Frequent	48	High
Winter Storm	1% GBS: $10,333,719 5% GBS: $51,668,595	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $2,303,400	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.

d. Loss estimates for the flood and earthquake hazards represent both structure and contents.

e. The HAZUS-MH earthquake model results are reported by Census Tract.

9.5.5 National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of Cedar Grove.

Table 9.5-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Cedar Grove, Township of	43	5	$53,045.00	0	0	11	11	32

Source: FEMA, 2014

Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.

Note (2) Total building and content losses from the claims file provided by FEMA Region 2.

Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The municipality does not have any critical facilities located in the 1% or 0.2% annual chance flood boundaries.

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), the Township of Cedar Grove is subject to flooding from the Peckman River and its tributaries. All flooding sources flow in well-defined channels with flooding occurring in adjacent low-lying areas. Flooding occurs along the Peckman River and its tributaries during times of excessive and prolonged rainfall, particularly in residential areas having steep slopes. This flooding is the result of high runoff combined with insufficient carrying capacity of bridge openings and culverts (FEMA FIS 2014).

Peckman River Basin

The Peckman River Basin is located in Essex and Passaic Counties. The Peckman River is a tributary to the Passaic River and originates in the Township of West Orange and flows northeasterly through Verona, Cedar Grove, and Little Falls to its confluence with the Passaic River in West Paterson (USACE 2014).

Extensive development in this Basin has resulted in damages from flooding and ecosystem degradation. The Peckman River Basin experiences frequent flooding from intense thunderstorms and heavy rain events. These storms can deposit large amounts of precipitation in the watershed, producing significant runoff, which quickly surpasses the capacity of the river channel, and bridge and culvert openings. Significant degradation of the ecology of the Basin has occurred as a result of extensive erosion at specific locations along the Peckman River. The development of the watershed has reduced the water-holding capacity of the landscape and altered the natural flow dynamics within the river system. As a result, the habitat suitability and ecological complexity of the River have been moderately impaired (USACE 2014).

A favorable reconnaissance report was completed in July 2001. The report recommended a feasibility study to develop alternatives for flood damage reduction and ecosystem restoration in the Peckman River Basin. On March 14, 2002, a Feasibility Cost Sharing Agreement was executed between the USACE and the NJDEP. A draft feasibility report is expected to be completed by July 2015 (USACE 2014).

9.5.6 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of Cedar Grove.

Table 9.5-5. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	Local	Building Department	Ordinance 73-19, Adopted 8/13/73
Zoning Ordinance	Y	Local	Building Department	Chapter 268, Adopted 9/20/02
Subdivision Ordinance	Y	Local	Building Department	Ordinance 77-35, Adopted 10/23/06
NFIP Flood Damage Protection Ordinance	Y	Local	FPA Engineers Office	Chapter 140, Adopted 10/17/1988 and updated 5/21/2007
Cumulative Substantial Damage	N			
Freeboard	N			
Floodplain Management/Basin Plan	N			
Stormwater Management Plan/Ordinance	Y	Local	FPA Engineers Office	Ordinance 06-646, Adopted 5/15/06
Capital Improvement Plan	Y	Local	Township Manager	2013
Site Plan Review Requirements	Y	Local	Building Department	Ordinance 73-19
Open Space Plan	Y	Local	Planning Department	Ordinance 77-22
Stream Corridor Management Plan	N			
Watershed Management Protection Plan	N			
Economic Development Plan	N			
Comprehensive Emergency Management Plan	Y	Local	Office of Emergency Management	2010
Emergency Response Plan	N			
Post Disaster Recovery Plan	N			
Post Disaster Recovery Ordinance	N			
Real Estate Disclosure Requirement	N			
Other [Special Purpose Ordinance (i.e. critical or sensitive areas)]	N/A			

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of Cedar Grove.

Table 9.5-6. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Township of Cedar Grove Department of Public Works
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Township of Cedar Grove Department of Public Works
Planners or engineers with an understanding of natural hazards	Y	Township of Cedar Grove Department of Public Works
NFIP Floodplain Administrator	Y	Engineering Department Alex Palumbo
Surveyor(s)	N	
Personnel skilled or trained in "GIS" applications	N	
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Township of Cedar Grove Office of Emergency Management
Grant Writer(s)	N	
Staff with expertise or training in benefit/cost analysis	N	
Professionals trained in conducting damage assessments	N	

Fiscal Capability

The table below summarizes financial resources available to the Township of Cedar Grove.

Table 9.5-7. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for specific purposes	Yes
User fees for water, sewer, gas or electric service	Yes
Impact Fees for homebuyers or developers of new development/homes	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	No
Mitigation grant programs	Yes
Other	

Community Classifications

The table below summarizes classifications for community program available to the Township of Cedar Grove.

Table 9.5-8. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	
Building Code Effectiveness Grading Schedule (BCEGS)	NP	
Public Protection	NP	
Storm Ready	NP	
Firewise	NP	

NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator:

Alex Palumbo, Township Engineer, Department of Public Works is the Floodplain Administrator

Flood Vulnerability Summary

The Township does not maintain lists/inventories of properties that have been damaged by floods. Substantial damage estimates were not made by the Floodplain Administrator during Hurricane Sandy or other events. Currently, there are no residents interested in mitigation (elevation or acquisition) in the Township.

Resources

The Floodplain Administrator is the sole person assuming responsibilities of floodplain administration and they feel that they are adequately supported and trained to fulfill their responsibilities. The Floodplain Administrator would consider attending continuing education and/or certification training on floodplain management. The Township does not provide any education or outreach to the community regarding flood

hazards/risk, and flood risk reduction through NFIP insurance, mitigation, etc. The Township has identified a new mitigation action to develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. Refer to mitigation action Cedar Grove-2 in Table 9.5-10.

Compliance History

The Floodplain Administrator did not provide information regarding compliance history.

Regulatory

The Township's floodplain management regulations/ordinances do not exceed the FEMA and State minimum requirements. There are local ordinances, plans and programs that support floodplain management and meet the NFIP requirements. The community has not considered joining the CRS program.

Community Rating System

The Township does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

Previous actions that are now on-going programs and capabilities are described below.

- The Township of Cedar Grove's flood prevention program includes cleaning brooks, streams, and tributaries to the Peckman River (FEMA FIS 2014).
- Catch basins and storm sewers are checked during heavy rains to prevent debris from entering watercourses (FEMA FIS 2014).
- On an annual basis, the Peckman River is cleared of trees, large debris and shoal material (FEMA FIS 2014).

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. In addition, the community identified specific integration activities that will be incorporated into municipal procedures. The following summarizes how the Township is already integrating hazard mitigation in their local government operations.

Plans: Currently the Township has a stormwater management plan and a stormwater management ordinance.

Outreach: The Township participates in on the West Paterson-Cedar Grove-Little Falls Passaic Valley Flood Control Board in an effort to manage the surface water of the Passaic River and the Peckman River basins.

On the Township's website is information on how to sign up for Nixle Alert System to stay informed on public safety and community information. The Township has identified a new mitigation action to develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. Refer to mitigation action Cedar Grove-2 in Table 9.5-10.

The Township established an Environmental Commission for the protection, development or use of natural resources, including water resources, within the Township.

Ordinances/Permitting: The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Cedar Grove website at http://www.cedargrovenj.org/site for further information.

During the permit review process, the Township considers hazards such as flood hazard zones and has hazard-resistant construction materials in their projects.

9.5.7 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The Township did not participate in the 2007 hazard mitigation planning project and therefore did not identify any mitigation strategies during the 2007 plan.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The Township has identified the following mitigation projects/activities that have also been completed but were not identified in the previous mitigation strategy in the 2007 Plan:

- The Township is currently purchasing generators for two municipal firehouses. Ensuring a continuity of electrical services at these facilities during outages will allow the following benefits to the community at large: serve as Points of Distribution (POD's) and heating and/or cooling stations.
- The Township of Cedar Grove's flood prevention program includes cleaning brooks, streams, and tributaries to the Peckman River (FEMA FIS 2014).
- Catch basins and storm sewers are checked during heavy rains to prevent debris from entering watercourses (FEMA FIS 2014).
- On an annual basis, the Peckman River is cleared of trees, large debris and shoal material (FEMA FIS 2014).

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township of Cedar Grove participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.5-10 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.5-11 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.5-9. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Cedar Grove-1 (NEW/LOI)	Obtain generators at Cedar Grove critical facilities to maintain continuity of operations and service the residents in times of hazard events. The following have been identified as locations to date: Upgrade Town Hall and new generator for Fire House Company 3 and Municipal Library	Existing	All Hazards	1.2 6.1	Township of Cedar Grove	High	High $150,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	SP
Cedar Grove-2	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. This program will include: • Providing general natural hazard risk, preparedness and mitigation in regular newsletter and mailings and website. • Including natural hazard risk and risk reduction information through social media channels and email blast systems. • Developing/maintaining a natural hazard risk management webpage on the municipal website where information and mapping can be posted.											
	See above.	N/A	All Hazards	3.1	Supervisor's Office	Medium	Low	Municipal Budget; HMA programs with local or county match	Short	High	EAP	PE

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV *Community Assistance Visit*
CRS *Community Rating System*
DPW *Department of Public Works*
FEMA *Federal Emergency Management Agency*
FPA *Floodplain Administrator*
HMA *Hazard Mitigation Assistance*
N/A *Not applicable*
NFIP *National Flood Insurance Program*
NJDEP *New Jersey Department of Environmental Protection*

NJOEM *New Jersey Office of Emergency Management*

OEM *Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Costs:

Where actual project costs have been reasonably estimated:

Low	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low	*Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium	*Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High	*Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:

Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low	*Long-term benefits of the project are difficult to quantify in the short term.*
Medium	*Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High	*Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.5-10. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/ Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High/ Medium/ Low
Cedar Grove-1 (NEW/LOI)	Obtain generators for Cedar Grove critical facilities	1	0	1	1	1	1	0	1	1	1	1	1	1	1	12	High
Cedar Grove-2	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program	1	1	1	1	1	1	1	1	1	1	1	0	0	0	11	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.5.8 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.5.9 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of Cedar Grove that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of Cedar Grove has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.5.10 Additional Comments

None at this time.

Figure 9.5-1. Township of Cedar Grove Hazard Area Extent and Location Map 1

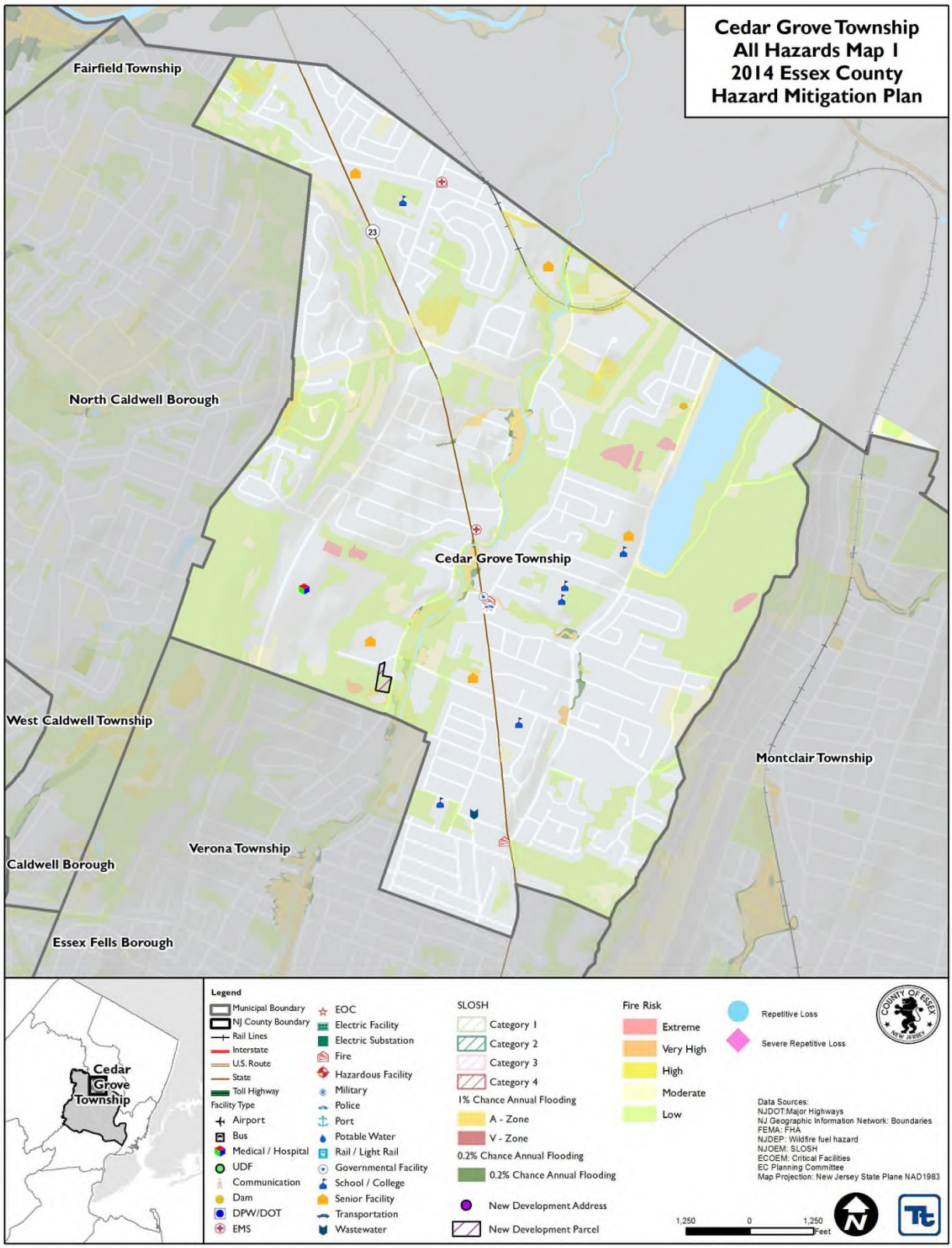
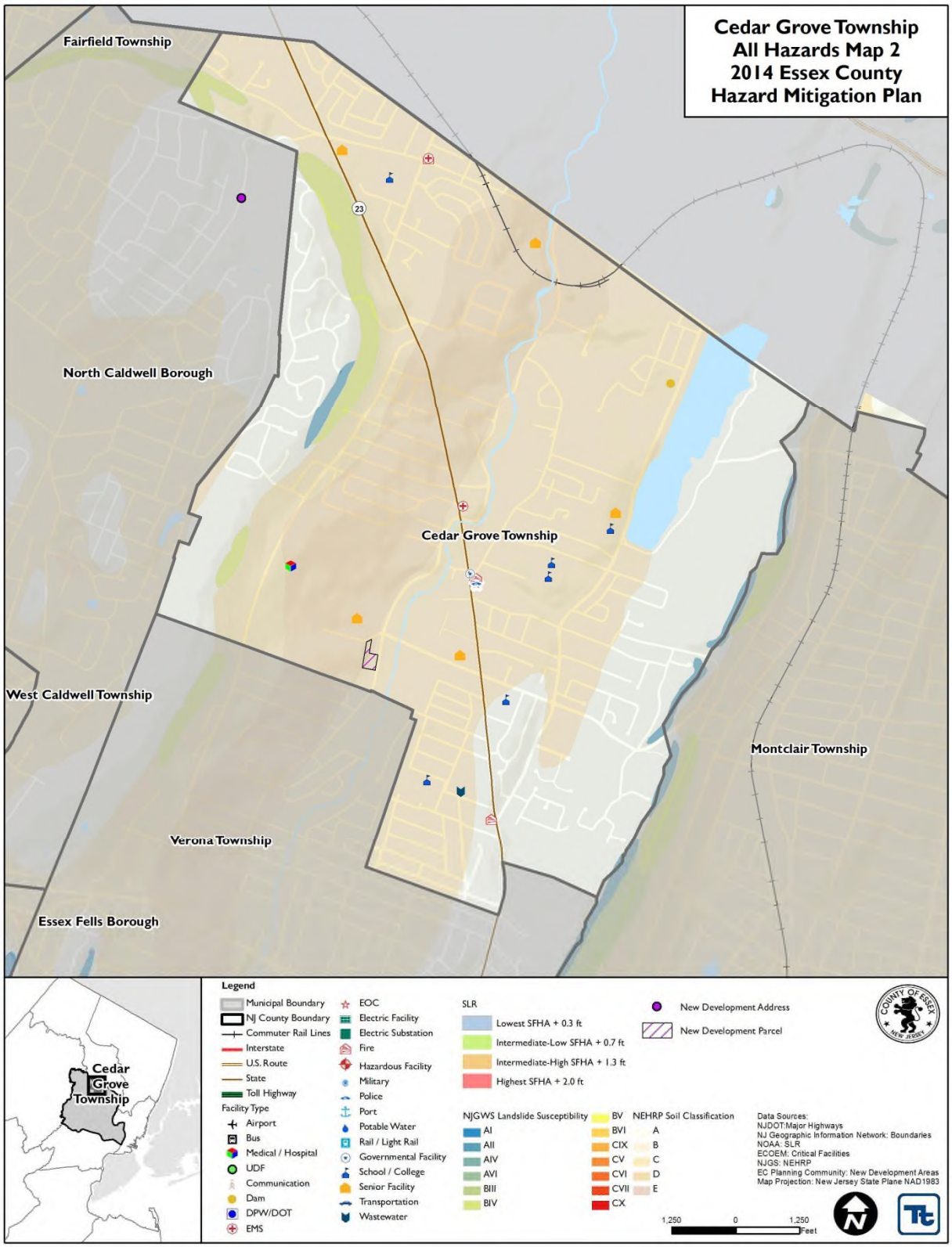


Figure 9.5-2. Township of Cedar Grove Hazard Area Extent and Location Map 2



Action Number: **Cedar Grove-1 (NEW/LOI)**

Mitigation Action/Initiative: Cedar Grove critical facilities generator projects

Assessing the Risk	
Hazard(s) addressed:	Hurricane, Nor'easter, Severe Storm, Severe Winter Storm, Earthquake
Specific problem being mitigated:	Each of the 3 facilities chosen to receive generators are on opposite ends of the Township. Dispersing resources throughout the community will provide greater ease of access to shelter during an emergency.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installing generators at the following 3 locations: South End Fire Company #3 Cedar Grove Public Library Township of Cedar Grove Municipal Building, Police Headquarters, Center Fire Company #1 (one building)
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$150,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Cedar Grove Engineering Office
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, Township budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Cedar Grove-1 (NEW/LOI)**

Mitigation Action/Initiative: Cedar Grove critical facilities generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Cedar Grove-2 (NEW/LOI)**

Mitigation Action/Initiative: Cedar Grove Public Outreach

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Increasing Public Awareness
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Increase Public Awareness
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance.
Action/Project Category	Education and Awareness Programs
Goals/Objectives Met	3.1
Applies to existing, future, or not applicable	N/A
Benefits (losses avoided)	Damage, loss of life
Estimated Cost	$10,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township Manager
Local Planning Mechanism	Mitigation Plan
Potential Funding Sources	Municipal Budget
Timeline for Completion	Short Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table

Action Number: **Cedar Grove-2 (NEW/LOI)**

Mitigation Action/Initiative: Cedar Grove library

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Awareness for Public.
Property Protection	1	Awareness for Public.
Cost-Effectiveness	1	Done in house.
Technical	1	Capabilities currently exist.
Political	1	Supported by municipal officials.
Legal	1	Authorized.
Fiscal	1	Done in house and low cost.
Environmental	1	Supports environment.
Social	1	This project supports all sectors of the community equally.
Administrative	1	Town has capabilities.
Multi-Hazard	1	This project provides information on a wide variety of hazards.
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	11	
Priority (High/Med/Low)	High	

9.6 City of East Orange

This section presents the jurisdictional annex for the City of East Orange.

9.6.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
R.David Williams, OEM Coordinator 402 Springdale Avenue, East Orange, NJ 07017 Phone: 973-677-8924 E-mail: David.Williams@eastorange-nj.gov	Lloyd Abdul Raheem, Building Official/East Orange Building Division 44 City Hall Plaza, East Orange, NJ 07019 Phone: 973-226-5175 E-mail: Lloyd.raheem@eastorange-nj.gov

9.6.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the City of East Orange was 64,270.

Location

According to the U.S. Census Bureau, the City has a total land area of 3.924 square miles, of which 3.924 square miles is land and 0 square miles is water.

Brief History

The City of East Orange separated from Orange in 1863 (City of East Orange, 2014). The East Orange Public Library system once included three of the thirty-six Carnegie-funded libraries in New Jersey. Parts of East Orange fall into an Urban Enterprise Zone where purchases made at specific merchants are taxed at 3.5% instead of the statewide 7% .

Governing Body Format

The City of East Orange has operated under a Mayor-Council form of government since being established by a special Charter in 1909 (City of East Orange, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.X of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.6-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
20 & 30 Evergreen Place	Residential	200 units	20 & 30 Evergreen Place 692/24	ND	Planned
125 South Harrison	Residential	103 units	125 South Harrison 711/10	None	Planned
742 Park Avenue	Residential	50+ units	742 Park Avenue 924/5.01	None	Planned
144 South Harrison	Residential	50+ units	144 South Harrison 710/17	None	Planned
120 Halstead St.	Residential	50+ units	120 Halstead St. 533/20.01	None	In progress

** Only location-specific hazard zones or vulnerabilities identified.*
Note: ND = Not determined because potential new development could not be located.

Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.6-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
April 14-20, 2007	Severe Weathers and Inland and Coastal Flooding	DR-1694	Yes	The City was severely impacted by this event with flooding and power outages
June 10, 2008	Severe Weathers	N/A	N/A	The City was severely impacted by this event with trees falling and power outages
March 12 – April 15, 2010	Severe Weathers and Flooding	DR-1897	Yes	The City was severely impacted by this event
October 1, 2010	Strong Wind	N/A	N/A	The City was severely impacted by this event with trees falling and power outages,
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	The City was severely impacted by this event. Many people were stranded in their vehicles during the storm and at least one person died as result of the storm
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	The City was severely impacted by this event. Many properties were flooded and/or without power for an extended period.
October 29, 2011	Severe Weather	DR-4048	Yes	The City was severely impacted by this event. Many were without power for an extended period
October 26 – November 8, 2012	Hurricane Sandy	EM-3354 DR-4086	Yes Yes	The City was severely impacted by this event. Many properties were without power for an extended period

9.6.3 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the City of East Orange. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for City of East Orange.

Table 9.6-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $3,506,254 2,500-year MRP: $77,330,706	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	36	High
Flood	1% Annual Chance: $3,781,469	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $0	Rare	6	Low
Severe Weather	100-Year MRP: $3,180,261 500-year MRP: $21,411,224 Annualized: $285,990	Frequent	48	High
Winter Storm	1% GBS: $33,075,988 5% GBS: $165,379,942	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $0	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. Loss estimates for the Severe Weather and severe winter storm hazards are structural values only and do not include the value of contents.

d. Loss estimates for the flood and earthquake hazards represent both structure and contents.

e. The HAZUS-MH earthquake model results are reported by Census Tract.

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the City of East Orange.

Table 9.6-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
East Orange, City of	11	10	$100,750.00	0	0	4	5	6

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The municipality does not have any identified critical facilities located in the 1% or 0.2% annual chance flood boundaries.

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), the flooding problem along the channel of the Second River Tributary in the City of East Orange has long been recognized and studied. The first comprehensive report on flooding problems of Second River Tributary in 1940 was stimulated by the 1938 flood. This report contained a master plan for the improvement of Second River Tributary, setting channel slopes and improvements capable of carrying design flows with an expected frequency of 30 years (FEMA FIS 2014).

Nishuane Brook has some reported flooding problems at the Dodd Street and Thomas Boulevard crossings. Flood damages during the August 1971 storm (Hurricane Doria) consisted of damage to approximately a dozen homes between Dodd Street and Lake Street along Second River Tributary. No specific damages were reported for East Orange for the flood of August 1973, even though the reported magnitude of this flood was on the same order as that of the 1971 flood in East Orange (FEMA FIS 2014).

In addition to the problems outlined above, there is local flooding in East Orange caused by poor pipe drainage facilities along Summit Street and Melmore Gardens west of North Clinton Street, and at the street crossing at the railroad and Fourth Avenue (FEMA FIS 2014).

Additionally, the municipality has identified the following hazard problems and/or problem areas:

- Power outages

- Falling trees
- Overflow of "Second River" in 1st Ward
- Basement flooding throughout the City
- Flooding at Police headquarters- 15 N Munn Avenue, East Orange, NJ
- Flooding at Fire headquarters – 468 MLK, East Orange, NJ
- Sewer overflow and back-up onto streets and basements throughout the City.
- Central City Garage - 333 Glenwood Avenue, East Orange, NJ
- East Orange General Hospital - 300 Central Avenue, East Orange, NJ
- Elmwood Park – Elmwood Avenue

Flood

Recent storm events have led to an increase in flooding throughout East Orange. Municipal-owned, commercial, and residential buildings have all suffered damage from flooding. Second River in the 1st Ward section of the City has consistently overflowed. East Orange General Hospital has also suffered losses due to flooding. The current outdated sewer infrastructure has overflowed and backed up into the streets and basements throughout East Orange. Flooding during Hurricane Sandy restricted the utilization of many emergency Points of Distribution (POD) and increased the amount of time it took for resources to get to individuals in need.

Power Outage

Recent storms have been powerful enough to down trees which in turn have downed electrical infrastructure. As a result, the people of East Orange have been without power for an extended time due to the restoration issues experienced.

9.6.4 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the City of East Orange.

Table 9.6-5. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	State, Local	East Orange Building Dept	
Zoning Ordinance	Y	Local	Planning Department	Chapter 50 Updated 2013
Subdivision Ordinance	Y	Local	Planning Department	Chapter 50 2013
NFIP Flood Damage Prevention Ordinance	N			
Cumulative Substantial Damages	N			
Freeboard	N			
Growth Management	N			
Floodplain Management / Basin Plan	N			
Stormwater Management Plan/Ordinance	Y	State	Department of Public Works	Ordinance #15 Adopted NJDEP rules
Comprehensive Plan / Master Plan/ General Plan	Y	Local	Planning Dept.	2010 presently being updated
Capital Improvements Plan	N			
Site Plan Review Requirements	Y	Local	Planning Dept	Chapter 50
Open Space Plan	Y	Local	Open Space Board	2013
Stream Corridor Management Plan	N/A			
Watershed Management or Protection Plan	Y	Local	Water Commission	
Economic Development Plan	N			Under development
Comprehensive Emergency Management Plan	Y	Local	Emergency Management	2013
Emergency Response Plan	N			
Post Disaster Recovery Plan	N			
Post Disaster Recovery Ordinance	N			

Table 9.6-5. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Real Estate Disclosure Requirement	N			
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]	N/A			

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the City of East Orange.

Table 9.6-6. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Planning Department
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Public Works
Planners or engineers with an understanding of natural hazards	Y	Public Works
NFIP Floodplain Administrator	Y	Lloyd Raheem, Zoning Officer/Property Maintenance, Building Department
Surveyor(s)	Y	Public Works
Personnel skilled or trained in "GIS" applications	Y	Public Works
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Emergency Management
Grant Writer(s)	Y	Planning Department
Staff with expertise or training in benefit/cost analysis	Y	City Administrator
Professionals trained in conducting damage assessments	Y	Planning Department

Fiscal Capability

The table below summarizes financial resources available to the City of East Orange.

Table 9.6-7. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes – Planning Department
Capital Improvements Project Funding	Yes – Finance Department
Authority to Levy Taxes for specific purposes	Yes – City Council
User fees for water, sewer, gas or electric service	Yes – Water Department
Impact Fees for homebuyers or developers of new development/homes	Yes
Incur debt through general obligation bonds	Yes – City Council & Water Department
Incur debt through special tax bonds	Yes through Parking Department, Housing and Water Commission
Incur debt through private activity bonds	Yes – City Council & Water Department
Withhold public expenditures in hazard-prone areas	No

Table 9.6-7. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Mitigation grant programs	Yes – Emergency Management
Other	

Community Classifications

The table below summarizes classifications for community program available to the City of East Orange.

Table 9.6-8. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	
Building Code Effectiveness Grading Schedule (BCEGS)	NP	
Public Protection	NP	
Storm Ready	NP	
Firewise	NP	

NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Lloyd Raheem, Zoning Officer/Property Maintenance

Flood Vulnerability Summary

Within East Orange City, there are currently 290 NFIP policies in force. The total premiums in force is $528,751. The total insurance in force is $61,838,500. 158 claims have been made as of August 31, 2013 with

117 closed losses, 0 open losses, and 41 Closed Without Payment (CWOP) losses. Total payout for the claims is $954,986.

Resources

In East Orange City, the responsibilities of the floodplain manager include obtaining a development permit before construction/development begins in a Special Flood Hazard Area. This permit is reviewed by the Construction Code Official and should include: plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area in question, existing or proposed structures, fill, storage of materials, drainage facilities, and the location of the foregoing. A submission of this nature is in compliance with Local Code 95-7.

Compliance History

East Orange City is currently in good standing in the NFIP. The current floodplain manager, Lloyd Raheem, has no knowledge of when the most recent Community Assistance Visit (CAV) took place. At this time, there is no need for a CAV to be conducted.

Regulatory

East Orange City floodplain management regulations current meet FEMA and New Jersey minimum requirements. It is the responsibility of the Construction Code Official to enforce the Flood Damage Prevention Ordinance.

Community Rating System

The City does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified by Municipality

The 2008 Plan identified addressing train station flooding as a mitigation action. The City continues to work with NJ Transit to address parking capacity, address flooding of the train stations viaduct and underpasses.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. In addition, the community identified specific integration activities that will be incorporated into municipal procedures. The following provides a brief summary of how the City currently integrates mitigation into their daily operations.

The City's Master Plan considers hazard areas as part of the Land Use Element. A goal of the Master Plan is to 'Promote sound land use planning in areas where flooding occurs by limiting impervious cover, providing best management practices, and stormwater management controls.'

One of the Land Use and Zoning objectives of the City's Master Plan is 'To improve range, quality and cost-effectiveness of community services and facilities.' To assist with achieving this goal, the City identified critical facilities that are in need of backup power to ensure continuity of operations: Fire Stations 2, 3, 5 and the City Garage. These actions are listed in Table 9.6-10.

One of the Community Facilities, Recreation and Open Space objectives identified is to address flooding issues through routine maintenance and upgrading of the stormwater system. The City has identified a new mitigation action (East Orange-7) to evaluate stormwater capacity City wide and develop mitigation actions to address flooding issues. Refer to Table 9.6-10.

As part of the City's Element X – Action Plan in their Comprehensive Master Plan, the City identifies the following actions:

- Incorporate Stormwater Management Plan recommendations for best management practices and zoning revisions as part of any zoning ordinance revision.
- Address flooding in Ward 5.

The City has their ordinances and flood protection measures available on their website. Please visit the City of East Orange website at http://www.eastorange-nj.gov for further information.

9.6.5 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.6-9. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Emergency Operations Plan in case of aircraft accident or hazmat spill	Discontinued	This mitigation action will be discontinued from the 2015 plan update. Emergency response departments and resources are available for these potential incidents.
2: Reconstruction of Second River channel walls; design phase funded for replacement channel structure, construction unfunded	Continuous	This mitigation action will continue to be part of the 2015 plan update. Funding and personnel issues have prevented this action from being completed.
3: Roadway infrastructure	Discontinued Need update from Chris	This mitigation action will be discontinued from the 2015 plan update. Engineering and Roadway Department maintain records of roadway infrastructure and needed repairs. Consultation was had with Engineering and a new initiative regarding infrastructure has been added for this plan update.
4: Train stations	Continuous	The City of East Orange has no jurisdictional responsibility regarding NJ Transit Train Stations. The City continues to work with NJ Transit to address parking capacity, address flooding of the train stations viaduct and underpasses.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The City has identified the following mitigation projects/activities that have also been completed but were not identified in the previous mitigation strategy in the 2007 Plan:

- Almost the entire length of Nishuane Brook in the City of East Orange was constructed to include concrete sidewalls and inverts (FEMA FIS 2014).
- 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 (FEMA FIS 2014).

Proposed Hazard Mitigation Initiatives for the Plan Update

The City participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the City participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.6-8 summarizes the comprehensive-range of specific mitigation initiatives the City would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.6-9 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.6-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
East Orange-1 (NEW/LOI)	Obtain sources of backup power for critical facilities to ensure continuity of operations. The following are currently identified: 1. East Orange Fire Station 2 generator 2. East Orange Fire Station 3 generator 3. East Orange Fire Station 5 generator 4. East Orange City garage generator	Existing	Coastal Storm, Severe Weather, Severe Winter Storm	1.2 6.1	Municipal OEM	High	Medium 1. $50,000 2. $25,000 3. $25,000 4. $50,000	FEMA Hazard Mitigation Grant Program, City budget	Short Term DOF	High	SIP	SP
East Orange-2 (OLD 2)	Reconstruction of Second River channel walls; design phase funded for replacement channel structure, construction unfunded	Existing	Flood	1.2 2.2	DPW, Engineering	High	High $2,500,000	External sources, General revenue	Design complete- < 3 months Construction complete- 1 year DOF	High	SIP	SP
East Orange-3 (OLD 4)	Continue to have dialog with NJ Transit to address parking capacity, address flooding of train station viaducts and underpasses	Existing	Flood, Severe Weather	1.2 2.1 6.1	Engineering Department, OEM	High	High	Federal and State Grant Opportunities HMGP, PDM, Homeland Security	Long Term DOF	Medium	SIP	SP
East Orange-4	Evaluate Stormwater capacity City wide and develop mitigation actions to address flooding in areas of: (list areas) 2008 Roadway infrastructure action revised	Existing	Flood Severe Weather	1.2 2.1 6.1	Engineering Department	High	High	Federal and State Grant Opportunities HMGP, PDM	Long Term DOF	Medium	SIP	SP
East Orange-5	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. This program will include: • Providing general natural hazard risk, preparedness and mitigation, and related NFIP information in regular newsletter and mailings. • Including natural hazard risk and risk reduction information through social media channels and email blast systems.											

Table 9.6-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	• Posting of flyers and other readily available NFIP informational materials at City Hall or distributing at regular civic meetings. • Preparation, distribution and analysis of public surveys. • Developing/maintaining a natural hazard risk management webpage on the municipal website where information and mapping can be posted. • Enhance public outreach to residents in NFIP floodplain areas to inform of annual grant opportunities, etc. which may include periodic articles and handouts.											
	See above.	N/A	All Hazards	3.1	City Supervisor's Office	Medium	Low	Municipal Budget; HMA programs with local or county match	Short Term	High	EAP	PE
East Orange-6	Develop and implement a post-event damage assessment program, including the following elements: • Conduct public outreach/education (see Public Education and Awareness Initiatives above) to inform property owners of the need to report property damage and obtain required permitting when making repairs. • Develop and organize local resources to conduct post-event damage assessments, including substantial damage determinations as warranted. • Develop an inventory (file system and/or database) of losses (incl. loss of service, property damage, economic losses, etc.) as reported to and/or identified by the City (e.g. building permit process).											
	See above.	Existing	Flood; Severe Weather; Severe Winter Storm; Coastal Storm	3.1 3.2 5.1	OEM	Medium – High (life Safety; Increased eligibility for mitigation grant funding)	Low-Medium	Municipal Budget	Short Term	High	LPR, EAP	PE ES
East Orange-7	Enhance/expand tree maintenance program (under contract with current vendor) and coordination with PSEG utility.	Existing	Severe Weather; Severe Winter Storm	1.2	Engineering and DPW, working with contractors and local utilities	Medium – High (reduced risk of utility outages; life safety)	Medium	Local Budget	Short Term	Medium	NRP	NP
East Orange-8	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	N/A	All Hazards	5.3 5.4	Municipality with support from County, NJOEM, FEMA and surrounding communities	Medium	Low	Municipal Budget	Short Term	High	LPR	PR

Notes:
Not all acronyms and abbreviations defined below are included in the table.

**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	Community Assistance Visit
CRS	Community Rating System
DPW	Department of Public Works
FEMA	Federal Emergency Management Agency
FPA	Floodplain Administrator
HMA	Hazard Mitigation Assistance
N/A	Not applicable
NFIP	National Flood Insurance Program
NJDEP	New Jersey Department of Environmental Protection
NJOEM	New Jersey Office of Emergency Management
OEM	Office of Emergency Management

Potential FEMA HMA Funding Sources:

FMA	Flood Mitigation Assistance Grant Program
HMGP	Hazard Mitigation Grant Program
PDM	Pre-Disaster Mitigation Grant Program
RFC	Repetitive Flood Claims Grant Program
SRL	Severe Repetitive Loss Grant Program

Timeline:

Short	1 to 5 years
Long Term	5 years or greater
OG	On-going program
DOF	Depending on funding

Costs:

Where actual project costs have been reasonably estimated:

Low	< $10,000
Medium	$10,000 to $100,000
High	> $100,000

Where actual project costs cannot reasonably be established at this time:

Low	Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.
Medium	Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
High	Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.

Benefits:

Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	< $10,000
Medium	$10,000 to $100,000
High	> $100,000

Where numerical project benefits cannot reasonably be established at this time:

Low	Long-term benefits of the project are difficult to quantify in the short term.
Medium	Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.
High	Project will have an immediate impact on the reduction of risk exposure to life and property.

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*

- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.6-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community	Total	High / Medium / Low
East Orange-1 (NEW/LOI)	Obtain sources of backup power for critical facilities to ensure continuity of operations.	1	0	1	1	1	1	0	1	1	1	1	1	1	1	12	High
East Orange- 2 (OLD 2)	Reconstruction of Second River channel walls	1	1	1	1	1	0	0	1	0	1	1	0	0	0	8	Medium
East Orange-3 (OLD 4)	Continue to have Dialog with NJ Transit to address flooding issues at train stations	1	1	1	1	1	0	0	1	0	1	1	0	0	0	8	Medium
East Orange-4 (OLD 2)	Evaluate Stormwater capacity City wide and develop mitigation actions	1	1	1	1	1	0	0	1	0	1	1	0	0	0	8	Medium
East Orange-5 (NEW)	Develop and implement an enhanced all –hazards public outreach / education / mitigation information program	1	1	1	1	1	1	0	0	1	1	1	1	1	0	12	High
East Orange-6 (NEW)	Develop and implement a post-event damage assessment program	1	1	1	1	1	1	0	0	1	1	1	1	1	0	12	High
East Orange-7	Enhance/expand tree maintenance program	1	1	1	1	1	1	0	1	1	0	1	1	0	0	11	Medium
East Orange-8	Create/Enhance/Maintain Mutual Air agreements	1	1	1	1	1	1	0	0	1	1	1	1	1	0	12	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.6.6 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.6.7 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the City of East Orange that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the City of East Orange has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.6.8 Additional Comments

None at this time.

Figure 9.6-1. City of East Orange Hazard Area Extent and Location Map 1

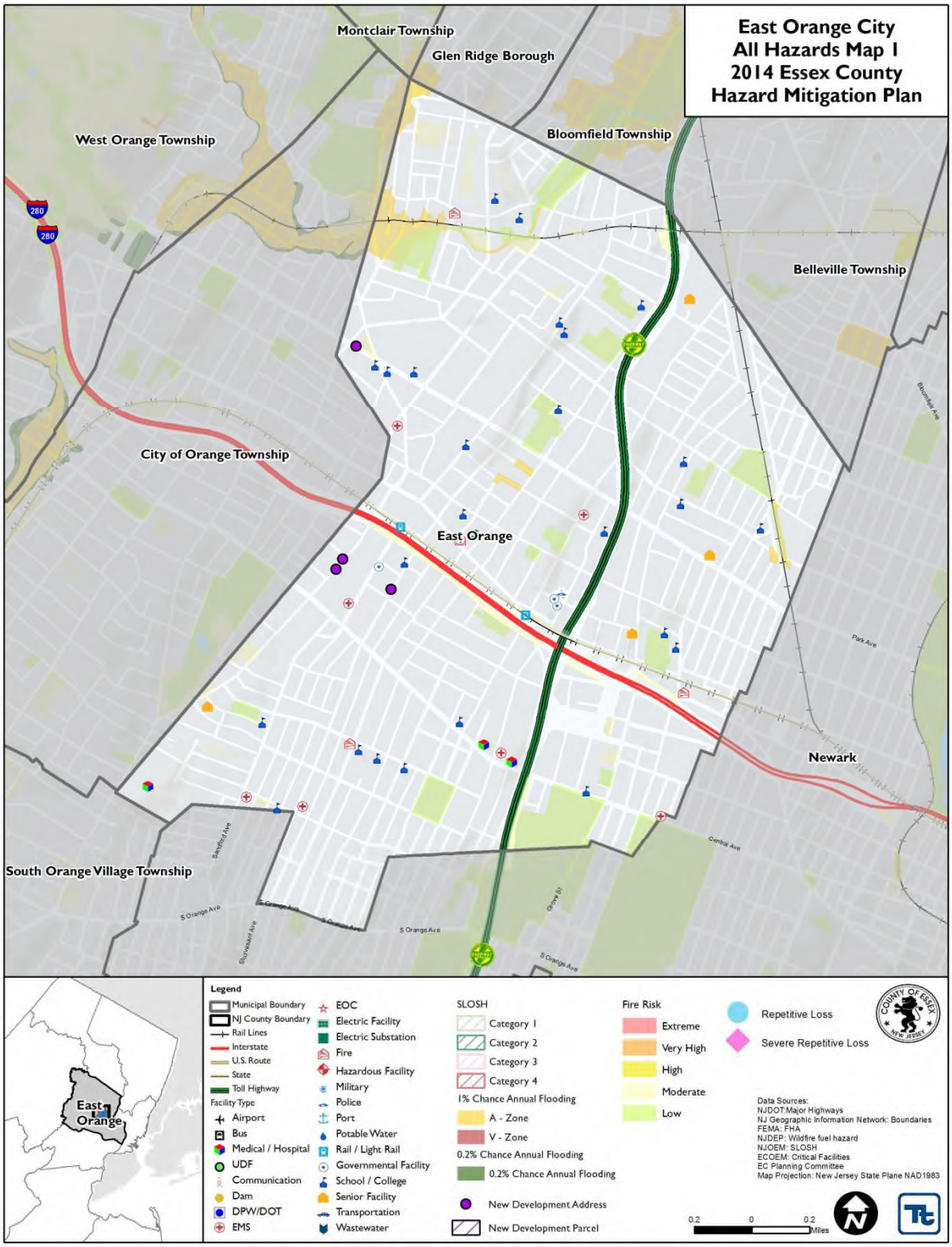
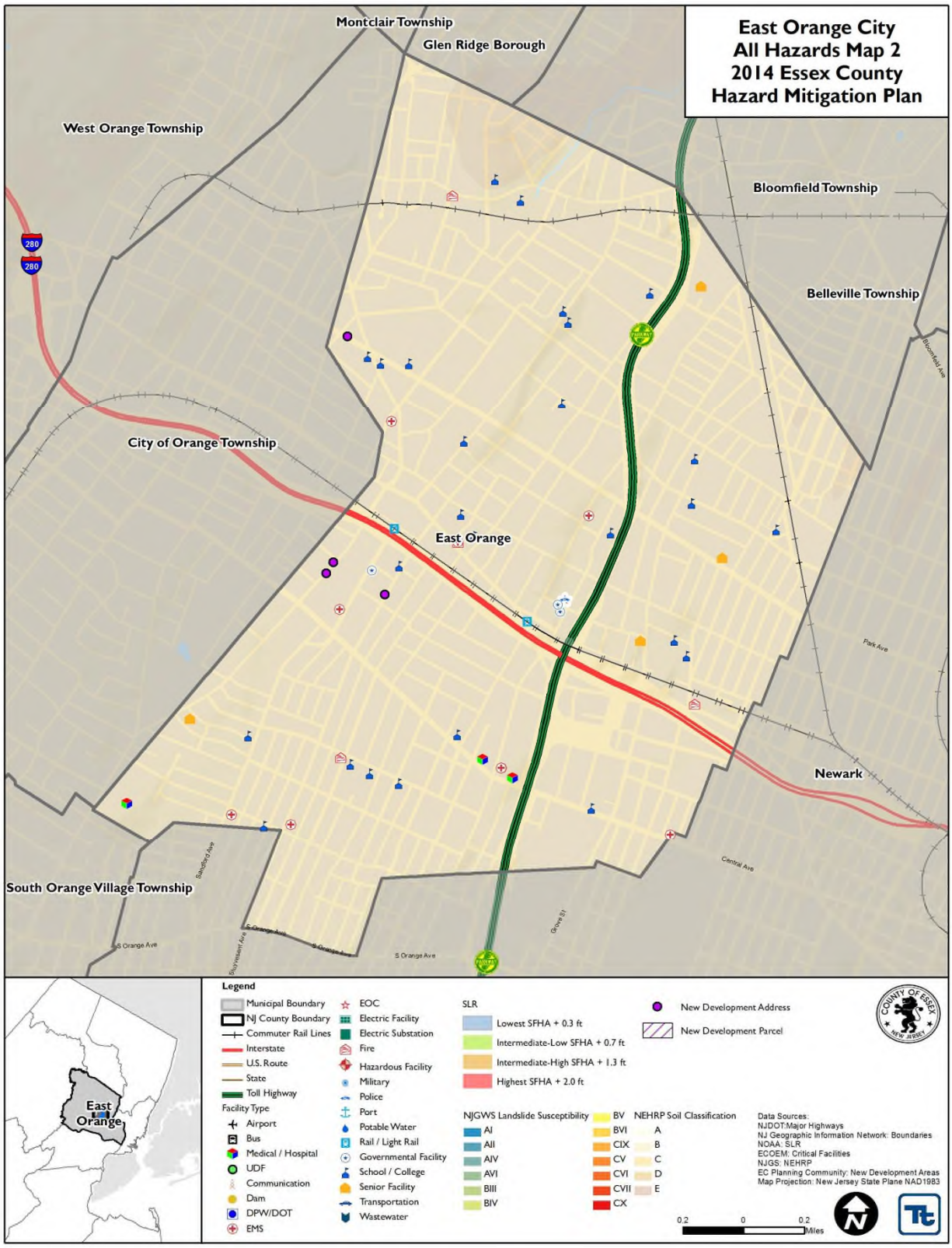


Figure 9.6-2. City of East Orange Hazard Area Extent and Location Map 2



Action Number: **East Orange- 1 (NEW/LOI)**

Mitigation Action/Initiative: Fire Station #2 Generator

Assessing the Risk	
Hazard(s) addressed:	Coastal Storm, Severe Weather, Severe Winter Storm, Earthquake
Specific problem being mitigated:	Power loss, continuity of operations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase generator for Fire Station #2 to provide continuity of operations and maintain public service
Action/Project Category	SIP
Goals/Objectives Met	1.2 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Loss of public service
Estimated Cost	$50,000
Priority*	HIGH
Plan for Implementation	
Responsible Organization	Engineering
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, City budget
Timeline for Completion	Short Term

Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **East Orange- 1 (NEW/LOI)**

Mitigation Action/Initiative: Fire Station #2

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **East Orange- 1 (NEW/LOI)**

Mitigation Action/Initiative: East Orange Fire Station 3 generator

Assessing the Risk	
Hazard(s) addressed:	Coastal Storm, Severe Weather, Severe Winter Storm, Earthquake
Specific problem being mitigated:	Power loss, continuity of operations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	2. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase generator for Fire Station #2 to provide continuity of operations and maintain public service
Action/Project Category	SIP
Goals/Objectives Met	1.2 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Loss of public service
Estimated Cost	$50,000
Priority*	HIGH
Plan for Implementation	
Responsible Organization	Engineering
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, City budget
Timeline for Completion	Short Term

Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **East Orange- 1 (NEW/LOI)**

Mitigation Action/Initiative: East Orange Fire Station 3 generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **East Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: East Orange Fire Station 5 generator

Assessing the Risk	
Hazard(s) addressed:	*Coastal Storm, Severe Weather, Severe Winter Storm, Earthquake*
Specific problem being mitigated:	*Power loss, continuity of operations*
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	3. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase generator for Fire Station #2 to provide continuity of operations and maintain public service
Action/Project Category	SIP
Goals/Objectives Met	1.2 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Loss of public service
Estimated Cost	$50,000
Priority*	HIGH
Plan for Implementation	
Responsible Organization	Engineering
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, City budget
Timeline for Completion	Short Term

Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **East Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: East Orange Fire Station 5 generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **East Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: East Orange City Garage generator

Assessing the Risk	
Hazard(s) addressed:	Coastal Storm, Severe Weather, Severe Winter Storm, Earthquake
Specific problem being mitigated:	Power loss, continuity of operations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	4. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase generator for East Orange Garage to provide continuity of operations and maintain public service
Action/Project Category	SIP
Goals/Objectives Met	1.2 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Loss of public service
Estimated Cost	$50,000
Priority*	HIGH
Plan for Implementation	
Responsible Organization	Engineering
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, City budget
Timeline for Completion	Short Term

Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **East Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: East Orange City Garage generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **East Orange-2 (NEW/LOI)**

Mitigation Action/Initiative: Reconstruction of Second River channel

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$2,000,000
Priority*	
Plan for Implementation	
Responsible Organization	DPW, Engineering
Local Planning Mechanism	
Potential Funding Sources	External sources, general revenue
Timeline for Completion	Design complete- < 3 months Construction complete- 1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **East Orange-2 (NEW/LOI)**

Mitigation Action/Initiative: Reconstruction of Second River channel

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	Medium	

Action Number: **East Orange-4**

Mitigation Action/Initiative: Evaluate Stormwater capacity and develop mitigation actions to address flooding

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	High
Priority*	
Plan for Implementation	
Responsible Organization	DPW, Engineering
Local Planning Mechanism	
Potential Funding Sources	External sources, general revenue
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **East Orange-4 (OLD 2)**

Mitigation Action/Initiative: Evaluate Stormwater capacity and develop mitigation actions to address flooding

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	Medium	

9.7 Borough of Essex Fells

This section presents the jurisdictional annex for the Borough of Essex Fells.

9.7.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Donald Allen, Deputh OEM.Coordinator/Lt 255 Roseland Ave, Essex Fells 973-226-3000 dallen@essexfellspd.org	John Schmunk, Deputy OEM Coordinator/Sergeant 255 Roseland Ave, Essex Fells 973-226-3000 jschmunk@essexfellspd.org

9.7.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Borough of Essex Fells was 2,113.

Location

According to the U.S. Census Bureau, the Borough has a total land area of 1.418 square miles, of which 1.412 square miles is land and 0.006 square miles is water.

Brief History

The name Essex Fells was derived from the name of the County in which it resides and one of the founders of the Suburban Land Company, John f. Fell), who helped create the new residential community. An ordinance passed in 1928 limited commercial activity to single three-story buildings that are constructed to look like a house (The Borough of Essex Fells, New Jersey, 2014).

Governing Body Format

The Borough of Essex Fells operates under the borough form of government which consists of a Mayor and six-member Council. The Council is elected at-large every three years on a staggering basis with two seats coming up for election every year. The Mayor is elected every four years (The Borough of Essex Fells, New Jersey, 2014).

Growth/Development Trends

Essex Fells did not note any major residential or commercial development, or major infrastructure development planned for the next 5 years in the municipality.

9.7.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.7-1. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
April 14-20, 2007	Severe Weathers and Inland and Coastal Flooding	DR-1694	Yes	Residential basement flooding. Police, Fire and DPW overtime costs.
March 12 – April 15, 2010	Severe Weathers and Flooding	DR-1897	Yes	Roadways closed due to flooding. Residential basement flooding. Debris removal. Police, Fire, and DPW overtime ref. emergency protective measures.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	Excessive snow removal and traffic issues.
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes	Roadways flooded, residential basement flooding, roadway closures, debris removal. Police, Fire, and DPW overtime ref. emergency protective measures.
October 26 – November 8, 2012	Hurricane Sandy	EM-3354 DR-4086	Yes	Power outages, police, fire service calls, debris removal. Police, Fire, and DPW overtime ref. emergency protective measures.

9.7.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Borough of Essex Fells. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for Borough of Essex Fells.

Table 9.7-2. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $333,917 2,500-year MRP: $7,654,994	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $0	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $291,200	Rare	6	Low
Severe Weather	100-Year MRP: $516,839 500-year MRP: $3,036,523 Annualized: $31,493	Frequent	48	High
Winter Storm	1% GBS: $3,728,401 5% GBS: $18,642,005	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $1,303,100	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. *Loss estimates for the Severe Weather and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Borough of Essex Fells.

Table 9.7-3. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Essex Fells, Borough of	11	10	$100,750.00	0	0	4	5	6

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The municipality does not have any critical facilities located in the 1% or 0.2% annual chance flood boundaries.

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), Flooding within the Borough of Essex Fells usually occurs as a result of heavy rainfall from localized thunderstorms and hurricanes during the summer and fall months. Because of the low permeability of certain soils, the high degree of development, and the borough's inadequate storm sewers, some areas are subject to frequent flooding and ponding of surface water. The basements of five houses along Devon Road and one house along Hawthorne Road in Essex Fells suffered considerable damage from flooding during Tropical Storm Doria in August 1971. The flood of August 2, 1973, had a 83-year recurrence interval measured at the nearest upstream gage (No. 01379500) to confluence with Passaic River, and had a less than 10-year recurrence interval measured at the nearest downstream gage (No. 01381900) at Pine Brook. The length of record of the upstream gage is from 1903 to 1911, and 1937 to the present, and the latter is from 1966 to the present. The flood of April 6-7, 1984, measured with the aforementioned gages, had a less than a 10-year recurrence interval upstream and a 44-year recurrence interval downstream. Floodwaters resulting from Hurricane Irene on August 29-30, 2011, measured at the same gages, had a recurrence interval of 16 years upstream and 22 years downstream (FEMA FIS 2014).

9.7.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Borough of Essex Fells.

Table 9.7-4. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	Local	Building Department	Adopted 12/21/1976, Chapter 103 pg. 103:1
Zoning Ordinance	Y	Local	Zoning Department	Adopted 8/11/1931, Chapter 132 pg.5-6
Subdivision Ordinance	Y	Local	Planning Board	Adopted 6/15/2004, 170:48
NFIP Flood Damage Prevention Ordinance	Y	Local	Building Department	Adopted 12/18/1979, Updated 6/5/2007, Chapter 141
Cumulative Substantial Damages				
Freeboard				
Growth Management	Y	Local	Planning Board	Adopted 4/16/1996, 170:50
Floodplain Management / Basin Plan				
Stormwater Management Plan/Ordinance	Y	Local	Engineering Department	Adopted 6/7/2005, 241:1
Comprehensive Plan / Master Plan/ General Plan	Y	Local	Planning Board	Adopted 7/19/1983, 5-12
Capital Improvements Plan	Y	Local	All Department Heads	Capital Budget is revised annually
Site Plan Review Requirements				
Open Space Plan				
Stream Corridor Management Plan				
Watershed Management or Protection Plan				
Economic Development Plan				
Comprehensive Emergency Management Plan	Y	Local	OEM	Adopted 3/2014
Emergency Response Plan	Y	Local	OEM	Adopted 3/2014
Post Disaster Recovery Plan				
Post Disaster Recovery Ordinance				
Real Estate Disclosure Requirement				
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]				

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Borough of Essex Fells.

Table 9.7-5. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Engineering
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineering
Planners or engineers with an understanding of natural hazards	Y	Engineering
NFIP Floodplain Administrator	Y	Frank Zichelli, Engineer
Surveyor(s)	N	Outsourced as needed
Personnel skilled or trained in "GIS" applications	N	
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	OEM
Grant Writer(s)	Y	Engineering/Department Heads
Staff with expertise or training in benefit/cost analysis	N	
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the Borough of Essex Fells.

Table 9.7-6. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes – Borough generally does not meet grant qualifications
Capital Improvements Project Funding	Yes – Finance
Authority to Levy Taxes for specific purposes	Yes – Mayor and Council
User fees for water, sewer, gas or electric service	Yes – Mayor and Council; Water and Sewer
Impact Fees for homebuyers or developers of new development/homes	No
Incur debt through general obligation bonds	Yes – Mayor and Council
Incur debt through special tax bonds	Yes – Mayor and Council
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	No
Mitigation grant programs	Yes
Other	N/A

Community Classifications

The table below summarizes classifications for community program available to the Borough of Essex Fells.

Table 9.7-7. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	
Building Code Effectiveness Grading Schedule (BCEGS)	NP	
Public Protection	NP	
Storm Ready	NP	
Firewise	NP	

NP = Not participating

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Frank Zichelli, Engineer

Flood Vulnerability Summary

Refer to the flood vulnerability assessment in this plan.

Resources

Construction Code Official, Carl E. Thunell is FPA

Compliance History

Not available at this time.

Regulatory

Adopted 12/18/1979, Updated 6/5/2007, Chapter 141

Community Rating System

The Borough does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

None identified at this time.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. In addition, the community identified specific integration activities that will be incorporated into municipal procedures. The following summarizes how the Borough currently integrates hazard mitigation into government operations.

Day-to-Day Operations: The Borough maintains a Twitter account to update residents on events.

The Borough of Essex Fells recognized the need for flood plain management and, in April 1977, a preliminary ordinance was adopted at a Planning Board meeting. This ordinance defines the flood hazard area as specified on the Special Flood Hazard Area Map prepared by FEMA. Chapter 141: Flood Damage Prevention was adopted by the Mayor and Council of the Borough of Essex Fells, December 18, 1979, by Ordinance No. 79-455 (Ch. 15.16 of the 1992 Code) and amended in its entirety June 5, 2007, by Ordinance No. 2007-829 (FEMA FIS 2014).

In July 2013, the Planning Board initiated Master Plan updates, which include incorporating the current environmental and stormwater management elements into the Master Plan (FEMA FIS 2014).

The Borough has their ordinances and flood protection measures available on their website. Please visit the Borough of Essex Fells website at http://www.essexfellsboro.com for further information (FEMA FIS 2014).

9.7.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.7-8. Past Mitigation Initiative Status

Description	Status	Review Comments
Upgrade security system for water utility	No progress	Funding and personnel issues have prevented this action from being completed. This action will be included in the 2015 plan update
Auxiliary power for water utility to mitigate loss of potable water during power outages	No progress	Funding and personnel issues have prevented this action from being completed. This action will be included in the 2015 plan update
Pine Brook flooding	No progress	Funding and personnel issues have prevented this action from being completed. This action will be included in the 2015 plan update
Emergency Response Plan	Completed	Police, OEM and DPW have collaborated to develop an internal traffic plan.
Traffic Diversion Plan	Completed	Police, OEM and DPW have collaborated to develop an internal traffic plan
Vulnerability Assessment	Discontinued	Funding and personnel issued have prevented this action from being completed. This action will be discontinued

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

None noted

Proposed Hazard Mitigation Initiatives for the Plan Update

The Borough participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.7-9 summarizes the comprehensive-range of specific mitigation initiatives the Borough would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.7-10 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.7-9. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Essex Fells-1 (NEW/LOI)	Obtain backup power for critical facilities to ensure continuity of operations. The following has been identified as project locations at this time: 1.Essex Fells Police and Borough Hall generator 2. Essex Department of Public Works Generator 3. Essex Fells First Aid Squad generator	Existing	All Hazards	1.2 6.1	Borough OEM	High	Medium 1. $65,982 2. $27,300 3. $33,114	Bond ordinance and FEMA HMGP	Short	High	SIP	ES
Essex Fells-2 (OLD)	Upgrade security system for water utility	Existing	All Hazards	1.2 2.1	Borough, OEM, Water Utility	High	Medium	Homeland Security Grants, County, Municipal Budgets	Short Term DOF	High	SIP	PP
Essex Fells-3 (OLD)	Auxiliary power for water utility to mitigate loss of potable water during power outages	Existing	All Hazards	1.2 2.1	Borough, OEM, Water Utility	High	High	HMA, HMGP, Homeland Security	Short Term DOF	Medium	SIP	PP
Essex Fells-4 (OLD)	Complete a flood study of the Pine Brook	N/A	Flood	1.2 2.2	Borough Engineer, Floodplain Administrator	Medium	Medium	Municipal Budget	Short Term DOF	Medium	EAP	PR
Essex Fells-5	Prioritize flood hazard mitigation alternatives for at risk properties within the floodplain, including those that have been identified as repetitive loss, such as acquisition/relocation, or elevation depending on feasibility. The parameters for feasibility for this initiative would be: funding, benefits versus costs and willing participation of property owners. Implement as funding becomes available. Specifically identified are properties in the following areas: • Oval Road • Roseland Avenue • Holly Lane											
	See above.	Existing	Flood, Coastal Erosion, Coastal Storm,	1.2 2.2	Town/Village Engineering via NFIP FPA) with	High	High	FEMA Mitigation Grant Programs and local budget (or property owner)	Ongoing (outreach and specific project identification	Medium	SIP	PP

Table 9.7-9. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
			Severe Weather, Wildfire, Winter Storm		NJOEM, FEMA support			for cost share	); Long term DOF (specific project application and implementation)			
Essex Fells-6	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. This program will include brochures, flyers, website: • Providing general natural hazard risk, preparedness and mitigation, and related NFIP information in regular newsletter and mailings. • Including natural hazard risk and risk reduction information through social media channels and email blast systems. • Posting of flyers and other readily available NFIP informational materials at Town/Village hall or distributing at regular civic meetings. • Preparation, distribution and analysis of public surveys. • Developing/maintaining a natural hazard risk management webpage on the municipal website where information and mapping can be posted. • Enhance public outreach to residents in NFIP floodplain areas to inform of annual grant opportunities, etc. which may include periodic articles and handouts in the annual newsletter.											
	See above.	N/A	All Hazards	3.1	Town/Village Supervisor's Office	Medium	Low	Municipal Budget; HMA programs with local or county match	Short	High	EAP	PE

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*
OEM	*Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Costs:

Benefits:

Costs:
Where actual project costs have been reasonably estimated:
Low *< $10,000*
Medium *$10,000 to $100,000*
High *> $100,000*

Where actual project costs cannot reasonably be established at this time:
Low *Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium *Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High *Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:
Low= *< $10,000*
Medium *$10,000 to $100,000*
High *> $100,000*

Where numerical project benefits cannot reasonably be established at this time:
Low *Long-term benefits of the project are difficult to quantify in the short term.*
Medium *Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High *Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.7-8. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Essex Fells-1 (NEW/LOI)	Obtain backup power for continuity of operations	1	1	1	1	1	1	1	0	1	1	1	1	1	0	12	High
Essex Fells-2 (OLD)	Upgrade security system for water utility	1	1	1	1	1	0	0	0	1	0	1	1	1	0	9	High
Essex Fells-3 (OLD)	Auxiliary power for water utility to mitigate loss of potable water during power outages	1	1	1	0	1	0	0	0	1	0	1	0	0	0	6	Medium
Essex Fells-4 (OLD)	Complete a flood study of the Pine Brook	0	1	0	1	1	1	0	1	1	1	0	0	1	1	9	Medium
Essex Fells-5 (NEW)	Prioritize flood hazard mitigation alternatives for at risk properties	1	1	1	1	0	0	1	1	1	1	0	0	1	0	9	Medium
Essex Fells-6 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program	1	1	1	1	1	1	0	0	1	1	1	1	1	1	12	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.7.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.7.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Borough of Essex Fells that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Borough of Essex Fells has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.7.9 Additional Comments

None at this time.

Figure 9.7-1. Borough of Essex Fells Hazard Area Extent and Location Map 1

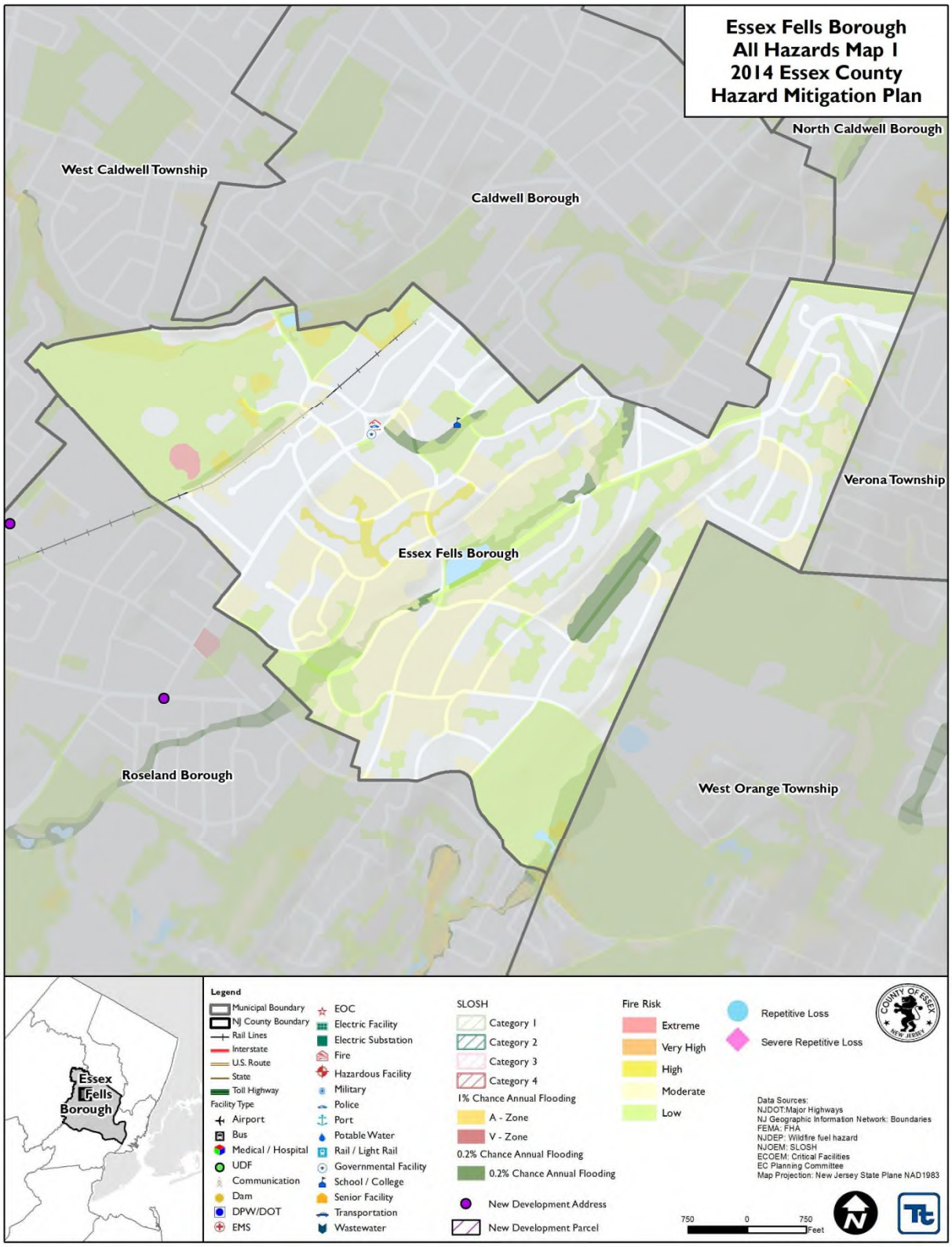
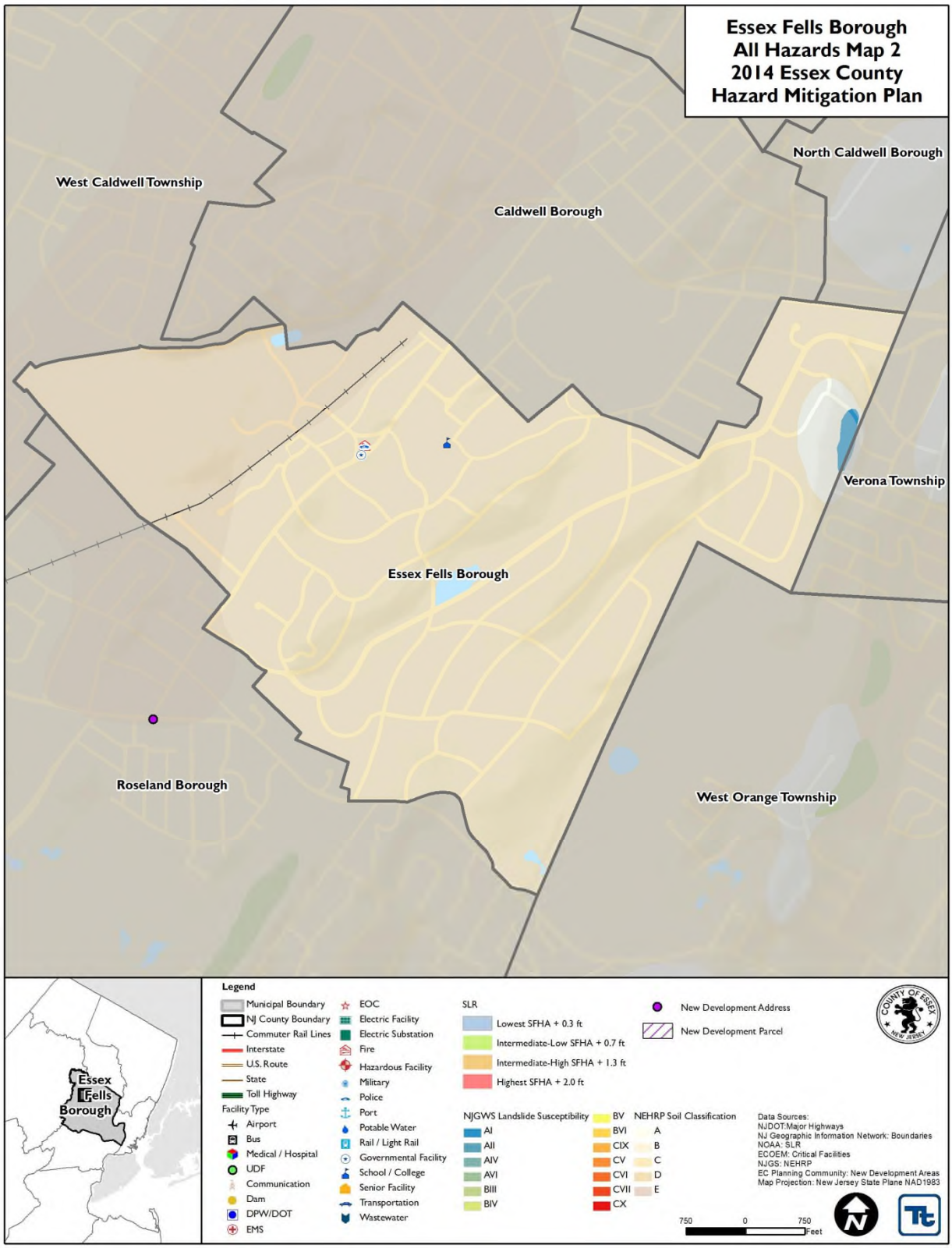


Figure 9.7-2. Borough of Essex Fells Hazard Area Extent and Location Map 2



Action Number: **Essex Fells-1 (NEW/LOI)**

Mitigation Action/Initiative: Emergency back-up power to Borough Hall and Police

Assessing the Risk	
Hazard(s) addressed:	Power Loss
Specific problem being mitigated:	Loss of power to Borough Hall and Police/Public Safety .
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Provide emergency power source at each affected location.
	2. Do nothing. This is an unacceptable option.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Provide permanent backup generator at Borough Hall and Police/Public Safety
Action/Project Category	SIP
Goals/Objectives Met	1.2 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Continuity of operations
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Borough of Essex Fells
Local Planning Mechanism	Capital Improvement Plan
Potential Funding Sources	Bond Ordinance and FEMA allocation.
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

***Refer to prioritization table.**

Action Number: **Essex Fells-1 (NEW/LOI)**

Mitigation Action/Initiative: Emergency back-up power to Borough Hall, DPW, and Public Safety.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	Preliminary design completed
Political	1	
Legal	1	Borough owns all involved properties
Fiscal	1	Local financing and FEMA allocation
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	OEM
Other Community Objectives	0	
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Essex Fells-1 (NEW/LOI)**

Mitigation Action/Initiative: Emergency back-up power to Department of Public Works

Assessing the Risk	
Hazard(s) addressed:	Power Loss
Specific problem being mitigated:	Loss of power to Department of Public Works.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Provide emergency power source at each affected location.
	2. Do nothing. This is an unacceptable option.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Provide permanent backup generator at Department of Public Works
Action/Project Category	SIP
Goals/Objectives Met	1.2 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Continuity of operations
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Borough of Essex Fells
Local Planning Mechanism	Capital Improvement Plan
Potential Funding Sources	Bond Ordinance and FEMA allocation.
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

***Refer to prioritization table.**

Action Number: **Essex Fells-1 (NEW/LOI)**

Mitigation Action/Initiative: Emergency back-up power Department of Public Works.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	Preliminary design completed
Political	1	
Legal	1	Borough owns all involved properties
Fiscal	1	Local financing and FEMA allocation
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	OEM
Other Community Objectives	0	
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Essex Fells-1 (NEW/LOI)**

Mitigation Action/Initiative: Emergency back-up power to First Aid Squad

Assessing the Risk	
Hazard(s) addressed:	Power Loss
Specific problem being mitigated:	Loss of power to First Aid Squad.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Provide emergency power source at each affected location.
	2. Do nothing. This is an unacceptable option.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Provide permanent backup generator at First Aid Squad
Action/Project Category	SIP
Goals/Objectives Met	1.2 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Continuity of operations
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Borough of Essex Fells
Local Planning Mechanism	Capital Improvement Plan
Potential Funding Sources	Bond Ordinance and FEMA allocation.
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

***Refer to prioritization table.**

Action Number: **Essex Fells-1 (NEW/LOI)**

Mitigation Action/Initiative: Emergency back-up power to First Aid Squad.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	Preliminary design completed
Political	1	
Legal	1	Borough owns all involved properties
Fiscal	1	Local financing and FEMA allocation
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	OEM
Other Community Objectives	0	
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Essex Fells-2 (OLD)**

Mitigation Action/Initiative: Upgrade security system for water utility

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Upgrade security system for water utility
Action/Project Category	SIP
Goals/Objectives Met	1.2, 2.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Borough, OEM, Water Utility
Local Planning Mechanism	
Potential Funding Sources	Homeland Security Grants, County, Municipal Budgets
Timeline for Completion	Short DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

***Refer to prioritization table.**

Action Number: **Essex Fells-2 (OLD)**

Mitigation Action/Initiative: Upgrade security system for water utility

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Essex Fells-3 (OLD)**

Mitigation Action/Initiative: Auxiliary power for Water Utility

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of potable water during power outages
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Auxiliary power for water utility to mitigate loss of potable water during power outages
Action/Project Category	SIP
Goals/Objectives Met	1.2, 2.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Borough, OEM, Water Utility
Local Planning Mechanism	
Potential Funding Sources	HMA, HMGP, Homeland Security
Timeline for Completion	Short DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

***Refer to prioritization table.**

Action Number: **Essex Fells-3 (OLD)**

Mitigation Action/Initiative: Auxiliary power for water utility

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	Medium	

Action Number: **Essex Fells-4 (OLD)**

Mitigation Action/Initiative: Flood Study of Pine Brook

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	EAP
Goals/Objectives Met	1.2, 2.2
Applies to existing, future, or not applicable	NA
Benefits (losses avoided)	Medium
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	Borough Engineer, Floodplain Administrator
Local Planning Mechanism	
Potential Funding Sources	Municipal Budget
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

***Refer to prioritization table.**

Action Number: **Essex Fells-4 (OLD)**

Mitigation Action/Initiative: Flood Study of Pine Brook

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	0	
Cost-Effectiveness	0	
Technical	1	
Political	0	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	Medium	

Action Number: **Essex Fells-5 (NEW)**

Mitigation Action/Initiative: Prioritize flood hazard mitigation alternatives for at risk properties

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Flooded areas: Oval Road, Roseland Avenue and Holly Lane
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Prioritize flood hazard mitigation alternatives for at risk properties within the floodplain, including those that have been identified as repetitive loss, such as acquisition/relocation, or elevation depending on feasibility. The parameters for feasibility for this initiative would be: funding, benefits versus costs and willing participation of property owners. Implement as funding becomes available.
Action/Project Category	EAP
Goals/Objectives Met	1.2, 2.2
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Borough Engineering and NFIP FPA
Local Planning Mechanism	
Potential Funding Sources	FEMA HMA, Local match
Timeline for Completion	DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

***Refer to prioritization table.**

Action Number: **Essex Fells-5 (NEW)**

Mitigation Action/Initiative: Prioritize flood hazard mitigation alternatives for at risk properties

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	Medium	

9.8 Township of Fairfield

This section presents the jurisdictional annex for the Township of Fairfield.

9.8.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Lawrence Gonnallo, Engineer 230 Fairfield Road, Fairfield, NJ 07004 Phone: 973-882-2727 E-mail: lgonnello@fairfieldnj.org	William Smith, OEM Coordinator 230 Fairfield Road, Fairfield, NJ 07004 Phone: 973-882-2740 E-mail: wsmith@fairfieldnj.org

9.8.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of Fairfield was 7,466.

Location

According to the U.S. Census Bureau, the Township has a total land area of 10.46 square miles, of which 10.296 square miles is land and 0.164 square miles is water.

Brief History

In 1669, the Dutch settled along the Passaic River in the area now known as Fairfield Township. The land was purchased from Native Americans and named Gansegat, which is Dutch for "duck's pond" (Township of Fairfield, 2014).

Governing Body Format

Fairfield Township has operated as a Small Municipality Plan C form of government since 1962 (Township of Fairfield, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.8-7 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.8-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Oak Park Construction	Residential	18 units	Block 4701/Lots 3.05,06,08	ND	Preliminary approval
Oak Park Construction	Residential	18 units	B: 5003 L: 3	Wildfire: Moderate, 1% Flood: A Zone 0.2% Flood NEHRP: D	Preliminary approval
Oak Park Construction	Residential	18 units	B: 4701 L: 3.03	Wildfire: Moderate, 1% Flood: A Zone 0.2% Flood NEHRP: D	Preliminary approval

** Only location-specific hazard zones or vulnerabilities identified.*
Note: ND = Not determined because potential new development could not be located.

9.8.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.8-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
April 14-20, 2007	Severe Weathers and Inland and Coastal Flooding	DR-1694	Yes	The Township experienced closed roads due to flooding, evacuation of flooded areas of the Township, opening of shelters, and the sanitary sewer system being compromised. Commercial Street was closed due to flooding. Private dwellings and commercial properties were damaged; public assistance was requested.
March 12 – April 15, 2010	Severe Weathers and Flooding	DR-1897	Yes	The Township experienced closed roads due to flooding, evacuation of flooded areas of the Township, opening of shelters, and the sanitary sewer system being compromised. Commercial Street was closed due to flooding. Private dwellings and commercial properties were damaged; public assistance was requested.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	Public Assistance requested, Overtime for Public Works for snow removal.
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	The Township experienced closed roads due to flooding, evacuation of flooded areas of the Township, opening of shelters, and the sanitary sewer system being compromised. Commercial Street was closed due to flooding. Private dwellings and commercial properties were damaged; public assistance was

Table 9.8-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
				requested. The Township requested assistance from the National Guard, Essex County OEM, and the sheriff's office. Overtime for police, OEM staff, fire and DPW.
October 29, 2011	Severe Weather	DR-4048	Yes	Trees down at residential properties causing damage to homes. Public assistance was requested. The DPW had overtime due to debris removal.
October 26 – November 8, 2012	Hurricane Sandy	EM-3354 DR-4086	Yes Yes	Warming and charging shelter was open due to loss of power. There were large-scale utility outages in the Township. Private dwellings and commercial properties were damaged due to downed trees and power outages. DPW removed debris. Overtime for police, fire, and DPW. The Township requested public assistance.

9.8.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of Fairfield. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for Township of Fairfield.

Table 9.8-3. Hazard Risk/Vulnerability Risk Ranking

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $5,194,775 2,500-year MRP: $84,041,089	Occasional	32	High
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $196,854,299	Frequent	42	High
Geological Hazards	Exposed to Class B and Class C: $370,000	Rare	6	Low
Severe Weather	100-Year MRP: $1,065,530 500-year MRP: $10,654,877 Annualized: $109,182	Frequent	48	High
Winter Storm	1% GBS: $18,518,899 5% GBS: $92,594,495	Frequent	54	High

Table 9.8-3. Hazard Risk/Vulnerability Risk Ranking

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Wildfire	Estimated Value Exposed to Extreme, Very High, and High: $23,819,300	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. *Building damage ratio estimates based on FEMA 386-2 (August 2001)*
b. *The valuation of general building stock and loss estimates was based on custom inventory for the municipality.*
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20
c. *Loss estimates for the Severe Weather and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of Fairfield.

Table 9.8-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Fairfield, Township of	1,148	1,670	$64,058,476.00	154	91	973	1,117	31

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.8-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

Municipality	1% Annual Chance					0.2% Annual Chance					
	Airport	Fire	Potable Water Plant	School	Transportation	Airport	Fire	Health Care	Potable Water Supply	School	Transportation
Township of Fairfield	1	1	4	4	2	1	1	1	4	5	6

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), the low-lying area of the wide floodplain of the Passaic River comprises much of the Township of Fairfield and forms a large natural storage area. Floodwaters from the Pompton River enter this storage area from the north near the Two Bridges area. During large floods, Beatties Dam, which is located above Little Falls, constricts the river section enough to cause floodwaters from the Pompton River to enter the Passaic River, flowing in both an upstream and downstream direction at the point where the two rivers join (Richard P. Browne Associates, 1975 and 1976). The storage area thus contains flows from the Passaic River and the Pompton River (FEMA FIS 2014).

The flood peaks from the Pompton River are reduced and retarded somewhat due to the lake and reservoir storage on the northern upland tributaries and the valley storage between Pompton Lakes and Two Bridges. According to a USACE analysis, the Pompton River peak reaches the Passaic River approximately 12 to 18 hours before the Passaic River peaks. The southern upland tributaries of the Passaic River are as precipitous as the northern tributaries, but they join the Passaic River at widely separated points which results in desynchronization of their peaks. They are greatly affected by the large valley storage in the lower reaches and are, therefore, low flood producers into the Passaic River floodplains (FEMA FIS 2014).

The Passaic River borders Fairfield Township on three sides. Residential and commercial properties along the Passaic River are prone to being flooded. In the Northeast corner of the Township, the Passaic and Pompton Rivers converge and localized flooding can be damaging. Township owned infrastructure such as the sanitary sewer system and Fire House nearby have been previously damaged during flood events in this area.

With approximately 70% of property and structures in the Township of Fairfield located in SHFAs the community encourages residents to explore flood protection measures such as drainage maintenance and improvements, wet and dry flood proofing and elevating (FEMA FIS 2014).

9.8.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of Fairfield.

Table 9.8-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	State	IBC	DCA
Zoning Ordinance	Y	Local	Chapter 45	Zoning
Subdivision Ordinance	Y	Local	Chapter 42	Zoning
NFIP Flood Damage Prevention Ordinance	Y	Local	Chapter 45	Construction
Cumulative Substantial Damages	Y	Local	Construction	Floodplain Ordinance Chapter45
Freeboard				
Growth Management				
Floodplain Management / Basin Plan	Y	Local	Chapter 45	Construction
Stormwater Management Plan/Ordinance	Y	Local	Section 42-10	Engineering
Comprehensive Plan / Master Plan/ General Plan	Y	Local	Chapter 45	Zoning
Capital Improvements Plan				
Site Plan Review Requirements	Y	Local	Chapter 45	Zoning
Open Space Plan				
Stream Corridor Management Plan				
Watershed Management or Protection Plan				
Economic Development Plan				
Comprehensive Emergency Management Plan	Y	Local	Emergency Operation Plan	Fairfield OEM
Emergency Response Plan	Y	Local	Emergency Operation Plan	Fairfield OEM
Post Disaster Recovery Plan				
Post Disaster Recovery Ordinance				
Real Estate Disclosure Requirement	Y	State	Division of Consumer Affairs	N.J.A.C. 13:45A-29.1

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]				

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of Fairfield.

Table 9.8-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Engineering
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	N	
Planners or engineers with an understanding of natural hazards	N	
Floodplain Administrator	Y	Building Department
Surveyor(s)	N	
Personnel skilled or trained in "GIS" applications	N	
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Emergency Management
Grant Writer(s)	N	
Staff with expertise or training in benefit/cost analysis	N	
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the Township of Fairfield.

Table 9.8-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community Development Block Grants (CDBG)	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for specific purposes	Yes
User fees for water, sewer, gas, or electric service	Yes
Impact Fees for homebuyers or developers of new development/homes	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	No
Mitigation grant programs	Yes

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Other	

Community Classifications

The table below summarizes classifications for community program available to the Township of Fairfield.

Table 9.8-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	6	April 2013
Building Code Effectiveness Grading Schedule (BCEGS)	NP	
Public Protection	NP	
Storm Ready	NP	
Firewise	NP	

NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Phil Cheff, CFM, Construction Official

Flood Vulnerability Summary

Fairfield Township maintains a list of flood-damaged properties along with the interest in mitigation expressed by the property owner. Over 950 residential and 750 commercial properties received Substantial Damage determinations after Hurricane Irene. Of the 940 residential properties damaged, 250 property owners have

expressed an interest in mitigation. Funding sources for mitigation projects include Increased Cost of Compliance (ICC), grants, and Green Acres funding grants.

Resources

The Fairfield Construction Official, Phil Cheff, CFM, is the designated floodplain manager. Responsibilities of the floodplain manager include: permit reviews, inspections, damage assessments, record keeping, GIS, and public education and outreach. Fairfield Township is currently a participating community in the Community Rating System (CRS) program with a rating of 6. Additional training and seminars on floodplain management would be welcomed.

Compliance History

Fairfield Township is currently in good standing in the NFIP. The most recent Community Assistance Visit (CAV) was completed in 2013 during the reauthorization of their CRS program.

Regulatory

Floodplain management regulations exceed the minimum set forth by both FEMA and New Jersey. Additional ordinances and programs help support the implementation of floodplain management within Fairfield Township.

Community Rating System

The municipality does participate in the Community Rating System (CRS) program. The Township entered the CRS program on May 1, 2013 and is current. The Township has a class rating of 6 which is a 20% discount for Special Flood Hazard Areas and a 10% for non-Special Flood Hazard Areas.

Other Capabilities Identified

Previous actions that are now on-going programs and capabilities are described below. Refer to Table 9.8-11 presented later in this annex.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

The Township is a participant in CRS and is currently a class rating 6.

On the Township's website there is a link to Swift911, a notification system so residents may receive important information from the Town during times of natural hazard events.

With approximately 70% of property and structures in the Township of Fairfield located in SHFAs the community encourages residents to explore flood protection measures such as drainage maintenance and improvements, wet and dry flood proofing and elevating (FEMA FIS 2014).

The Township ordinance restricts construction in floodplain areas in accordance with FEMA's land-use regulation requirements (FEMA FIS 2014).

The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Fairfield website at http://www.fairfieldnj.org/index.html for further information (FEMA FIS 2014).

The Township will establish a community resilience committee/advisor. In addition, the Township will work with the local school district and assist with identifying joint mitigation projects. Please refer to Table 9.8-11 which summarizes the proposed mitigation actions for this update.

9.8.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.8-10. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Lower 72" water lines	Discontinued	The Township has no authorization from United Water/Jersey City. This initiative will not be carried over into the current mitigation strategy.
2: Evacuation plan for Two Bridges	Complete	Completed 2014.
3: Purchase flood prone properties through Blue Acres Program	Continuous	Properties will be purchased as grants come available. Total 13 properties have been purchased. This initiative will be carried over into the current mitigation strategy.
4: Elevate homes in Camp Lane area with FEMA grant	Continuous	When grant money comes available to home owners, interested in elevating their properties. This initiative will be carried over into the current mitigation strategy.
5: Essex County Airport – terrorism plan?	Discontinued for the Township.	This initiative will not be carried over into the current mitigation strategy.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

Following Hurricane Irene, Fairfield Township began the acquisition of flood-prone properties. This is an ongoing process and will continue as funding through FEMA and NJDEP grants is made available.

The Township has funded numerous clean-outs of the Great Piece Meadow drainage ditch system north of Route 80. The Township is currently pursuing the funding of additional clean-outs with federal and state grant money. The Governor announced in September 2013 that local and county governments in the Passaic River Basin may now apply for State grants for the removal of snags, debris, and shoals under a new $3 million program that is intended to reduce flooding risks in communities throughout the Passaic River region.

The NJDEP is distributing applications and other information about grants to 116 eligible municipalities in the basin.

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township of Fairfield participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.8-11 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.8-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.8-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Fairfield-1 (NEW/LOI OLD 4)	Acquire thirteen (13) properties - all are SRL or RL identified properties located on Camp Lane, Riveredge Dr, Horseneck Rd, and Park Ave	Existing	Flood	1.2 2.2	Engineering Department	High	High $3,716,900	FEMA Grants HMGP FMA PDM	Long Term DOR	High	EAP, NSP, LPR, SIP	PP
Fairfield-2 (NEW/LOI)	Fairfield EOC retrofit/hurricane shutters and roof replacement	Existing	Severe Weather, Coastal Storm	2.1 2.2 6.1	Engineering Department	High	High $200,000	FEMA Grants HMGP, PDM	Long Term DOF	High	SIP	SP
Fairfield-3 (NEW/LOI)	Obtain backup power to ensure continuity of operations. Locations identified at this time: 1. Fairfield critical facilities emergency generators 2. Fairfield municipal building generator 3. Fairfield library generator	Existing	All	1.2 6.1	Engineering Department	High	High 1. $191,000 2. $200,000 3. $34,000	HMGP	Short Term DOF	High	SIP	ES
Fairfield-4 (OLD 3)	Support mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage with repetitive and severe repetitive loss properties as a priority when applicable.	Existing	Coastal Storm, Flood, Severe Weather	1.2 2.2	Engineering	High	High	HMA Grants, State DEP Grants	Less than one year from plan adoption	High	SIP	SP
Fairfield-5 (NEW)	The Township will establish a community resilience committee/advisor.	Existing	All Hazards	1.2 2.2	Township	High	Low	Municipal funds	Short	Low	EAP	PP
Fairfield-6 (NEW)	The Township will work with the local school district and assist	Existing	Flood	1.1 2.2	Township	High	Low	Municipal funds	Short	Low	EAP	PP

Table 9.8-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	with identifying joint mitigation projects.											

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*
OEM	*Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Costs:
Where actual project costs have been reasonably estimated:

Low	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low	*Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium	*Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High	*Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low	*Long-term benefits of the project are difficult to quantify in the short term.*
Medium	*Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High	*Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*

- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.8-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Fairfield-1	Fairfield acquisition thirteen (13) properties	1	1	1	1	1	1	0	0	1	1	0	1	1	1	11	High
Fairfield-2	Fairfield EOC retrofit/hurricane shutters and roof replacement	1	1	1	1	1	1	0	0	0	1	1	1	1	1	11	High
Fairfield-3	Obtain backup power to ensure continuity of operations.	1	1	1	1	1	1	1	0	0	1	1	1	1	1	12	High
Fairfield-4	Support mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures	1	1	1	1	1	1	1	1	1	1	0	0	1	1	12	High
Fairfield-5	The Township will establish a community resilience committee/advisor.	1	0	1	1	1	1	1	1	1	1	0	1	1	1	12	Low
Fairfield-6	The Township will work with the local school district and assist with identifying joint mitigation projects.	1	1	1	1	1	1	1	1	0	1	1	0	1	1	12	Low

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.8.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.8.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of Fairfield that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of Fairfield has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.8.9 Additional Comments

None at this time.

Figure 9.8-1. Township of Fairfield Hazard Area Extent and Location Map 1

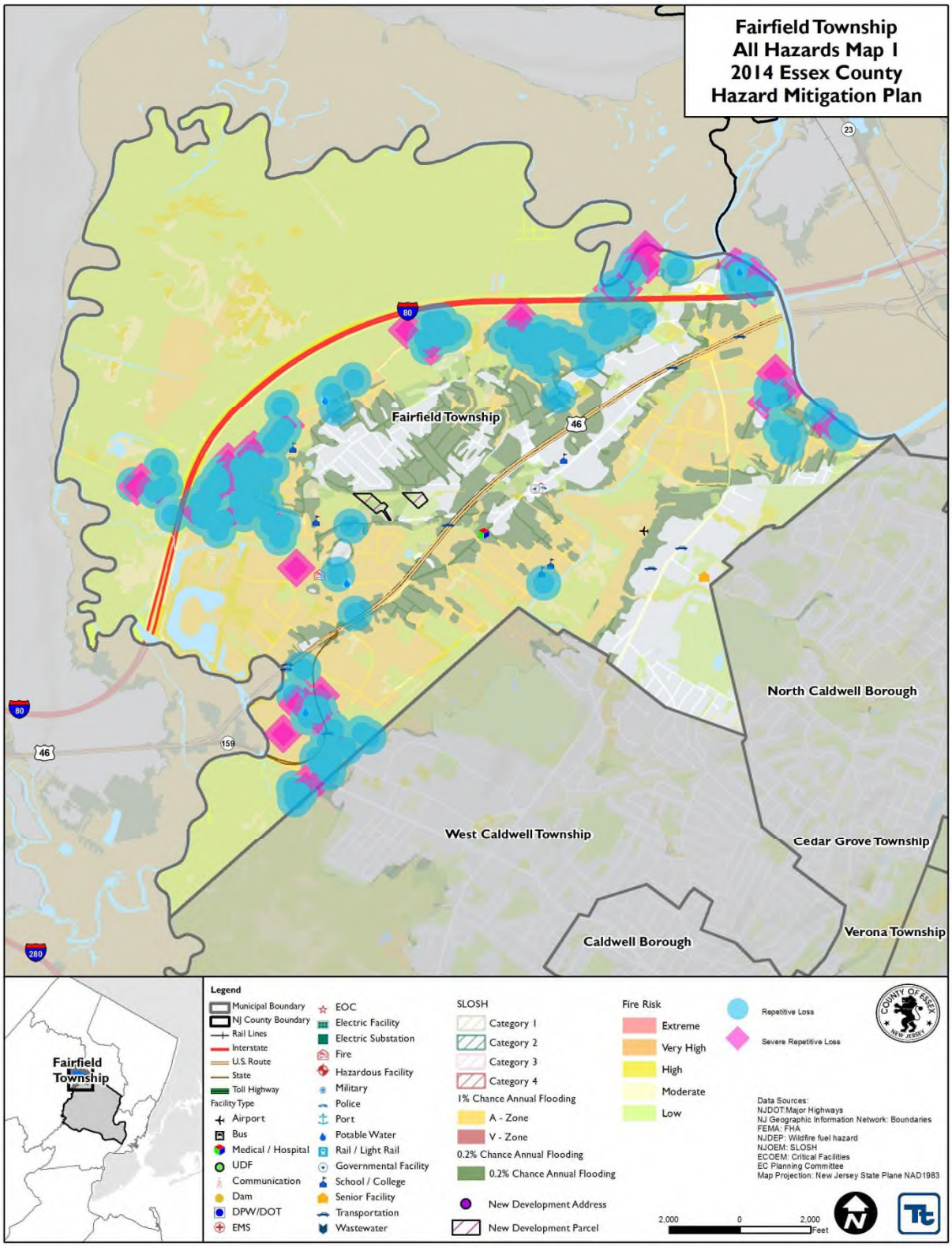
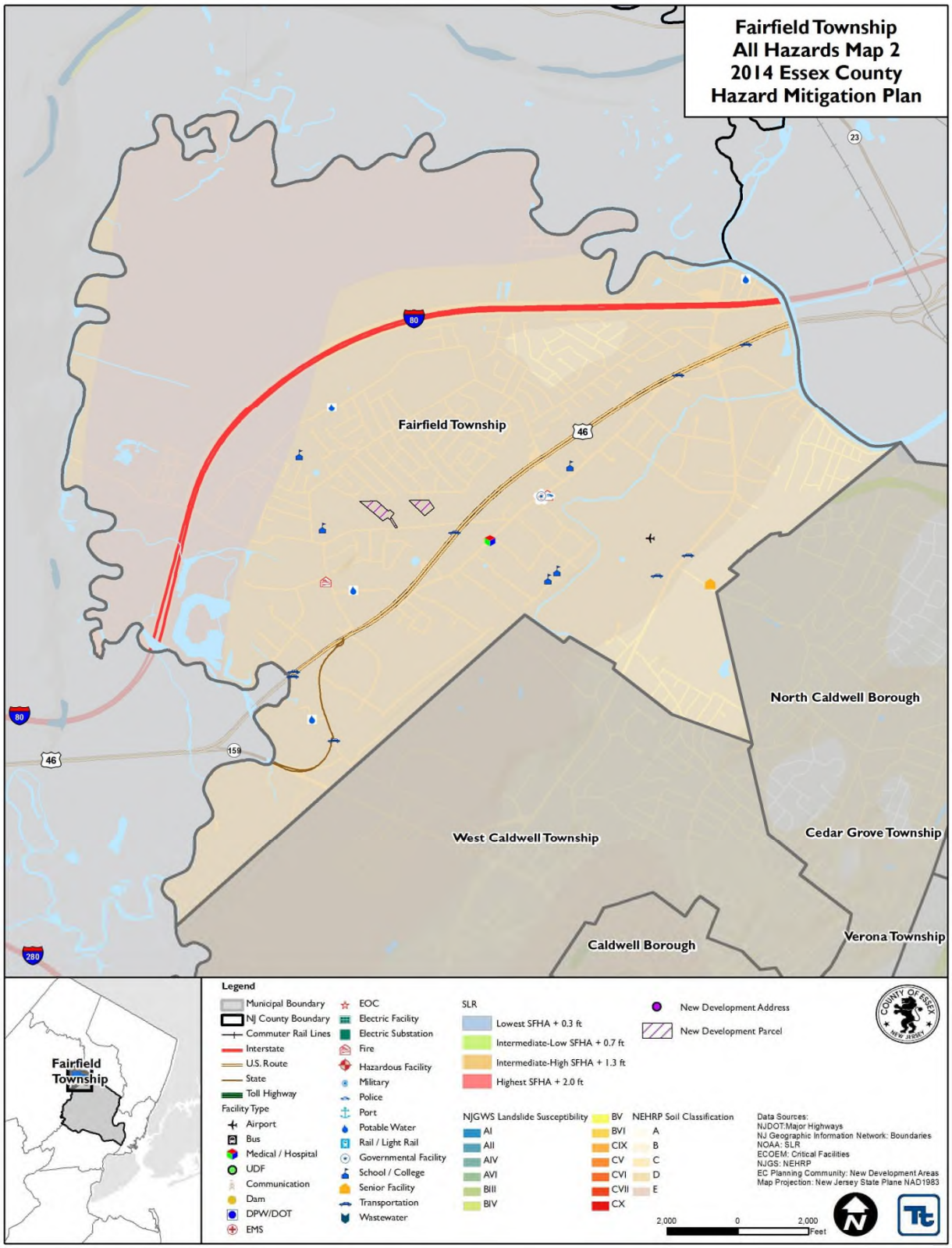


Figure 9.8-2. Township of Fairfield Hazard Area Extent and Location Map 2



Action Number: **Fairfield-1 (NEW/LOI)**

Mitigation Action/Initiative: Fairfield acquisition thirteen (13) properties

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Flooding of homes
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Acquire structures 2. Elevate structures 3. Do nothing
Action/Project Intended for Implementation	
Description of Selected Action/Project	Acquire thirteen (13) properties - all are SRL or RL identified properties located on Camp Lane, Riveredge Drive, Horseneck Road, and Park Avenue
Action/Project Category	EAP, NSP, LPR, SIP
Goals/Objectives Met	1.2, 2.2
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$3,716,900
Priority*	High
Plan for Implementation	
Responsible Organization	Engineering Department, Property Owners
Local Planning Mechanism	
Potential Funding Sources	FEMA HMA grants, local match
Timeline for Completion	Long term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Fairfield-1 (NEW/LOI)**

Mitigation Action/Initiative: Fairfield acquisition thirteen (13) properties

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Fairfield-2 (NEW/LOI)**

Mitigation Action/Initiative: Fairfield EOC retrofit/hurricane shutters and roof replacement

Assessing the Risk	
Hazard(s) addressed:	Hurricane, Severe Winds, Rain
Specific problem being mitigated:	Damage to EOC
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Retrofit building
	2. Build a new EOC
	3. Do nothing
Action/Project Intended for Implementation	
Description of Selected Action/Project	Retrofit EOC with hurricane shutters and replace roof
Action/Project Category	SIP
Goals/Objectives Met	2.1, 2.2, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$200,000
Priority*	High
Plan for Implementation	
Responsible Organization	Engineering Department
Local Planning Mechanism	
Potential Funding Sources	FEMA HMA grant funding, HMGP
Timeline for Completion	Long term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Fairfield-2 (NEW/LOI)**

Mitigation Action/Initiative: Fairfield EOC retrofit/hurricane shutters and roof replacement

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Fairfield-3 (NEW/LOI)**

Mitigation Action/Initiative: Fairfield critical facilities emergency generators (EOC, Municipal Bldg, shelter)

Assessing the Risk	
Hazard(s) addressed:	Loss of Power due to natural hazard events
Specific problem being mitigated:	Loss of power to critical facilities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase and install backup power generators
	2. Do nothing
	3. Build new critical facilities with backup power capabilities
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install backup generators for critical facilities
Action/Project Category	SIP
Goals/Objectives Met	1.1; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$191,000
Priority*	High
Plan for Implementation	
Responsible Organization	Engineering Department
Local Planning Mechanism	
Potential Funding Sources	HMGP
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Fairfield-3 (NEW/LOI)**

Mitigation Action/Initiative: Fairfield critical facilities emergency generators

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	12	
Priority (High/Med/Low)	High	

9.9 Borough of Glen Ridge

This section presents the jurisdictional annex for the Borough of Glen Ridge.

9.9.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Michael J. Rohal, P.E., P.P, Borough Administrator/Engineer 825 Bloomfield Avenue, Glen Ridge, NJ 07028 973-748-8400 ext. 235 mjrohal@glenridgenj.org	Michael Zichelli, AICP, P.P., Deputy Administrator/Director of Planning 825 Bloomfield Avenue, Glen Ridge, NJ 07028 973-748-8400 ext. 235 mpzichelli@glenridgenj.org

9.9.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Borough of Glen Ridge was 7,527.

Location

The Borough of Glen Ridge is located between Montclair to the Northwest, Nutley to the Northeast, Belleville to the East, East Orange to the Southeast, and West Orange to the Southwest (Glen Ridge Borough, 2014).

Brief History

In 1666, 64 Connecticut families bought land from the Lennilenape Tribe and named the newly acquired area New Ark. This was to reflect the ability for all to worship freely. The area was originally part of Bloomfield but when residents were unsatisfied with their representation in the local government, they formed their own community in 1895. Throughout the 19th Century, Glen Ridge transformed from rural farming area into a suburban community with the expansion of mass transportation (Glen Ridge Borough, 2014).

Governing Body Format

The Borough of Glen Ridge is governed under the Borough form of New Jersey municipal government. This form of government has a six member Borough Council and a mayor (Glen Ridge Borough, 2014).

Growth/Development Trends

The Borough of Glen Ridge did not note any major residential or commercial development, or major infrastructure development planned for the next 5 years in the municipality.

Table 9.9-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
None identified at this time.					

9.9.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.9-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Fallen trees damaged infrastructure and residential structures
October 29, 2011	Severe Storm	DR-4048	Yes	Fallen trees damaged infrastructure and residential structures. Widespread power outages.
October 26 – November 8, 2012	Hurricane Sandy	EM-3354 DR-4086	Yes Yes	Fallen trees damaged infrastructure and residential structures. Widespread power outages.

9.9.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Borough of Glen Ridge. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Borough of Glen Ridge.

Table 9.9-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $601,219 2,500-year MRP: $13,972,913	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	18	Medium
Flood	1% Annual Chance: $850,646	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $1,357,000	Rare	6	Low
Severe Storm	100-Year MRP: $1,087,381 500-year MRP: $5,568,574 Annualized: $73,161	Frequent	48	High
Winter Storm	1% GBS: $6,362,080 5% GBS: $31,810,400	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $0	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. *Building damage ratio estimates based on FEMA 386-2 (August 2001)*
b. *The valuation of general building stock and loss estimates was based on custom inventory for the municipality.*
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20
c. *Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Borough of Glen Ridge.

Table 9.9-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Glen Ridge, Borough of	53	13	$38,521.00	0	0	18	18	35

Source: FEMA, 2014

Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.

Note (2) Total building and content losses from the claims file provided by FEMA Region 2.

Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The municipality does not have any critical facilities located in the 1% or 0.2% annual chance flood boundaries.

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), Toneys Brook is contained in a deep gorge formed by the railroad embankment and Bloomfield Avenue. The gorge runs from a point upstream of Hillside Avenue to a point behind the Parkway Apartments. Downstream of Hillside Avenue, a limited amount of homes and businesses have experienced minor flooding (FEMA FIS 2014).

Additionally, the municipality has identified the following hazard problems and/or problem areas; further described below:

- Toneys Brook
- Bridge projects
- Power system rehabilitation
- Mountainside Hospital

Critical Facilities

Mountainside Hospital has been identified as a facility within the Borough of Glen Ridge that is vulnerable to the impacts of various disasters. The hospital must remain fully operational during disasters to allow emergency response activities, sheltering, and continuity of care to occur throughout the duration of an event.

Infrastructure

Infrastructure in the Borough remains vulnerable to the destructive strength of floodwaters. Making improvements to the retaining walls along Toney's Brook would protect both the banks of the brook as well as those private properties along the brook that are susceptible to flooding. The Borough is also reviewing the

status of all bridges to see which ones require structural work. In support of their mitigation strategy to address vulnerable bridges, two bridges have been stabilized. Three remaining bridges the Borough is pursuing projects for include the Bloomfield Avenue and Ridgewood Avenue Bridges that span the Montclair and Boonton railroad lines.

Power

Sustained loss of power remains a constant threat before, during, and after storm events. The Borough is currently pursuing two generator projects to ensure continuity of utilities during an event. A generator installed at the Glen Ridge Municipal Complex would allow for the following services to continue during an emergency without interruption: Police Department, Ambulance Squad, Administrative Offices, and Public Library. A hardening project for the electrical distribution system is also being pursued to make the current power system more resilient.

9.9.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Borough of Glen Ridge.

Table 9.9-5. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y			Chapter 15
Zoning Ordinance	Y			Chapter 17
Subdivision Ordinance	Y			Chapter 16
NFIP Flood Damage Prevention Ordinance	Y			Chapter 15
Cumulative Substantial Damages	N			None
Freeboard	N			None
Growth Management	N			None
Floodplain Management / Basin Plan	N			None
Stormwater Management Plan/Ordinance	Y			Chapter 13, Updated 2005
Comprehensive Plan / Master Plan/ General Plan	Y			
Capital Improvements Plan	Y			Annual Budget
Site Plan Review Requirements	Y			
Open Space Plan	Y			
Stream Corridor Management Plan	N			None
Watershed Management or Protection Plan	N			None
Economic Development Plan	N			
Comprehensive Emergency Management Plan	Y			
Emergency Response Plan	Y			
Post Disaster Recovery Plan	Y			
Post Disaster Recovery Ordinance	N			
Real Estate Disclosure Requirement	N			
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)] Historic Preservation	Y			

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Borough of Glen Ridge.

Table 9.9-6. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	
Planners or engineers with an understanding of natural hazards	Y	
NFIP Floodplain Administrator	Y	Michael J. Rohal, P.E., P.P, Borough Administrator/Engineer
Surveyor(s)	Y	Contracted: Petry Engineering
Personnel skilled or trained in "GIS" applications	Y	
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	
Grant Writer(s)	Y	
Staff with expertise or training in benefit/cost analysis	Y	
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the Borough of Glen Ridge.

Table 9.9-7. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	No
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for specific purposes	Yes
User fees for water, sewer, gas or electric service	Yes
Impact Fees for homebuyers or developers of new development/homes	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activity bonds	Yes
Withhold public expenditures in hazard-prone areas	Yes
Mitigation grant programs	Yes
Other	No

Community Classifications

The table below summarizes classifications for community program available to the Borough of Glen Ridge.

Table 9.9-8. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	N/A
Building Code Effectiveness Grading Schedule (BCEGS)		
Public Protection		
Storm Ready	NP	N/A
Firewise	NP	N/A

N/A = Not applicable. NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Michael J. Rohal, P.E., P.P, Borough Administrator/Engineer

Flood Vulnerability Summary

The Borough of Glen Ridge maintains records of properties that sustained damage as a result of flooding. No records are currently kept however to track if property owners sustaining flood damage are interested in mitigation; however, the Borough has included this as a new mitigation (refer to Table 9.9-10, mitigation action Glen Ridge-18). The NFIP floodplain administrator stated there were no properties damaged by flooding as a result of Hurricane Sandy. Flood-related damage was last reported following Hurricane Floyd in 1999.

Resources

Michael J. Rohal is the sole individual responsible for floodplain administration within Glen Ridge Borough. The responsibilities of the Floodplain Administrator include permit review, inspection, and damage assessments. At this time no formal education and outreach is provided to the community. No known barriers

to running an effective floodplain management program were cited. Additional training and guidance on implementing an effective as well as efficient floodplain management program would be welcomed.

Compliance History

Glen Ridge Borough is currently in good standing in the NFIP and does not have any outstanding compliance issues. The current floodplain administrator has no knowledge of the most recent Community Assistance Visit (CAV) and stated the Borough is currently in the process of scheduling a visit.

Regulatory

Floodplain management regulations in the Borough of Glen Ridge currently meet the FEMA and New Jersey requirements. There are no additional regulations to assist in further implementing floodplain management. Glen Ridge Borough does not currently participate in the Community Rating System (CRS) but would attend a seminar to receive more information.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

None at this time.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

The Borough of Glen Ridge has a Comprehensive Master Plan which is the legal roadmap to planning for appropriate and safe land development. One of their general planning objectives is 'To secure safety from fire, flood, panic and other natural and manmade disasters.' The hazard mitigation plan will be used to guide the addition of hazard information for inclusion in the next Master Plan update. Refer to new action Glen Ridge-11 in Table 9.9-10 below.

The Borough has their ordinances and flood protection measures available on their website. Please visit the Borough of Glen Ridge website at http://www.glenridgenj.org/index.html for further information (FEMA FIS 2014).

The Borough will pursue adding mitigation project funding to their municipal/operating budget. The Borough would like to establish a community resilience committee/advisor. The Borough will keep a list of all properties that experienced damage and had to receive grant money, and a list of all property owners who are interested in mitigation (see new mitigation Action Glen Ridge-18 in Table 9.9-10 below).

In terms of outreach, the Borough would like to increase their outreach to include the following: 1) Conduct outreach on hazards, 2) Provide/attend training on grant application preparation; and 3) reach out to colleges/universities for technical assistance with natural hazard mitigation activities. Refer to new action Glen Ridge-11 in Table 9.9-10 below.

9.9.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.9-9. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Tony's Brook. It is the intent and purpose of this project to make improvements to the retaining walls along Toney's Brook. This will mitigate damage to private properties.	Continuous	The retaining walls are inspected bi-annually as part of the Storm Water Management inspection process. Continues review and improvements are required. This initiative will be carried over to the current mitigation strategy.
2: Bridge projects. Five vulnerable bridges have been identified. It is the intent and purpose of this project to rehabilitate the remaining bridges requiring structural work.	Discontinued for the Borough	Two of the five bridges have been rebuilt. These projects are within the jurisdiction of Essex County. Seeking funding for remaining bridges with Essex County and NJDOT. All bridges are owned and maintained by Essex County or the State of New Jersey. Therefore, this initiative will be not carried over by Glen Ridge. Please refer to Essex County Annex. (Section 9.1)
3: Power system rehabilitation. It is the intent and purpose of this project to harden the electrical distribution system and make it more resilient.	Continuous	The system is currently in the design phase. Project is designated under PSEG NJ Strong Program. Joint project with PSEG and Glen Ridge. This initiative will be carried over to the current mitigation strategy.
4: Retaining walls at Hillside Ave and Bloomfield Ave	Completed	New retaining walls under the bridge are now complete. Additional studies and improvements are necessary which must be done in cooperation with Essex County. This initiative will not be carried over to the current mitigation strategy.
5: Mountainside Hospital	Continuous	Ongoing training between the hospital and multiple agencies is continuous. This initiative will be carried over to the current mitigation strategy.

Completed Mitigation Initiatives Not Identified in the Previous Mitigation Strategy

The Borough of Glen Ridge identified the following projects have been completed or are in-progress, but not included in the 2007 previous mitigation strategy:

- The retaining walls under the bridge at Hillside and Bloomfield Avenues have been repaired.
- Two of the five bridges identified as vulnerable structures have been stabilized.
- A project focusing on the protection and hardening of the power system has entered the design phase.
- Training at Mountainside Hospital continues to ensure personnel are familiar with and have practice emergency operations procedures.

Proposed Hazard Mitigation Initiatives for the Plan Update

The Borough participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Borough participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.9-10 summarizes the comprehensive-range of specific mitigation initiatives the Borough would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.9-11 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.9-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures *	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Glen Ridge-1 (NEW/ LOI)	Obtain back-up power for critical facilities in the Borough to maintain continuity of operations: Currently identified location are: 1.Glen Ridge municipal complex which consists of the Police Department, Ambulance Squad, Administrative Offices and Public Library 2. Glen Ridge would like to acquire a tow-behind generator	Existing	All	1.2 6.1	Engineering Department	High	High 1. $194,350 2. $91,000	HMGP	Short Term DOF	High	SIP	ES
Glen Ridge- 2 (OLD 1)	Tony's Brook. It is the intent and purpose of this project to make improvements to the retaining walls along Toney's Brook. This will mitigate damage to private properties.	Existing	Flood		Department of Public Works	High	$1,000,000	Grants, Capital program	2-3 years	High	SIP	PP
Glen Ridge-3 (OLD 3)	Power system rehabilitation. It is the intent and purpose of this project to harden the electrical distribution system and make it more resilient. The system is currently in the design phase. Project is designated under PSEG NJ Strong Program.	Existing	All Hazards		PSE&G, supported by the Borough	High	High	PSE&G	On-going	High	SIP	PP
Glen Ridge-4 (OLD 5)	Mountainside Hospital: Continue to provide training at Mountainside Hospital continues to ensure personnel are familiar with and have practice emergency operations procedures.	Existing	All Hazards		Public Safety and Merit Health	High	Medium	Grants, Operating budget, Merit Health	On-going	High	EAP	PR
Glen Ridge-5 (NEW)	Rebuild Bloomfield Avenue bridge which spans the Montclair rail line	Existing	All	1.2 2.1	Engineering Department	High	High	Federal, State Grant Opportunities	Long Term DOF	Medium	SIP	SP
Glen Ridge-6 (NEW)	Rebuild Ridgewood Avenue bridge which spans the Boonton rail line	Existing	All	1.2 2.1	Engineering Department	High	High	Federal, State Grant Opportunities	Long Term DOF	Medium	SIP	SP
Glen Ridge-7 (NEW)	Rebuild Ridgewood Avenue bridge which spans the Montclair rail line	Existing	All	1.2 2.1	Engineering Department	High	High	Federal, State Grant Opportunities	Long Term DOF	Medium	SIP	SP

Table 9.9-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures *	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Glen Ridge-8 (NEW)	Upgrade and harden electrical distribution system in the south end of the Borough.	Existing	All	1.2 2.1 6.1	Engineering Department	High	High	Federal, State Grant Opportunities	Long Term DOF	Medium	SIP	SP
Glen Ridge-9 (NEW)	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.											
	See above.	Existing	Flood, Severe Weather, Coastal Storm	1.2 2.2	Borough Engineering via NFIP FPA) with NJOEM, FEMA support	High	High	FEMA Mitigation Grant Programs and local budget (or property owner) for cost share	Ongoing (outreach and specific project identification); Long term DOF (specific project application and implementation)	High	SIP	PP
Glen Ridge-10 (NEW)	The hazard mitigation plan will be used to guide the addition of hazard information for inclusion in the next Master Plan update.	Both	All	All	Planning	High	Low	Local	Short	High	EAP	PR
Glen Ridge-11 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. This program will include: • Conduct outreach on hazards, • Provide/attend training on grant application preparation; • Reach out to colleges/universities for technical assistance with natural hazard mitigation activities.											
	See above.	N/A	All Hazards	3.1	Supervisor's Office	Medium	Low	Municipal Budget; HMA programs with local or county match	Short	High	EAP	PE
Glen Ridge-12 (NEW)	Develop and implement a post-event damage assessment program, including the following elements: • Conduct public outreach/education (see Public Education and Awareness Initiatives above) to inform property owners of the need to report property damage and obtain required permitting when making repairs. • Develop and organize local resources to conduct post-event damage assessments, including substantial damage determinations as warranted. • Develop an inventory (file system and/or database) of losses (incl. loss of service, property damage, economic losses, etc.) as reported to and/or identified by the Town/Village (e.g. building permit process).											
	See above.	Existing	Flood; Severe Storm; Severe Winter Storm;	3.1 3.2 5.1	Engineering (NFIP FPA); Town/Village Supervisor's Office	Medium – High (life Safety; Increased eligibility for	Low-Medium	Municipal Budget	Short	High	LPR, EAP	PE ES

Table 9.9-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures *	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
			Hurricane, Nor'easter			mitigation grant funding)						
Glen Ridge-13 (NEW)	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.	N/A	Flood	1.3 3.2	NFIP FPA, as fully supported by local government officials	Medium - High	Low	Municipal Budget	Short (year 1)	High	LPR, EAP	PR
Glen Ridge-14 (NEW)	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).	N/A	Flood	1.3 3.2	NFIP FPA	Low - Medium	Low	Municipal Budget	Short (year 1)	High	LPR	PR
Glen Ridge-15 (NEW)	Have designated NFIP Floodplain Administrator (FPA), and other local officials who would benefit, become a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training such as FEMA Benefit-Cost Analysis (BCA) and Substantial Damage Estimation (SDE).	N/A	Flood	1.3 3.3 5.2	NFIP FPA	Medium	Low	Municipal Budget	Short (DOF)	High	EAP	PR
Glen Ridge-16 (NEW)	Enhance/expand tree maintenance program (under contract with various vendors) and coordination with utilities (e.g., PSEG).	Existing	Severe Storm; Severe Winter Storm	1.2	Engineering and DPW, working with contractors and local utilities	Medium – High (reduced risk of utility outages; life safety)	Medium	Local Budget	Short	Medium	NRP	NR

Table 9.9-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures *	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Glen Ridge-17 (NEW)	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	N/A	All Hazards	5.3 5.4	Municipality with support from County, NJOEM, FEMA and surrounding communities	Medium	Low	Municipal Budget	Short Term	High	LPR	PR
Glen Ridge-18 (NEW)	The Borough will keep a list of all properties that experienced damage and had to receive grant money, and a list of all property owners who are interested in mitigation.	Both	All Hazards	1.3 3.2	Engineering, DPW, NFIP FPA	Medium	Medium	Municipal Budget	Short Term	Medium	LPR	PR

Notes: Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*
OEM	*Office of Emergency Management*

Costs:
Where actual project costs have been reasonably estimated:

Low	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low	*Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium	*Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low	*Long-term benefits of the project are difficult to quantify in the short term.*
Medium	*Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk*

Costs:		Benefits:	
	project would have to be spread over multiple years.		*exposure to property.*
High	*Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*	*High*	*Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.9-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Glen Ridge-1 (NEW/LOI)	Obtain back-up power for critical facilities in the Borough to maintain continuity of operations	1	1	1	1	1	1	1	1	0	1	1	1	1	1	13	High
Glen Ridge- 2 (OLD 1)	Tony's Brook. It is the intent and purpose of this project to make improvements to the retaining walls along Toney's Brook. This will mitigate damage to private properties.	1	1	1	1	1	1	1	1	0	1	1	1	1	1	13	High
Glen Ridge-3 (OLD 3)	Power system rehabilitation. It is the intent and purpose of this project to harden the electrical distribution system and make it more resilient.	1	1	1	1	1	1	1	1	1	1	1	0	1	1	13	High
Glen Ridge-4 (OLD 5)	Mountainside Hospital	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Glen Ridge-5 (NEW)	Rebuild Bloomfield Avenue bridge which spans the Montclair rail line	1	0	1	1	1	0	1	1	1	1	1	0	1	1	11	Medium
Glen Ridge-6 (NEW)	Rebuild Ridgewood Avenue bridge which spans the Boonton rail line	1	0	1	1	1	0	1	1	1	1	1	0	1	1	11	Medium
Glen Ridge-7 (NEW)	Rebuild Ridgewood Avenue bridge which spans the Montclair rail line	1	0	1	1	1	0	1	1	1	1	1	0	1	1	11	Medium
Glen Ridge-8 (NEW)	Upgrade and harden electrical distribution system	1	1	1	1	1	1	1	1	0	1	1	0	1	1	12	High
Glen Ridge-9 (NEW)	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High

Table 9.9-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
	acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.																
Glen Ridge-10 (NEW)	The hazard mitigation plan will be used to guide the addition of hazard information for inclusion in the next Master Plan update.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Glen Ridge-11 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Glen Ridge-12 (NEW)	Develop and implement a post-event damage assessment program	0	1	1	1	1	1	0	0	0	1	1	0	1	1	9	High
Glen Ridge-13 (NEW)	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.	0	1	1	1	1	1	1	0	0	1	1	1	1	1	11	High

Table 9.9-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Glen Ridge-14 (NEW)	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).	0	1	1	1	1	1	1	0	0	1	1	1	1	1	11	Medium
Glen Ridge-15 (NEW)	Have designated NFIP Floodplain Administrator (FPA), and other local officials who would benefit, become a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training such as FEMA Benefit-Cost Analysis (BCA) and Substantial Damage Estimation (SDE).	0	0	1	1	1	1	1	0	0	1	1	1	1	1	10	High
Glen Ridge-16 (NEW)	Enhance/expand tree maintenance program (under contract with various vendors) and coordination with utilities (e.g., PSEG).	0	1	1	1	1	1	0	0	0	1	1	0	1	1	9	High
Glen Ridge-17 (NEW)	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	0	1	1	1	1	1	0	0	0	1	1	1	1	1	10	High
Glen Ridge-18	The Borough will keep a	0	1	1	1	1	1	0	0	1	1	1	1	0	0	9	Medium

Table 9.9-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
(NEW)	list of all properties that experienced damage and had to receive grant money, and a list of all property owners who are interested in mitigation.																

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.9.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.9.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Borough of Glen Ridge that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Borough of Glen Ridge has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.9.9 Additional Comments

None at this time.

Figure 9.9-1. Borough of Glen Ridge Hazard Area Extent and Location Map

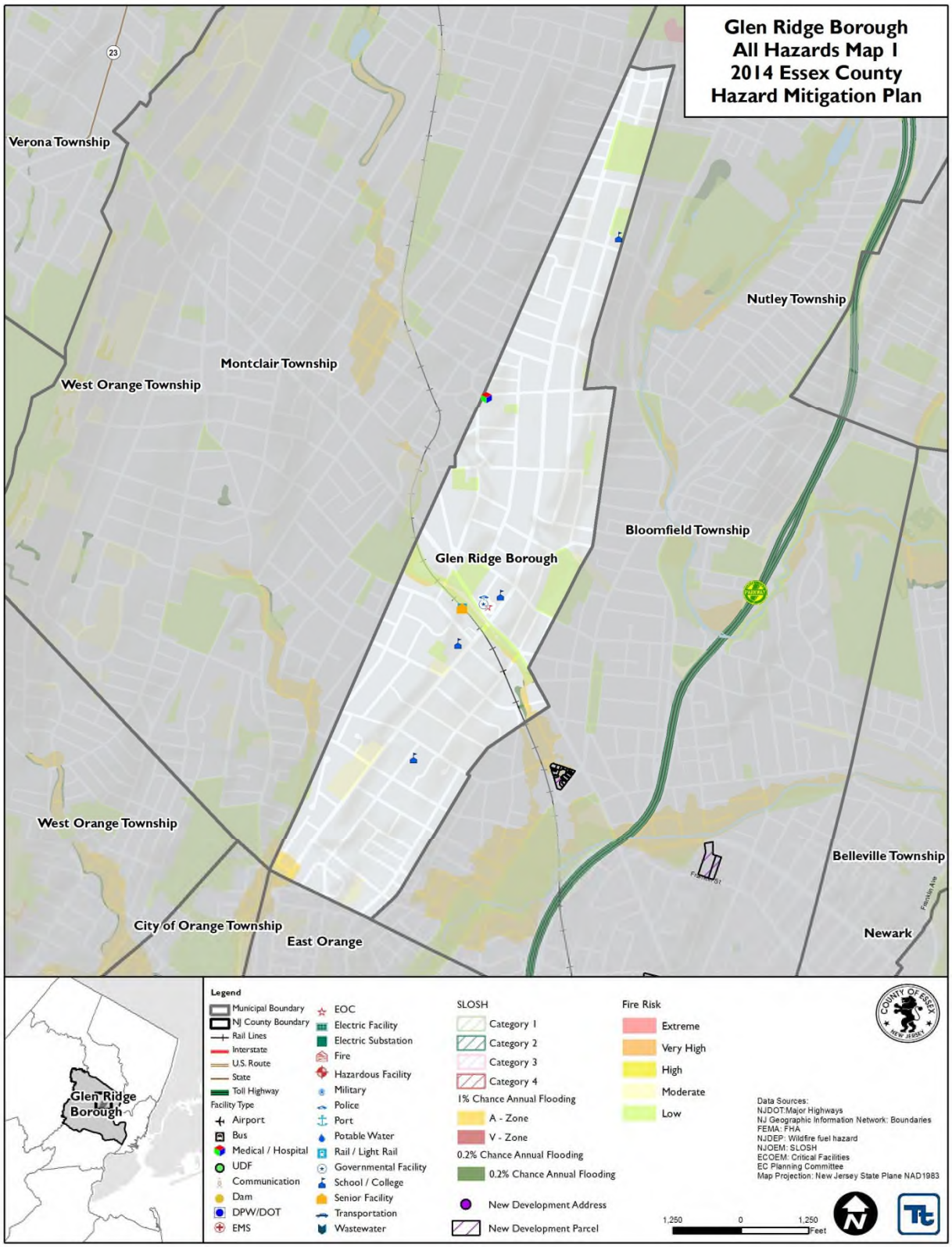
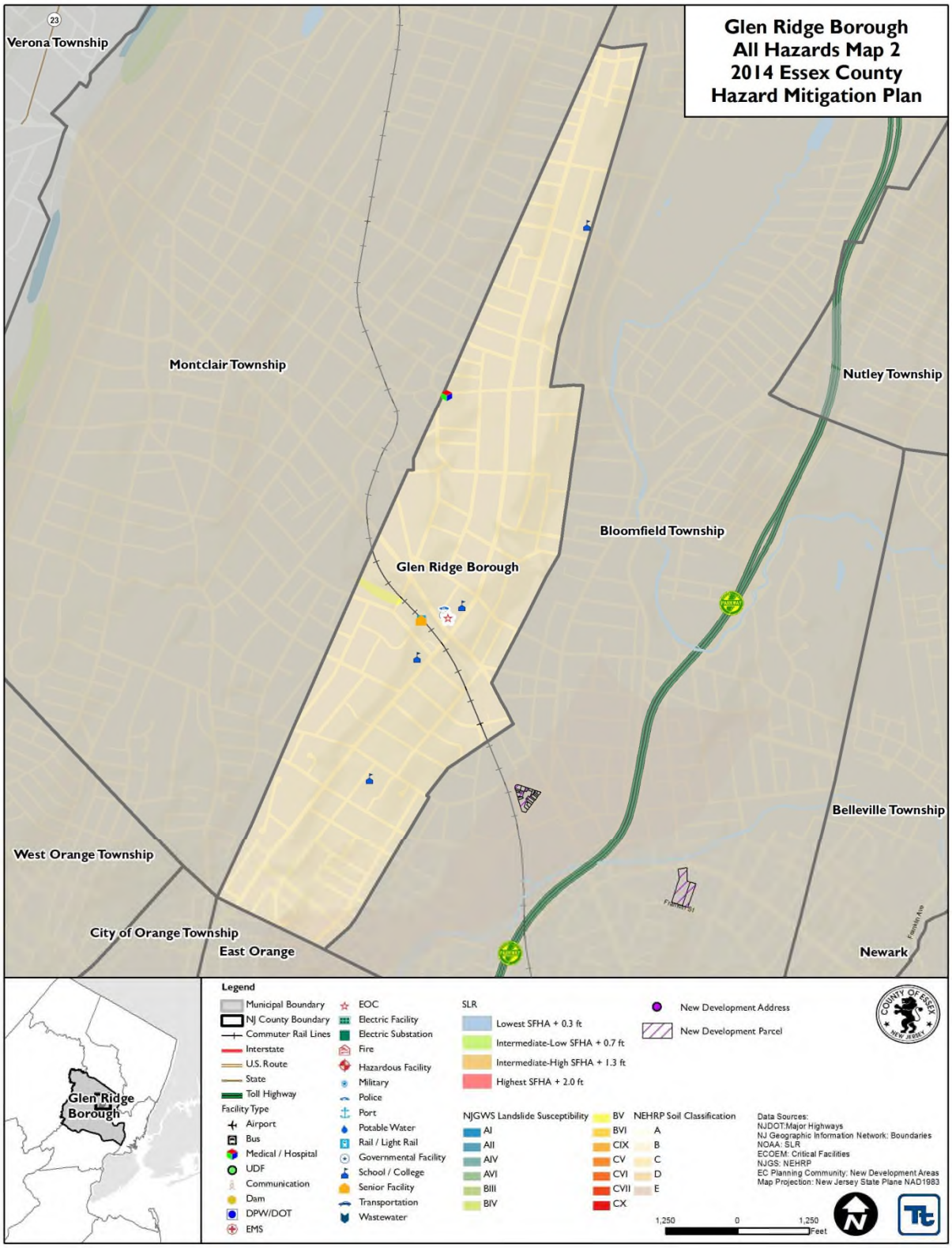


Figure 9.9-2. Borough of Glen Ridge Hazard Area Extent and Location Map



Action Number: **Glen Ridge-1 (NEW/LOI)**

Mitigation Action/Initiative: Glen Ridge municipal building generator

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	Replace current inadequate generator
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Ensure continuity of services and operation of the facility by installing a new generator.
Action/Project Category	SIP
Goals/Objectives Met	Continuity of municipal operations
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$194,350
Priority*	High
Plan for Implementation	
Responsible Organization	Borough of Glen Ridge
Local Planning Mechanism	Engineering
Potential Funding Sources	Grants, Capital program
Timeline for Completion	Short Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: Design Phase

Refer to prioritization table.

Action Number: **Glen Ridge-1 (NEW/LOI)**

Mitigation Action/Initiative: Glen Ridge municipal building generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Glen Ridge-1 (NEW/LOI)**

Mitigation Action/Initiative: Glen Ridge tow behind generator

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	Provide emergency power to various Borough facilities.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Ensure continuity of services and operations for Public Works facilities.
Action/Project Category	SIP
Goals/Objectives Met	Continuity of Operations
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$91,000
Priority*	High
Plan for Implementation	
Responsible Organization	Borough of Glen Ridge
Local Planning Mechanism	Emergency Management
Potential Funding Sources	HMGP, Grants, Capital program
Timeline for Completion	Short Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Glen Ridge-1 (NEW/LOI)**

Mitigation Action/Initiative: Glen Ridge tow behind generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Glen Ridge- 2 (OLD 1)**

Mitigation Action/Initiative: Tony's Brook

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Deteriorated Retaining Walls
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	It is the intent and purpose of this project to make improvements to the retaining walls along Toney's Brook. This will mitigate damage to private properties.
Action/Project Category	NRP
Goals/Objectives Met	Protection of private properties
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$1,000,000
Priority*	Medium
Plan for Implementation	
Responsible Organization	Borough of Glen Ridge
Local Planning Mechanism	Department of Public Works
Potential Funding Sources	Grants, Capital program
Timeline for Completion	4-5 years
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Glen Ridge- 2 (OLD 1)**

Mitigation Action/Initiative: Tony's Brook

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Glen Ridge- 3 (OLD 3)**

Mitigation Action/Initiative: Power system rehabilitation

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Frequent Power Outages
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	It is the intent and purpose of this project to harden the electrical distribution system and make it more resilient by installing new primary feed to the south end of the Borough.
Action/Project Category	SIP
Goals/Objectives Met	Reduce power outages
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	PSE&G
Local Planning Mechanism	Engineering
Potential Funding Sources	PSE&G & Capital Fund
Timeline for Completion	On-going
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: Design Phase

Refer to prioritization table.

Action Number: **Glen Ridge- 3 (OLD 3)**

Mitigation Action/Initiative: Power system rehabilitation

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Glen Ridge- 4 (OLD 5)**

Mitigation Action/Initiative: Mountainside Hospital

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Coordination of Resources
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Continue to provide training at Mountainside Hospital continues to ensure personnel are familiar with and have practice emergency operations procedures.
Action/Project Category	EAP
Goals/Objectives Met	Ensure continuity of operations
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Hackensack/UMC/Mountainside Hospital
Local Planning Mechanism	Public Safety and Hackensack/UMC/Mountainside Hospital
Potential Funding Sources	Grants, Operating budget, Hackensack/UMC/Mountainside Hospital
Timeline for Completion	On-going
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Glen Ridge- 4 (OLD 5)**

Mitigation Action/Initiative: Mountainside Hospital

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Glen Ridge- 5 (NEW)**

Mitigation Action/Initiative: Bloomfield Avenue bridge which spans the Montclair rail line

Assessing the Risk	
Hazard(s) addressed:	All
Specific problem being mitigated:	Bridge is designated for replacement based on inspections.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Rebuild Bloomfield Avenue bridge which spans the Montclair rail line
Action/Project Category	SIP
Goals/Objectives Met	Restore structural integrity of bridge. 1.2, 2.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	NJDOT
Local Planning Mechanism	NJDOT
Potential Funding Sources	NJDOT Capital Fund & Grants
Timeline for Completion	Long Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: Design completed.

Refer to prioritization table.

Action Number: **Glen Ridge- 5 (NEW)**

Mitigation Action/Initiative: Bloomfield Avenue bridge which spans the Montclair rail line

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	Medium	

Action Number: **Glen Ridge-6 (NEW)**

Mitigation Action/Initiative: Ridgewood Avenue bridge which spans the Boonton rail line

Assessing the Risk	
Hazard(s) addressed:	All
Specific problem being mitigated:	Bridge is designated for replacement based on inspections.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Rebuild Ridgewood Avenue bridge which spans the Boonton rail line
Action/Project Category	SIP
Goals/Objectives Met	Restore structural integrity of bridge. 1.2, 2.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	County of Essex
Local Planning Mechanism	County of Essex DPW
Potential Funding Sources	County of Essex Capital Fund & Grants
Timeline for Completion	Long Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Glen Ridge- 6 (NEW)**

Mitigation Action/Initiative: Ridgewood Avenue bridge which spans the Boonton rail line

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	Medium	

Action Number: **Glen Ridge-7 (NEW)**

Mitigation Action/Initiative: Ridgewood Avenue bridge which spans the Montclair rail line

Assessing the Risk	
Hazard(s) addressed:	All
Specific problem being mitigated:	Deteriorated parapet walls & understructure.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Repair bridge.
Action/Project Category	SIP
Goals/Objectives Met	Restore structural integrity of bridge. 1.2, 2.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Essex County
Local Planning Mechanism	Essex County DPW
Potential Funding Sources	Essex County Capital Fund & Grants
Timeline for Completion	Long Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Glen Ridge-7 (NEW)**

Mitigation Action/Initiative: Ridgewood Avenue bridge which spans the Montclair rail line

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	Medium	

Action Number: **Glen Ridge-8 (NEW)**

Mitigation Action/Initiative: Upgrade and harden electrical distribution system

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	It is the intent and purpose of this project to harden the Borough wide electrical distribution system and make it more resilient.
Action/Project Category	SIP
Goals/Objectives Met	Reduce Power Outages 1.2,2.1,6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	PSE&G
Local Planning Mechanism	
Potential Funding Sources	PSE&G
Timeline for Completion	On-going
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Glen Ridge-8 (NEW)**

Mitigation Action/Initiative: Upgrade and harden electrical distribution system

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Glen Ridge-9 (NEW)**

Mitigation Action/Initiative: Vulnerable Structures

Assessing the Risk	
Hazard(s) addressed:	Flood & Severe Weather
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.
Action/Project Category	
Goals/Objectives Met	1.2 2.2
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Borough of Glen Ridge
Local Planning Mechanism	Borough Engineering via NFIP FPA with NJOEM, FEMA support
Potential Funding Sources	FEMA Mitigation Grant Programs and local budget (or property owner) for cost share
Timeline for Completion	Long term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Glen Ridge-9 (NEW)**

Mitigation Action/Initiative: Vulnerable Structures

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Glen Ridge-10**

Mitigation Action/Initiative: Master Plan Update

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	The hazard mitigation plan will be used to guide the addition of hazard information for inclusion in the next Master Plan update.
Action/Project Category	LPR
Goals/Objectives Met	All
Applies to existing, future, or not applicable	Both
Benefits (losses avoided)	High
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Borough of Glen Ridge
Local Planning Mechanism	Planning Board
Potential Funding Sources	Operating Budget
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Glen Ridge-10 (NEW)**

Mitigation Action/Initiative: Master Plan Update

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Glen Ridge-11 (NEW)**

Mitigation Action/Initiative: Outreach

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Conduct outreach on hazards.
	2. Provide/attend training on grant application preparation;
	3. Reach out to colleges/universities for technical assistance with natural hazard mitigation activities
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance.
Action/Project Category	EAP
Goals/Objectives Met	3.1
Applies to existing, future, or not applicable	NA
Benefits (losses avoided)	Medium
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Borough of Glen Ridge
Local Planning Mechanism	Emergency Management
Potential Funding Sources	Operating Budget
Timeline for Completion	Short Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Glen Ridge-11 (NEW)**

Mitigation Action/Initiative: Outreach

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	High	

9.10 Township of Irvington

This section presents the jurisdictional annex for the Township of Irvington.

9.10.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
John A. Wiggins, P.E., P.P., Township Engineer/Engineering Division, Department of Neighborhood Services Municipal Building, 1 Civic Square, Irvington, NJ 07111 Phone: 973-399-6696 E-mail: wiggins@njit.edu	Chief Gary Shumlich, Chief and Director, Irvington Fire Department Municipal Building, 1 Civic Square, Irvington, NJ 07111 Phone: 973-399-6553 E-mail:

9.10.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of Irvington was 53,926.

Location

Township of Irvington has a total land area of 2.930 square miles of which 2.928 square miles is land and 0.002 square miles is water. The bordering communities are Maplewood to the West, Newark to the East, South Orange to the Northwest, and Union and Hillside to the Southwest.

Brief History

The area now known as the Township of Irvington has significant ties to the Revolutionary War when it was known as Clinton Township and later Camptown. What was known as Camptown in 1834 included Irvington, Maplewood, and parts of Newark and South Orange. The name of the Township was changed after the iconic "Camptown Races" ballad written by Stephen Foster in 1850 was published. In order to avoid any association with the song, the name of the Township was changed to Irvington in honor of the author Washington Irving. In 1874, New Jersey approved the political area to be known as the Village of Irvington. On March 2, 1898, Irvington was incorporated as a Town, replacing Irvington Village.

Governing Body Format

Township of Irvington operates its local government with a Mayor-Council form of government under the Faulkner Act. There are seven members of the Council and an elected Mayor. Of the seven council members, four are elected as ward council members and three are elected at large.

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.10-8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.10-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Irvington General Hospital	Residential	700	806-842 Chancellor Avenue B: 324 L: 1	Landslide Class: BIII, Wildfire: Moderate	Municipal Hospital sold for site redevelopment as a 700-unit residential community. Project has been approved by the Planning Board.
Valley Plaza Mall	Commercial	1	468-480 Chancellor Avenue	None	Rehabilitation/ upgrading of existing commercial structure.

** Only location-specific hazard zones or vulnerabilities identified.*

9.10.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.10-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
March 12 — April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	Electrical power was out about 25% of the Township. Minor flooding throughout the Township. The Township had $28,083.78 in damages/losses.
December 26-27, 2010	Severe Winter Storm and Severe Storm	DR-1954	Yes	Roadways were impassable throughout the Township; $135,023.18 in damages/losses.
August 26— September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Evacuation of building due to roof collapse, shelter was open. Electrical power was out about 25% of the Township; 25% of the streets were blocked from trees and downed power lines. Flooding occurred in approximately 25% of the Township. Damage to the water system, no water pressure for seven days; damage to the roof and clock tower of Town Hall; minor structural damage to 250 homes. $369,882.08 in damages/losses.
October 29, 2011	Severe Storm	DR-4048	Yes	Electrical power was out about 25% of the Township, and 30% of the streets were blocked from trees and downed power lines. $192,275.65 in damages/losses.
October 26 —	Hurricane	EM-3354	Yes	Homes were evacuated that were damaged from

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
November 8, 2012	Sandy	DR-4086	Yes	fallen trees, shelter was opened. Electrical power was out about 80% of the Township, 50% of the streets were blocked from trees and downed power lines. Sidewalks, curbing, and roadways damaged. Roofs damaged on three public buildings; 75 homes damaged from fallen trees. $933,386.09 in damages/losses.

9.10.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of Irvington. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Township of Irvington.

Table 9.10-3. Hazard Risk/Vulnerability Risk Ranking

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $1,777,653 2,500-year MRP: $40,636,952	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $4,665,426	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $15,890,400	Occasional	12	Low
Severe Storm	100-Year MRP: $2,433,973 500-year MRP: $15,276,653 Annualized: $199,703	Frequent	48	High
Winter Storm	1% GBS: $17,131,872 5% GBS: $85,659,360	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $0	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.

d. Loss estimates for the flood and earthquake hazards represent both structure and contents.

e. The HAZUS-MH earthquake model results are reported by Census Tract.

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of Irvington.

Table 9.10-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Irvington, Township of	66	86	$485,759.00	6	0	29	41	25

Source: FEMA, 2014

Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.

Note (2) Total building and content losses from the claims file provided by FEMA Region 2.

Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.10-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

Municipality	0.2% Transportation
Township of Irvington	1

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), the two major sources of flooding in the Township of Irvington are the Elizabeth River and inadequate internal drainage. During the August 2, 1973, (40-year recurrence interval, based upon frequency discharge curve for the Elizabeth River at Hillside) storm there was severe flooding throughout the township with many streets being impassable. During the August 17, 1974, (10-percent-annual-chance recurrence interval, based upon frequency discharge curve for the Elizabeth River at Hillside) storm and during Hurricane Doria (2-percent-annual-chance recurrence interval, based upon frequency discharge curve for the Elizabeth River at Hillside) in 1971, the township was declared a flood disaster area (FEMA FIS 2014).

Additional flooding due to inadequate internal drainage has occurred in several areas of Irvington located in the vicinity of Durand Place and Wagner Place, Isabella Avenue and Delmar Place, Augusta Street and Ball Street, and Chestnut Avenue (FEMA FIS 2014).

Additionally, the Township indicated that damages have been suffered during storm events as a function of the failure of certain local systems such as maintenance of the shade tree inventory or localized failure of portions of an aging infrastructure system. This has primarily been noted in localized failures in the sanitary sewer system.

There have been damages suffered through the inability to predict the condition of the storm sewer channels and trunk sewers that run through the Township.

One on-going situation that the Township identified is that of the channel of the Elizabeth River that runs through Irvington Center. This channel was constructed in the 1930s as part of a Public Works Administration project. It experiences localized failures within the masonry wall that is utilized as a portion of the channel improvement. The US Army Corps of Engineers (USACOE) is aware of the project and their responsibility to maintain or repair this channel but lacks the funding to conduct a study or to affect repairs. Contact has been made with our Congressional representatives and the USACOE but, to date, these efforts have not been particularly successful.

The Joint Meeting of Union and Essex County sewers owns and operates a trunk sewer that crosses through the Township. Under several rain events this interceptor has surcharged which indicates either a lack of capacity or an inflow/infiltration problem. This sewer needs investigation and remedial action.

9.10.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of Irvington.

Table 9.10-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Status Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept./Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	Local	Construction Official	Chapter 82; 1997; Periodic updates since 1977
Zoning Ordinance	Y	Local	Zoning Officer	Updated 6/15/04; Periodic updates since 2004
Subdivision Ordinance	Y	Local	Planning Board	Chapter 174; updated 5/14/79; Periodic updates since 1979
NFIP Flood Damage Prevention Ordinance	Y	Local	Engineer	Chapter 107; updated 4/10/07
Cumulative Substantial Damages	N		NA	
Freeboard	N		NA	
Growth Management	Y	Local	Planning Board	
Floodplain Management / Basin Plan	Y	Local	Engineer	Chapter 105; updated 4/10/07
Stormwater Management Plan/ Ordinance	Y	Local	Engineer	Chapter 172; updated 2/14/07
Comprehensive Plan /Master Plan/General Plan	Y	Local	Planning Board	N/A; updated 12/09
Capital Improvements Plan	Y	Local	Municipal Council	Under Development
Site Plan Review Requirements	Y	Local	Engineer	Chapter 174 Section 170:40-43 (8/14/79); Periodic Updates since 8/14/79
Open Space Plan	Y	Local	Engineer	Chapter 174 Section 174:40-43 (8/14/79)
Stream Corridor Management Plan	Y	Local	Engineer	Under Development
Watershed Management or Protection Plan	Y	Local	Engineer	Under Development
Economic Development Plan	Y	Local	Dept. of Community Development and Planning	Under Development
Comprehensive Emergency Management Plan	Y	Local	Office of Emergency Management	Plan is required by the County Office of Emergency Management and updated on a regular basis.

Table 9.10-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Status Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept./Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
			(Fire Dept.)	
Emergency Response Plan	Y	Local	Office of Emergency Management	Plan is required by the County Office of Emergency Management and updated on a regular basis.
Post Disaster Recovery Plan	N			
Post Disaster Recovery Ordinance	N			
Real Estate Disclosure Requirement	N			
Other				

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of Irvington.

Table 9.10-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Dept. of Neighborhood Services/Township Engineer
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Dept. of Neighborhood Services/Township Engineer
Planners or engineers with an understanding of natural hazards	Y	Dept. of Neighborhood Services/Township Engineer
NFIP Floodplain Administrator	Y	John A. Wiggins, P.E., Engineer
Surveyor(s)	N	
Personnel skilled or trained in “GIS” applications	N	
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	N	
Grant Writer(s)	Y	Consultant/ Bruno Associates
Staff with expertise or training in benefit/cost analysis	Y	Township’s Engineer/ Dept. of Neighborhood Services
Professionals trained in conducting damage assessments	Y	Irvington Fire Department

Fiscal Capability

The table below summarizes financial resources available to the Township of Irvington.

Table 9.10-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes – Dept. of Community Development
Capital Improvements Project Funding	No
Authority to Levy Taxes for specific purposes	Yes – Tax Assessor
User fees for water, sewer, gas or electric service	Yes – Tax Collector
Impact Fees for homebuyers or developers of new development/homes	No
Incur debt through general obligation bonds	Yes – Municipal Council
Incur debt through special tax bonds	Yes – Municipal Council
Incur debt through private activity bonds	Yes – Municipal Council
Withhold public expenditures in hazard-prone areas	No
Mitigation grant programs	No
Other	No

Community Classifications

The table below summarizes classifications for community program available to the Township of Irvington.

Table 9.10-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	
Building Code Effectiveness Grading Schedule (BCEGS)	NP	
Public Protection	NP	
Storm Ready	NP	
Firewise	NP	

NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule

- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

John A. Wiggins, P.E., P.P., Township Engineer

Flood Vulnerability Summary

The Township does not maintain lists/inventories of properties that have been damaged by floods. The extent of damage in Irvington Township following Hurricane Sandy and other recent disasters is unknown. No damage has been significant enough to warrant a substantial damage determination.

Resources

The community Flood Damage Prevention Ordinance identifies the Township Engineer as the local NFIP Floodplain Administrator, currently John Wiggins, for which floodplain administration is an auxiliary duty. He is the sole person assuming the responsibility of floodplain administration in Irvington Township.

Currently, NFIP administration services permit reviews as needed. No education and outreach is provided to the community at this time through the NFIP program in Irvington Township.

John Wiggins feels he is not adequately supported to fulfill his responsibilities as the municipal floodplain administrator. Lack of staffing proves to make enforcement of the floodplain management program difficult. John Wiggins is a licensed professional engineer and planner but is not a certified in floodplain management and attends regular continuing education programs. Additional training and information on floodplain management would be welcomed.

Compliance History

The community is in good standing in the NFIP. The current NFIP Floodplain Administrator has no knowledge of when the last CAV was performed. The municipality sees no specific need for a CAV at this time.

Regulatory

The community's Flood Damage Prevention Ordinance was last updated on April 10, 2007, and is found at Chapter 107 of the local code.

Irvington Township floodplain management regulations and ordinances meet FEMA and New Jersey minimum requirements. The Stormwater Management Plan requires the Planning and Zoning Board to review any new development for floodplain compliance issues.

At this time, Irvington Township does not participate in the Community Rating System (CRS) program. Attending a seminar on CRS would be of interest to Irvington Township to familiarize themselves with the program.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

The Township has received a grant for an inventory of local shade trees and has implemented a program to plant new trees in the street tree inventory.

As part of the stormwater permitting process, the Township monitors the conditions of the river channels.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

In accordance with the Township's Flood Control Commission (Chapter 17), the municipal council agrees to participate in the creation and operations of the Elizabeth River Flood Control Commission.

The Township's Stream Corridor Management Plan, Capital Improvement Plan, Water Management Plan and Economic Development Plans are under development. According to the Township, their Continuity of Operations (COOP) Plan integrates hazard mitigation.

The Township is essentially fully developed so that development activities are, for the most part, limited to infill development and the Township's planning and land use mechanisms operate in a more efficient manner than the County Hazard Mitigation Plan.

The regulatory horizon that the Township is faced with, such as Stormwater Act requirements, flood zone regulations, and assorted associated mandatory state regulatory actions, impose a much larger burden upon the Township than the County Hazard Mitigation Plan.

In the past, the Township has funded mitigation projects through their capital improvement budget. In an effort to further enhance the integration of hazard mitigation into their day-to-day operations, the Township will include a line-item in their capital improvement budget for mitigation projects.

The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Irvington website at https://www.irvington.net for further information (FEMA FIS 2014).

9.10.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.10-10. Past Mitigation Initiative Status

Description	Status	Review Comments
1: USACOE to do a study to identify corrective issues with flooding and affect repairs to concrete and masonry flumes	No Progress	The USACOE was contacted concerning the condition of the channel. They responded with a meeting and explained the process for funding. Our Congressional representatives are contacted on a regular basis by the Mayor but there is presently no funding available in the federal budget to fund a feasibility study. Efforts to obtain funding are on-going. This initiative will be carried over to the current mitigation strategy.
2: Effort to police condition of river channels	Continuous	As part of the stormwater permitting process, this is a required activity and is being done annually. This initiative will be carried over to the current mitigation strategy.
3: Sanitary sewers in Columbia Ave. area	Continuous	Several repairs have been made with the result that the problem is being addressed as new problems arise. This initiative will be carried over to the current mitigation strategy.
4: GSP flooding	Discontinued	A portion of the Garden State Parkway was flooded as a one-time event. This was the result of a tree falling into the Elizabeth River downstream of Township borders. The municipality that was responsible has improved their monitoring of the Elizabeth River channel. This initiative will not be carried over to the current mitigation strategy.
5: Hazmat roadway corridors	Continuous	The Hazmat Corridors that were created as part of the County Emergency response plan require constant monitoring for these roadway to maintain their efficiency. This initiative will be carried over to the current mitigation strategy.
6: Utility substations	Discontinued	The operation of the utility substations within the Township are crucial to

Table 9.10-10. Past Mitigation Initiative Status

Description	Status	Review Comments
		maintaining electrical power to the Township and its residents. However, this operation is under the control of others (PSE&G) and beyond the control of the Township. This initiative is not under the jurisdiction of the Township and will not be carried over to the current mitigation strategy.
7:NJ Transit Bus terminal	Completed	This project was completed by NJ Transit. This initiative will not be carried over to the current mitigation strategy.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The Township has identified the following mitigation projects/activities that have also been completed but were not identified in the previous mitigation strategy in the 2007 Plan:

- 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 30ft (FEMA FIS 2014).
- A double culvert was built to accommodate the Garden State Parkway (FEMA FIS 2014).

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.10-11 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.10-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.10-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Irvington-1 (NEW/LOI)	Obtain backup power for critical facilities to ensure continuity of operations. The following Irvington critical facilities have been identified to acquire generators – Fire Station 1 Fire Station 2 Fire Station 4 Chris Gatling Center Irvington Township Fire Hall	Existing	All	1.2 6.1	Office of Emergency Management	High	High $280,300	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Irvington-2 (NEW/AW)	Construction of an Emergency Operations Center	New	All	1.1 1.2 3.1 6.1 6.2	Township of Irvington	High	High $1,100,000	FEMA, Federal grant programs and local capital improvement program	Short Term	High	LPR, SIP	SP ES
Irvington-3 (OLD 1)	ACOE to do a study to identify corrective issues with flooding and affect repairs to concrete and masonry flumes	Existing	Flood	2.1	US ACOE	High	$2,000,000	Federal Earmark	Within a year	High	SIP	PP, SP
Irvington-4 (OLD 2)	Continue to police the condition of river channels. Monitoring is performed annually which is required under the Township Storm water permit. Inspection looks for illicit discharges and structural integrity of the channel.	Existing	Flood	2.3	Township of Irvington Department of Public Works	High	$100,000	Municipal funding	6 months	High	NSP	NR
Irvington-5 (OLD 3)	Sanitary sewers in Columbia Ave. area – action to rehabilitate and monitor the condition of the sewer lines.	Existing	Flood	2.1	Township of Irvington Department of Public Works	High	$1,500,000 $300,000 for Phase I (Ellis Ave.)	CDBG, grant monies, Local capital improvement fund	3 months	Medium	SIP	PP, SP
Irvington-6 (OLD 5)	Hazmat roadway corridors - the identification, monitoring and ability to address hazardous materials within the Township. Reduce exposure to Hazardous Materials being transported in the community	Existing	Hazardous Materials	1.2 3.2	NJ State Police, NJ DOT, Township of Irvington Police Department	High	$200,000		1 year	Medium	EAP, SIP	PP

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Irvington-7 (OLD 6)	Monitor utility substations	Both	All	2.1	PSE&G, Township of Irvington Police Department	High	$200,000	None	Ongoing	Medium	SIP	PP
Irvington-8	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.	Existing	Flood, Coastal Storm, Severe Weather	1.2 2.1	Township with support from homeowners, NJOEM, FEMA	High	High	FEMA HMA funding; local match	Long	Medium	SIP	PP

Notes:

Not all acronyms and abbreviations defined below are included in the table.

**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV *Community Assistance Visit*
CRS *Community Rating System*
DPW *Department of Public Works*
FEMA *Federal Emergency Management Agency*
FPA *Floodplain Administrator*
HMA *Hazard Mitigation Assistance*
N/A *Not applicable*
NFIP *National Flood Insurance Program*
NJDEP *New Jersey Department of Environmental Protection*
NJOEM *New Jersey Office of Emergency Management*
OEM *Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA *Flood Mitigation Assistance Grant Program*
HMGP *Hazard Mitigation Grant Program*
PDM *Pre-Disaster Mitigation Grant Program*
RFC *Repetitive Flood Claims Grant Program*
SRL *Severe Repetitive Loss Grant Program*

Timeline:

Short *1 to 5 years*
Long Term *5 years or greater*
OG *On-going program*
DOF *Depending on funding*

Costs:

Where actual project costs have been reasonably estimated:

Low *< $10,000*

Medium *$10,000 to $100,000*

High *> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low *Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*

Medium *Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*

High *Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:

Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low= *< $10,000*

Medium *$10,000 to $100,000*

High *> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low *Long-term benefits of the project are difficult to quantify in the short term.*

Medium *Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*

High *Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.10-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Irvington-1 (NEW/LOI)	Irvington critical facilities generators.	1	1	1	1	0	0	0	0	0	1	1	1	1	1	9	High
Irvington-2 (NEW/AW)	Construction of an Emergency Operations Center	1	1	1	1	1	1	1	0	1	1	1	1	1	1	13	High
Irvington-3 (OLD 1)	ACOE to do a study to identify corrective issues with flooding and affect repairs to concrete and masonry flumes	1	1	1	1	1	0	0	0	0	0	1	1	1	0	9	High
Irvington-4 (OLD 2)	Effort to police condition of river channels	1	1	1	1	0	0	0	1	0	1	1	1	1	1	11	High
Irvington-5 (OLD 3)	Sanitary sewers in Columbia Ave. area	1	1	1	1	0	0	0	1	0	1	0	1	1	0	8	Medium
Irvington-6 (OLD 5)	Hazmat roadway corridors	1	1	1	1	1	1	0	0	0	0	0	1	1	1	9	Medium
Irvington-7 (OLD-6)	Monitor utility substations	1	1	1	1	0	0	0	1	0	0	0	0	0	1	6	Medium
Irvington-8	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.	1	1	1	1	0	0	0	0	1	0	1	0	1	0	7	Medium

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.10.7 Future Needs To Better Understand Risk/Vulnerability

Irvington is a fully developed community and the risks that face the community result not from a lack of planning to address natural hazards, such as flooding, structures in low lying areas, etc., as these areas do not exist within the Township and are were not and are not permitted within the Township. Rather the challenges that the Township faces in terms of risk/vulnerability are either due to a lack of maintenance and updating of the current facilities that are within the Township or the presence of a new challenge, such as the identification of hazardous materials, terrorism or vandalism that confront the Township.

9.10.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of Irvington that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of Irvington has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.10.9 Additional Comments

None at this time.

Figure 9.10-1. Township of Irvington Hazard Area Extent and Location Map 1

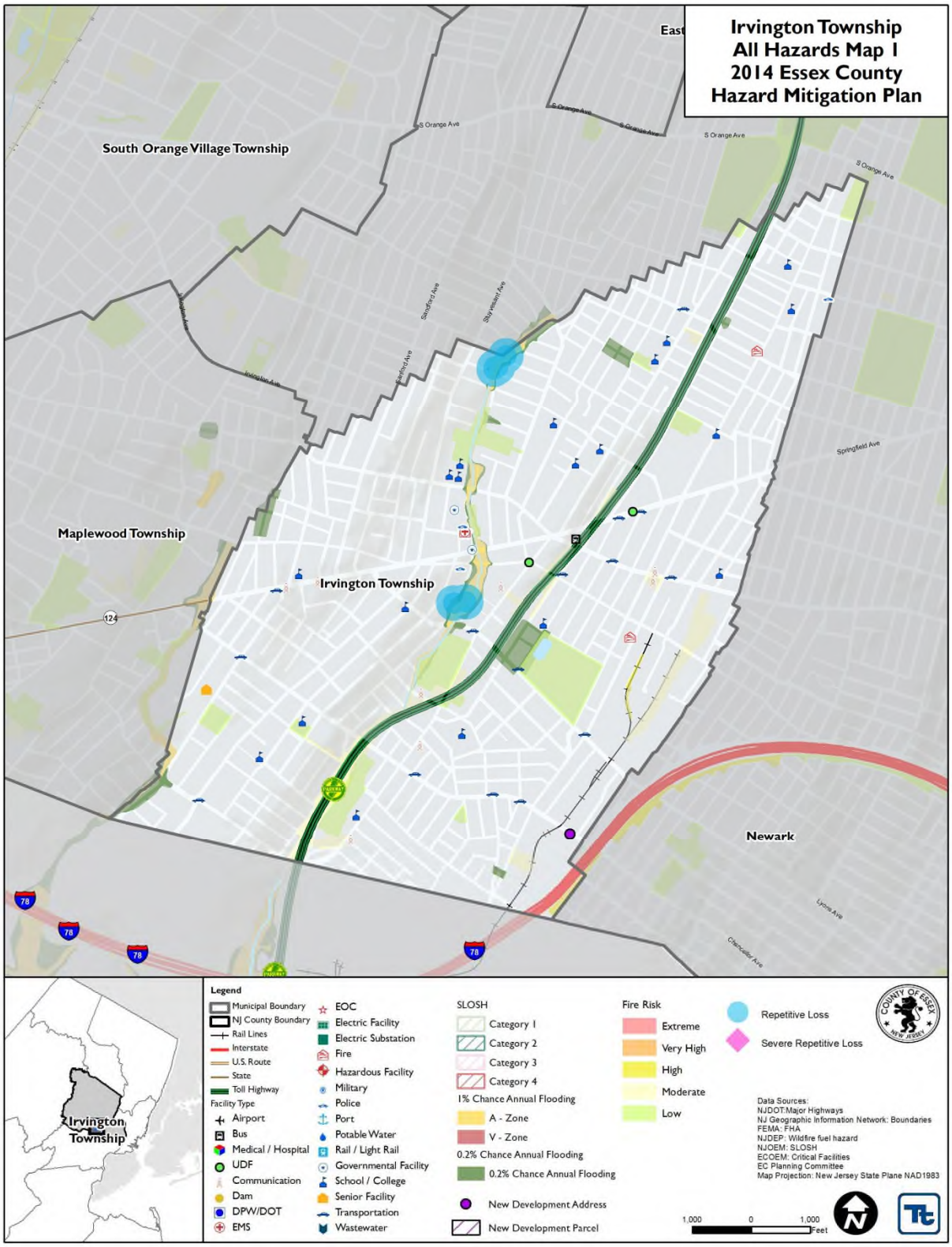
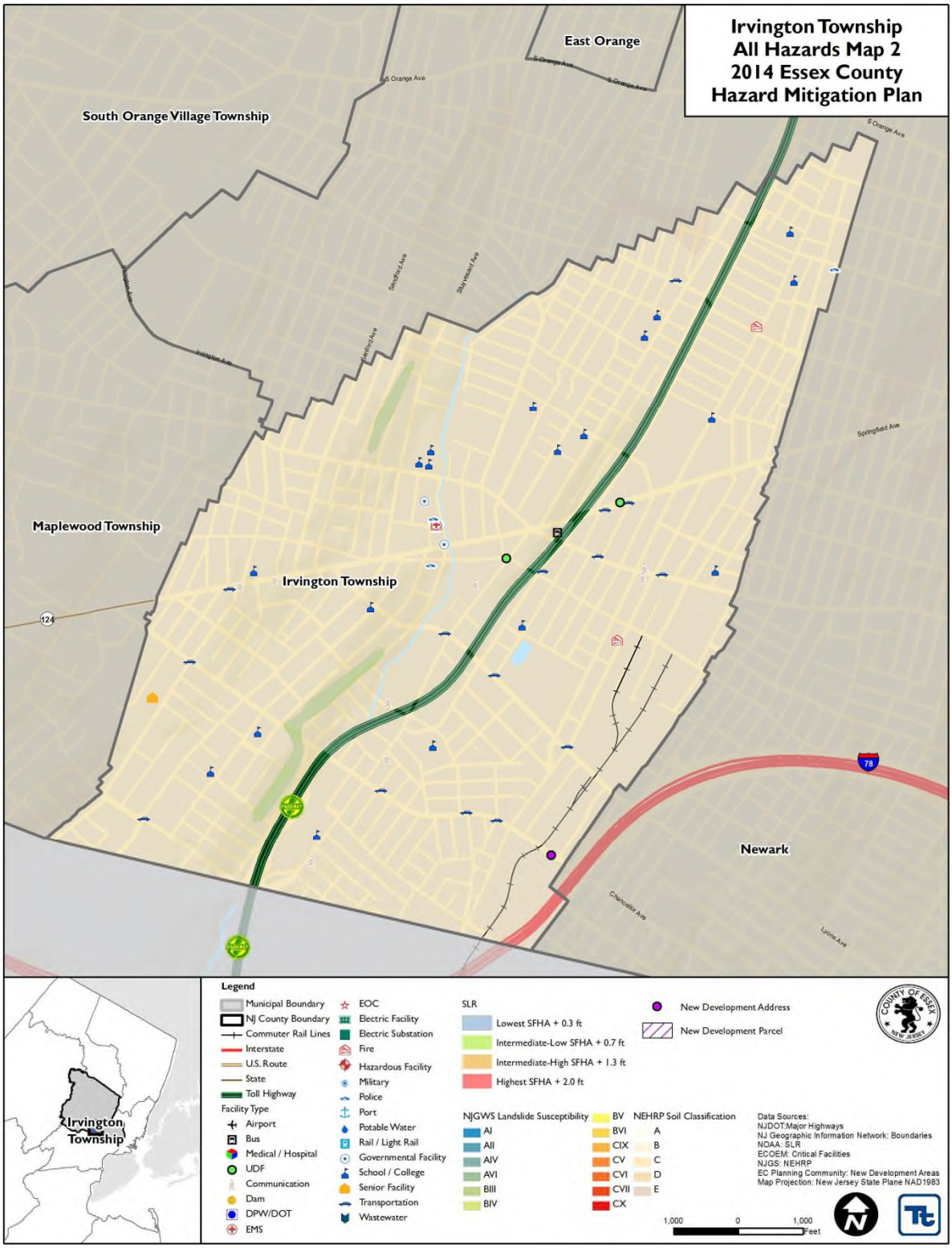


Figure 9.10-2. Township of Irvington Hazard Area Extent and Location Map 2



Action Number: **Irvington-1 (NEW/LOI)**
Mitigation Action/Initiative: Irvington critical facilities generators. 4 facilities

Assessing the Risk	
Hazard(s) addressed:	Power Failure/Power interruption during severe events
Specific problem being mitigated:	Public Safety/Town Hall complex, Fire Stations #2 and #4, and Chris Gatling Center all experience power outages putting vulnerable populations at risk and slowing response times to emergencies.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Install new generators at all locations. Not selected due to cost.
	2. Install new generators in an phased operations, addressing Fire Station 1 first, Fire Stations 2 and 4 next and the Gatling Center last; Selected as the best action as funding will be based on need.
	3. No action. Not selected due to potential damages.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install generators to ensure continuity of operations
Action/Project Category	SIP
Goals/Objectives Met	Avoid disruption of services during severe events
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Loss of functionality
Estimated Cost	$200,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Irvington
Local Planning Mechanism	Municipal Council
Potential Funding Sources	Local Funding supported with grant resources
Timeline for Completion	Short term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date:6/25/14 Progress on Action/Project: Emergency Operations Center is under construction. Grant application for Fire Station is underway. All others pending funding.

Refer to prioritization table in the following subsection.

Action Number: **Irvington-1 (NEW/LOI)**
Mitigation Action/Initiative: Irvington critical facilities generators. 4 facilities

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	Police and Fire Departments are the lead agencies.
Other Community Objectives	1	Gatling Center will also provide emergency housing.
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Irvington-1 (NEW/LOI)**
Mitigation Action/Initiative: Irvington Town Hall Fire Dept. generators

Assessing the Risk	
Hazard(s) addressed:	Power Failure/Power interruption during severe events
Specific problem being mitigated:	Existing generator has outlived its useful lifetime and is subject to failure during emergencies.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Install new generator using grant funds. This option has been selected. 2. Install new generator using Township funds. This option has not been selected. 3. Do nothing. Repair existing generator on an as needed basis. Not Selected.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install new generator
Action/Project Category	SIP
Goals/Objectives Met	Avoid disruption of services during severe events.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Loss of Functionality
Estimated Cost	$48,900
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Irvington
Local Planning Mechanism	Municipal Council
Potential Funding Sources	Grant application
Timeline for Completion	Short Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date:6/25/14 Progress on Action/Project: Grant application process is underway.

Refer to prioritization table in the following subsection.

Action Number: **Irvington-1 (NEW/LOI)**
Mitigation Action/Initiative: Irvington Township Fire Hall generators

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Irvington- 1 (NEW/LOI)**
Mitigation Action/Initiative: Irvington Township Chris Gatling Center

Assessing the Risk	
Hazard(s) addressed:	Power Failure/Power interruption during severe events
Specific problem being mitigated:	Existing generator has outlived its useful lifetime and is subject to failure during emergencies.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Install new generator using grant funds. This option has been selected.
	2. Install new generator using Township funds. This option has not been selected.
	3. Do nothing. This option has not been selected.
Description of Selected Action/Project	Install new generator
Action/Project Category	SIP
Goals/Objectives Met	Avoid disruption of services for emergency shelter.
Applies to existing, future, or not applicable	Existing need
Benefits (losses avoided)	Loss of functionality.
Estimated Cost	$31,400
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Irvington
Local Planning Mechanism	Township of Irvington
Potential Funding Sources	Municipal budget or Capital Improvement Program
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date:6/25/14 Progress on Action/Project: No progress pending budget deliberation

Refer to prioritization table in the following subsection.

Action Number: **Irvington- 1 (NEW/LOI)**
Mitigation Action/Initiative: Irvington Township Chris Gatling Center

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	Champion for the project is the Municipal Administration
Other Community Objectives	1	Ability to provide emergency shelter
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Irvington-2 (NEW/AW)**
Mitigation Action/Initiative: Construction of an Emergency Operations Center

Assessing the Risk	
Hazard(s) addressed:	Creation of an updated Emergency Operations Center(EOC)
Specific problem being mitigated:	Current EOC is at risk for flooding during severe storm events.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Creation of a new EOC and Training Center. Option was abandoned due to budget constraints 2. Abandonment of project due to lack of additional funding. Option was abandoned due to exposure of existing facility. 3. Rehabilitation of existing vacant fire station. This option was selected as being the most cost efficient and being able to construct the project within the project budget.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Creation of updated EOC at Fire Station 4 (Wagner Place Fire House)
Action/Project Category	Local Plans and Regulations (LPR) and Structure and Infrastructure Project (SIP)
Goals/Objectives Met	Creation of an updated EOC within an existing structure based on an available FEMA grant.
Applies to existing, future, or not applicable	Existing Structure
Benefits (losses avoided)	Loss of Functionality
Estimated Cost	$ 1,100,000.00
Priority*	1
Plan for Implementation	
Responsible Organization	Township of Irvington
Local Planning Mechanism	Township of Irvington
Potential Funding Sources	FEMA and Local Capital Improvement Program
Timeline for Completion	Short - Within the calendar year 2014
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 6/25/14 Progress on Action/Project: Project under construction.

Refer to prioritization table in the following subsection.

Action Number: **Irvington-2 (NEW/AW)**
Mitigation Action/Initiative: Construction of an Emergency Operations Center

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Present EOC is at often at risk during flooding situations.
Property Protection	1	Having a functional, up to date EOC will provide to better deployment of emergency services to serve Township residents.
Cost-Effectiveness	1	Plan is to rehabilitate an existing underutilized fire house so that only interior renovations, although extensive, are required.
Technical	1	Project will provide a safe environment for the operation of the EOC and provide updated equipment.
Political	1	The Municipal Council supports this project.
Legal	1	As a portion of the funding for this project was obtained from FEMA, approval from NJDEP for the historical aspects of the building needed to be acquired.
Fiscal	1	The current funding is a match (25/75) of municipal/FEMA funds.
Environmental	0	There are no adverse impacts from this project.
Social	1	The neighborhood is in support of the project as it will reestablish a fire department presence in the neighborhood.
Administrative	1	The fire department has indicated an ability to staff the facility.
Multi-Hazard	1	The EOC will be able to respond to multi-hazards as well as supply an emergency shelter for displaced persons.
Timeline	1	Short - The construction of project should be awarded shortly. The completion of the project should be accomplished by December, 2014.
Agency Champion	1	The Township, as a whole, and the Fire Department are the champions of the project.
Other Community Objectives	1	The project meets community objectives in providing an updated EOC as well as having the capability of providing some emergency shelter housing.
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Irvington-3 (OLD 1)**

Mitigation Action/Initiative: ACOE to do a study to identify corrective issues with flooding and affect repairs to concrete masonry flumes.

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Local flooding and damage to existing structures due to failure of existing concrete flume that conveys the easterly branch of the Elizabeth through the Township.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Do nothing. This option is **not** selected.
	2. Have USACOE conduct feasibility study to determine appropriate actions. This is the selected option.
	3. Have Township conduct the study. This is **not** a selected option as the property in question is not under the jurisdiction of the Township.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Have USACOE conduct feasibility study to determine appropriate actions
Action/Project Category	SIP
Goals/Objectives Met	Prevent local flooding and structures damage
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Flooding damage and loss of structures
Estimated Cost	$2,000,000
Priority*	High
Plan for Implementation	
Responsible Organization	USACOE
Local Planning Mechanism	Municipal Council
Potential Funding Sources	Federal earmark
Timeline for Completion	Medium
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 6/25/14 Progress on Action/Project: No action since last report.

Refer to prioritization table in the following subsection.

Action Number: **Irvington-3 (OLD 1)**

Mitigation Action/Initiative: ACOE to do a study to identify corrective issues with flooding and affect repairs to concrete masonry flumes

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Irvington-4 (OLD 2)**
Mitigation Action/Initiative: Effort to police condition of river channels

Assessing the Risk	
Hazard(s) addressed:	Flooding and Stormwater system functionality
Specific problem being mitigated:	Monitoring of condition of storm water channel and operation of stormwater system.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Monitor condition of system by evaluating channel condition and discharges. This is the selected option.
	2. Do nothing. This is not a selected option as this project is not only indicated, it is also a state mandate.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Township Engineer to inspect condition of channel with the assistance of the Police and fire departments, as needed and formalize findings into an annual report.
Action/Project Category	NRP
Goals/Objectives Met	Local flooding, storm water system operation and state mandate.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Flooding, sewer failure, illicit discharges
Estimated Cost	$100,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Irvington Department of Public Works
Local Planning Mechanism	Township Department of Public Works
Potential Funding Sources	Grant and municipal fund
Timeline for Completion	6 months
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 6/25/14 Progress on Action/Project: Inspection to be conducted annually in July.

Refer to prioritization table in the following subsection.

Action Number: **Irvington-4 (OLD 2)**
Mitigation Action/Initiative: Effort to police condition of river channels

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	Department of Public Works
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Irvington-5 (OLD 3)**
Mitigation Action/Initiative: Sanitary sewers in Columbia Ave. area

Assessing the Risk	
Hazard(s) addressed:	Sanitary sewer system operation
Specific problem being mitigated:	Backup of sewage into resident's homes
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Do nothing. This is not a selected option
	2. Authorize a detailed engineering study to analyze the condition of the existing system and prepare detailed plans and specifications to address the problem. This is not a selected option due to lack of funding.
	3. Monitor the condition of the system and respond to the situations as they arise on an emergency basis. This is the selected option due to available funding.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Monitor the condition of the system and respond to the situations as they arise on an emergency basis.
Action/Project Category	SIP
Goals/Objectives Met	Reduce/eliminate sanitary sewer system failures
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Health risk of sanitary waste
Estimated Cost	$ 300,000 Phase 1
Priority*	Medium
Plan for Implementation	
Responsible Organization	Township of Irvington Department of Public Works
Local Planning Mechanism	Department of Public Works
Potential Funding Sources	CDBG, grant monies, local capital improvement fund
Timeline for Completion	On going
Reporting on Progress	
Date of Status Report/ Report of Progress	Date:6/25/14 Progress on Action/Project: Project is on going

Refer to prioritization table.

Action Number: **Irvington-5 (OLD 3)**
Mitigation Action/Initiative: Sanitary sewers in Columbia Ave. area

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	Department of Public Works
Other Community Objectives	0	
Total	7	
Priority (High/Med/Low)	Medium	

Action Number: **Irvington-6 (OLD 5)**
Mitigation Action/Initiative: HAZMAT roadway corridors

Assessing the Risk	
Hazard(s) addressed:	Hazardous Materials monitoring
Specific problem being mitigated:	Awareness of Hazardous Materials
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Conduct a study of Hazardous Materials on roadways
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Conduct a study or Hazardous Materials in transit through Township
Action/Project Category	EAP, SIP
Goals/Objectives Met	1.2; 3.2
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$200,000
Priority*	Medium
Plan for Implementation	
Responsible Organization	NJ State Police, NJ DOT, Township of Irvington Police Department
Local Planning Mechanism	Irvington Police Department
Potential Funding Sources	Grant Funding
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date:6/25/14 Progress on Action/Project: None since last report.

Refer to prioritization table.

Action Number: **Irvington-6 (OLD 5)**
Mitigation Action/Initiative: HAZMAT roadway corridors

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	Medium	

Action Number: **Irvington-7 (OLD 6)**
Mitigation Action/Initiative: Utility substations

Assessing the Risk	
Hazard(s) addressed:	All hazards
Specific problem being mitigated:	Service Interruption
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Do nothing. This is not the selected option
	2. Monitor activities of the Utility companies. This is a selected option.
	3. Coordinate activities of utility activities. This is also a selected option.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Combination of options
Action/Project Category	SIP
Goals/Objectives Met	Loss of functionality
Applies to existing, future, or not applicable	New
Benefits (losses avoided)	Loss of functionality
Estimated Cost	$200,000
Priority*	
Plan for Implementation	
Responsible Organization	PSE&G, Township of Irvington Police Department
Local Planning Mechanism	None
Potential Funding Sources	None
Timeline for Completion	Ongoing
Reporting on Progress	
Date of Status Report/ Report of Progress	Date:6/25/14 Progress on Action/Project: Ongoing.

Refer to prioritization table.

Action Number: **Irvington-7 (OLD 6)**
Mitigation Action/Initiative: Utility substations

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	0	
Agency Champion	0	
Other Community Objectives	1	
Total	6	
Priority (High/Med/Low)	Med	

9.11 Township of Livingston

This section presents the jurisdictional annex for the Township of Livingston.

9.11.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Chief Craig Handschuch, Police Chief/OEM Coordinator 333-357 South Livingston Ave., Livingston, NJ 07039 Phone: 973-436-4320 E-mail: Chandschuch@livingstonnj.org	Chief Christopher Mullin, Fire Chief/Dep.OEM Coordinator 62 South Livingston Ave., Livingston, NJ 07039 Phone: 973-992-2373 E-mail: Cmullin@livingstonnj.org

9.11.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of Livingston was 29,366.

Location

Livingston Township is located 21.9 miles west of New York City, providing easy commuting access for residents through public transportation or personal vehicle (Township of Livingston, 2014). The land area of Livingston Township encompasses 14.08 square miles with 13.77 square miles being land and 0.31 square miles being water. To the west is Florham Park, to the south is Short Hills, to the east is South and West Orange, and to the north is Roseland.

Brief History

Livingston Township is named for the first Governor of New Jersey who also had an integral role in the formation of the United States Constitution, William Livingston. Seven Hamlets, Teedtown, Northfield, Morehousetown, Cheapside, Washington Place, and Squiretown, resided in the area prior to coming together to create Livingston Township (Township of Livingston, 2014).

Governing Body Format

The Council-Manager form of government was started in Livingston Township in 1957. The Town Council consists of five Livingston residents. From the members of the town council, the Mayor is chosen (Township of Livingston, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.11.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.11-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Hillside Northfield	Residential	80 units	B: 5500 L: 9	None	PB approved
Hillside Northfield	Residential	80 units	B: 5500 L: 8	None	PB approved
Hillside Northfield	Residential	80 units	B: 5500 L: 7	None	PB approved
Hillside Northfield	Residential	80 units	B: 5500 L: 5	Wildfire: Low	PB approved
Kushner	Residential	225	S. Orange Ave. B: 6100; L: 35	ND	Under review
Squiretown	Residential	220 units	B: 5900 L: 42	Wildfire: Moderate NEHRP: D	PB approved
Squiretown	Residential	220 units	B: 5900 L: 37	Wildfire: Moderate NEHRP: D	PB approved
Squiretown	Residential	220 units	B: 5900 L: 36	Wildfire: Moderate NEHRP: D	PB approved
Squiretown	Residential	220 units	B: 5900 L: 35	Wildfire: Moderate NEHRP: D	PB approved
Squiretown	Residential	220 units	B: 5900 L: 34	Wildfire: High NEHRP: D	PB approved
Squiretown	Residential	220 units	B: 5900 L: 33	Wildfire: High NEHRP: D	PB approved
St. Barnabas Ambulatory Care	Commercial	42,000 square feet	S. Orange Ave. B: 6101; L: 48	ND	Under review
TMB	Residential	62	S. Orange Ave. B: 7001; L: 1.01	ND	PB Approved

* Only location-specific hazard zones or vulnerabilities identified.

Note: ND = Not determined because potential new development could not be located.

9.11.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.11-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
June 10, 2008	Severe Storms	N/A	N/A	The municipality did not report any damages for the HMP.

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
March 12 – April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	The municipality did not report any damages for the HMP.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	The municipality did not report any damages for the HMP.
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	The municipality did not report any damages for the HMP.
October 29, 2011	Severe Storm	DR-4048	Yes	The municipality did not report any damages for the HMP.
October 26 – November 8, 2012	Hurricane Sandy	EM-3354 DR-4086	Yes Yes	The municipality did not report any damages for the HMP.

9.11.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of Livingston. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Township of Livingston.

Table 9.11-3. Hazard Risk/Vulnerability Risk Ranking

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $3,364,630 2,500-year MRP: $75,061,414	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $22,064,214	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $3,920,400	Rare	6	Low
Severe Storm	100-Year MRP: $3,228,158 500-year MRP: $23,267,683 Annualized: $250,796	Frequent	48	High
Winter Storm	1% GBS: $33,773,019 5% GBS: $168,865,095	Frequent	54	High

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $1,189,000	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.

d. Loss estimates for the flood and earthquake hazards represent both structure and contents.

e. The HAZUS-MH earthquake model results are reported by Census Tract.

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of Livingston.

Table 9.11-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Livingston, Township of	323	154	$1,162,839.00	4	0	97	114	209

Source: FEMA, 2014

Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.

Note (2) Total building and content losses from the claims file provided by FEMA Region 2.

Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.11-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

Municipality	1% EMS	0.2% EMS
Township of Livingston	1	1

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), the Livingston area is subject to frequent rainfalls of great intensity and varying origin. The rainfall may be from local thunderstorms, hurricanes, storms originating over the Atlantic Ocean, or storms coming from the mainland. High intensity, short duration storms tend to cause flooding of the smaller drainage basins of the Township. Lower intensity, longer duration storms are more troublesome to the waterways with larger tributary areas, such as Canoe Brook and the Passaic River (FEMA FIS 2014).

The Township of Livingston is highly developed with buildings and paved areas covering a significant portion of the land area and effectively reducing the amount of land available to absorb precipitation. Throughout most of the Township, the surface soil has a relatively low permeability, although there are a few local deposits of sand and gravel. In general, the slope of the terrain varies from one percent to ten percent throughout most of the Township. The low permeability of the soil, the steep slope of the terrain, and the high degree of development in Livingston all contribute to relatively high amounts of runoff, especially from the high intensity storms experienced on the east coast of the United States. The runoff is carried in open waterways to the Passaic River. The present problems due to storm water runoff are principally related to high velocity flow, channel erosion (particularly in upstream areas), and subsequent depositions of rock and silt in the downstream portions of the brooks (FEMA FIS 2014).

Local flooding in Livingston is generally due to inadequate storm sewers, high-water elevations in the streams to which the storm sewers discharge, or blockages, such as silting of the stream channel at the point of discharge from a storm sewer. In addition to causing silting and blockage of the stream channel, the erosion caused by the high velocities also undermines the embankments of the streams and affects the adjacent land area. This type of damage is caused not only by severe floods but also by the cumulative effects of lesser, but more frequent storms (FEMA FIS 2014).

The downstream portions of Canoe Brook and Slough Brook, as well as the land area bordering the Passaic River, are greatly influenced by high water levels in the Passaic River. A historic flood in Livingston in the Passaic River Basin occurred during October 1903; however, because of the low level of development at that time, damages were not too severe. The storm of October 1903 was centered over Paterson, where a total of 15.5 inches of rainfall was recorded (FEMA FIS 2014).

A review of the great storms which have occurred in the northeastern states reveals that the Rahway River and its tributaries are located in the North Atlantic storm belt. Under extremely intensive and prolonged rains, the East Branch Rahway River, its tributary, Crooked Brook, and Lightning Brook, a tributary of the Elizabeth River, overflow their banks in the Township of Maplewood. Also some bridges over East Branch Rahway River are topped by floodwaters thus making roads impassable (FEMA FIS 2014).

Additionally, the municipality has identified the following hazard problems and/or problem areas:

Flood and Severe Storms

- Dorsa Avenue/Navlon Avenue/Navlon Place – Substantial flooding occurs during major rain events in which the Passaic River overflows its banks and floods the industrial area. This area is generally closed and the buildings are not accessible by vehicles. This flooding and the fact that these buildings are not accessible by fire apparatus increase the possibility of a substantial large scale fire loss in the industrial section of the Township.
- 235 South Livingston Avenue (Town Garage) – During periods of heavy rain, water from the brook behind the garage overfills its banks and comes into the garage, causing a hazard for equipment and personnel. The Township has lost vehicles and equipment. In an emergency, DPW is sometimes ineffective because they are dealing with an emergency in their own facility.
- Broadlawn Place – During a one inch or greater rain event, the roadway floods to impassable levels because Canoe Brook has a drainage problem in this area. During substantial periods of rain, people from adjoining houses have had to evacuate.
- Royal Avenue – During substantial rain, Royal Avenue floods, making it impassable to traffic and the road has to be closed until the water recedes.
- Robert Harp Drive – The oval between St. Philomena's and 5 Livingston Avenue floods during heavy rain events.
- Falcon Road – During major storm events, Falcon Road between the path and West Oakwood Avenue becomes impassable to traffic.
- Hillside Terrace, Zahn Terrace, Charles Street, Grand Terrace – During periods of major storms, this entire area becomes impassable to traffic and requires the roads to be closed.
- Route 10 East/West – In front of Pizzeta, during heavy rains (one inch or greater), it becomes impassable.
- Bryant Drive/Madison Court – During major events, these two adjoining roads become dangerous to vehicle traffic and need to be closed down.

9.11.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of Livingston.

Table 9.11-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y		Building	Chapter 110, 2010
Zoning Ordinance	Y		Planning, Building & Zoning	Chapter 170, 2010
Subdivision Ordinance	Y		Planning, Building & Zoning	Chapter 170-IX
NFIP Flood Damage Prevention Ordinance	Y		Engineering	Chapter 170-X, 2007
Cumulative Substantial Damages				
Freeboard				
Growth Management				
Floodplain Management / Basin Plan				
Stormwater Management Plan/Ordinance	Y		Engineering	Chapter 170-XIII, 2006
Comprehensive Plan / Master Plan/ General Plan	Y		Planning	2007
Capital Improvements Plan	Y		Finance	Annual
Site Plan Review Requirements	Y		Planning & Engineering	Chapter 170-IX, Various
Open Space Plan	Y		Planning	2002
Stream Corridor Management Plan				
Watershed Management or Protection Plan				
Economic Development Plan				
Comprehensive Emergency Management Plan	Y		Police	
Emergency Response Plan				
Post Disaster Recovery Plan				
Post Disaster Recovery Ordinance				
Real Estate Disclosure Requirement				
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]				

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Riparian zone protection	Y			Ordinance 8-2011, 2011
Steep slope protection	Y			Ordinance 24-2009, 2009
Lot Surface Drainage permit	Y	Local	Livingston Engineering Department	Ordinance 35-2008, 2008

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of Livingston.

Table 9.11-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Planning & Engineering
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineering
Planners or engineers with an understanding of natural hazards	Y	Planning & Engineering
NFIP Floodplain Administrator	Y	Engineering, Richard Calbi
Surveyor(s)	N	
Personnel skilled or trained in “GIS” applications	Y	Planning & Engineering
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	N	
Grant Writer(s)	N	
Staff with expertise or training in benefit/cost analysis	N	
Professionals trained in conducting damage assessments	N	

Fiscal Capability

The table below summarizes financial resources available to the Township of Livingston.

Table 9.11-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes, Manager's Office
Capital Improvements Project Funding	Yes, Finance
Authority to Levy Taxes for specific purposes	
User fees for water, sewer, gas or electric service	Yes, Finance
Impact Fees for homebuyers or developers of new development/homes	Yes, Planning and Engineering
Incur debt through general obligation bonds	Yes, Finance
Incur debt through special tax bonds	
Incur debt through private activity bonds	
Withhold public expenditures in hazard-prone areas	
Mitigation grant programs	
Other	

Community Classifications

The table below summarizes classifications for community program available to the Township of Livingston.

Table 9.11-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	N/A
Building Code Effectiveness Grading Schedule (BCEGS)		
Public Protection		
Storm Ready	NP	N/A
Firewise	NP	N/A

N/A = Not applicable. NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html

- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Richard Calbi, Township of Livingston-Engineer

Flood Vulnerability Summary

The aftermath of the two biggest tropical storms in recent history, Hurricanes Irene and Sandy, did not result in significant flooding damage in Livingston Township. Though some flood damage may have occurred following Hurricane Irene, none was reported. Livingston Township does not maintain an inventory of properties damaged during flooding nor of flood-damaged properties that have owners interested in mitigation.

Substantial Damage determinations are not conducted by the Floodplain Administrator. This task is the responsibility of the Department of Public Works for Township-owned properties.

Resources

The community FDPO identifies the Township Engineer as the local NFIP Floodplain Administrator, Richard Calbi, for which floodplain administration is an auxiliary duty.

In addition to the NFIP FPA, the community has supplementary staff for which NFIP is an auxiliary duty; personnel include the Assistant Township Engineer, Jannette Harduby.

Duties and responsibilities of the Township Engineer/NFIP Administrator are using GIS during permit reviews to determine flood risk and provide construction recommendations to ensure compliance with floodplain ordinances. Currently there is no direct public education and outreach conducted in Livingston Township. Online resources are available to the community on the Township website.

The major barrier to running a more effective floodplain management program in Livingston Township is a lack of training. More in-depth training and exposure to floodplain management implementation would help the program greatly and be welcomed.

Regulatory

The community is in good standing in the NFIP. The current NFIP Floodplain Administrator has no knowledge of when the last CAV was performed. The municipality sees no specific need for a CAV at this time.

Floodplain management regulations do not exceed FEMA and New Jersey minimum requirements. Additional ordinances supporting floodplain management in Livingston Township include the need for a Lot Surface Drainage permit for single family residences changing the grade of the property. This permit is reviewed for compliance with the floodplain management ordinance prior to approval.

Livingston Township does not currently participate in the Community Rating System (CRS) program. To gain familiarity with the program and determine the Township's options as a member, the Floodplain Administrator would consider attending a seminar on CRS.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

Previous actions that are now on-going programs and capabilities are described below. Refer to Table 9.X-11 presented later in this annex.

The municipality has identified the following mitigation projects/activities that have been completed:

- North Hillside Booster Station- Replacement of emergency generator, pending the release of funding from grant. The design is underway.
- Bear Brook Dam – a classification study has been completed and submitted to NJDEP for approval. The Township will be developing an Emergency Action Plan for the dam structure.
- Road drainage improvements are included in every road project. The Township improved curbside drainage collection with the additional of new inlets and piping.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

It is the intention of this municipality to incorporate mitigation planning as an integral component of daily municipal operations. Currently, the Township has the following special purpose ordinances:

- Riparian zone protection
- Steep slope protection
- Log surface drainage permit

According to the preliminary 2014 FEMA FIS, the Township of Livingston established regulations to prevent flooding problems along the Passaic River.

The Township's 2011 Master Plan is their legal roadmap to planning for appropriate and safe land development. Their objectives include the following which contain hazard mitigation components:

- To secure safety from fire, flood and other natural or man-made disasters.
- To promote the conservation of open space through the protection of forests, woodlands, wetlands, floodplains, marsh and aquifer recharge areas, stream corridors, steep slopes and valuable natural resources; to prevent degradation of the environment through improper use of land; and, to prevent negative environmental impact upon property adjacent to property being developed.

In an effort to reduce stormwater runoff and stormwater flooding, the Township will evaluate all new development to reduce stormwater runoff. In addition, the Township will develop and implement an easement and culvert cleaning plan. Refer to their new mitigation actions Livingston-4 through Livingston-6 in Table 9.11-11.

To prevent negatively impacting properties adjacent to rivers/streams, the Township proposes to conduct regular stream clearing and restoration to reduce flooding and streambank erosion that is impacting private

residents. Refer to Table 9.11-11, new mitigation action Livingston-2. These meets the Master Plan objective noted above.

In addition, the general recommendations for change in the Land Use Element includes rezoning a site located in the flood hazard area of the Passaic River and preserving the wetland and flood hazard areas as open space.

The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Livingston website at http://www.livingstonnj.org for further information (FEMA FIS 2014).

9.11.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.11-10. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Relocate DPW garage.	In Progress, 5% Completed	Alternatives study completed in 2013. Awaiting Township Council decision on recommendations. This initiative will be included in the new mitigation strategy.
2: Township flood mitigation plan. Develop a plan that identifies all localized flooding outside of FEMA designated zones and devise mitigation options to eliminate these hazards.	No Progress	Lack of funding for study. This initiative will be included in the new mitigation strategy. Though lack of funding is cited as the reason for no progress, this is an important strategy for Livingston.
3: Roadway flooding between municipalities.	Discontinue	Low priority. Essex County Road/ Bridge Authority is the lead agency for this project. Therefore, this initiative will be not carried over by Livingston. Please refer to Essex County Annex. (Section 9.1)
4: Canoe Brook Reservoir.	Discontinue	Privately owned. This action will not be carried forward.
5: Increase stormwater runoff due to adjacent development.	Continuous	All new development evaluated for impacts. This initiative will be included in the new mitigation strategy.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The following initiatives have been completed by the municipality. These initiatives were not identified in the previous mitigation strategy in the 2007 Plan.

- Bear Brook Dam: A classification study has been completed and submitted to NJDEP for approval. The Township will be developing an Emergency Action Plan for the dam structure.
- Road Drainage Improvements: Included in every road project, the Township improves curbside drainage collection with the addition of new inlets and piping.
- 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 (FEMA FIS 2014).
- 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 (FEMA FIS 2014).

- 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 750ft. 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 (FEMA FIS 2014).

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.11-11 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.11-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.11-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Livingston-1 (NEW)	Provide emergency backup power at critical facility locations to ensure utilities can function during power outages. Facilities identified at this time: 1.Livingston Senior Center 2. Livingston North Hillside water booster station	New and Existing	All	1.2 6.1	Office of Emergency Management	High	High 1.$140,000 2.$82,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Livingston-2 (NEW)	Conduct stream cleaning and restoration to reduce flooding and streambank erosion that is impacting property of private residents. Locations include Canoe Brook, Cub Brook and Slough Brook; within the limits of Livingston and the private properties that adjoin them.	Existing	Flood, Erosion	1.2 2.3	Township of Livingston, Planning, Engineering	High	High	Capital funding, Federal, State and County Grants	Short Term DOF	High	NSP	NR
Livingston-3 (Old-1)	Relocate DPW garage which repetitively floods causing loss of function and property and vehicle damage.	Existing	Flood	2.1 2.2 6.1	Township Planning and Engineering	High	High $11 Million	Capital budgets, Grants	Long Term DOF	High	SIP	SP ES
Livingston-4 (Old-2 and 5)	Evaluate all new development to reduce stormwater runoff with every plan review. Complete a town-wide drainage study that evaluates capacity of all systems to handle today's runoff. This study and plan will identify all localized flooding outside of FEMA designated zones	New and Existing	Flood	1.2 2.4	Township Engineer	High	High $1,000,000	Capital budget, Grants, Private residents	Long Term DOF 3-5 years	Medium	SIP, LPR	PR

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	and devise mitigation options to eliminate these hazards.											
Livingston-5 (NEW)	Develop and implement an easement and culvert cleaning plan	Both	Flood, Severe Weather, Coastal Storm	4.1	Township	Medium	Medium	Municipal	DOF	Medium	LPR	PR
Livingston-6 (NEW)	Restore old drainage ways to their original capacity	Existing	Flood, Severe Weather, Coastal Storm	2.3	Township	High	High	Municipal	DOF	Medium	SIP, NRP	NR, PP
Livingston-7 (NEW)	Develop and implement a post-event damage assessment program, including the following elements: • Conduct public outreach/education (see Public Education and Awareness Initiatives above) to inform property owners of the need to report property damage and obtain required permitting when making repairs. • Develop and organize local resources to conduct post-event damage assessments, including substantial damage determinations as warranted. • Develop an inventory (file system and/or database) of losses (incl. loss of service, property damage, economic losses, etc.) as reported to and/or identified by the Town/Village (e.g. building permit process).											
	See above.	Existing	Flood, Severe Storm, Severe Winter Storm, Hurricane, Nor'easter	3.1 3.2 5.1	Engineering (NFIP FPA), Supervisor's Office	Medium – High (life Safety; Increased eligibility for mitigation grant funding)	Low-Medium	Municipal Budget	Short	High	LPR, EAP	PE ES
Livingston-8 (NEW)	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.	N/A	Flood	1.3 3.2	NFIP FPA, as fully supported by local government officials	Medium - High	Low	Municipal Budget	Short (year 1)	High	LPR, EAP	PR
Livingston-9 (NEW)	Determine if a Community Assistance Visit (CAV) or	N/A	Flood	1.3 3.2	NFIP FPA	Low - Medium	Low	Municipal Budget	Short (year 1)	High	LPR	PR

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).											
Livingston-10 (NEW)	Have designated NFIP Floodplain Administrator (FPA), and other local officials who would benefit, become a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training such as FEMA Benefit-Cost Analysis (BCA) and Substantial Damage Estimation (SDE).	N/A	Flood	1.3 3.3 5.2	NFIP FPA	Medium	Low	Municipal Budget	Short (DOF)	High	EAP	PR
Livingston-11 (NEW)	Enhance/expand tree maintenance program and coordination with utilities (e.g., PSEG).	Existing	Severe Storm; Severe Winter Storm	1.2	Engineering and DPW, working with contractors and local utilities	Medium – High (reduced risk of utility outages; life safety)	Medium	Local Budget	Short	Medium	NSP	NR
Livingston-12 (NEW)	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	N/A	All Hazards	5.3 5.4	Municipality with support from County, NJOEM, FEMA and surrounding communities	Medium	Low	Municipal Budget	Short Term	High	LPR	PR
Livingston-13	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with	Existing	Flood, Coastal Storm, Severe Weather,	1.2 2.2	Town via NFIP FPA) with NJOEM, FEMA support	High	High	FEMA Mitigation Grant Programs and local budget (or	Long term DOF (specific project application and implementation)	High	SIP	PP

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	repetitive loss and severe repetitive loss properties as a priority when applicable.							property owner) for cost share				

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	Community Assistance Visit
CRS	Community Rating System
DPW	Department of Public Works
FEMA	Federal Emergency Management Agency
FPA	Floodplain Administrator
HMA	Hazard Mitigation Assistance
N/A	Not applicable
NFIP	National Flood Insurance Program
NJDEP	New Jersey Department of Environmental Protection
NJOEM	New Jersey Office of Emergency Management
OEM	Office of Emergency Management

Potential FEMA HMA Funding Sources:

FMA	Flood Mitigation Assistance Grant Program
HMGP	Hazard Mitigation Grant Program
PDM	Pre-Disaster Mitigation Grant Program
RFC	Repetitive Flood Claims Grant Program
SRL	Severe Repetitive Loss Grant Program

Timeline:

Short	1 to 5 years
Long Term	5 years or greater
OG	On-going program
DOF	Depending on funding

Costs:
Where actual project costs have been reasonably estimated:

Low	< $10,000
Medium	$10,000 to $100,000
High	> $100,000

Where actual project costs cannot reasonably be established at this time:

Low	Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.
Medium	Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
High	Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	< $10,000
Medium	$10,000 to $100,000
High	> $100,000

Where numerical project benefits cannot reasonably be established at this time:

Low	Long-term benefits of the project are difficult to quantify in the short term.
Medium	Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.
High	Project will have an immediate impact on the reduction of risk exposure to life and property.

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*

- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.11-12. Summary of Prioritization of Actions

Mitigation Action / Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Livingston-1 (NEW)	Provide emergency backup power at critical facility locations.	1	0	1	1	1	1	1	1	1	1	0	1	1	1	11	High
Livingston-2 (NEW)	Conduct stream cleaning and restoration.	1	1	1	1	1	-1	1	-1	1	1	1	1	1	1	10	High
Livingston-3 (Old-1)	Relocate DPW garage.	1	1	1	1	0	0	0	1	1	1	1	1	1	1	11	High
Livingston-4 (Old-5)	Evaluate all new development to reduce stormwater runoff with every plan review.	0	1	1	1	1	1	0	0	0	1	1	0	1	1	9	Medium
Livingston-5 (NEW)	Develop and implement an easement and culvert cleaning plan	0	1	1	1	1	1	0	0	0	1	1	0	1	1	9	Medium
Livingston-6 (NEW)	Restore old drainage ways to their original capacity	0	1	1	1	1	1	0	0	0	1	1	0	1	1	9	Medium
Livingston-7 (NEW)	Develop and implement a post-event damage assessment program	0	1	1	1	1	1	0	0	0	1	1	0	1	1	9	High
Livingston-8 (NEW)	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.	0	1	1	1	1	1	1	0	0	1	1	1	1	1	11	High
Livingston-9 (NEW)	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is	0	1	1	1	1	1	1	0	0	1	1	1	1	1	0	High

Mitigation Action / Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
	needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).																
Livingston-10 (NEW)	Have designated NFIP Floodplain Administrator (FPA), and other local officials who would benefit, become a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training such as FEMA Benefit-Cost Analysis (BCA) and Substantial Damage Estimation (SDE).	0	1	1	1	1	1	1	0	0	1	1	1	1	1	11	High
Livingston-11 (NEW)	Enhance/expand tree maintenance program and coordination with utilities (e.g., PSEG).	0	1	1	1	1	1	0	0	0	1	1	0	1	1	9	Medium
Livingston-12 (NEW)	Create/Enhance/ Maintain Mutual Aid agreements with neighboring communities for continuity of operations	0	1	1	1	1	1	0	0	0	1	1	1	1	1	10	High
Livingston-13 (NEW)	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties	1	1	1	1	0	0	0	1	1	1	1	0	1	1	10	High

Mitigation Action / Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
	as a priority when applicable.																

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.11.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.11.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of Livingston that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of Livingston has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.11.9 Additional Comments

None at this time.

Figure 9.11-1. Township of Livingston Hazard Area Extent and Location Map 1

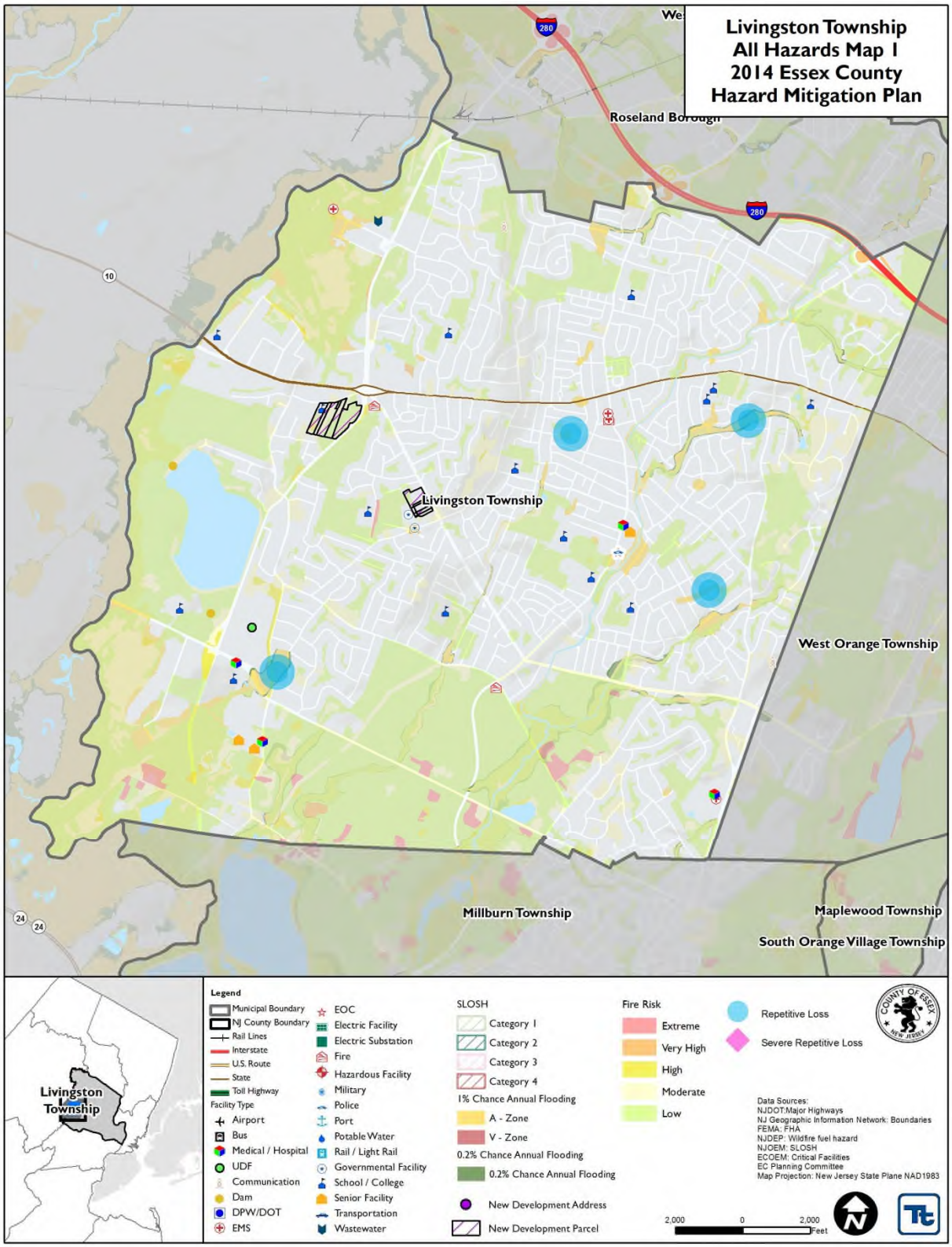
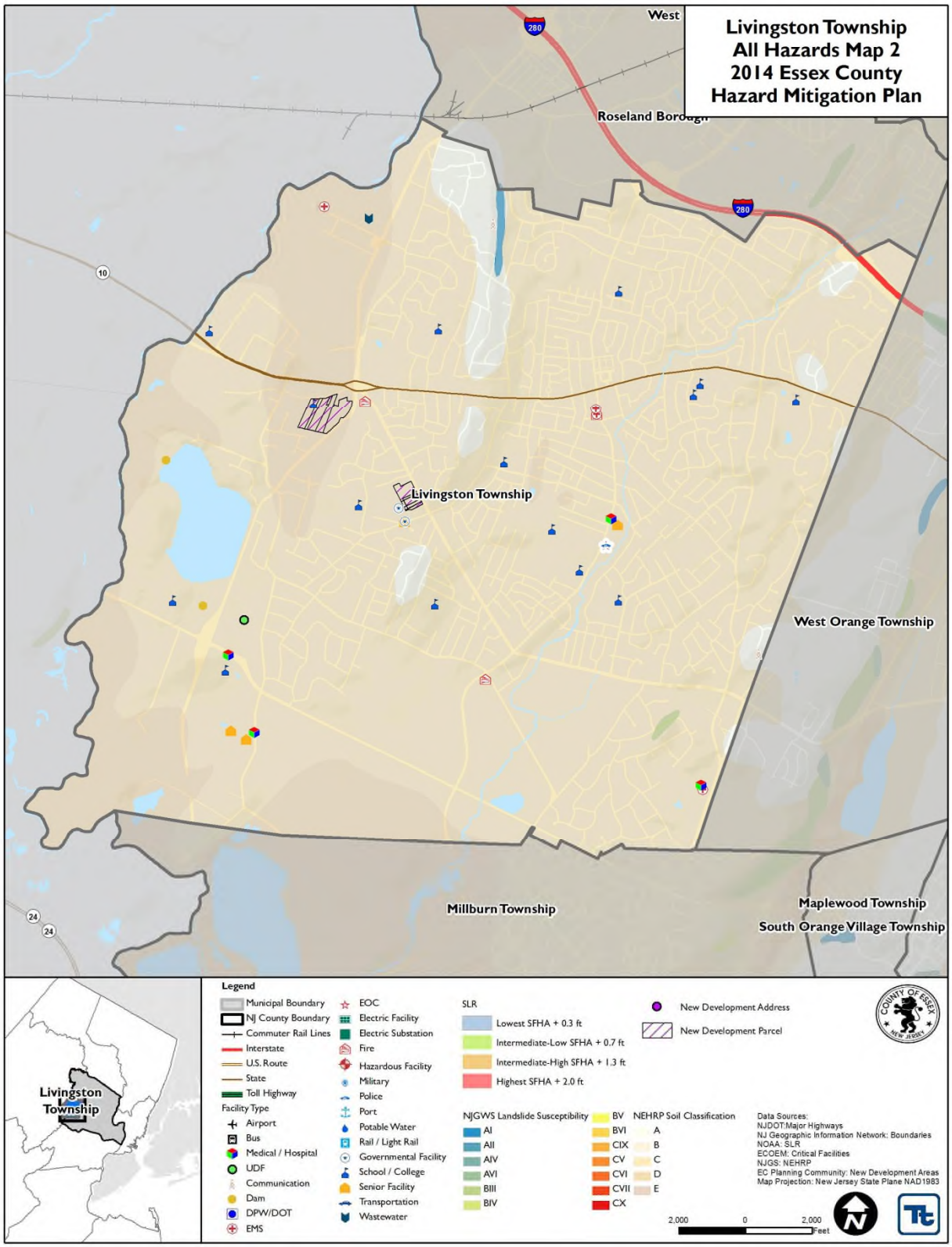


Figure 9.11-2. Township of Livingston Hazard Area Extent and Location Map 2



Action Number: **Livingston-1 (NEW)**

Mitigation Action/Initiative: Provide emergency backup power at critical facility locations to ensure utilities can function during power outages.

Assessing the Risk	
Hazard(s) addressed:	All hazards
Specific problem being mitigated:	Major utilities such as water and sewer lack back-up power causing a loss of vital services.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Provide emergency power at all critical facilities. 2. Provide alternate sources of utility. 3. No action.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Provide emergency backup power at critical facility locations to ensure utilities can function during power outages.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing and future.
Benefits (losses avoided)	Loss of vital services; drinking water, sewage treatment, shelter.
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Livingston
Local Planning Mechanism	Planning & Engineering
Potential Funding Sources	Capital Funding & Grants
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	

Refer to prioritization.

Action Number: **Livingston-1 (NEW)**

Mitigation Action/Initiative: Provide emergency backup power at critical facility locations to ensure utilities can function during power outages.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives		
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Livingston-1 (NEW/LOI)**

Mitigation Action/Initiative: Livingston Senior Center generator project

Assessing the Risk	
Hazard(s) addressed:	Back-up electricity to facility
Specific problem being mitigated:	Provide back-up electricity to Community Center/ O.E.M. Evacuation Shelter
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Allow Senior Center to operate as primary shelter for Livingston by installing a new generator
Action/Project Category	SIP
Goals/Objectives Met	Applied for Grant/ Grant Awarded
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Continuity of O.E.M. Shelter functions during widespread power failures.
Estimated Cost	$140,000
Priority*	High
Plan for Implementation	
Responsible Organization	Twp. Of Livingston
Local Planning Mechanism	Planning & Engineering
Potential Funding Sources	Capital Funding & Grants
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	7/29/14 - Letter of Award July 2014; Not started as of this date.

Refer to prioritization table.

Action Number: **Livingston-1 (NEW/LOI)**

Mitigation Action/Initiative: Livingston Senior Center generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	12	
Priority (High/Med/Low)	High	Provide emergency power for Community Center/Evacuation Shelter

Action Number: **Livingston-1 (NEW/LOI)**

Mitigation Action/Initiative: Livingston North Hillside Water Booster Station generator

Assessing the Risk	
Hazard(s) addressed:	Back-up energy to facility.
Specific problem being mitigated:	Providing drinking water and fire protection water to North Hillside section of Twp.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of Emergency Back-up Generator at Water Well-House/North Hillside Ave.
Action/Project Category	Applied for Grant; Grant Awarded
Goals/Objectives Met	Ability to pump water from well-house during times of power outages
Applies to existing, future, or not applicable	
Benefits (losses avoided)	Providing drinking water and fire protection water to North Hillside section of Twp.
Estimated Cost	$82,000
Priority*	
Plan for Implementation	
Responsible Organization	Twp. Of Livingston
Local Planning Mechanism	Planning & Engineering
Potential Funding Sources	Capital Funding & Grants
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	7/29/14 – Letter of Award - October 2013; Not started as of this date.

Refer to prioritization table.

Action Number: **Livingston- 1 (NEW/LOI)**

Mitigation Action/Initiative: Livingston North Hillside Water Booster Station generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	High	Provide drinking water and fire protection for North Hillside area of Twp.

Action Number: **Livingston-2 (NEW)**

Mitigation Action/Initiative: Stream cleaning and restoration

Assessing the Risk	
Hazard(s) addressed:	Flooding/Erosion
Specific problem being mitigated:	Clogged waterways and eroding banks affecting private residential property.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Mechanically clean brooks and restore banks.
	2. Pipe brooks.
	3. No action.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Mechanical cleaning and restoration.
Action/Project Category	NSP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Loss of property and degraded water quality from erosion.
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Livingston
Local Planning Mechanism	Planning and Engineering
Potential Funding Sources	Capital Funding and Grants
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	

Refer to prioritization table.

Action Number: **Livingston-2 (NEW)**

Mitigation Action/Initiative: Stream cleaning and restoration

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	-1	NJDEP regulations will hinder mechanically cleaning and restoration efforts.
Fiscal	1	
Environmental	-1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Livingston-3 (Old-1)**

Mitigation Action/Initiative: Relocate DPW garage

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Interruption of emergency response services, property damage, vehicle damage due to repetitively flooding at current DPW garage location.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Relocate the garage
	2. Flood proof the site and buildings.
	3. No action.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Relocate the garage
Action/Project Category	SIP
Goals/Objectives Met	Removes vital municipal operation from hazard and allows the DPW to operate during an emergency, without being in an emergency itself.
Applies to existing, future, or not applicable	Existing/Future
Benefits (losses avoided)	Property and vehicle damage. Loss of vital function during emergencies.
Estimated Cost	$11 Million
Priority*	High
Plan for Implementation	
Responsible Organization	Township
Local Planning Mechanism	Planning & Engineering
Potential Funding Sources	Capital Funding, Grants
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3/18/14 Progress on Action/Project: 5% Complete, study phase completed and presented to the Township Council.

Refer to prioritization table.

Action Number: **Livingston-3 (Old-1)**

Mitigation Action/Initiative: Relocate DPW Garage

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Livingston-4 (Old-2)**

Mitigation Action/Initiative: Township drainage study

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Property damage, motorist hazards.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Design and construct new collections systems.
	2. No action.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Drainage Improvements
Action/Project Category	Infrastructure
Goals/Objectives Met	Eliminates potential foe vehicles encountering high water and prevents damage to adjacent property.
Applies to existing, future, or not applicable	Existing/Future
Benefits (losses avoided)	Property and vehicle damage.
Estimated Cost	Unknown
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Livingston
Local Planning Mechanism	Planning and Engineering
Potential Funding Sources	Capital Funding and Grants
Timeline for Completion	Long
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Livingston-4 (Old-2)**

Mitigation Action/Initiative: Township drainage study

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	-1	Cost to benefits will have to be considered for each improvement.
Technical	1	
Political	0	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	12	
Priority (High/Med/Low)	High	

9.12 Township of Maplewood

This section presents the jurisdictional annex for the Township of Maplewood.

9.12.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Joseph Manning, Business Administrator-Administration 54 Valley St., Maplewood, NJ 07040 973-762-8120 ext. 2000 twpadmin@twp.maplewood.nj.us	Robert Cimino, Chief of Police 1618 Springfield Ave., Maplewood, NJ 07040 973-762-3400 ext. 7901 policechief@twp.maplewood.nj.us

9.12.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of Maplewood was 23,867.

Location

Township of Maplewood is located near the convergence of Interestate-78 and the Garden State Parkway. Communities bordering Maplewood include South Orange to the North, Irvington to the East, Union to the South, and Millburn to the West. The East Branch of the Rahway River runs through the middle of the Township. Total land area for the Township of Maplewood is 3.879 square miles of which 3.877 square miles are land and 0.002 square miles are water (Maplewood Township New Jersey, 2014).

Brief History

The area now known as the Township of Maplewood was settled in 1675 by the Dutch, English, and French Puritans. Maplewood developed into a center for trade and light manufacturing as it was a stagecoach stop between Newark, Jersey City, and Morristown. Cider, rum, honey, and livestock were major sources of trade. In 1922, Maplewood parted from South Orange Township and became known as Maplewood (Maplewood Township New Jersey, 2014).

Governing Body Format

Township of Maplewood operates using a five-member township Committee which selects a Mayor annually (Maplewood Township New Jersey,2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.12.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.12-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
71 Dunnell Road	Residential	10	67-79 Dunnell Rd. BL 17.16 L 136,156.01,157,161,161.01	Floodplain	Approved by Planning Board
CVS	Commercial.	13,000 SF	453 Valley St. BL 16.01 L 22	None	Approved by Planning Board
DAIBES	Commercial	6 units/10,000 SF Commercial	1611 Springfield Ave. BL 13.05 L 1, 3	None	5% Complete
Elite Properties	Residential	126 units	B: 48.47 L: 7	Wildfire: Low	50% complete
Elite Properties	Residential	126 units	B: 48.47 L: 6.01	None	50% complete
Elite Properties	Residential	126 units	B: 48.47 L: 5.01	None	50% complete
Elite Properties	Residential	134 units	92 Burnett Ave.	None	50% complete
Parke Place at Maplewood LLC	Residential	235 units	B: 44.02 L: 2	None	N/A
Post Office Redevelopment	Mixed-Use	24 units/15,000 SF Commercial	160 Maplewood Ave. B: 13.09 L: 180, 181, 185	None	Conceptual
PSEG Redevelopment	Residential	235 units	200 Boyden Ave.	None	Redevelopment, Approved by Planning Board

** Only location-specific hazard zones or vulnerabilities identified.*

9.12.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages to the community is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.12-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Residential homes reported water in basements and/or trees into homes. The river along West Park crested over the bridge deck. Power outages were reported throughout the Township. Many roads were closed and residents were evacuated in the area of West Parker and Oakland Streets due to a brook overflowing. All of Maplewood was notified to boil their water.
October 26 – November 8, 2012	Superstorm Sandy	EM-3354 DR-4086	Yes Yes	Residential homes reported water in basements and/or trees into homes.

9.12.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of Maplewood. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Township of Maplewood.

Table 9.12-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $1,469,380 2,500-year MRP: $33,916,762	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $5,367,294	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $11,652,300	Occasional	12	Low
Severe Storm	100-Year MRP: $2,535,267 500-year MRP: $15,052,899 Annualized: $176,431	Frequent	48	High
Winter Storm	1% GBS: $17,109,313 5% GBS: $85,546,565	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $0	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. *Building damage ratio estimates based on FEMA 386-2 (August 2001)*
b. *The valuation of general building stock and loss estimates was based on custom inventory for the municipality.*
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20
c. *Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of Maplewood.

Table 9.12-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Maplewood, Township of	157	61	$1,159,326.00	9	1	32	34	123

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.12-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

Municipality	0.2% Transportation
Township of Maplewood	1

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), at the time the FIS for the Township of Maplewood was published, local flooding was due mainly to poor drainage. The storm sewer system was originally designed for 5- to 10-percent-annual-chance storms and the storm sewer could not accommodate rainfall resulting from the 1-percent-annual-chance storm (FEMA FIS 2014).

The Township of Maplewood has sustained damages from floods that have occurred in the past, with the historic floods occurring during July 1901, February 1902, October 1903, August 1927, July 1938, August 1955, September 1971, and August 2, 1973. The damaging storms occurred in Maplewood during the floods of August 2, 1973, and July 1938. The historic flooding occurred during the storm of October 1903; however, because of the absence of development in the community, damages were not as great as those caused by the August 2, 1973 flood (FEMA FIS 2014).

Additionally, the municipality has identified the following hazard problems and/or problem areas:

- Structures located along the stream corridors are subjected to flooding during large storm events.

9.12.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of Maplewood.

Table 9.12-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y		Building	NJAC 5;23, Adopted 1977
Zoning Ordinance	Y		Zoning	Maplewood Code Chapter 271, Adopted 2005
Subdivision Ordinance	Y		Zoning	Maplewood Code Chapter 271, Adopted 2005
NFIP Flood Damage Prevention Ordinance	Y		Engineering	Maplewood Code Chapter 271, Adopted 2005
Cumulative Substantial Damages	N			
Freeboard	N			
Growth Management				
Floodplain Management / Basin Plan	Y		Engineering	Maplewood Code Chapter 271, Adopted 2005
Stormwater Management Plan/Ordinance	Y		Engineering	Maplewood Code Chapter 238, Adopted 2006
Comprehensive Plan / Master Plan/ General Plan	Y		Engineering	Adopted 2011
Capital Improvements Plan	Y		Engineering	Updated annually
Site Plan Review Requirements	Y		Zoning/ Engineering	Maplewood Code Chapter 271, Adopted 2005
Open Space Plan	Y			Adopted 2008
Stream Corridor Management Plan	Y		Zoning/ Engineering	Maplewood Code Chapter 213, Adopted 2009
Watershed Management or Protection Plan	Y		Zoning/ Engineering	Maplewood Code Chapter 213, Adopted 2009
Economic Development Plan	Y		Administration	Adopted 1999
Comprehensive Emergency Management Plan	Y		Fire	Adopted 2010
Emergency Response Plan	Y		Fire	Adopted 2010

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Post Disaster Recovery Plan	N			
Post Disaster Recovery Ordinance	N			
Real Estate Disclosure Requirement	N			
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]	N			

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of Maplewood.

Table 9.12-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Engineering
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineering
Planners or engineers with an understanding of natural hazards	Y	Engineering
NFIP Floodplain Administrator	Y	Thomas Malavasi, Township Engineer/Engineering Department/Building Department
Surveyor(s)	N	
Personnel skilled or trained in “GIS” applications	Y	Multiple
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Fire
Grant Writer(s)	Y	Administration
Staff with expertise or training in benefit/cost analysis	N	
Professionals trained in conducting damage assessments	N	

Fiscal Capability

The table below summarizes financial resources available to the Township of Maplewood.

Table 9.12-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes – Administration
Capital Improvements Project Funding	Yes – Administration
Authority to Levy Taxes for specific purposes	No
User fees for water, sewer, gas or electric service	No
Impact Fees for homebuyers or developers of new development/homes	No
Incur debt through general obligation bonds	Yes - Administration
Incur debt through special tax bonds	No
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	No
Mitigation grant programs	No
Other	No

Community Classifications

The table below summarizes classifications for community program available to the Township of Maplewood.

Table 9.12-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	
Building Code Effectiveness Grading Schedule (BCEGS)	NP	
Public Protection	NP	
Storm Ready	NP	
Firewise	NP	

NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule

- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Thomas Malavasi, Township Engineer/Engineering Department

Flood Vulnerability Summary

Damage sustained during Superstorm Sandy and other recent disaster events was primarily to garages. Only one residence sustained damage to a family room and roof. Many residences lost connection to power as a result of trees falling and taking out power lines. The Hilton Library, a Township-owned building, sustained damage to a parapet when a tree limb fell. No interest in mitigation has been expressed by property owners who sustained damage at their properties.

Resources

The Township Engineer and Construction Official share the responsibilities of floodplain manager. Responsibilities shared include conducting permit reviews and inspections. At this time, no formal education and outreach is conducted regarding floodplain management. There are no known barriers to running an effective floodplain management program in Maplewood Township. The current floodplain administrator, Thomas Malavasi, does not feel he is adequately supported in his role. Additional training and information on floodplain management would be welcomed.

Compliance History

Maplewood Township is in good standing in the NFIP. There is no knowledge of when the most recent Community Assistance Visit (CAV) took place. The current floodplain administrator does not feel there is a need to schedule a CAV at this time.

Regulatory

Current floodplain management regulations and ordinances meet the minimum requirements for both FEMA and New Jersey. There are additional local plans, ordinances, and programs which further support the implementation of the NFIP within Maplewood Township. Maplewood Township does not currently participate in the Community Rating System (CRS) but attending a seminar to receive more information would be appreciated.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

None at this time.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

The Township has a Master Plan which is the legal roadmap to planning for appropriate and safe land development. According to their Master Plan, the Township is at the forefront on municipal sustainability efforts and community green initiatives. Maplewood was one of the first municipalities in the State to receive 'Sustainable Jersey' certification.

A number of other local plans and studies have also been completed that consider hazard mitigation:

- Maplewood Climate Initiative Action Plan (June 2007)
- Drainage/Flood Mitigation Improvements Study for four study areas (February 2009)
- Rahway River Corridor Study (June 2010)

A Rahway River Basin Flood Risk Management Feasibility Study is currently in progress being led by the U.S. Army Corps of Engineers. The U.S. Army Corps of Engineers is partnering with the New Jersey State Department of Environmental Protection to identify various flood risk management alternatives for communities along the Rahway River Basin, with a specific emphasis on the cities of Rahway and Cranford. The alternatives are currently undergoing economic analysis, comparing the amount of risk management provided to each alternative's associated costs.

The Township's website has a page dedicated to studies and plans developed organized by year: http://www.twp.maplewood.nj.us/index.aspx?NID=100

The Township currently considers hazard areas including flood zones prior to land use changes or development permitting. The Township restricts development in the floodplain and along stream corridors.

The Township will expand its public outreach program on natural hazards (Maplewood-10) and is interested in the Community Rating System (Maplewood-12). Refer to new mitigation actions listed in Table 9.12-11.

The Township will consider safe growth practices for the next Master Plan update. In addition, the Township will use the HMP as a guide when updating municipal ordinances.

9.12.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.12-10. Past Mitigation Initiative Status

Description	Status	Review Comments
1: BOE parking lot damage due to hurricane rains	Continuous	Board of Education needs funding to complete this work. This mitigation action will be carried forward in this HMP update.
2: Public building improvements	Continuous	Repairs complete at Hilton Library due to Sandy. Other repairs ongoing as they arise and are needed. There are no current projects planned.
3: Drainage culvert on Mountain, Maple and Berkley Streets	Completed	Complete
4: Project after DEP flooding study	In progress	Study complete, future projects identified in the updated mitigation strategy presented in this annex.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

None identified at this time.

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.12-11 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.12-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.12-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Maplewood-1 (NEW/LOI)	Obtain backup power for critical facilities to ensure continuity of operations. Locations identified at the time of this HMP update: 1.Maplewood Community Center 2. Maplewood Main Library 3. Maplewood Municipal Building 4. Town Hall 5.Community Center 6.Mobile generator for various sites	Existing	All	1.2 6.1	Office of Emergency Management	High	Medium 1.$66,000 2. $100,000 3. $100,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Maplewood-2 (OLD 1)	Repair the Board of Education parking lot damage due to hurricane rains	Existing	Coastal Erosion, Flood	Reduced erosion	South Orange and Maplewood School District (SOMSD)	Property damage, road flooding, road closures	High	SOMSD funds, general revenue	DOF	Low	SIP	PP
Maplewood-3 (OLD 2)	Public building improvements as needed. No specific projects at this time.	Existing	Flooding	Reduced Flooding	Township of Maplewood Engineering Department	Property damage, road flooding, road closures	Medium	Local funds, FEMA, loans	Med	Medium	SIP	PP
Maplewood-4 (OLD 3)	Increase drainage capacity of the drainage culvert on Mountain, Maple and Berkley St. to mitigate flooding	Existing	Flood	Reduced Flooding	Township of Maplewood Engineering Department	High	Medium	Local Funds	Med	High	SIP	PP
Maplewood-5 (NEW)	Stream bank improvements to stabilize the banks of Lightning Brook	Both	Flood		Township of Maplewood Engineering Department	High	High	FEMA HMA grant funding, Township capital funds,	Short-Long DOF	Medium	NRP	NR

Table 9.12-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
								general				
Maplewood-6 (NEW)	Streambank stabilization of the East Branch of the Rahway River	Both	Flood		South Orange, Maplewood BOE	High	High	FEMA HMA grant funding, Township capital funds, general	Short-Long DOF	Medium	NRP	NR
Maplewood-7 (NEW)	Drainage upgrades in the Orchard Study Area to reduce flooding	Both	Flood		Township of Maplewood Engineering Department	High	High	FEMA HMA grant funding, Township capital funds, general	Short-Long DOF	Medium	SIP	PP
Maplewood-8 (NEW)	Drainage upgrades to Wyoming/Jefferson	Both	Flood		Township of Maplewood Engineering Department	High	High	FEMA HMA grant funding, Township capital funds, general	Short	Medium	SIP	PP
Maplewood-9 (NEW)	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable. Assess and prioritize non-structural flood hazard mitigation alternatives for at risk properties within the floodplain, including those that have been identified as repetitive loss, such as acquisition/relocation, or elevation depending on feasibility. The parameters for feasibility for this initiative would be: funding, benefits versus costs and willing participation of property owners. Implement as funding becomes available. Although the Township has a limited number of at-risk homes and no specific properties identified at this time, the Township is willing to assist any property owner that seeks help to reduce future damages.											
	See above.	Existing	Flood, Coastal Erosion, Severe Weather, Coastal Storm	1.2 2.2	Engineering via NFIP FPA) with NJOEM, FEMA support	High	High	FEMA Mitigation Grant Programs and local budget (or property owner) for cost share	Ongoing (outreach and specific project identification); Long term DOF (specific project application and implementation)	High	SIP	PP
Maplewood-10 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. This program will include • Providing information on the Township Website to inform residents about development in flood plains and wetlands. Informing residents about FEMA and how to find											

Table 9.12-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	information there. • Provide information to residents on the Township web site about Emergency Management. • Provide emergency notifications to residents through the Code Red system											
	See above.	N/A	All Hazards	3.1	Supervisor's Office	Medium	Low	Municipal Budget; HMA programs with local or county match	Short	Medium	EAP	PE
Maplewood-11 (NEW)	Develop and implement a post-event damage assessment program, including the following elements: • Conduct public outreach/education (see Public Education and Awareness Initiatives above) to inform property owners of the need to report property damage and obtain required permitting when making repairs. • Develop and organize local resources to conduct post-event damage assessments, including substantial damage determinations as warranted. • Develop an inventory (file system and/or database) of losses (incl. loss of service, property damage, economic losses, etc.) as reported to and/or identified by the Township (e.g. building permit process).											
	See above.	Existing	Flood; Severe Storm; Severe Winter Storm; Hurricane, Nor'easter	3.1 3.2 5.1	Engineering (NFIP FPA); Supervisor's Office	Medium – High (life Safety; Increased eligibility for mitigation grant funding)	Low- Medium	Municipal Budget	Short	Medium	LPR, EAP	PE ES
Maplewood-12 (NEW)	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community	N/A	Flood	1.3 3.2	NFIP FPA, as fully supported by local government officials	Medium - High	Low	Municipal Budget	Short (year 1)	Medium	LPR, EAP	PR

Table 9.12-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	Assistance Visit (CAV) initiative.											
Maplewood-13 (NEW)	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).	N/A	Flood	1.3 3.2	NFIP FPA	Low - Medium	Low	Municipal Budget	Short (year 1)	Medium	LPR	PR
Maplewood-14 (NEW)	Have designated NFIP Floodplain Administrator (FPA), and other local officials who would benefit, become a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training such as FEMA Benefit-Cost Analysis (BCA) and Substantial Damage Estimation (SDE).	N/A	Flood	1.3 3.3 5.2	NFIP FPA	Medium	Low	Municipal Budget	Short (DOF)	Medium	EAP	PR

Table 9.12-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Maplewood-15 (NEW)	Enhance/expand tree maintenance program and coordination with utilities (e.g., PSEG).	Existing	Coastal Storm, Severe Weather; Severe Winter Storm	1.2	Engineering and DPW, working with contractors and local utilities	Medium – High (reduced risk of utility outages; life safety)	Medium	Local Budget	Short	Medium	NSP	NR
Maplewood-16 (NEW)	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	N/A	All Hazards	5.3 5.4	Municipality with support from County, NJOEM, FEMA and surrounding communities	Medium	Low	Municipal Budget	Short Term	Medium	LPR	PR

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*
OEM	*Office of Emergency Management*
DOF	*Depending on funding*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*

Costs:
Where actual project costs have been reasonably estimated:
Low *< $10,000*
Medium *$10,000 to $100,000*
High *> $100,000*

Where actual project costs cannot reasonably be established at this time:
Low *Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium *Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High *Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:
Low= *< $10,000*
Medium *$10,000 to $100,000*
High *> $100,000*

Where numerical project benefits cannot reasonably be established at this time:
Low *Long-term benefits of the project are difficult to quantify in the short term.*
Medium *Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High *Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.12-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Maplewood-1 (NEW/LOI)	Obtain backup power to ensure continuity of operations.	1	1	1	1	1	1	1	0	1	1	1	1	1	1	13	High
Maplewood-2 (OLD 1)	BOE parking lot damage due to hurricane rains	0	1	0	1	-1	0	-1	1	0	0	0	-1	0	0	-1	LOW
Maplewood-3 (OLD 2)	Public building improvements	1	1	1	1	1	0	1	0	0	1	0	1	0	0	8	high
Maplewood-4 (OLD 3)11	Drainage culvert on Mountain, Maple and Berkley St.	1	1	1	1	1	0	1	0	0	1	0	1	0	0	8	high
Maplewood-5 (NEW)	Stream bank improvements to stabilize the banks of Lightning Brook	1	1	-1	1	1	1	-1	1	0	1	0	0	0	1	6	Medium
Maplewood-6 (NEW)	Streambank stabilization of the East Branch of the Rahway River	1	1	-1	1	1	1	-1	1	0	1	0	0	0	1	6	Medium
Maplewood-7 (NEW)	Drainage upgrades in the Orchard Study Area to reduce flooding	1	1	-1	1	-1	0	-1	0	0	0	1	0	0	1	2	Medium
Maplewood-8 (NEW)	Drainage upgrades to Wyoming/Jefferson	1	1	0	1	-1	1	-1	1	0	0	0	0	0	1	3	Medium
Maplewood-9 (NEW)	Support the mitigation of vulnerable structures	1	1	1	1	1	0	-1	0	1	0	1	0	1	1	9	Medium
Maplewood-10 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance.	1	1	0	1	1	0	0	0	1	0	1	0	1	1	8	Medium
Maplewood-11 (NEW)	Develop and implement a post-event damage assessment program.	1	1	0	1	1	0	0	0	1	0	1	0	1	1	8	Medium
Maplewood-12 (NEW)	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the	1	1	0	0	1	0	0	1	1	0	1	0	1	1	8	Medium

Table 9.12-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
	county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.																
Maplewood-13 (NEW)	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).	1	1	0	0	1	0	0	1	1	0	1	0	1	1	8	Medium
Maplewood-14 (NEW)	Have designated NFIP FPA and other local officials who would benefit, become a Certified Floodplain Manager (CFM), and pursue relevant continuing education training	0	0	0	0	1	0	0	1	1	0	1	0	1	1	6	Medium
Maplewood-15 (NEW)	Enhance/expand tree maintenance program and coordination with utilities (e.g., PSEG).	1	1	0	0	1	0	0	1	0	0	1	0	1	1	7	Medium
Maplewood-16 (NEW)	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	1	1	0	0	1	0	0	1	0	0	1	0	1	1	7	Medium

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.12.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.12.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of Maplewood that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of Maplewood has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.12.9 Additional Comments

None at this time.

Figure 9.12-1. Township of Maplewood Hazard Area Extent and Location Map 1

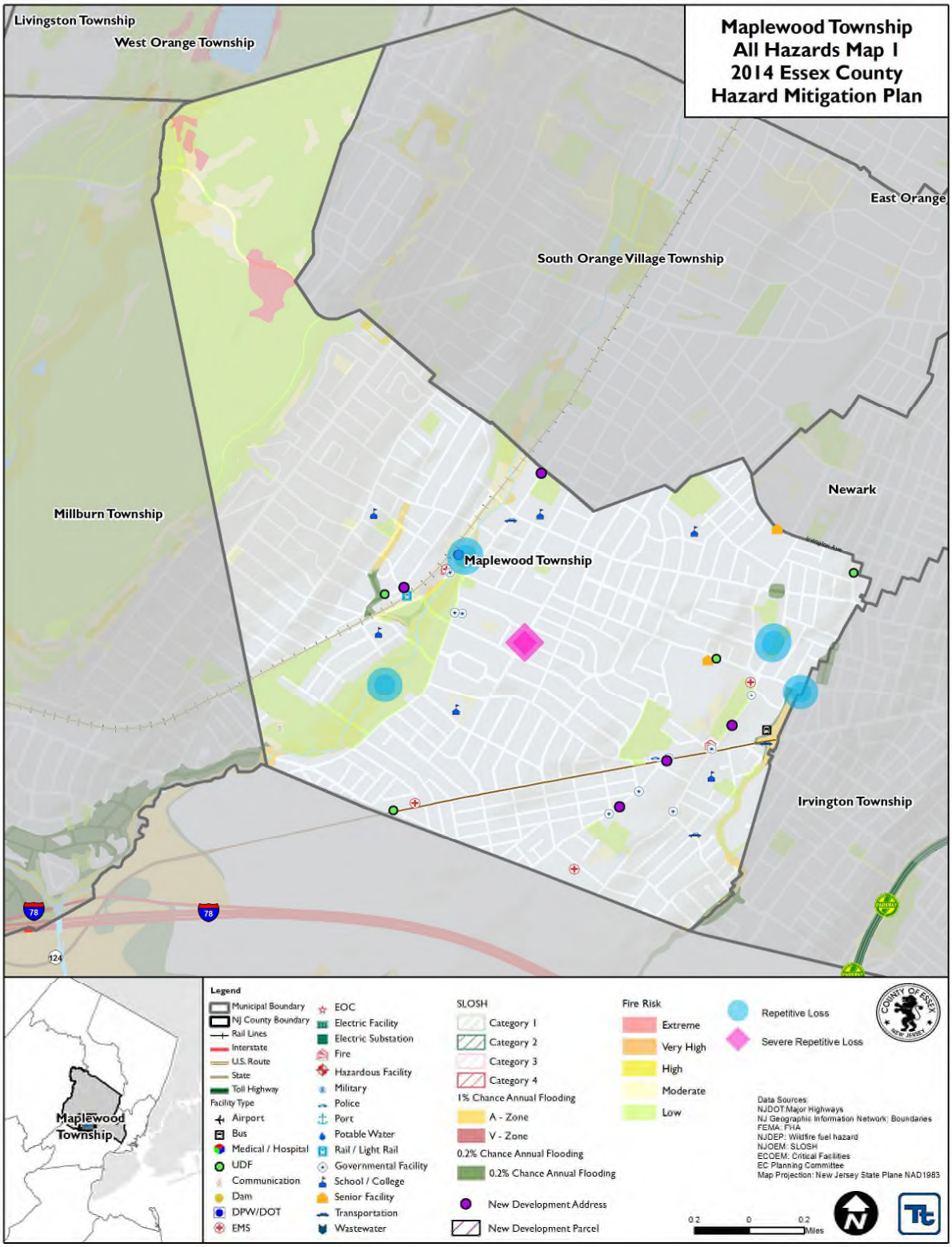
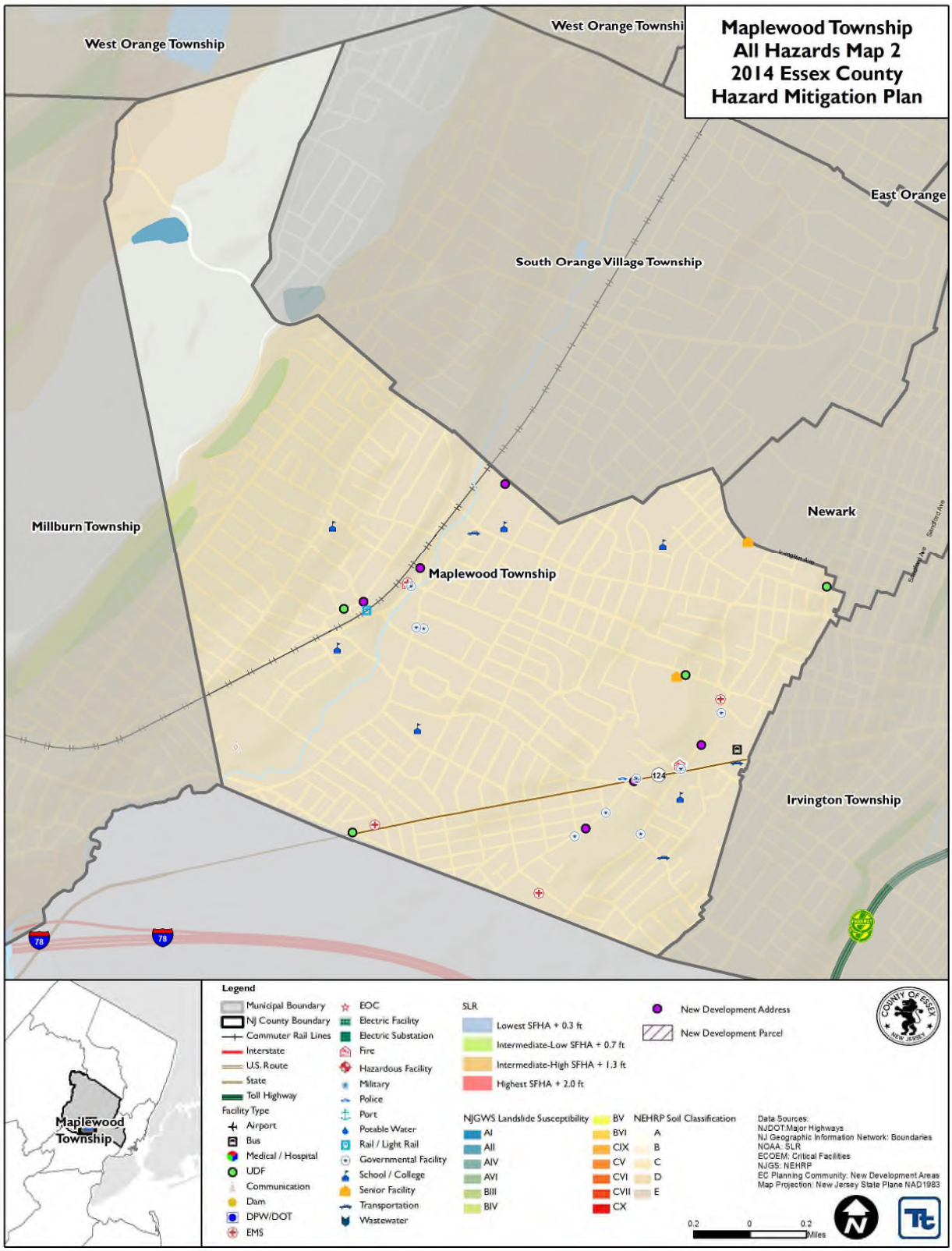


Figure 9.12-2. Township of Maplewood Hazard Area Extent and Location Map 2



Action Number: **Maplewood-1 (NEW/LOI)**

Mitigation Action/Initiative: Maplewood Community Center generator

Assessing the Risk	
Hazard(s) addressed:	Power outage as a result of storm events
Specific problem being mitigated:	Municipality was without power for 4-10 days following Superstorm Sandy.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Do nothing – municipality was without power 4-10 days post Superstorm Sandy 2. Purchase generator 3. Co-generation facility – too expensive
Action/Project Intended for Implementation	
Description of Selected Action/Project	Ensure continuity of services following a storm and preventing power outages.
Action/Project Category	SIP
Goals/Objectives Met	1.2, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$66,000
Priority*	High
Plan for Implementation	
Responsible Organization	Office of Emergency Management
Local Planning Mechanism	
Potential Funding Sources	FEMA HMGP, Township budget
Timeline for Completion	Short, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Maplewood-1 (NEW/LOI)**

Mitigation Action/Initiative: Maplewood Community Center generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Maplewood-1 (NEW/LOI)**

Mitigation Action/Initiative: Maplewood Main Library generator

Assessing the Risk	
Hazard(s) addressed:	Power outage as a result of storm events
Specific problem being mitigated:	Municipality was without power for 4-10 days following Superstorm Sandy.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Do nothing – municipality was without power 4-10 days post Superstorm Sandy 2. Purchase generator 3. Co-generation facility – too expensive
Action/Project Intended for Implementation	
Description of Selected Action/Project	Ensure continuity of services following a storm and preventing power outages.
Action/Project Category	SIP
Goals/Objectives Met	1.2, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$100,000
Priority*	High
Plan for Implementation	
Responsible Organization	Office of Emergency Management
Local Planning Mechanism	
Potential Funding Sources	FEMA HMGP, Township budget
Timeline for Completion	Short, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Maplewood-1 (NEW/LOI)**

Mitigation Action/Initiative: Maplewood Main Library generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Maplewood-1 (NEW/LOI)**

Mitigation Action/Initiative: Maplewood Municipal Building generator

Assessing the Risk	
Hazard(s) addressed:	Power outage as a result of storm events
Specific problem being mitigated:	Municipality was without power for 4-10 days following Superstorm Sandy.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Do nothing – municipality was without power 4-10 days post Superstorm Sandy 2. Purchase generator 3. Co-generation facility – too expensive
Action/Project Intended for Implementation	
Description of Selected Action/Project	Ensure continuity of services following a storm and preventing power outages.
Action/Project Category	SIP
Goals/Objectives Met	1.2, 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$100,000
Priority*	High
Plan for Implementation	
Responsible Organization	Office of Emergency Management
Local Planning Mechanism	
Potential Funding Sources	FEMA HMGP, Township budget
Timeline for Completion	Short, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Maplewood-1 (NEW/LOI)**

Mitigation Action/Initiative: Maplewood Municipal Building generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Maplewood-2 (OLD 1)**

Mitigation Action/Initiative: BOE parking lot repairs due to Hurricane Irene

Assessing the Risk	
Hazard(s) addressed:	Coastal Erosion, Flood
Specific problem being mitigated:	Erosion
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Bank stabilization East Branch of the Raritan River
	2. No Action
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install stream bank improvements
Action/Project Category	SIP
Goals/Objectives Met	Reduced erosion
Applies to existing, future, or not applicable	New
Benefits (losses avoided)	Property damage, road flooding, road closures
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	South Orange Maplewood Board of Education
Local Planning Mechanism	South Orange Maplewood Board of Education
Potential Funding Sources	Local funds, FEMA, loans
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Maplewood-2 (OLD 1)**

Mitigation Action/Initiative: BOE parking lot repairs due to Hurricane Irene

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	0	
Technical	1	
Political	-1	
Legal	0	
Fiscal	-1	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	-1	
Agency Champion	0	
Other Community Objectives	0	
Total	-1	
Priority (High/Med/Low)	Low	

Action Number: **Maplewood-3 (OLD 2)**

Mitigation Action/Initiative: Public building improvements

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Protect public buildings from flooding
	2. No Action
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Provide drainage or pumps for buildings subject to flooding
Action/Project Category	SIP
Goals/Objectives Met	Reduce flooding
Applies to existing, future, or not applicable	Ongoing
Benefits (losses avoided)	Property damage, road flooding, road closures
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	Township of Maplewood
Local Planning Mechanism	Administration/Engineering
Potential Funding Sources	Local funds, FEMA, loans
Timeline for Completion	Medium
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Maplewood-3 (OLD 2)**

Mitigation Action/Initiative: Public building improvements

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	High	

Action Number: **Maplewood-4 (OLD 3)**

Mitigation Action/Initiative: Upper Ridgewood Drainage Project

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Protect homes and streets from flooding
	2. No Action
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Increase drainage capacity of the drainage culvert on Mountain, Maple, and Berkley St.; provide drainage in areas subject to flooding
Action/Project Category	SIP
Goals/Objectives Met	Reduced flooding
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Property damage, road flooding, road closures
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Maplewood
Local Planning Mechanism	Administration/Engineering
Potential Funding Sources	Local funds
Timeline for Completion	Medium
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Maplewood-4 (OLD 3)**

Mitigation Action/Initiative: Upper Ridgewood Drainage Project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	0	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	High	

Action Number: **Maplewood-5**
Mitigation Action/Initiative: Bank Stabilization Lightning Brook

Assessing the Risk	
Hazard(s) addressed:	Erosion
Specific problem being mitigated:	Erosion
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Bank Stabilization Lightning Brook
	2. No Action
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install stream bank improvements
Action/Project Category	SIP
Goals/Objectives Met	Reduced erosion
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Property damage, road flooding, road closures
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Township of Maplewood
Local Planning Mechanism	Engineer/Administration
Potential Funding Sources	Local funds, FEMA, loans
Timeline for Completion	Medium
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: Design not started

Action Number: **Maplewood- 5**

Mitigation Action/Initiative: Bank Stabilization Lightning Brook

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Decreased flooding with allow easier access
Property Protection	1	Will reduce flooding on several properties
Cost-Effectiveness	-1	Expensive for the benefit
Technical	1	Not difficult to implement
Political	1	No issues should be easy to implement
Legal	1	No issues should be easy to implement
Fiscal	-1	No funding available
Environmental	1	Little environmental impact
Social	0	
Administrative	1	No issues should be easy to implement
Multi-Hazard	0	
Timeline	0	
Agency Champion	0	
Other Community Objectives	1	
Total	4	
Priority (High/Med/Low)	Medium	

Action Number: **Maplewood-6**

Mitigation Action/Initiative: Streambank stabilization of the East Branch of the Rahway River

Assessing the Risk	
Hazard(s) addressed:	Erosion
Specific problem being mitigated:	Erosion
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Bank Stabilization
	2. No Action
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install stream bank improvements to restore access and parking
Action/Project Category	SIP
Goals/Objectives Met	Reduced erosion
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Property damage, road flooding, road closures
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	South Orange / Maplewood BOE
Local Planning Mechanism	South Orange / Maplewood BOE
Potential Funding Sources	Local funds, FEMA, loans
Timeline for Completion	Medium
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: Design not started

Refer to prioritization table.

Action Number: **Maplewood- 6**

Mitigation Action/Initiative: Streambank stabilization of the East Branch of the Rahway River

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Provide better and safer access to parking lot
Property Protection	1	Will reduce flooding erosion
Cost-Effectiveness	-1	Expensive for the benefit
Technical	1	Not difficult to implement
Political	1	No issues should be easy to implement
Legal	1	No issues should be easy to implement
Fiscal	-1	No funding available
Environmental	1	Little environmental impact
Social	0	
Administrative	1	No issues should be easy to implement
Multi-Hazard	0	
Timeline	0	
Agency Champion	0	
Other Community Objectives	1	
Total	6	
Priority (High/Med/Low)	M	

Action Number: **Maplewood-7**

Mitigation Action/Initiative: Drainage upgrades in the Orchard Study Area

Assessing the Risk	
Hazard(s) addressed:	Flooding along the stream and local streets
Specific problem being mitigated:	Flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Drainage upgrades Orchard Study Area 1-year attenuation
	2. Drainage upgrades Orchard Study Area 5-year attenuation
	3. No Action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install larger piping and improve inlets
Action/Project Category	SIP
Goals/Objectives Met	Reduced flooding
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Property damage, road flooding, road closures
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Township of Maplewood
Local Planning Mechanism	Engineer/Administration
Potential Funding Sources	Local funds, FEMA, loans
Timeline for Completion	Medium
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: Design not started

Action Number: **Maplewood- 7**

Mitigation Action/Initiative: Drainage upgrades – Orchard Study Area

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Decreased erosion
Property Protection	1	Will reduce erosion on several properties
Cost-Effectiveness	-1	Expensive for the benefit
Technical	1	Not difficult to implement
Political	-1	Easements needed
Legal	0	Easements needed
Fiscal	-1	No funding available
Environmental	0	Some wetlands disturbance
Social	0	
Administrative	0	Easements needed
Multi-Hazard	1	Erosion and some flooding
Timeline	0	
Agency Champion	0	
Other Community Objectives	1	
Total	2	
Priority (High/Med/Low)	Medium	

Action Number: **Maplewood-8**

Mitigation Action/Initiative: Drainage upgrades Wyoming/Jefferson

Assessing the Risk	
Hazard(s) addressed:	Flooding along the stream and local streets
Specific problem being mitigated:	Flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Drainage upgrades Wyoming/Jefferson 1-year attenuation
	2. Drainage upgrades Wyoming/Jefferson 5-year attenuation
	3. No Action
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install larger piping and improve inlets
Action/Project Category	SIP
Goals/Objectives Met	Reduced flooding
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Property damage, road flooding, road closures
Estimated Cost	High
Priority*	
Plan for Implementation	
Responsible Organization	Township of Maplewood
Local Planning Mechanism	Engineer/Administration
Potential Funding Sources	Local funds, FEMA, loans
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: Design not started

Action Number: **Maplewood- 8**

Mitigation Action/Initiative: Drainage upgrades – Wyoming/Jefferson

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Decreased flooding with allow easier access
Property Protection	1	Will reduce flooding on several properties
Cost-Effectiveness	0	Comparatively expensive for the benefit
Technical	1	Not difficult to implement
Political	-1	Work on private property, need easements
Legal	1	No issues should be easy to implement
Fiscal	-1	No funding available
Environmental	1	Little environmental impact
Social	0	
Administrative	0	Potential easement issues
Multi-Hazard	0	
Timeline	0	
Agency Champion	0	
Other Community Objectives	1	
Total	3	
Priority (High/Med/Low)	Medium	

9.13 Township of Millburn

This section presents the jurisdictional annex for the Township of Millburn.

9.13.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Battalion Fire Chief Robert Echavarria, Millburn Fire Department 459 Essex Street Millburn, NJ 07041 Phone: 973-564-7035 E-mail: rechavarria@millburntwp.org	Fire Chief J. Michael Roberts, Deputy OEM Coordinator 459 Essex Street Millburn, NJ 07041 Phone: 973-564-7040 E-mail: mroberts@millburntwp.org

9.13.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of Millburn was 20,149.

Location

According to the U.S. Census Bureau, the Township has a total land area of 9.876 square miles, of which 9.322 square miles is land and 0.554 square miles is water.

Brief History

Once part of Elizabethtown and Newark, Millburn Township was part of Springfield Township and created by King Charles II for his brother, James, in 1664. In 1857, Millburn Township separated from Springfield Township. Millburn Township is home to the internationally known Paper Mill Playhouse where many Broadway shows have gotten their preview start much like the Tony Award winning musical *Newsies*. The first planned commuter suburb in America, Short Hills, is in Millburn Township (Township of Millburn New Jersey, 2014).

Governing Body Format

Millburn Township operates under the Township form of government with a five-member Committee. Annually, the Committee selects one member to serve as Mayor (Township of Millburn New Jersey, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.13.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.13-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Special Improvement District	Mixed-Use	Unknown	179 Millburn Ave. B: 305; L: 1 B: 1212; L: 24	None	Storm Water/Sewer
Stop and Shop (Springfield NJ) Bordering Short Hills	Commercial	1 unit	520-550 Millburn Ave.	None	Unknown
Toll Brothers-The Enclaves	Residential	30 units	1 Short Hills Ave. B: 1101 L: 42	Storm Water NEHRP: D	Installed Tension Basin
Toll Brothers-The Enclaves	Residential	30 units	1 Short Hills Ave. B:1101 L: 42	Sanitary Sewer NEHRP: D	Relocate Joint Meeting Line

** Only location-specific hazard zones or vulnerabilities identified.*

9.13.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.13-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
April 14-20, 2007	Severe Weathers and Inland and Coastal Flooding	DR-1694	Yes	JFK Parkway flooding; South Mountain residential area.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	Shelter in place; Several roads closed due to traffic signal problems
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	The Township received 8.92 inches of rain in 24 hours. Residents were evacuated in flooded areas. There was a loss of power and utilities in the flooded areas. There was a stone wall repair to the West Branch of the Rahway River. Curb and sidewalks needed repairs. Local drainage improvements were needed; groundwater issues in the Township. The sanitary sewer outflowed. The Township had over $680,000 in repairs and expenses.
October 29, 2011	Severe Weather	DR-4048	Yes	Schools in the Township were closed for three days due to power outages and unsafe driving conditions. Over 200 Millburn residents were without power and over 2,500 Short Hills residents were without power. The Township had over $200,000 in repairs and expenses.
October 26 –	Hurricane Sandy	EM-3354	Yes	High winds knocked down power lines,

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
November 8, 2012		DR-4086	Yes	transformers, and signs. The Township experienced a low of power and phone service. Essex County opened their shelter. All public schools were closed for several days. Millburn Police and Fire Departments lost emergency radio communications. The Township had to rent a generator to power the Canoe Brook Road pumping station. Schools needed several repairs due to wind damages; homes had tree damage. The Township had over $540,000 in personnel and operating expenses.
Sept. 12, 2013	Severe Weather	N/A	N/A	A possible lightning strike damaged the Glenwood School fire alarm; causing approximately $10,000 to $15,000 in repairs. Fire Watch was provided by the fire department to prevent school closures ($8,500 in expenses).

9.13.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of Millburn. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Township of Millburn.

Table 9.13-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $8,092,032 2,500-year MRP: $148,770,599	Occasional	22	Medium
Extreme Temperature	Damage estimate not available	Frequent	18	Medium
Flood	1% Annual Chance: $45,443,264	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $49,194,700	Occasional	12	Low
Severe Weather	100-Year MRP: $5,318,632 500-year MRP: $38,481,544 Annualized: $390,705	Frequent	48	High
Winter Storm	1% GBS: $49,839,266	Frequent	54	High

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
	5% GBS: $249,196,330			
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $2,356,900	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. Loss estimates for the Severe Weather and severe winter storm hazards are structural values only and do not include the value of contents.

d. Loss estimates for the flood and earthquake hazards represent both structure and contents.

e. The HAZUS-MH earthquake model results are reported by Census Tract.

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of Millburn.

Table 9.13-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Millburn, Township of	292	222	$6,609,357.00	21	2	21	142	150

Source: FEMA,2014

Note (1) Policies,claims,repetitivelossandsevererepetitivelossstatisticsprovidedbyFEMAand are current as of March 31, 2014 and are summarized by Community Name. Pleasenotethetotalnumberofrepetitivelosspropertiesexcludesthesevererepetitivelossproperties. The number of claims represents claims closed by 3/31/2014.

Note (2) Totalbuildingandcontentlossesfromtheclaimsfileprovidedby FEMARegion2.

Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided byFEMARegion2inthepolicyfile.

Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.13-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

	1%	0.2%			
Municipality	**Dam**	**Dam**	**Government**	**School**	**WWTP**
Township of Millburn	5	5	2	1	1

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), stream bank overflow along the East Branch and West Branch Rahway River, the Passaic River, Canoe Brook, Taylor Brook, and Great Hills Brook is the principal flood problem within the Township of Millburn. Such flooding along the East Branch and West Branch Rahway River has caused damage to some homes and a number of commercial establishments. Flooding along the brooks primarily affects private residences and property in Millburn (FEMA FIS 2014).

Additionally, the municipality has identified the following hazard problems and/or problem areas:

Flood

Millburn Township experiences flooding in areas of poor drainage and along the East and West Branches of the Rahway River. Alleviating the flooding issue requires modifying the local storm drainage system and stormwater management practices. No structures built solely for flood protection exist in the Township of Millburn (FEMA FIS 2014).

Other areas prone to flooding in the Township include:

- South Mountain section of Millburn – moderate to severe flooding has occurred.
- Wyoming section of Millburn has had moderate to severe flooding.
- Meadowbrook section of Short Hills has had flooding issues.
- Downtown area of Millburn that surrounds the West Branch of the Rahway River.
- Millburn Avenue near the East Branch of the Rahway River.

9.13.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of Millburn.

Table 9.13-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y		Stephen Jones, Construction Official	2009
Zoning Ordinance	Y		Planning / Zoning Eileen Davitt Zoning Officer	Dec 18, 1984; Amended through Dec 31, 2012
Subdivision Ordinance	Y		Planning / Zoning Eileen Davitt Zoning Officer	Dec 18, 1984
NFIP Flood Damage Prevention Ordinance	Y		Tom Watkinson Municipal Engineer, Flood Plain Administrator	2002; Amended in entirety by Ordinance 2287-07
Cumulative Substantial Damages	N		-	-
Freeboard	N		-	-
Growth Management	Y		Tom Watkinson, Municipal Engineer, Flood Plain Administrator	2002; Amended in entirety by Ordinance 2287-07
Floodplain Management / Basin Plan	Y		Tom Watkinson, Municipal Engineer, Flood Plain Administrator	2002; Amended by Ordinance 2374-11
Stormwater Management Plan/Ordinance	Y		Tom Watkinson, Municipal Engineer, Flood Plain Administrator	2002; Amended by Ordinance 2374-11
Comprehensive Plan / Master Plan/ General Plan	Y		Planning Board	June 1985; Master Plan Updated and Adopted Feb. 27,1991
Capital Improvements Plan	Y		Jason Gabloff,	6 Year Capital Program 2013-2018

Table 9.13-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
			Chief Financial Officer Cert No.N0457	South Mountain Drainage Engineering Project
Site Plan Review Requirements	Y		Planning / Zoning Eileen Davitt Zoning Officer	Amended through Dec 31, 2012 Zoning Ordinances and Construction Code
Open Space Plan	Y		Planning Board	June 1990; Master Plan Updated and Adopted Feb. 27,1991
Stream Corridor Management Plan	Y		Tom Watkinson, Municipal Engineer, Flood Plain Administrator	Amended by Ordinance 2374-11
Watershed Management or Protection Plan	Y		Tom Watkinson, Municipal Engineer, Flood Plain Administrator	Ordinance 2214-03
Economic Development Plan	N			Under Development by Township Business Administrator
Comprehensive Emergency Management Plan	Y		Tim Gordon, Business Administrator OEM Coordinator	Updated Plan accepted and adopted by Essex County OEM
Emergency Response Plan	Y		Tim Gordon, Business Administrator OEM Coordinator	Updated Plan accepted and adopted by Essex County OEM
Post Disaster Recovery Plan	Y		Tim Gordon, Business Administrator OEM Coordinator	Feb 10, 2012; Updated Plan accepted and adopted by Essex County OEM
Post Disaster Recovery Ordinance	N		-	-
Real Estate Disclosure Requirement	N		-	-
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]	Y		Tom Watkinson, Municipal Engineer, Flood Plain Administrator	Ordinance 2214-03

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of Millburn.

Table 9.13-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Engineering Department
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Tom Watkinson, PE – Township Engineer Stephen Jones, Construction Official
Planners or engineers with an understanding of natural hazards	Y	Tom Watkinson, PE – Township Engineer
NFIP Floodplain Administrator	Y	Tom Watkinson, PE – Township Engineer
Surveyor(s)	Y	Richard Smith, LS (Engineering/Yearly Contract)
Personnel skilled or trained in "GIS" applications	Y	Jack Flood, Spatial Data Products
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Tim Gordon, OEM Coordinator Mike Roberts, Deputy OEM Coordinator
Grant Writer(s)	Y	Martha Annoni, Assistant Municipal Engineer
Staff with expertise or training in benefit/cost analysis	Y	Jason Gabloff, CFO – Finance Department
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the Township of Millburn.

Table 9.13-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes; Martha Annoni, Asst. Engineer
Capital Improvements Project Funding	Yes; Jason Gabloff, CFO – Finance
Authority to Levy Taxes for specific purposes	Yes; Township Committee (Robert Tillotson, Mayor; Tim Gordon, Business Administrator)
User fees for water, sewer, gas or electric service	Yes; Donna Ruggiero, Tax Collector
Impact Fees for homebuyers or developers of new development/homes	Yes; Zoning Board
Incur debt through general obligation bonds	Yes; Jason Gabloff, CFO – Finance
Incur debt through special tax bonds	Yes; Jason Gabloff, CFO – Finance
Incur debt through private activity bonds	No; Jason Gabloff, CFO – Finance
Withhold public expenditures in hazard-prone areas	Yes; Jason Gabloff, CFO – Finance
Mitigation grant programs	Yes; Jason Gabloff, CFO – Finance
Other	

Community Classifications

The table below summarizes classifications for community program available to the Township of Millburn.

Table 9.13-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	
Building Code Effectiveness Grading Schedule (BCEGS)	4 Residential, 3 Commercial	2011
Public Protection	3	January 2007
Storm Ready	NP	
Firewise	NP	

NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website athttp://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Tom Watkinson, PE – Township Engineer

Flood Vulnerability Summary

The municipality does not maintain lists/inventories of properties that have been flood damaged. During Hurricane Sandy, tree damage was experienced. During Hurricane Irene, basements flooding and some first floor flooding was also experienced.

The NFIP Floodplain Administrator does not make substantial damage estimates.

The NFIP Floodplain Administrator does not know if anyone is interested in mitigation or how many are currently in the process of mitigation. Any property being mitigated is funded by homeowners and flood insurance.

Resources

The NFIP Floodplain Administrator is the sole person responsible for floodplain administration. The services Administrator provides inspections and damage assessments. The Administrator does not provide any education or outreach to the community regarding flood hazards/risk.

The NFIP Floodplain Administrator indicated that there are barriers to running an effective floodplain management program in the municipality. The Administrator also indicated that they do not feel adequately supported and trained to fulfill responsibilities as the municipal floodplain administrator. They also stated that they would consider continuing education and/or certification training in floodplain management if it was offered.

Compliance History

The community is in good standing in the NFIP. The current NFIP Floodplain Administrator has no knowledge of when the last CAV was performed. The municipality sees no specific need for a CAV at this time.

Regulatory

The communities Flood Damage Prevention Ordinance was last updated on 12/17/2013, and is found at the Development Regulations and Zoning Ordinances Article 7 of the local code.

Millburn Township floodplain management regulations and ordinances meet FEMA and New Jersey minimum requirements. There are additional local ordinances and plans supporting the implementation of the floodplain management program.

At this time, Millburn Township does not participate in the Community Rating System (CRS) program. Attending a seminar on CRS would be of interest to Millburn Township to familiarize themselves with the program.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

None identified at this time.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

Millburn Township has a history of environmental awareness, planning and regulation through its commissions, committees, master plan and municipal codes. The summary below briefly touches upon how the Township integrates mitigation into their day-to-day operations.

Plans: The Township's Master Plan, available on their Township website, is the legal roadmap to planning for appropriate and safe land development. Millburn Township completed its last comprehensive master plan in 1991. Reexamination reports of the master plan and development regulations were subsequently prepared in

1997, 2002, and 2008. The 1991 Municipal Master Plan contains multiple elements that set goals and objectives relative to land use, historic preservation, recreation and conservation, traffic circulation, and recycling.

The 2008 Master Plan Reexamination lists the goals and objectives which include a hazard mitigation component: 'To prohibit development of areas inappropriate for development, such as flood plains, water reserves, wetlands and other environmentally sensitive area.'

The Environmental Resources Inventory (ERI) was created for Millburn Township with the support of the Association of New Jersey Environmental Commissions (ANJEC) to objectively identify and describe the natural resources, cultural conditions, environmental features, and concerns within the community. This document summarizes the general goals the Township considers for the following: habitats and wildlife; air quality; water quality; environmental education; land use and sustainability. There are sections dedicated to discussing the regulations and local ordinances relative to steep slopes, wetlands and floodplains.

According to the ERI, the Stormwater Management Plan for Millburn (April 2005) contains information on the strategy against stormwater-related impacts. The Township established an ordinance that requires all proposed major development to comply with New Jersey's soil and erosion and sediment control standards, as well as the erosion control, groundwater recharge, stormwater runoff quantity, and stormwater quality standards, in accordance with the Municipal Stormwater Regulation Program.

The Township is in support of the current study being performed by the US Army Corps of Engineers of the entire Rahway River Basin. The study has, so far, identified ten (10) alternative solutions to relieve flooding in towns along the river, and has narrowed that to four (4) that provide a positive B/C ratio.

Codes, Ordinances and Regulations:

The Development Regulations and Zoning Ordinance were adopted by the Township Committee on December 18, 1984 by Ordinance No. 1838-84. ARTICLE 7 - FLOOD DAMAGE PREVENTION [Ord. 2197-02; amended in entirety by Ord. 2287-07]. A development permit must be obtained prior to commencement of any construction or development in special flood hazard areas. All new construction and substantial improvements must comply with the general provisions and standards set forth within the ordinance.

According to Article 7, Section 706 (Riparian Zone) of the Township's Development Regulations and Zoning Ordinance (Ordinance No. 1838-34; adopted December 18, 1984 and amended through December 31, 2010), the Township Committee acknowledges that riparian lands adjacent to streams, lakes, or other surface water bodies that are adequately vegetated provide an important environmental protection and water resource management benefit.

No construction, development, use, activity, or encroachment is permitted in a riparian zone unless the effects of such development are accompanied by preparation, approval, and implementation of a Riparian Zone Management Plan. The plan must be approved by the Township Engineer, in coordination with the Environmental Commission.

The Township has an ordinance that limits the development on pieces of property that have a slope greater than 15 (as per Article 6, Section 608 (Protection of Steep Slope Areas) of the Township's Development Regulations and Zoning Ordinance (Ordinance No. 1838-34; adopted December 18, 1984 and amended through December 31, 2010).

All site plans and major subdivisions must incorporate soil erosion and sediment control plans developed in accordance with the requirements of the Soil Erosion and Sediment Control Act.

The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Millburn website at http://twp.millburn.nj.us for further information (FEMA FIS 2014).

Outreach and Partnering with Schools: According to the ERI, Aquafest is an interactive water education program presented annually to grades two (2) through five (5) at a Millburn Township public elementary school. The program is run by the Millburn Township EC in partnership with the Millburn High School Environmental Club. Aquafest is recognized as New Jersey's first educational program in compliance with Stormwater Phase II regulations.

Planned Integration Activities

The Township continues to pursue integrating mitigation into day-to-day operations. The Township's Continuity of Operations Plan (COOP) and Fire Plan do not integrate the HMP; however the Township will use the HMP as a guide for the next COOP and Fire Plan update. The Township is also interested in conducting outreach on natural and human-caused hazards. Below is a summary of mitigation actions identified as part of this planning effort to continue the integration. Please refer to Table 9.13-11 and the mitigation action worksheets located at the end of this annex for more details on each mitigation action:

- Participate in Firewise
- Participate in the Community Rating System
- Participate in StormReady to educate the public on how to prepare for hazards and disasters
- Improve stormwater drainage capacities including stormwater pumping capacity at South Mountain – identified as a need in the Township's ERI
- Conduct additional flood planning by modeling a 50-year event along the east and west branches of the Rahway River.

9.13.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.13-10. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Flooding – JFK Parkway and mall area	No Progress; Continuous	In early stages of planning by Essex County Engineer. It's incorporated in their five year Hazard Plan. The Essex County DPW is the lead agency; therefore, this initiative will not be carried over by Millburn. Please refer to the Essex County Annex (Section 9.1).
2: Mitigation plan for 50 year storm event along east and west branches of Rahway River	In Progress; 95% complete	Flood walls complete exceptions. Earth Dam complete. Upgrade of pump station at Gilbert Place in study. Approximately on the low end = $1.5 Million. Capital project. This initiative will be carried over to current mitigation strategy.
3: NJ American Reservoirs	No Progress; Discontinued	The New Jersey American Water Company operates an integrated CCTV/Access? Intrusion system at over 150 locations on a closed proprietary network. Corporate IT policy no remote connections into the system can be made. They can provide a liaison at any command post that will have remote VPN access into their system. This initiative will be not carried over to current mitigation strategy.
4: Well House security	No progress; Discontinued	East Orange Water Company states that the Canoe Brook station is above the flood plain. Sand bags are utilized during flooding conditions at all well houses. No plans currently. Talking about a camera system. Installed new fence and gated entrance at Parsonage Hill Rd pumping station. Operates a state of the art computer system that controls the system. Also working on a 25 year plan. This initiative will not be carried over to current mitigation strategy.
5: Taylor Park dam	In Progress; 40% complete; Continuous	Currently under construction. Engineering Capital Project $ 43,600 Engineering costs plus $383,000 Construction costs. This initiative will be carried over to current mitigation strategy.
6: Millburn Avenue bridge	Complete	Completed by Essex County Department of Public Works. Since this project was completed by the County, it will not be carried over by Millburn. Please refer to the Essex County Annex (Section 9.1).

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The Township has identified the following as mitigation projects/activities that have been completed, are planned, or on-going within the municipality:

- Lakeview Dr and Knollwood Rd – Local Drainage Improvements.
- Locust Ave and Mountain Ave – Local Drainage Improvements.
- South Side of West Branch of Rahway River – Flood mitigation – retaining wall reconstruction.
- Cypress St and Millburn Ave – Modification of local storm drainage system.
- South Mountain section – Flood wall upgrades project.
- Haran Circle – Earth and Bern project. Dike Pump Station.
- Taylor Park – Replace/Repair Dam.
- Gilbert Place and Ridgewood Rd – Local Drainage Improvements. Low flood walls improvements.
- Millburn/Short Hills – Leaf Collection Program – Flood Mitigation/Storm Water Management.
- Reconstruction of Vauxhall Road Bridge at East Branch Rahway River.
- Stream realignment and channel improvements along East Branch Rahway River between Millburn Ave and Vauxhall Rd.
- Reconstruction of Millburn Avenue Bridge at West Branch Rahway River
- Some of the brooks have paved or piped sections that may aid in reducing channel obstructions (FEMA FIS 2014)
- A section of the West Branch Rahway River is channelized (FEMA FIS 2014)

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.13-11 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.13-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.13-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Millburn-1 (NEW/LOI)	Millburn Haran Circle dike generator.	Existing	All	1.2 6.1	Office of Emergency Management	High	High $150,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Millburn-2 (NEW/LOI)	Millburn Gilbert Place generator.	Existing	All	1.2 6.1	Office of Emergency Management	High	High $270,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Millburn-3 (NEW/LOI)	Millburn Ridgewood Road generator.	Existing	All	1.2 6.1	Office of Emergency Management	High	High $180,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Millburn-4 (NEW/LOI)	Millburn Police Station and EOC generator.	Existing	All	1.2 6.1	Office of Emergency Management	High	High $150,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Millburn-5 (NEW)	Inflow/Infiltration to protect infrastructure during sanitary sewer back-ups.	Existing	Flood	1.2 2.2	Township of Millburn	High	High	Local budget	Long-term	High	SIP	SP
Millburn-6 (NEW)	Fix undermined retaining wall at Arboretum Brook by stabilizing slopes susceptible to erosion.	Existing	Flood Severe Weather	1.2 2.1 2.2	Township of Millburn DPW and Public Works	High	Medium	Local	On-going	High	SIP, NSP	SP

Table 9.13-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Millburn-7 (NEW)	Township of Millburn Community Rating System membership.	New and Existing	Flood	1.3 3.2 5.4	Township of Millburn	High	Low	Local	Short	High	LPR	PR
Millburn-8 (NEW)	Enroll local Floodplain Manager in CFM education and prepare for exam.	New and Existing	Flood	4.2 5.2	Township of Millburn	High	Low	Local budget	Short	High	LPR	PR
Millburn-9 (NEW)	Add drainage structures to Chatham Road.	New	Flood, Severe Weather, Severe Winter Storm	1.2 2.1	Township of Millburn	High	Medium	Local budget	Medium	High	SIP	SP
Millburn-10 (NEW)	Participate in Firewise program	New and Existing	Fire	1.1 3.1	Local Office of Emergency Management, Millburn Fire Department	High	Low	Local	Short	Medium	LPR	PR
Millburn-11 (NEW)	Improve flood risk assessment for NFIP properties using GIS.	New and Existing	Flood	1.2 1.3 3.2	Township of Millburn	Medium	Medium	Local/State grants or loans	Short	Medium	LPR, EAP	PR
Millburn-12 (NEW)	Form partnerships to support floodplain management.	New and Existing	Flood	5.4	State and Federal	Medium	High	Local budget	Long-term	High	LPR	PR
Millburn-13 (NEW)	Improve stormwater drainage system capacity for Meadowbrook Road drainage.	New and Existing	Flood	1.2 2.2	Township of Millburn-Public Works and Engineering	High	High	HMGP, FMA, PDM, Local budget	Long-term DOF	Low	SIP	SP
Millburn-14 (NEW)	South Mountain storm pumps.	New	Flood, Severe Weather, Severe Winter Storm	1.2 2.2	Township of Millburn Public Works and Engineering	High	High	HMGP, FMA, PDM, Local budget	Long-term DOF	High	SIP	SP
Millburn-15	New drainage system	New	Flood,	1.2	Township of	High	High	HMGP,	Short Term		SIP	SP

Table 9.13-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
(NEW)	to be constructed on Knollwood Road.		Severe Weather, Severe Winter Storm	2.2	Millburn Public Works and Engineering			FMA, PDM, Local	DOF	High		
Millburn-16 (NEW)	Drainage infrastructure for private properties added to South Mountain.	New	Flood, Severe Weather, Severe Winter Storm	1.2 2.2	Township of Millburn Public Works and Engineering	High	High	Local budget, Local or State loans and grants	Long-term	High	SIP	SP
Millburn-17 (NEW)	Participate in Storm Ready program and educate the public on how to prepare for hazards and disasters.	New and Existing	All Hazards	1.2 3.1 3.2	Local Office of Emergency Management	Medium	Low	Local budget	Short	High	LPR, EAP	PR
Millburn-19 (Old 2)	Mitigation plan for 50 year storm event along east and west branches of Rahway River.	New and Existing	Flood		Township of Millburn		$1,500,000	Local	Long-term	High	LPR	
Millburn-21 (Old 5)	Taylor Park dam. Replace outdated leaking dam, repair undermining of concrete discharge apron and reconstruct 100ft of retaining wall along West Branch of Rahway river.	Existing	Flood		Township of Millburn		$43,600 (Engineering) $383,000 (Construction)	Capital budget	On-going	High	SIP	
Millburn-22	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable. Assess and prioritize non-structural flood hazard mitigation alternatives for at risk properties within the floodplain, including those that have been identified as repetitive loss, such as acquisition/relocation, or elevation depending on feasibility. The parameters for feasibility for this initiative would be: funding, benefits versus costs and willing participation of property owners. Implement as funding becomes available.											
	See above.	Existing	Flood, Coastal Storm,	1.2 2.2	Township Engineering via NFIP FPA)	High	High	FEMA Mitigation Grant	Long term DOF (specific project application and	High	SIP	PP

Table 9.13-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
			Severe Weather, Winter Storm		with NJOEM, FEMA support			Programs and local budget (or property owner) for cost share	implementation)			
Millburn-23 (NEW)	375 Millburn Ave – Town Hall. See mitigation action worksheet for further details.	Existing	Flood	1.2, 2.2	Township	High	High	Local budget	Long Term	Low	SIP	PP

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:
CAV Community Assistance Visit
CRS Community Rating System
DPW Department of Public Works
FEMA Federal Emergency Management Agency
FPA Floodplain Administrator
HMA Hazard Mitigation Assistance
N/A Not applicable
NFIP National Flood Insurance Program
NJDEP New Jersey Department of Environmental Protection
NJOEM New Jersey Office of Emergency Management
OEM Office of Emergency Management

Potential FEMA HMA Funding Sources:
FMA Flood Mitigation Assistance Grant Program
HMGP Hazard Mitigation Grant Program
PDM Pre-Disaster Mitigation Grant Program
RFC Repetitive Flood Claims Grant Program
SRL Severe Repetitive Loss Grant Program

Timeline:
Short 1 to 5 years
Long Term 5 years or greater
OG On-going program
DOF Depending on funding

Costs:
Where actual project costs have been reasonably estimated:
Low < $10,000
Medium $10,000 to $100,000
High > $100,000

Where actual project costs cannot reasonably be established at this time:
Low Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.
Medium Could budget for under existing work plan, but would require a reapportionment of the

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:
Low= < $10,000
Medium $10,000 to $100,000
High > $100,000

Where numerical project benefits cannot reasonably be established at this time:
Low Long-term benefits of the project are difficult to quantify in the short term.
Medium Project will have a long-term impact on the reduction of risk exposure to life and

Costs:

budget or a budget amendment, or the cost of the project would have to be spread over multiple years.

High Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.

Benefits:

property, or project will provide an immediate reduction in the risk exposure to property.

High Project will have an immediate impact on the reduction of risk exposure to life and property.

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.13-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Millburn-1 (NEW/LOI)	Millburn Haran Circle dike generator.	1	1	0	1	1	1	1	1	-1	1	1	1	1	1	11	High
Millburn-2 (NEW/LOI)	Millburn Gilbert Place generator.	1	1	0	1	1	1	1	1	-1	1	1	1	1	1	11	High
Millburn-3 (NEW/LOI)	Millburn Ridgewood Road generator.	1	1	0	1	1	1	1	1	-1	1	1	1	1	1	11	High
Millburn-4 (NEW/LOI)	Millburn Police Station and EOC generator.	1	1	1	1	1	1	1	1	-1	1	1	1	1	1	11	High
Millburn-5 (NEW)	Inflow/Infiltration to protect infrastructure during sanitary sewer back-ups.	0	1	0	0	1	1	0	1	1	1	1	-1	1	1	8	High
Millburn-6 (NEW)	Fix undermined retaining wall at Arboretum Brook by stabilizing slopes susceptible to erosion.	0	1	1	1	1	1	1	1	0	0	1	1	0	1	10	High
Millburn-7 (NEW)	Township of Millburn Community Rating System membership.	0	1	1	1	1	1	1	0	1	1	1	0	0	0	9	High
Millburn-8 (NEW)	Enroll local Floodplain Manager in CFM education and prepare for exam.	0	1	1	1	1	1	1	1	1	1	1	1	1	1	13	High
Millburn-9 (NEW)	Add drainage structures to Chatham Road.	0	1	1	1	1	1	0	0	0	1	0	1	1	1	9	High
Millburn-10 (NEW)	Participate in Firewise program	1	1	1	1	1	0	1	1	1	1	1	1	1	0	12	Neutral
Millburn-11	Improve flood risk	0	1	1	1	1	1	1	0	1	0	1	1	1	1	11	Short

Table 9.13-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
(NEW)	assessment for NFIP properties using GIS.																
Millburn-12 (NEW)	Form partnerships to support floodplain management.	1	1	0	1	0	1	-1	-1	1	-1	1	-1	1	0	3	High
Millburn-13 (NEW)	Improve stormwater drainage system capacity for Meadowbrook Road drainage.	-1	0	-1	1	0	0	0	1	1	1	1	0	0	0	3	Low
Millburn-14 (NEW)	South Mountain storm pumps.	0	1	0	1	1	0	0	0	1	1	1	1	1	1	9	High
Millburn-15 (NEW)	New drainage system to be constructed on Knollwood Road.	0	1	0	1	1	1	1	0	1	1	1	1	1	1	11	High
Millburn-16 (NEW)	Drainage infrastructure for private properties added to South Mountain.	0	1	0	1	1	0	0	0	1	1	1	0	1	1	8	High
Millburn-17 (NEW)	Participate in Storm Ready program and educate the public on how to prepare for hazards and disasters.	1	1	1	1	1	1	1	1	1	1	1	1	1	0	13	High
Millburn-19 (Old 2)	Mitigation plan for 50 year storm event along east and west branches of Rahway River.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Millburn-21 (Old 5)	Taylor Park dam. Replace outdated leaking dam, repair undermining of concrete discharge	1	1	1	1	1	-1	1	1	-1	1	1	1	1	0	9	High

Table 9.13-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
	apron and reconstruct 100ft of retaining wall along West Branch of Rahway river.																
Millburn-22 (NEW)	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.	1	1	1	1	1	0	0	0	1	0	1	0	0	0	7	High
Millburn-23 (NEW)	375 Millburn Ave – Town Hall	0	1	1	1	1	0	-1	1	-1	1	0	-1	-1	1	3	Low

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.13.7 Future Needs To Better Understand Risk/Vulnerability

The Township of Millburn has identified a need for an Inflow and Infiltration (I&I) study of the sanitary sewer system in order to assess the location and extent of remedial work required. Excess I&I into the system exacerbates flooding in the south mountain area of the township as the sanitary system exceeds capacity during a flood event and contributes to the flood situation. Related to that, the Township would also desire a study done by the Joint Meeting to determine the adequacy of the entire system as it continues to the treatment facility in Elizabeth, NJ. Some of the surcharging experienced in the south mountain area may possibly be attributed to the lack of capacity in the entire system.

The Township also recognizes a need to analyze our existing storm sewer system, especially in problem areas, to identify capacity problems.

The Township has identified a need to provide temporary stormwater detention or impoundment to relieve pressure on the current storm sewer system and attempt to redirect floodwater away from flood prone areas. To that end, the Township would like to commission a study to investigate the possibility of creating stormwater detention in the area of Bleeker Street in the southeast corner of the township.

The Township also would like to petition the NJ Forest Fire Service to perform a risk analysis of the entire community, including adjacent areas in surrounding communities.

The Township is in support of the current study being performed by the US Army Corps of Engineers of the entire Rahway River Basin. The study has, so far, identified ten (10) alternative solutions to relieve flooding in towns along the river, and has narrowed that to four (4) that provide a positive B/C ratio.

9.13.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of Millburn that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of Millburn has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.13.9 Additional Comments

None at this time

Figure 9.13-1. Township of Millburn Hazard Area Extent and Location Map 1

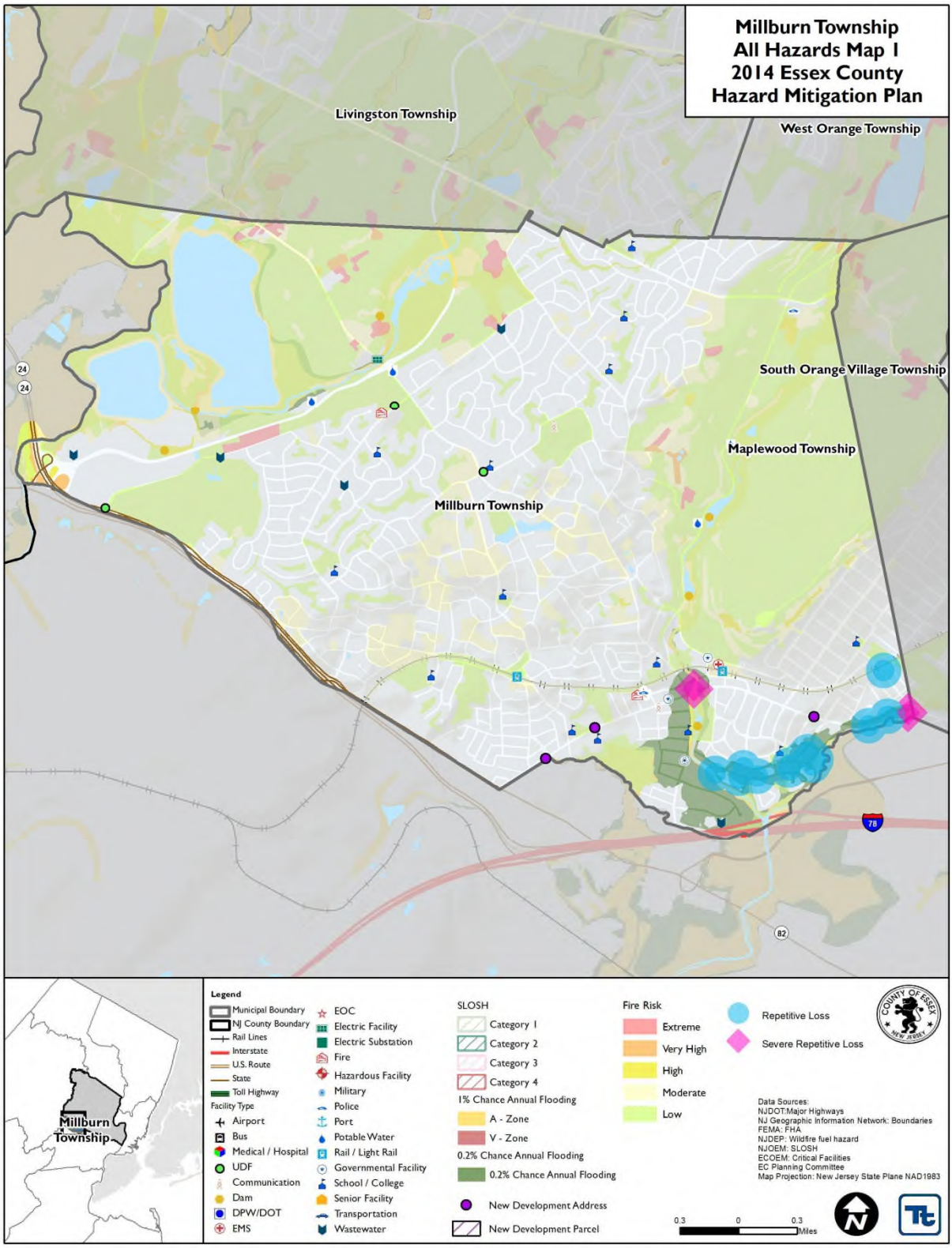
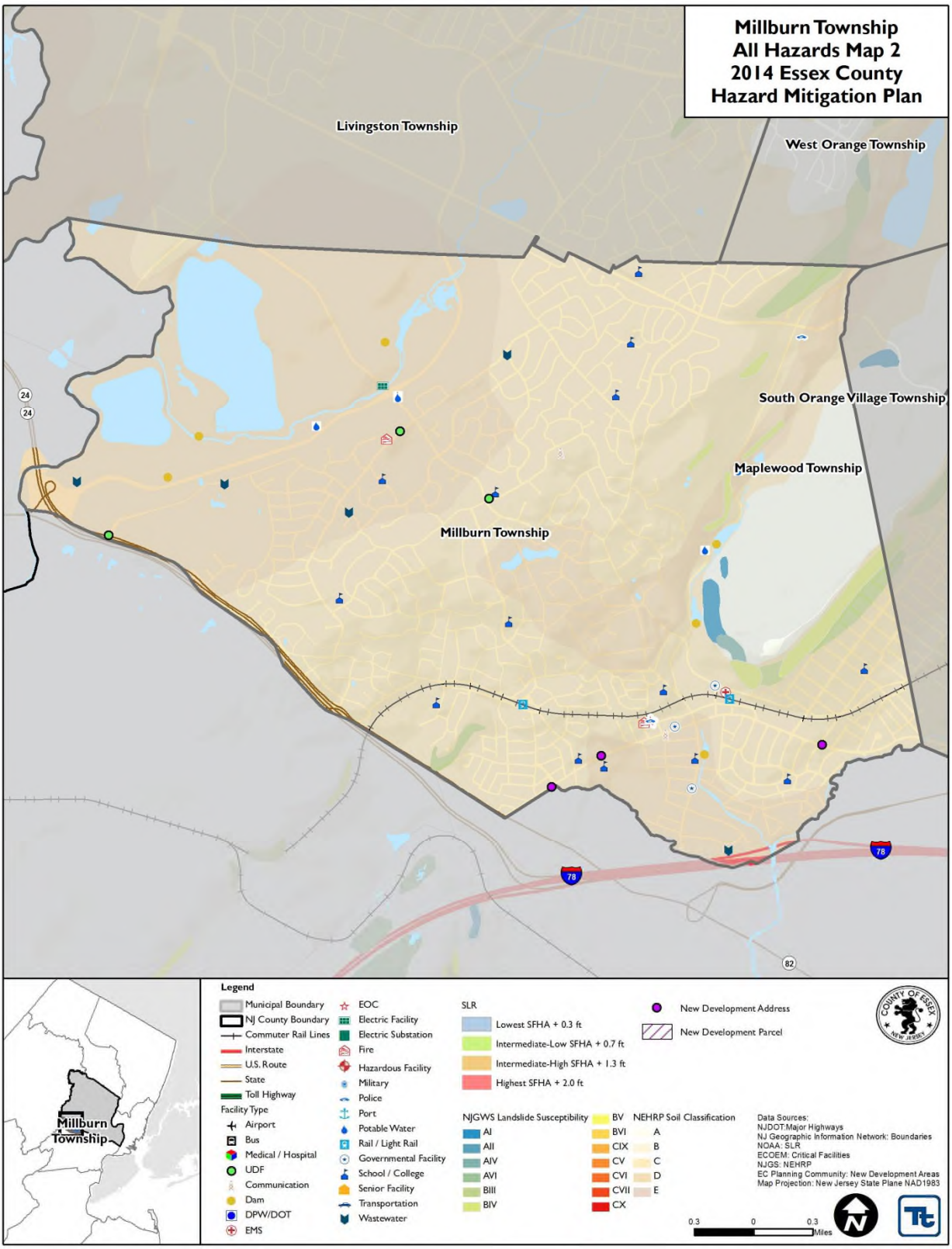


Figure 9.13-2. Township of Millburn Hazard Area Extent and Location Map 2



Action Number: **Millburn-1 (NEW)/LOI)**
Mitigation Action/Initiative: Millburn Haran Circle dike generator

Assessing the Risk	
Hazard(s) addressed:	Multi-Hazard
Specific problem being mitigated:	This localized flood reduction project is to install a 65kW generator at a storm water pumping station in a FEMA recognized flood zone to supply power during power outages. During significant rain events, flood waters inundate the rear yards and basements of private residents in the flood plain. The existing pump at the earthen dike is the only means of evacuating water that accumulates behind the dike. This pump when operating protects properties designated by the NFIP as in the Flood Plain. In this area, several large trunk lines from other communities come together which compounds the problem when power is lost.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Protection of Critical Facilities.
	2. Install 65kW generator.
	3. Installing back-up generators for pumping and lift stations in sanitary sewer systems along with other measures.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Protection of Critical Facilities
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	Goal is to reduce flooding by providing back-up power to storm water pumping station.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Reduce damage, Protection of Structures located in the floodplain.
Estimated Cost	$150,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Township of Millburn Engineer
Potential Funding Sources	State of NJ HMGP, Local Capital Improvement Budget, State/FEMA Grants.
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 06/27/2014 Progress on Action/Project: Existing project pending funding source.

Refer to prioritization table.

Action Number: **Millburn-1 (NEW)/LOI)**
Mitigation Action/Initiative: Millburn Haran Circle dike generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Protect lives due to flooded homes and roads. Protection of township workers.
Property Protection	1	Reduce loss of property. Reduce risk.
Cost-Effectiveness	0	No current funding source. Pending NJ HMGP funding.
Technical	1	Technically feasible.
Political	1	Public support.
Legal	1	State doesn't have the Authority to implement.
Fiscal	1	Project has no current funding pending NJ HMGP approval.
Environmental	1	Project complies with regulations.
Social	-1	Project would not disrupt established neighborhoods.
Administrative	1	Township Engineer
Multi-Hazard	1	Reduces flooding, erosion.
Timeline	1	Short
Agency Champion	1	Strong advocates.
Other Community Objectives	1	Supports local flooding projects and planning.
Total	11	
Priority (High/Med/Low)		

Action Number: **Millburn-2 (NEW/LOI)**
Mitigation Action/Initiative: Millburn Gilbert Place generator

Assessing the Risk	
Hazard(s) addressed:	Multi-Hazard
Specific problem being mitigated:	This localized flood reduction project is to install a 300kW generator at a storm water pumping station in a FEMA recognized flood zone to supply power during power outages. During significant rain events, flood waters inundate the rear yards and basements of private residents in the flood plain. The existing pump at the earthen dike is the only means of evacuating water that accumulates behind the dike. This pump when operating protects properties designated by the NFIP as in the Flood Plain. In this area, several large trunk lines from other communities come together which compounds the problem when power is lost.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Protection of Critical Facilities.
	2. Install a 300 kW generator.
	3. Installing back-up generators for pumping and lift stations in sanitary sewer systems along with other measures.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Protection of Critical Facilities
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	Goal is to reduce flooding by providing back-up power to storm water pumping station.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Reduce damage, Protection of Structures located in the floodplain.
Estimated Cost	$270,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Township of Millburn Engineer
Potential Funding Sources	State of NJ HMGP, Local Capital Improvement Budget, State/FEMA Grants.
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 06/27/2014 Progress on Action/Project: Existing project pending funding source.

Refer to prioritization table.

Action Number: **Millburn-2 (NEW/LOI)**
Mitigation Action/Initiative: Millburn Gilbert Place generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Protect lives due to flooded homes and roads. Protection of township workers.
Property Protection	1	Reduce loss of property. Reduce risk.
Cost-Effectiveness	0	No current funding source. Pending NJ HMGP funding.
Technical	1	Technically feasible.
Political	1	Public support.
Legal	1	State doesn't have the Authority to implement.
Fiscal	1	Project has no current funding pending NJ HMGP approval.
Environmental	1	Project complies with regulations.
Social	-1	Project would not disrupt established neighborhoods.
Administrative	1	Township Engineer
Multi-Hazard	1	Reduces flooding, erosion.
Timeline	1	Short
Agency Champion	1	Strong advocates.
Other Community Objectives	1	Supports local flooding projects and planning
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Millburn-3 (NEW/LOI)**
Mitigation Action/Initiative: Millburn Ridgewood Road generator

Assessing the Risk	
Hazard(s) addressed:	Multi-Hazard
Specific problem being mitigated:	This localized flood reduction project is to install a 100kW generator at a potential future storm water pumping station and/or a portable trailer mounted 100kW generator in a FEMA recognized flood zone to supply power during power outages. During significant rain events, flood waters inundate the rear yards and basements of private residents in the flood plain. The existing pump at the earthen dike is the only means of evacuating water that accumulates behind the dike. This pump when operating protects properties designated by the NFIP as in the Flood Plain. In this area, several large trunk lines from other communities come together which compounds the problem when power is lost.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Protection of Critical Facilities.
	2. Install 100kW generator.
	3. Installing back-up generators for pumping and lift stations in sanitary sewer systems along with other measures.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Protection of Critical Facilities
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	Goal is to reduce flooding by providing back-up power to storm water pumping station.
Applies to existing, future, or not applicable	Future Project that will tie in with Project 14 and 16. South Mountain Storm Pumps and Drainage Infrastructure for private properties.
Benefits (losses avoided)	Reduce damage, Protection of Structures located in the floodplain.
Estimated Cost	$180,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Township of Millburn Engineer
Potential Funding Sources	State of NJ HMGP, Local Capital Improvement Budget, State/FEMA Grants.
Timeline for Completion	5 years
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 06/27/2014 Progress on Action/Project: Future project pending funding source.

Refer to prioritization table.

Action Number: **Millburn-3 (NEW/LOI)**
Mitigation Action/Initiative: Millburn Ridgewood Road generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Protect lives due to flooded homes and roads. Protection of township workers.
Property Protection	1	Reduce loss of property. Reduce risk.
Cost-Effectiveness	0	No current funding source. Pending NJ HMGP funding.
Technical	1	Technically feasible.
Political	1	Public support.
Legal	1	State doesn't have the Authority to implement.
Fiscal	1	Project has no current funding pending NJ HMGP approval.
Environmental	1	Project complies with regulations.
Social	-1	Project would not disrupt established neighborhoods.
Administrative	1	Township Engineer
Multi-Hazard	1	Reduces flooding, erosion.
Timeline	1	Long term. In planning stages.
Agency Champion	1	Strong advocates.
Other Community Objectives	1	Supports local flooding projects and planning
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Millburn-4 (NEW/LOI)**
Mitigation Action/Initiative: Millburn Police Station and EOC generator

Assessing the Risk	
Hazard(s) addressed:	Multi-Hazard
Specific problem being mitigated:	The current generator at police headquarters is 41 years old and located in the basement of the building adjacent to the Emergency Operations Center for the Township. It no longer meets current code and emits odor that permeates the entire building as was the case in the last two hurricanes causing health concerns. The building is vital to the Community and must remain operable during any situation as it is the communications center for police to dispatch emergency calls, municipal court, detective bureau, detentions areas and vital administrative offices as well as the Emergency Operations Center for OEM.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Protection of Critical Facilities.
	2. Install 150kW generator.
	3. Installing back-up generator for Critical Facility
Action/Project Intended for Implementation	
Description of Selected Action/Project	Protection of Critical Facilities
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	Goal is to provide back-up power to support operations 24/7.
Applies to existing, future, or not applicable	Existing Project
Benefits (losses avoided)	Retrofitting police department to become hazard resistant.
Estimated Cost	$150,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Township of Millburn Engineer
Potential Funding Sources	State of NJ HMGP, Local Capital Improvement Budget, State/FEMA Grants.
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 06/27/2014 Progress on Action/Project: Existing project pending funds from NJ HMGP.

Refer to prioritization table.

Action Number: **Millburn-4 (NEW/LOI)**
Mitigation Action/Initiative: Millburn Police Station and EOC generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Life Safety of all residents in township needing services.
Property Protection	1	Reduce loss of property. Reduce risk.
Cost-Effectiveness	1	Pending NJ HMGP funding.
Technical	1	Technically feasible.
Political	1	Public support.
Legal	1	State doesn't have the Authority to implement.
Fiscal	1	Pending NJ HMGP approval.
Environmental	1	Project complies with regulations.
Social	-1	Project would not disrupt established neighborhoods.
Administrative	1	Township Engineer
Multi-Hazard	1	Yes
Timeline	1	Short term
Agency Champion	1	Strong advocates.
Other Community Objectives	1	None
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Millburn-5 (NEW)**
Mitigation Action/Initiative: Inflow/infiltration to protect infrastructure during sanitary sewer back-ups

Assessing the Risk	
Hazard(s) addressed:	Protect Infrastructure
Specific problem being mitigated:	Sanitary Sewer back-ups
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Reline Pipes/Sewers
	2. Grout pipe joints
	3. Replace pipes
Action/Project Intended for Implementation	
Description of Selected Action/Project	Protection of waste water system
Action/Project Category	Structure and Infrastructure project
Goals/Objectives Met	Techniques to protect critical facilities from flood
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Reduce sanitary sewer back-ups and pollution of streams
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Local Budget
Potential Funding Sources	Local and State grants or loans
Timeline for Completion	Long term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/10/14 Progress on Action/Project: Not completed; in-progress.

Refer to prioritization table.

Action Number: **Millburn-5 (NEW)**

Mitigation Action/Initiative: Inflow/infiltration to protect infrastructure during sanitary sewer back-ups

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	0	
Technical	0	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	-1	
Agency Champion	1	
Other Community Objectives	1	
Total	8	
Priority (High/Med/Low)	High	

Action Number: **Millburn-6 (NEW)**

Mitigation Action/Initiative: Fix undermined retaining wall at Arboretum Brook by stabilizing slopes susceptible to erosion

Assessing the Risk	
Hazard(s) addressed:	Structure and infrastructure project
Specific problem being mitigated:	Arboretum Brook retaining Walls undermining
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Maintain/Protect Wall footing
	2. Line Channel bottom with concrete
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Stabilize Erosion Hazard Areas
Action/Project Category	Natural Systems Protection
Goals/Objectives Met	To stabilize slopes susceptible to erosion
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Maintain wall stability, prevent land and soil loss
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn-Public Works, Engineering
Local Planning Mechanism	Local budget
Potential Funding Sources	Local
Timeline for Completion	Ongoing
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/10/14 Progress on Action/Project: Not completed

Refer to prioritization table.

Action Number: **Millburn-6 (NEW)**

Mitigation Action/Initiative: Fix undermined retaining wall at Arboretum Brook by stabilizing slopes susceptible to erosion

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	0	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Millburn-7 (NEW)**
Mitigation Action/Initiative: Township of Millburn Community Rating System membership

Assessing the Risk	
Hazard(s) addressed:	Local Planning and Regulations
Specific problem being mitigated:	Provide affordable Flood Insurance
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Participate in the CRS
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Exceed the minimum NFIP requirements. Participate in NFIP/CRS
Action/Project Category	Local Planning and Regulations
Goals/Objectives Met	Advising public about the local flood hazard, flood insurance, and flood protection measures
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Provide potential of lower flood insurance rates to residents
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Administration Budget
Potential Funding Sources	Local
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/10/14 Progress on Action/Project: Beginning of fact gathering. Signing up for educational course about CRS

Refer to prioritization table.

Action Number: **Millburn-7 (NEW)**

Mitigation Action/Initiative: Township of Millburn Community Rating System membership

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Millburn-8 (NEW)**
Mitigation Action/Initiative: Enroll local Floodplain Manager in CFM education and prepare for exam

Assessing the Risk	
Hazard(s) addressed:	Flood Plain management
Specific problem being mitigated:	Join or Improve Compliance with NFIP.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Designating a local floodplain manager and/or CRS coordinator who achieves CFM certification.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Enroll in CFM education curriculum and prepare for exam.
Action/Project Category	Local Planning and Regulations
Goals/Objectives Met	Provide flood plain management, increase floodplain awareness and education.
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Lower insurance rates, reduce risk, floodplain management
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Local budget
Potential Funding Sources	Local
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/10/14 Progress on Action/Project: Enrolled/ in-progress

Refer to prioritization table.

Action Number: **Millburn-8 (NEW)**

Mitigation Action/Initiative: Enroll local Floodplain Manager in CFM education and prepare for exam

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Millburn-9 (NEW)**
Mitigation Action/Initiative: Add drainage structures to Chatham Road

Assessing the Risk	
Hazard(s) addressed:	Improve Stormwater Drainage System Capacity
Specific problem being mitigated:	Road flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Add drainage structures
	2. Lower road
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Add drainage structures
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	Adding drainage structures would minimize roadway flooding
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Improve vehicle access and safety
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Local Budget
Potential Funding Sources	Local
Timeline for Completion	Medium
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/10/14 Progress on Action/Project: Planning stage

Refer to prioritization table.

Action Number: **Millburn-9 (NEW)**

Mitigation Action/Initiative: Add drainage structures to Chatham Road

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Millburn-10 (NEW)**
Mitigation Action/Initiative: Participate in Firewise program

Assessing the Risk	
Hazard(s) addressed:	Wildfire Education and Awareness Program.
Specific problem being mitigated:	The Firewise program provides a series of steps that individual residents and their neighbors can take to keep their homes and neighborhoods safer from "Fire."
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Joining the "Firewise Communities/USA" recognition program. 2. Sponsoring Firewise workshops for local officials, civic groups, and neighborhood/homeowner's associations.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Educate the public on how to reduce risk of Fire.
Action/Project Category	Wildfire-WF10 Education and Awareness Program.
Goals/Objectives Met	Increase Wildfire Education and Risk Awareness
Applies to existing, future, or not applicable	Future project.
Benefits (losses avoided)	Prevent or reduce loses by educating the public of risks.
Estimated Cost	Low
Priority*	Neutral
Plan for Implementation	
Responsible Organization	Local Office of Emergency Management, Millburn Fire Department
Local Planning Mechanism	Federal, State, County and local planning
Potential Funding Sources	Local
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/1/2014 Progress on Action/Project: Future Project.

Refer to prioritization table.

Action Number: **Millburn-10 (NEW)**
Mitigation Action/Initiative: Participate in Firewise program

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Increase Hazard Education and Risk Awareness
Property Protection	1	Increase Hazard Education and Risk Awareness
Cost-Effectiveness	1	Most resources are available free from FEMA and local, state resources.
Technical	1	Technically feasible.
Political	1	Overall public support.
Legal	0	State has no authority.
Fiscal	1	Can be funded through local resources.
Environmental	1	Increase Hazard Education and Risk Awareness
Social	1	Increase Hazard Education and Risk Awareness
Administrative	1	Local resources has the capability.
Multi-Hazard	1	Yes. Increase Hazard Education and Risk Awareness
Timeline	1	Short time line = less than 2 year.
Agency Champion	1	Local support from Township.
Other Community Objectives		Supports all functions of local government.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Millburn-11 (NEW)**
Mitigation Action/Initiative: Improve flood risk assessment for NFIP properties using GIS

Assessing the Risk	
Hazard(s) addressed:	Improve Flood Risk Assessment
Specific problem being mitigated:	Mapping flood prone properties using GIS
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Map individual properties in field
	2. Prepare overlays of topographic information on flood delineations
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Improve flood risk assessment.
Action/Project Category	Local Planning and Regulations + Education and Awareness Programs
Goals/Objectives Met	Provide graphic document to promote flood awareness
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Promote planning and preparedness thru awareness
Estimated Cost	Medium
Priority*	Short
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Local Budget
Potential Funding Sources	Local/State Grant or Loans
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/10/14 Progress on Action/Project: In discussion

Refer to prioritization table.

Action Number: **Millburn-11 (NEW)**

Mitigation Action/Initiative: Improve flood risk assessment for NFIP properties using GIS

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Millburn-12 (NEW)**
Mitigation Action/Initiative: Form partnerships to support floodplain management

Assessing the Risk	
Hazard(s) addressed:	Rahway River
Specific problem being mitigated:	Regional Flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Flood control structures
	2. Land buy out
	3. Feasibilities studies
Description of Selected Action/Project	Form partnerships to support floodplain management
Action/Project Category	Local Planning and Regulations
Goals/Objectives Met	Plan for flood control
Applies to existing, future, or not applicable	Existing and future
Benefits (losses avoided)	Reduce flooding and property loss
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	State and Federal
Local Planning Mechanism	Local Budget
Potential Funding Sources	Local/State/Federal
Timeline for Completion	Long-term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/10/14 Progress on Action/Project: in-progress

Refer to prioritization table.

Action Number: **Millburn-12 (NEW)**

Mitigation Action/Initiative: Form partnerships to support floodplain management

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	0	
Technical	1	
Political	0	
Legal	1	
Fiscal	-1	
Environmental	-1	
Social	1	
Administrative	-1	
Multi-Hazard	1	
Timeline	-1	
Agency Champion	1	
Other Community Objectives	0	
Total	3	
Priority (High/Med/Low)	High	

Action Number: **Millburn-13 (NEW)**

Mitigation Action/Initiative: Improve stormwater drainage system capacity for Meadowbrook road drainage

Assessing the Risk	
Hazard(s) addressed:	Structure and Infrastructure projects
Specific problem being mitigated:	Improve Stormwater Drainage system capacity
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Add drainage to rear residential yards
	2. Add drains and inlets to street
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Improve Stormwater drainage system capacity
Action/Project Category	Structure and Infrastructure project
Goals/Objectives Met	Installing, re-routing, or increasing the capacity of a storm drainage system
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Reduce localized flooding
Estimated Cost	High
Priority*	Low
Plan for Implementation	
Responsible Organization	Township of Millburn-Public Works, Engineering
Local Planning Mechanism	Local Budget
Potential Funding Sources	Local
Timeline for Completion	Long-term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/10/14 Progress on Action/Project: not completed

Refer to prioritization table.

Action Number: **Millburn-13 (NEW)**

Mitigation Action/Initiative: Improve stormwater drainage system capacity for Meadowbrook road drainage

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	-1	
Property Protection	0	
Cost-Effectiveness	-1	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	3	
Priority (High/Med/Low)	Low	

Action Number: **Millburn-14 (NEW)**
Mitigation Action/Initiative: South Mountain storm pumps

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Increase storm water pumping capacity.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Modify existing pumps.
	2. Install new pumps.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install New Pumps.
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	Minimize flooding and reduce risk.
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Reduce property damage, public safety
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Local Budget
Potential Funding Sources	Local and State Loans or Grants
Timeline for Completion	Long Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/10/14 Progress on Action/Project: In planning stages.

Refer to prioritization table.

Action Number: **Millburn-14 (NEW)**
Mitigation Action/Initiative: South Mountain storm pumps

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	0	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Millburn-15 (NEW)**
Mitigation Action/Initiative: New drainage system to be constructed on Knollwood Road

Assessing the Risk	
Hazard(s) addressed:	Flooding – Stormwater management project
Specific problem being mitigated:	Improve Stormwater Drainage System Capacity
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Increase size of existing pipes
	2. Construct new drainage system
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Construct new drainage system
Action/Project Category	Structure and Infrastructure project
Goals/Objectives Met	Contain runoff in underground system. Divert runoff to street, away from dwellings
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Reduce property damage, reduce risk, road flooding
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Local Budget
Potential Funding Sources	Local
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/10/14 Progress on Action/Project: in-progress

Refer to prioritization table.

Action Number: **Millburn-15 (NEW)**

Mitigation Action/Initiative: New drainage system to be constructed on Knollwood Road

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	0	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Millburn-16 (NEW)**
Mitigation Action/Initiative: Drainage infrastructure for private properties added to South Mountain

Assessing the Risk	
Hazard(s) addressed:	Flooding- Improve Stormwater Management Planning. Structure and Infrastructure Project.
Specific problem being mitigated:	Improve Stormwater Drainage Capacity. Increase Drainage capacity.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Improve drainage in flood prone areas.
	2. Provide adequate infrastructure for private property drainage.
	3.
Action/ProjectIntended for Implementation	
Description of Selected Action/Project	Provide adequate drainage infrastructure for private property drainage.
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	Decrease/minimize flooding.
Applies to existing, future, or not applicable	Future Project.
Benefits (losses avoided)	Reduce property damage, Road closures.
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Local Budget
Potential Funding Sources	Local and State loans or grants.
Timeline for Completion	Long-term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date:4/10/14 Progress on Action/Project: In planning stage

Refer to prioritization table.

Action Number: **Millburn-16 (NEW)**

Mitigation Action/Initiative: Drainage infrastructure for private properties added to South Mountain

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	In past storms Emergency Services needed to evacuate/rescue trapped residents.
Property Protection	1	Reduce risk of property damage.
Cost-Effectiveness	0	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	8	
Priority (High/Med/Low)	High	

Action Number: **Millburn-17 (NEW)**

Mitigation Action/Initiative: Participate in Storm Ready program and educate the public on how to prepare for hazards and disasters.

Assessing the Risk	
Hazard(s) addressed:	Multi-hazard. Implement and adopt a program on educating the public on how to prepare for hazards and disasters. Participating in National Weather Service StromReady Program. Providing hazard vulnerability checklists to homeowners to conduct their own inspections.
Specific problem being mitigated:	Improve Household Disaster Preparedness.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Education and Awareness Program.
	2. National Weather Service StormReady.
	3. Establishing an interactive website for educational materials.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Educate the public on how to prepare for hazards and disasters.
Action/Project Category	Multi-Hazard MU-15 & MU-14.
Goals/Objectives Met	Increase Hazard Education and Risk Awareness
Applies to existing, future, or not applicable	Future project.
Benefits (losses avoided)	Prevent or reduce loses by educating the public of risks.
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Local Office of Emergency Management
Local Planning Mechanism	Federal, State, County and local planning
Potential Funding Sources	Local
Timeline for Completion	Short.
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/1/2014 Progress on Action/Project: Future Project

Refer to prioritization table.

Action Number: **Millburn-17 (NEW)**

Mitigation Action/Initiative: Participate in Storm Ready program and educate the public on how to prepare for hazards and disasters.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Increase Hazard Education and Risk Awareness
Property Protection	1	Increase Hazard Education and Risk Awareness
Cost-Effectiveness	1	Most resources are available free from FEMA and local, state resources.
Technical	1	Technically feasible.
Political	1	Overall public support.
Legal	1	State has the authority to implement the program through the Local OEM.
Fiscal	1	Can be funded through local resources.
Environmental	1	Increase Hazard Education and Risk Awareness
Social	1	Increase Hazard Education and Risk Awareness
Administrative	1	Local resources has the capability.
Multi-Hazard	1	Yes. Increase Hazard Education and Risk Awareness
Timeline	1	Short time line = less than 1 year.
Agency Champion	1	Local support from Township.
Other Community Objectives		Supports all functions of local government.
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Millburn-19 (Old 2)**

Mitigation Action/Initiative: Mitigation plan for 50 year storm event along east and west branches of Rahway River

Assessing the Risk	
Hazard(s) addressed:	Local Planning and Regulations
Specific problem being mitigated:	Flood planning
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Construct flood walls
	2. Earth Dam
	3. Upgrade to Gilbert Place Pump
Action/Project Intended for Implementation	
Description of Selected Action/Project	Monitor Mitigation Plan Implementation
Action/Project Category	Multi-Hazards Local Plans and Regulations
Goals/Objectives Met	95% Complete. Reduce risk. Flood plan.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Loss of property damage, save lives.
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Milburn
Local Planning Mechanism	Local
Potential Funding Sources	Local
Timeline for Completion	Long-term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 4/10/14 Progress on Action/Project: progress

Refer to prioritization table.

Action Number: **Millburn-19 (Old 2)**

Mitigation Action/Initiative: Mitigation plan for 50 year storm event along east and west branches of Rahway River

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Reduce flooding. Residents in past need evacuation and/or rescue from floods
Property Protection	1	Reduce property loss
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	Reduce loss of natural system
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	95% complete
Agency Champion	1	
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Millburn-21 (Old 5)**

Mitigation Action/Initiative: Taylor Park dam. Replace outdated leaking dam, repair undermining of concrete discharge apron and reconstruct 100ft of retaining wall along West Branch of Rahway River.

Assessing the Risk	
Hazard(s) addressed:	Flooding-Multi Hazard.
Specific problem being mitigated:	Reconstruction of outdated dam and repair retaining walls.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Project has been selected and is currently under construction.
	2. Timeline is short.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Project will replace an outdated leaking dam, repair undermining of the concrete discharge apron and reconstruct 100+ feet of retaining wall along the Rahway River (West Branch).
Action/Project Category	Structure and Infrastructure Project & Natural Systems Project.
Goals/Objectives Met	Flood Control, Eliminate Soil Erosion.
Applies to existing, future, or not applicable	Applies to existing dam.
Benefits (losses avoided)	Flood control, repair/replace existing structure and repair failed retaining walls.
Estimated Cost	High + >
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Engineering Dept.
Potential Funding Sources	Capital Budget-Local
Timeline for Completion	OG
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3/13/2104 Progress on Action/Project: Progress. Under construction.

Refer to prioritization table.

Action Number: **Millburn-21 (Old 5)**

Mitigation Action/Initiative: Taylor Park dam. Replace outdated leaking dam, repair undermining of concrete discharge apron and reconstruct 100ft of retaining wall along West Branch of Rahway River.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Protection of nearby children's playground and day care facility.
Property Protection	1	Protect businesses and downstream residences.
Cost-Effectiveness	1	Low cost with high benefits.
Technical	1	Township hired an Engineer to design project.
Political	1	Overall public support.
Legal	-1	State has no legal authority.
Fiscal	1	Project funded with local funds. Capital expense.
Environmental	1	The environmental impacts were severe. Soil erosion, retaining walls destroyed.
Social	-1	Project would not impact any groups.
Administrative	1	Township hired an Engineer to design and implement project. Local Engineer was involved.
Multi-Hazard	1	Yes. Infrastructure, structure, protect land due to erosion.
Timeline	1	Short. Project completed.
Agency Champion	1	Strong local support from Township.
Other Community Objectives	0	None.
Total	9	
Priority (High/Med/Low)	High	Project complete.

Action Number: **Millburn-23**
Mitigation Action/Initiative: 375 Millburn Ave – Town Hall

Assessing the Risk	
Hazard(s) addressed:	Structure and Infrastructure Project
Specific problem being mitigated:	Requiring all critical facilities to meet requirements of Executive Order 11988 and be built 1 foot above the 500 year flood elevation. Requiring that all critical facilities be located outside of the flood-prone areas.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Downtown District Redevelopment Plan
	2. Purchase/Acquire Properties for redevelopment
	3. Refurbish and/or Construction of a new Town Hall
Action/Project Intended for Implementation	
Description of Selected Action/Project	On February 20, 2007 the Township of Millburn governing body was requesting Proposals for comprehensive planning services necessary to assist the Planning Board in the preparation of a Redevelopment Plan for approximately 13 acres of property situated in Millburn's Downtown District. The Township purchased a property that formally housed Rimback Storage in 2008 for approximately $3 million and original plans called for this site to be used as a new Town Hall and incorporated into a $100 million downtown redevelopment project. On December 2, 2008 the Township of Millburn governing body officially voted down the Redevelopment Plan. This plan was opposed by many residents and local non-profit grassroots organizations.
Action/Project Category	F-18 Protect Critical Facilities
Goals/Objectives Met	Property acquired. Goal of Township governing body is still to relocate Town Hall in the future. Refer to Township Master Plan.
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Prevent future flooding of a government building. Reduce Risk of loss of function, services.
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Township of Millburn
Local Planning Mechanism	Local governing body
Potential Funding Sources	Local Budget
Timeline for Completion	Long Term > years
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 6/11/2014 Progress on Action/Project: New Action

Action Number: **Millburn-23**
Mitigation Action/Initiative: 375 Millburn Ave – Town Hall

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	Non-life safety.
Property Protection	1	Relocation Town hall to another location would move it out of the 500 year flood elevation area.
Cost-Effectiveness	1	Relocation of Town hall was originally part of a Redevelopment Plan.
Technical	1	Very Technical
Political	1	Redevelopment plan was highly opposed by residents and grassroots organizations.
Legal	0	State of NJ has no legal authority.
Fiscal	-1	Plan was approximately $100 million in 2008.
Environmental	1	Would comply with environment regulations.
Social	-1	Heavily opposed
Administrative	1	Township governing body and Local Zoning Board in consultation with a planning professional.
Multi-Hazard	0	Non-Multi hazard
Timeline	-1	>5 years
Agency Champion	-1	Original plan was voted down.
Other Community Objectives	1	Project advanced local objectives: Capital Improvement's, economic development
Total	3	
Priority (High/Med/Low)	Low	

9.14 Township of Montclair

This section presents the jurisdictional annex for the Township of Montclair.

9.14.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Kimberli Craft, P.E., Township Engineer/Community Services 219 N.Fullerton Avenue, Montclair, NJ 07042 Phone: 973-509-5707 E-mail: kcraft@montclairnjusa.org	Tom Diveny, Deputy Chief/Fire Dept. One Pine Street, Montclair, NJ 07042 Phone: 973-509-4999 E-mail: tdiveny@monclairnjusa.org

9.14.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of Montclair was 37,669.

Location

Montclair Township is approximately 6.16 square miles. It is bordered by Bloomfield to the east, West Orange to the south, the Eagle Rock Reservation to the southwest, and Clifton to the northeast. The First Watchung Mountain can be found along the southern and western borders (Montclair Township, 2014).

Brief History

The area now known as Montclair Township was once part of the land of the Lenape Indians. Lenape heritage is still represented today in Montclair Township with the areas Watchung (on the hill) and Yantacaw (means place of dancing). The expansion of the railroad system in 1856 gave Montclair Township the opportunity to turn from a quiet country town into a commuter town for the people working in New York City. In 1873 five railroad stations along the Greenwood Lake line were completed. To this day, Montclair Township embraces both its country setting and easy access to New York City. There are over 40,000 trees in the many park areas and nature reserves within Montclair Township. Montclair State University can also be found in Montclair Township (Montclair Township, 2014).

Governing Body Format

Montclair Township has used the Faulkner Act's Council-Manager form of municipal government to set up its government operations. This style of government is also known as the Optional Municipal Charter Law. The Council is the elected power and the manager is appointed by the Council (Montclair Township, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.14.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.14-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
190-192 Bloomfield Avenue	Residential	11 units	190-192Bloomfield Avenue	None	Under Construction
Centro Verde	Mixed-Use	329 units/ 80,000 SF Commercial	638 Bloomfield Avenue	ND	Under Construction
Kensington	Residential	88 units	65 Church Street	None	Approved
Montclairion II	Residential	40 units	10 Pine Street	None	Approved
HD Orange 2013 Urban Renewal	Commercial	148 room hotel	Block 1401, Lot 1.01	None	

** Only location-specific hazard zones or vulnerabilities identified.*

9.14.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.14-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
February 5-6, 2010	Severe Winter Storm and Snowstorm	DR-1889	Yes	Water damage to residence
March 12 – April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	Storm and water damage to multiple residences
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Storm and water damage to multiple residences
October 29, 2011	Severe Storm	DR-4048	Yes	Storm and water damage to multiple residences
October 26 – November 8, 2012	Superstorm Sandy	EM-3354 DR-4086	Yes Yes	Storm damage

9.14.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of Montclair. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Township of Montclair.

Table 9.14-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]		Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA:	$0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: Category 2 SLOSH: Category 3 SLOSH: Category 4 SLOSH:	$0 $0 $0 $0	Occasional	12	Low
Drought	Damage estimate not available		Occasional	18	Medium
Earthquake	500-year MRP: 2,500-year MRP:	$3,669,112 $83,350,000	Occasional	12	Low
Extreme Temperature	Damage estimate not available		Frequent	27	Medium
Flood	1% Annual Chance:	$11,451,898	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C:	$105,075,800	Occasional	12	Low
Severe Storm	100-Year MRP: 500-year MRP: Annualized:	$5,210,069 $29,057,801 $354,125	Frequent	48	High
Winter Storm	1% GBS: 5% GBS:	$36,743,895 $183,719,473	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High:	$11,453,100	Frequent	18	Medium
Civil Disorder	Damage estimate not available		Occasional	24	Low
Cyber Attack	Damage estimate not available		Occasional	10	Low
Disease Outbreak	Damage estimate not available		Frequent	15	Medium
Hazardous Substances	Damage estimate not available		Frequent	15	Medium
Power Outages	Damage estimate not available		Frequent	36	Low
Terrorism	Damage estimate not available		Occasional	24	Low
Transportation Failure	Damage estimate not available		Frequent	36	Low

Notes:

a. *Building damage ratio estimates based on FEMA 386-2 (August 2001)*
b. *The valuation of general building stock and loss estimates was based on custom inventory for the municipality.*
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20
c. *Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of Montclair.

Table 9.14-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Montclair, Township of	369	143	$1,142,339.00	13	2	209	227	142

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.14-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

Municipality	1% Annual Chance Event	% Annual Chance Event
	EMS	EMS
Township of Montclair	1	1

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), flooding along the streams within the Township of Montclair is mainly caused by backwater that is created by inadequate pipes, box culverts, and bridges clogged by deposits of silt and debris. Shallow, rocky streambeds and heavy brush cover on overbanks also limit effective flow areas (FEMA FIS 2014).

The adjacent land area for the streams studied in detail in Montclair is affected by heavy rainfall, with the exception of a few areas where the channel is relatively wide and the banks are well stabilized. There are several other areas in the township, which, although not adjacent to a body of water, experience flooding due to an inadequate storm water drainage system (FEMA FIS 2014).

Montclair has sustained damages from past floods. The significant floods occurred during May 1968, August and September 1971, and on February 2, 1973. Floodwaters caused disruption in traffic, inundation of streets, interruption of businesses, danger to life, and flooding of homes (FEMA FIS 2014).

Additionally, the municipality identified the following hazard problems and problem areas:

- Flooding losses in several areas due to under-sized road culverts. Structural damage to buildings related to flooding (primarily mold), damage to building systems (water, heating and electrical systems), infrastructure damage (streets, drainage structures). Also vehicle damage from road flooding. No loss of life to date.
- As a result of Superstorm Sandy, high winds downed trees which blocked roads, caused utility infrastructure to fall, and damage structures (primarily roofs). Damage sustained from Superstorm Sandy resulted in the loss of several lives.

9.14.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of Montclair.

Table 9.14-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y		Planning	Chapter 121, Adopted 3/25/1997
Zoning Ordinance	Y		Planning	Chapter 347, Adopted 4/15/1980
Subdivision Ordinance	Y		Planning	Chapter 301, Adopted 4/29/1980
NFIP Flood Damage Prevention Ordinance	Y		Engineering	Chapter 161, Adopted 5/22/2007
Cumulative Substantial Damages				
Freeboard				
Growth Management				
Floodplain Management / Basin Plan				
Stormwater Management Plan/Ordinance	Y		Engineering	Chapter 295, Adopted 5/9/2006
Comprehensive Plan / Master Plan/ General Plan	Y		Planning	Adopted 2006; New Land Use Plan under development. There are anticipated changes to the plan that reduce impervious coverage in certain zones.
Capital Improvements Plan				
Site Plan Review Requirements	Y		Planning	Chapter 281; Adopted 4/15/19080; Amended 10/4/2011. Additional tree protection and landscaping requirements adopted.
Open Space Plan	Y		Planning	Green Acres ROSI completed June 2008.
Stream Corridor Management Plan				
Watershed Management or Protection Plan				
Economic Development Plan				
Comprehensive Emergency Management Plan				
Emergency Response Plan				
Post Disaster Recovery Plan				

Table 9.14-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Post Disaster Recovery Ordinance				
Real Estate Disclosure Requirement				
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]	Y		Planning/Engineering	Steep slope ordinance, Chapter 294, Adopted 10/6/1998.

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of Montclair.

Table 9.14-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Planning/Municipal Planner
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Planning/Building Code Official
Planners or engineers with an understanding of natural hazards	Y	Community Services/Municipal Engineer
NFIP Floodplain Administrator	Y	Community Services/Municipal Engineer
Surveyor(s)	N	
Personnel skilled or trained in “GIS” applications	N	
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	N	
Grant Writer(s)		
Staff with expertise or training in benefit/cost analysis	Y	Community Services/Municipal Engineer
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the Township of Montclair.

Table 9.14-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don’t Know)
Community development Block Grants (CDBG)	Yes. Planning/Municipal Planner and Community Services/Municipal Engineer. Planner administers grants, Engineer manages design and construction
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for specific purposes	Yes
User fees for water, sewer, gas or electric service	Yes. Water/Sewer utility. Municipally owned.
Impact Fees for homebuyers or developers of new development/homes	No
Incur debt through general obligation bonds	Yes. Township Manager/Finance.
Incur debt through special tax bonds	

Table 9.14-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	No
Mitigation grant programs	No
Other	

Community Classifications

The table below summarizes classifications for community program available to the Township of Montclair.

Table 9.14-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	10	Status - Rescinded
Building Code Effectiveness Grading Schedule (BCEGS)	TBD	
Public Protection	TBD	
Storm Ready	NP	
Firewise	NP	

NP = Not participating. TBD = To be determined.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Kimberli Craft, P.E., Township Engineer/Community Services

Flood Vulnerability Summary

The municipality does not maintain lists/inventories of properties that have been damaged by floods. Following Superstorm Sandy, over 150 structures were damaged in Montclair Township. There were no Substantial Damage determinations made from those structure damaged. Property owners sustaining damage have not expressed an interest in mitigation at this time.

Resources

The community Flood Damage Prevention Ordinance identifies the Township Engineer as the local NFIP Floodplain Administrator, currently Kimberli Craft, P.E., for which floodplain administration is an auxiliary duty. She is the sole person assuming the responsibility of floodplain administration in Montclair Township.

Currently, NFIP administration services include Community Acknowledgement Form only. No education and outreach is provided to the community at this time through the NFIP program in Montclair Township.

Kimberli Craft, P.E., feels she is not adequately supported and trained to fulfill her responsibilities as the municipal floodplain administrator. Kimberli Craft, P.E. is not certified in floodplain management. Additional training and information on floodplain management would be welcomed.

Compliance History

The community is unsure of its current standing in the NFIP. The current NFIP Floodplain Administrator has no knowledge of when the last CAV was performed. The municipality would like to have a CAV at this time, in anticipation of qualifying for the CRS program.

Regulatory

The community's Flood Damage Prevention Ordinance was last updated on May 22, 2007, and is found at Chapter 161 of the local code.

Montclair Township floodplain management regulations and ordinances meet FEMA and New Jersey minimum requirements. The floodplain administrator, Kimberli Craft, P.E., thinks the current regulations and ordinances in place may exceed the minimum requirements. A steep slope ordinance supports the enforcement of floodplain management in Montclair Township.

At this time, Montclair Township does not participate in the Community Rating System (CRS) program. Talks have commenced to discuss joining CRS and a consultant may be hired to prepare application documents. Attending a seminar on CRS would be of interest to Montclair Township to familiarize themselves with the program.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

Previous actions that are now on-going programs and capabilities are described below. Refer to Table 9.14-10 presented later in this annex.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

Currently the Township conducts public outreach program to inform citizens on hazards. The Township's Health Educator consistently puts messages in local media (Township Website, newspaper, watercooler, baristanet, cable TV) for outreach regarding weather-related events, disease outbreaks, emergency planning, etc.

The Township is currently updating elements of their Master Plan. The Master Plan is the roadmap to planning for appropriate and safe land development. The Township will use the HMP as a guide when updating their Master Plan and incorporate findings as appropriate. Refer to the new action Montclair-12 in Table 9.14-11.

The Township has a Stormwater Management Plan, an element to their Master Plan (April 2005). The Stormwater Management Plan was adopted by the Planning Board in April 2005 and establishes stormwater goals for the Township, provides design and performance standards for stormwater, and proposes ordinance changes for nonstructural stormwater management strategies. This Plan discusses localized flooding in the Township due to undersized culverts and debris in streams. The Township's updated mitigation strategy includes several drainage improvement projects. Please refer to mitigation initiatives Montclair-1, Montclair-4, Montclair-5 in Table 9.14-11 and their associated mitigation action worksheets at the end of this annex for additional details on these projects.

To further integrate hazard mitigation into daily operations, the Township will consider mitigation actions when allocating funding from their municipal/operating and capital improvement budget. In addition, the Township has identified a new mitigation action to develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. Refer to Table 9.14-11, mitigation action Montclair-7.

The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Montclair website at http://www.montclairnjusa.org for further information (FEMA FIS 2014).

9.14.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.14-10. Past Mitigation Initiative Status

Description	Status	Review Comments
Montclair-1: Drainage improvements by adding stormwater retention capacity to three specific areas of the Township.	One area removed (see review comments)	Repairs were made to the existing drainage system at Burnside Street/Appleton Place. Other areas have been moved down the priority list due to lack of funding. This initiative will be carried over to the current mitigation strategy.
Montclair-2: Utility modification.	Continuous	Drainage improvements are made to reduce localized flooding as streets are improved. This initiative will be carried over to the current mitigation strategy.
Montclair-3: Housing buy-out in flood areas.	Discontinued	Magnitude/type of losses does not justify the cost to acquire property. This initiative will not be carried over to the current mitigation strategy.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The Township has identified the following mitigation projects/activities that have also been completed but were not identified in the previous mitigation strategy in the 2007 Plan:

- Drainage improvements have been made in locations where localized street flooding occurs. This will continue as the budget allows and road projects are completed.
- 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 (FEMA FIS 2014)

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.14-11 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions

carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.14-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.14-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Montclair- 1 (NEW/LOI)	Obtain backup power to ensure continuity of operations. Obtain generators for Montclair critical facilities.	Existing	All	1.2 6.1	Office of Emergency Management	High	Medium $90,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Montclair- 2 (NEW/LOI)	Obtain backup power to ensure continuity of operations. The following has been identified at this time: Township of Montclair ambulance station generator.	Existing	All	1.2 6.1	Office of Emergency Management	High	Medium $40,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Montclair - 3 (Old -1)	Conduct drainage improvements by adding culvert capacity to Parkside road crossing	New and existing	Flood	1.2	Engineering	Medium	$500,000 to $1,000,000	Infrastructure Trust, HMGP, FMA, PDM	5 years	Medium	SIP	PP
Montclair - 4 (Old - 2)	Utility modification. Add storm drainage in areas where missing that experience localized flooding	New and existing	Flood		Engineering	Medium	$300,000	Township	Ongoing	Medium	SIP	PP
Montclair-5	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable. Phase 1: Identify appropriate candidates and determine most cost-effective mitigation option (in progress). Phase 2: Work with the property owners to implement selected action based on available funding from FEMA and local match availability. Assess and prioritize non-structural flood hazard mitigation alternatives for at risk properties within the floodplain, including those that have been identified as repetitive loss, such as acquisition/relocation, or elevation depending on feasibility. The parameters for feasibility for this initiative would be: funding, benefits versus costs and willing participation of property owners. Implement as funding becomes available. Specifically identified are properties in the following areas: • Nishuane Brook • Toneys Brook											
	See above.	Existing	Flood, Coastal Erosion, Hurricane, Severe Storm, Wildfire,		Twp. Manager Communications Engineering via NFIP FPA) with NJOEM, FEMA support	High	High	FEMA Mitigation Grant Programs and local budget (or property	Ongoing (outreach and specific project identification); Long term DOF (specific project application and	High	SIP	PP

Table 9.14-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
			Winter Storm					owner) for cost share	implementation)			
Montclair-6	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. This program will include: • Providing general natural hazard risk, preparedness and mitigation, and related NFIP information in regular newsletter and mailings. • Including natural hazard risk and risk reduction information through social media (Facebook and Twitter) and email blast systems. • Posting of flyers and other readily available NFIP informational materials at Municipal Building offices. • Preparation, distribution and analysis of public surveys. • Developing/maintaining a natural hazard risk management webpage on the municipal website where information and mapping can be posted. Enhance public outreach to residents in NFIP floodplain areas to inform of grant opportunities, etc. which may include periodic articles and handouts.											
	See above.	N/A	All Hazards	3.1	Envir. Affairs Communications Engineer (NFIP FPA)	Medium	Low	Municipal Budget; HMA programs with local or county match	Short	High	EAP	PI
Montclair-7	Develop and implement a post-event damage assessment program, including the following elements: • Conduct public outreach/education (see Public Education and Awareness Initiatives above) to inform property owners of the need to report property damage and obtain required permitting when making repairs. • Develop and organize local resources to conduct post-event damage assessments, including substantial damage determinations as warranted. • Develop an inventory (file system and/or database) of losses (incl. loss of service, property damage, economic losses, etc.) as reported to and/or identified by the Township (e.g. building permit process).											
	See above.	Existing	Flood; Severe Storm; Severe Winter Storm; Hurricane,	3.2, 4.1	Community Services Building Dept. Engineer (NFIP FPA) Twp Manager's Office	Medium – High (life Safety; Increased eligibility for mitigation grant funding)	Low-Medium	Municipal Budget	Short	High	LPR, EAP	PR, PI
Montclair-8	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be	N/A	Flood	All	Building Engineering Envir. Affairs Elected Officials	Medium - High	Low	Municipal Budget	Short (year 1)	High	LPR, EAP	PR

Table 9.14-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	dedicated. See following related Community Assistance Visit (CAV) initiative.											
Montclair-9	Request a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) if needed (part of the process of joining CRS, see above).	N/A	Flood	All	Engineering (NFIP FPA)	Low - Medium	Low	Municipal Budget	Short (year 1)	High	LPR	PR
Montclair-10	Have designated NFIP Floodplain Administrator (FPA) and other local officials who would benefit, become a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training such as FEMA Benefit-Cost Analysis (BCA) and Substantial Damage Estimation (SDE).	N/A	Flood	3.3, 5.2	Engineering (NFIP FPA)	Medium	Low	Municipal Budget	Short (DOF)	High	EAP	PI
Montclair-11	The Township will use the HMP as a guide when updating their Master Plan and incorporate findings as appropriate.	Both	All	5.4	Township	High	Low	Municipal Budget	Short (DOF)	High	LPR	PR

Notes: Not all acronyms and abbreviations defined below are included in the table.

**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*
OEM	*Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Costs:

Where actual project costs have been reasonably estimated:

Low	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low	*Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium	*Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High	*Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:

Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low	*Long-term benefits of the project are difficult to quantify in the short term.*
Medium	*Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High	*Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*

- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.14-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High/ Medium/ Low
Montclair- 1 (NEW/LOI)	Montclair critical facilities generators.	1	0	1	0	0	0	0	0	1	0	1	1	1	0	6	High
Montclair- 2 (NEW/LOI)	Township of Montclair ambulance station generator.	1	0	1	0	0	0	0	0	1	0	1	1	1	0	6	High
Montclair - 3 (Old -1)	Drainage improvements by adding stormwater retention capacity at two locations: • Church Street • Claremont/N. Willow Streets	0	1	0	0	0	0	-1	0	0	0	0	0	0	0	0	Low
Montclair -4 (Old - 2)	Utility modification.	0	1	1	0	0	0	0	0	0	0	0	0	1	0	3	Low
Montclair – 5 (NEW)	Have designated NFIP Floodplain Administrator (FPA) and other local officials who would benefit, become a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training such as FEMA Benefit-Cost Analysis (BCA) and Substantial Damage Estimation (SDE).	0	0	0	1	1	1	1	0	1	1	1	1	1	1	10	High

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High/ Medium/ Low
Montclair – 6 (NEW)	Request a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) if needed (part of the process of joining CRS, see above).	0	0	1	1	1	1	1	0	1	1	0	1	0	0	8	High
Montclair – 7 (NEW)	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.	0	0	1	1	1	1	1	0	1	1	0	1	0	0	8	High
Montclair – 8 (NEW)	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.	1	1	1	1	0	0	0	0	0	0	0	0	0	0	4	Medium
Montclair – 9 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do	1	1	1	0	1	0	0	1	1	0	1	1	1	0	9	High

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High/ Medium/ Low
	in the way of mitigation and preparedness, including flood insurance.																
Montclair -10 (NEW)	Develop and implement a post-event damage assessment program	0	0	0	1	1	1	0	0	1	0	0	0	0	0	4	Medium
Montclair-11 (NEW)	Use the HMP as a guide when updating their Master Plan and incorporate findings as appropriate.	1	1	1	1	1	1	0	0	1	0	1	0	0	1	9	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.14.7 Future Needs To Better Understand Risk/Vulnerability

Montclair's future needs will continue to be in the same areas where we are currently experiencing losses due to weather-related hazards. The Township has already expanded its activities with regard to monitoring and maintenance of street trees. As long as there are above ground electric utilities, there will always be some level of vulnerability to power loss.

Flood risk will also be difficult to abate completely because certain low-lying areas remain vulnerable to flooding losses. The first priority for the community will be to try to reduce losses with non-structural mitigation strategies and explore other alternatives for those properties for which these prove ineffective.

9.14.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of Montclair that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of Montclair has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.14.9 Additional Comments

None at this time.

Figure 9.14-1. Township of Montclair Hazard Area Extent and Location Map 1

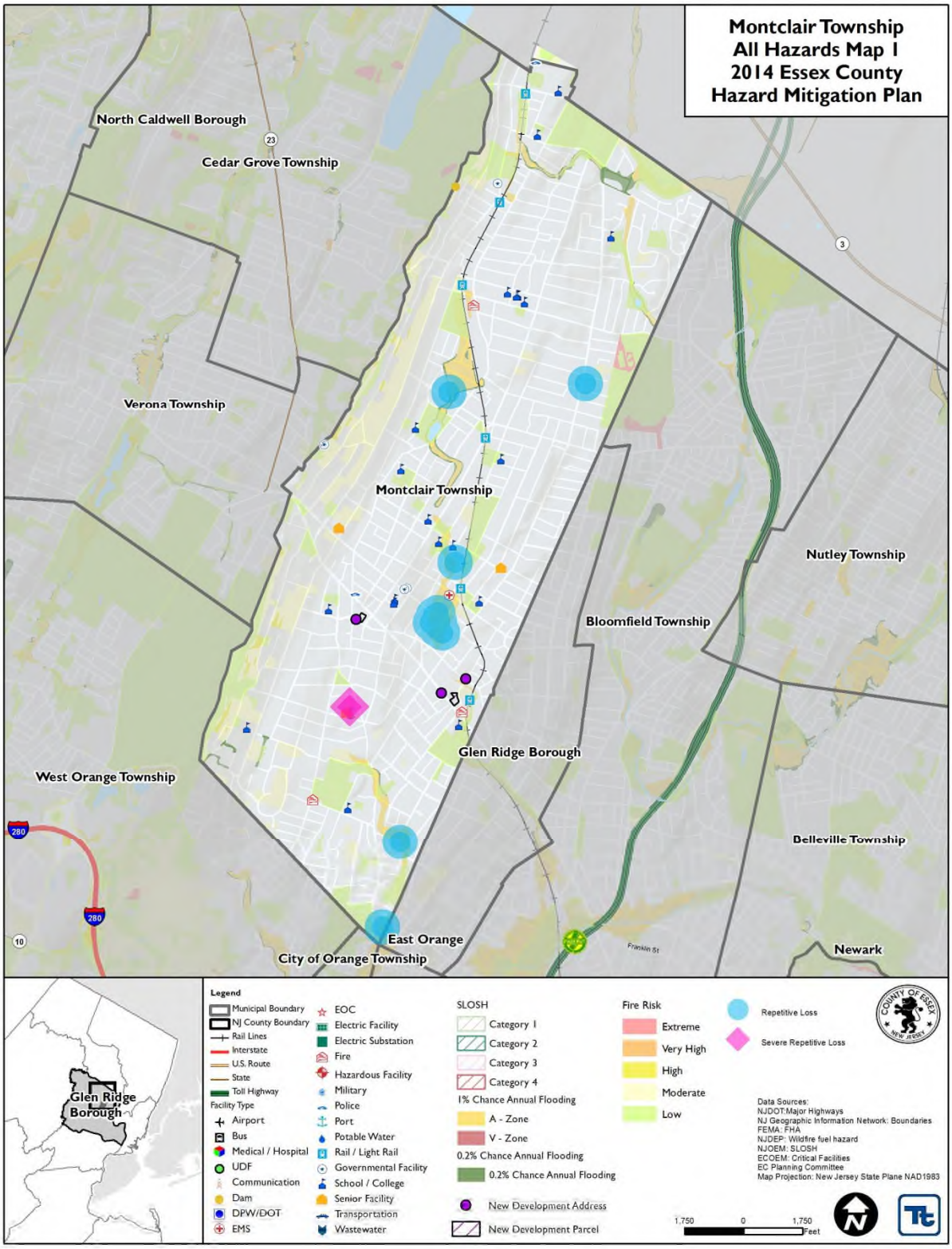
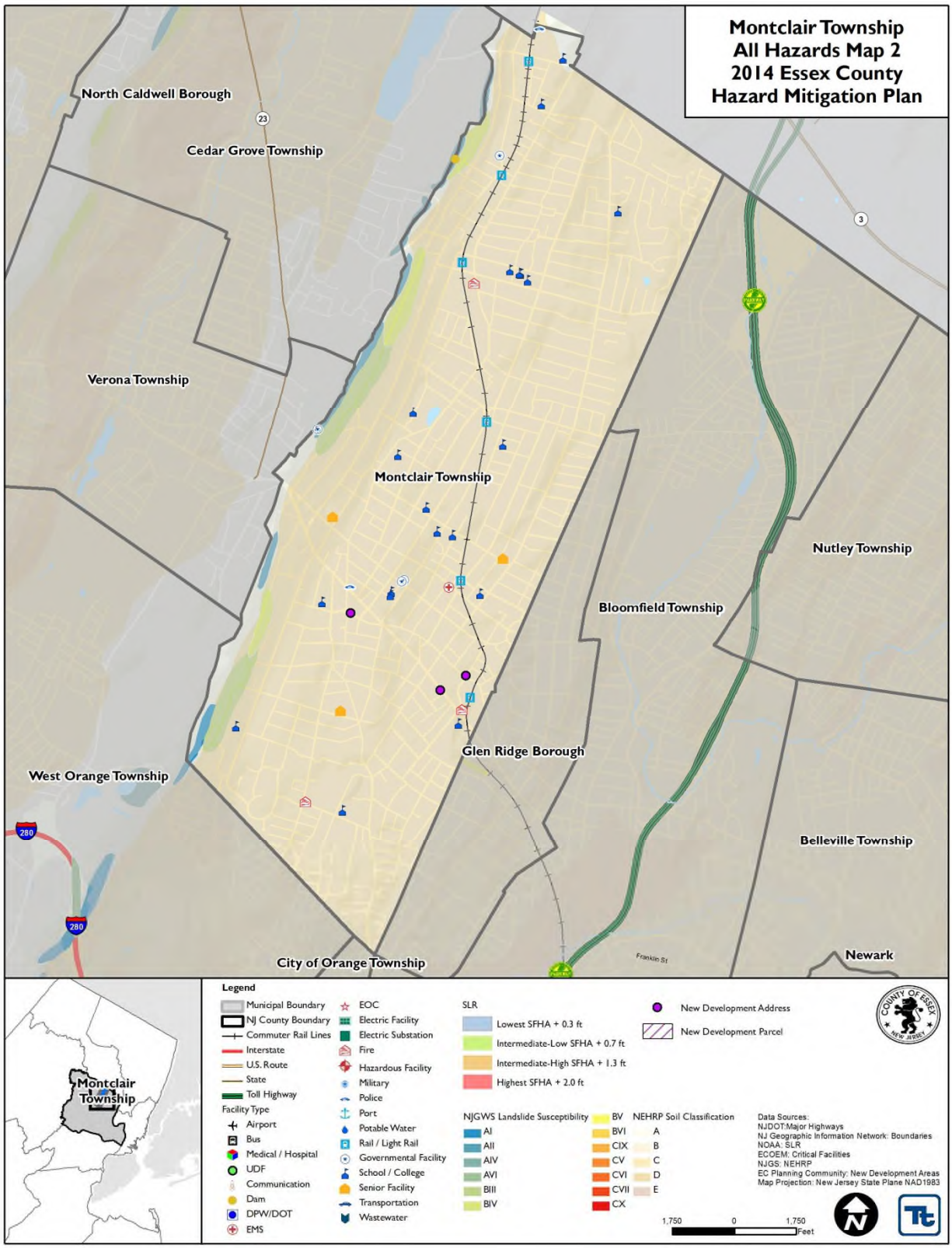


Figure 9.14-2. Township of Montclair Hazard Area Extent and Location Map 2



Action Number: **Montclair – 1 (NEW/LOI)**
Mitigation Action/Initiative: Montclair critical facilities generators

Assessing the Risk	
Hazard(s) addressed:	All
Specific problem being mitigated:	Need to maintain services during extended power outage
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. None
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Ensure continuity of services and prompt response to emergencies following a storm event.
Action/Project Category	
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	
Estimated Cost	$90,000
Priority*	High
Plan for Implementation	
Responsible Organization	Montclair Fire Dept
Local Planning Mechanism	NA
Potential Funding Sources	Grant
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 7/3/14 Progress on Action/Project: Estimates solicited

Refer to prioritization table.

Action Number: **Montclair – 1 (NEW/LOI)**

Mitigation Action/Initiative: Montclair critical facilities generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	0	
Legal	0	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	High	

Action Number: **Montclair – 2 (NEW/LOI)**
Mitigation Action/Initiative: Township of Montclair ambulance station generator

Assessing the Risk	
Hazard(s) addressed:	All
Specific problem being mitigated:	Need to maintain services during extended power outage
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. None
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Ensure continuity of services and prompt response to emergencies following a storm event.
Action/Project Category	
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	
Estimated Cost	$40,000
Priority*	High
Plan for Implementation	
Responsible Organization	Montclair Fire Dept
Local Planning Mechanism	NA
Potential Funding Sources	Grant
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 7/3/14 Progress on Action/Project: Estimates solicited

Refer to prioritization table.

Action Number: **Montclair – 2 (NEW/LOI)**

Mitigation Action/Initiative: Township of Montclair ambulance station generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	0	
Political	0	
Legal	0	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	High	

Action Number: **Montclair – 3 (Old -1)**

Mitigation Action/Initiative: Drainage improvements by adding stormwater retention capacity to two specific areas

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Localized flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. None
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Drainage improvements by adding stormwater retention capacity to two specific areas
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	
Applies to existing, future, or not applicable	New and Existing
Benefits (losses avoided)	
Estimated Cost	$500,000 to $1,000,000
Priority*	
Plan for Implementation	
Responsible Organization	Engineering
Local Planning Mechanism	
Potential Funding Sources	Infrastructure Trust
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 7/3/14 Progress on Action/Project: One location (of original three) determined to require maintenance of existing drainage system only (extensive cleaning and debris removal), which eliminated localized flooding.

Refer to prioritization table.

Action Number: **Montclair – 3 (Old -1)**

Mitigation Action/Initiative: Drainage improvements by adding stormwater retention capacity to three specific areas of town

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	0	
Technical	0	
Political	0	
Legal	0	
Fiscal	-1	
Environmental	0	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	0	
Agency Champion	0	
Other Community Objectives	0	
Total	0	
Priority (High/Med/Low)	Low	

Action Number: **Montclair – 4 (Old - 2)**
Mitigation Action/Initiative: Utility modification

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Inadequate or non-existent road drainage
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. None
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Add or improve storm drainage system for streets experiencing localized flooding
Action/Project Category	Structure and Infrastructure
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Flood damage
Estimated Cost	$300,000
Priority*	Medium
Plan for Implementation	
Responsible Organization	Engineering
Local Planning Mechanism	NA
Potential Funding Sources	Township, Infrastructure Trust
Timeline for Completion	5 years (on-going)
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 7/3/14 Progress on Action/Project: In progress

Refer to prioritization table.

Action Number: **Montclair – 4 (Old - 2)**
Mitigation Action/Initiative: Utility modification

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	0	
Legal	0	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	0	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	3	
Priority (High/Med/Low)	High	

9.15 City of Newark

This section presents the jurisdictional annex for the City of Newark.

9.15.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Phillip Scott, Director of Engineering Dept. 920 Broad Street, Newark, NJ 07102 Suite 412 Phone: 973-733-8520 E-mail: pscott@ci.newark.nj.us	Andrea Adebowale, Acting Director of Water & Sewer Dept. 920 Broad Street, Newark, NJ 07102 B-31F Phone: 973-733-6303 E-mail: adebowalea@ci.newark.nj.us

9.15.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the City of Newark was 277,140.

Location

The City of Newark is located West of Manhattan, South of Belleville, and East of East Orange along the Newark Bay. Both Newark Liberty International Airport and the Port of Elizabeth are located South and East of Newark (City of Newark New Jersey, 2014).

Brief History

On April 11, 1836 Newark was incorporated as a City but its origin dates back to the Newark Tract in October 1693. Newark's Branch Brook Park is the oldest County park in the country and is home to the largest collection of cherry blossom trees in the country. The 1967 Newark Riots were a result of urban decline experienced in the city during the early 20th Century. Newark has experienced a revitalization since the late 20th Century and early 21st Century (City of Newark New Jersey, 2014).

Governing Body Format

Since the 1950's, the City of Newark has operated using the Mayor-Council for of government. The Council includes nine (9) members who serve five (5) year terms. Five (5) members are elected at large and four (4) are elected by the wards the individuals represent (City of Newark New Jersey, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.15.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.15-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Cablevision Office building	Commercial	1	N/A	ND	Under construction
Chadwick Capital/Clinton Newark, LLC	Residential	7 Story Building	505 Clinton Ave	None	N/A
Chadwick Capital/Clinton Newark, LLC	Residential	7 Story Building	506 Clinton Ave	None	N/A
Chadwick Capital/Clinton Newark, LLC	Residential	7 Story Building	507 Clinton Ave	None	N/A
Chadwick Capital/Clinton Newark, LLC	Residential	7 Story Building	508 Clinton Ave	None	N/A
Chadwick Capital/Clinton Newark, LLC	Residential	7 Story Building	509 Clinton Ave	None	N/A
Four Corner Millennium	Residential/ Mixed use	337	N/A	ND	Plan to convert Broad and Market Street into residential and retail centers / In development
Hahnes Building	Residential/ Mixed use	180 / 1	N/A	ND	Under construction
Hayes Park East	Park	1	N/A	Severe Flooding	Improving existing parcel and building indoor soccer facility
HELP | Springfield Avenue Urban Renewal Company LP	Residential	45 units	B: 2614 L: 32	None	App/Rej.
HELP | Springfield Avenue Urban Renewal Company LP	Residential	45 units	B: 2614 L: 34	None	App/Rej.
HELP | Springfield Avenue Urban Renewal Company LP	Residential	45 units	B: 2614 L: 33	None	App/Rej.
HELP | Springfield Avenue Urban Renewal Company LP	Residential	45 units	B: 2614 L: 31	None	App/Rej.
HELP | Springfield Avenue Urban Renewal Company LP	Residential	45 units	B: 2614 L: 4	None	App/Rej.
HELP | Springfield Avenue Urban Renewal Company LP	Residential	45 units	B: 2614 L: 2	None	App/Rej.
HELP | Springfield Avenue Urban Renewal Company LP	Residential	45 units	B: 2614 L: 30	None	App/Rej.
HELP | Springfield Avenue Urban Renewal Company LP	Residential	45 units	B: 2614 L: 5	None	App/Rej.
HELP | Springfield Avenue Urban Renewal	Residential	45 units	B: 2614 L: 1	None	App/Rej.

Table 9.15-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Company LP					
Hess NEC, LLC	Industrial	655 MW Electrical Generation Plant	B: 5074 L: 25	Wildfire: High, SLOSH: Category 1, 2, 3, 4 1% Flood: A Zone 0.2% Flood SFHA +0.3 ft., +0.7 ft., +1.3 ft., +2.0 ft. NEHRP: E	N/A
Hess NEC, LLC	Industrial	656 MW Electrical Generation Plant	B: 5074 L: 25.01	Wildfire: High, SLOSH: Category 1, 2, 3, 4 1% Flood: A Zone 0.2% Flood SFHA +0.3 ft., +0.7 ft., +1.3 ft., +2.0 ft. NEHRP: E	N/A
Ironbound Stadium	Commercial/ Recreation	1	N/A	Severe Flooding	Under Design to develop football stadium
Mid-Atlantic Investment Alliance, LLC	Residential	24 units	90 Clinton Avenue	Wildfire: Moderate	N/A
Mid-Atlantic Investment Alliance, LLC	Residential	24 units	91 Clinton Avenue	Wildfire: Moderate	N/A
Mid-Atlantic Investment Alliance, LLC	Residential	24 units	92 Clinton Avenue	Wildfire: Moderate	N/A
Mid-Atlantic Investment Alliance, LLC	Residential	24 units	93 Clinton Avenue	Wildfire: Moderate	N/A
Mid-Atlantic Investment Alliance, LLC	Residential	24 units	94 Clinton Avenue	Wildfire: Moderate	N/A
Mid-Atlantic Investment Alliance, LLC	Residential	24 units	95 Clinton Avenue	Wildfire: Moderate	N/A
Mid-Atlantic Investment Alliance, LLC	Residential	24 units	96 Clinton Avenue	Wildfire: Moderate	N/A
NJPAC Residential Tower	Residential	244	N/A	ND	In development
One Riverview at Rector	Residential	N/A	N/A	ND	Under construction
Prudential Tower One	Commercial	3	N/A	ND	Under construction

Table 9.15-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
TDAF | Springfield Avenue Urban Renewal Company LP	Mixed-Use	152 units	B: 236 L: 1.04	None	App.
TDAF | Springfield Avenue Urban Renewal Company LP	Mixed-Use	152 units	B: 236 L: 1.03	None	App.
TDAF | Springfield Avenue Urban Renewal Company LP	Mixed-Use	152 units	B: 236 L: 1.02	None	App.
TDAF | Springfield Avenue Urban Renewal Company LP	Mixed-Use	152 units	B: 236 L: 1.01	None	App.
The Plaza at Springfield, LP	Mixed-Use	5 Story Mixed-Use w/ 50 units	B: 253 L: 27	ND	N/A
The Plaza at Springfield, LP	Mixed-Use	5 Story Mixed-Use w/ 50 units	B: 253 L: 29	None	N/A
The Plaza at Springfield, LP	Mixed-Use	5 Story Mixed-Use w/ 50 units	B: 253 L: 30	None	N/A
The Plaza at Springfield, LP	Mixed-Use	5 Story Mixed-Use w/ 50 units	B: 253 L: 37	None	N/A

** Only location-specific hazard zones or vulnerabilities identified.*
Note: ND = Not determined because potential new development could not be located.

9.15.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.15-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	This event was the City's first severe snow storm of the 2010 winter season. Total snow accumulation far exceeded known forecasts which forced the City to implement their emergency procedures to address the weather in order to protect the safety of its residents. This included: clearing large amounts of snow from bus stops, handicap accessible walkways and curbs, plowing major roads, secondary and tertiary streets. A small section of the East Ward was severely impacted by flooding. Due to the heavy amounts of snow, many City roads were practically impassable. The Newark Sanitation Division engaged in a "push and clear" operation during the stated time period. They also "removed" snow to three City-owned locations where the snow was permitted to melt. Overall, the City did not have any evacuations or reported deaths or injuries related to this storm. The City did have over $380,000 in equipment use and overtime.
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Damages and losses experienced during this even by the municipality are discussed in further detail below in the section "Other Vulnerabilities Identified by Municipality".
October 29, 2011	Severe Storm	DR-4048	Yes	Damages and losses experienced during this even by the municipality are discussed in further detail below in the section "Other Vulnerabilities Identified by Municipality".
October 26 – November 8, 2012	Hurricane Sandy	EM-3354 DR-4086	Yes Yes	Damages and losses experienced during this even by the municipality are discussed in further detail below in the section "Other Vulnerabilities Identified by Municipality".

9.15.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the City of Newark. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the City of Newark.

Table 9.15-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]		Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA:	$6,131,100	Occasional	14	Medium
Coastal Storm	Category 1 SLOSH: Category 2 SLOSH: Category 3 SLOSH: Category 4 SLOSH:	$1,428,179,599 $2,737,880,899 $3,438,831,599 $3,689,954,299	Occasional	24	Medium
Drought	Damage estimate not available		Occasional	18	Medium
Earthquake	500-year MRP: 2,500-year MRP:	$35,119,663 $496,802,974	Occasional	32	High
Extreme Temperature	Damage estimate not available		Frequent	36	High
Flood	1% Annual Chance:	$549,978,470	Frequent	45	High
Geological Hazards	Exposed to Class B and Class C:	$0	Rare	6	Low
Severe Storm	100-Year MRP: 500-year MRP: Annualized:	$10,345,221 $58,847,765 $1,071,554	Frequent	48	High
Winter Storm	1% GBS: 5% GBS:	$103,896,564 $519,482,820	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High:	$6,155,600	Frequent	18	Medium
Civil Disorder	Damage estimate not available		Occasional	24	Low
Cyber Attack	Damage estimate not available		Occasional	10	Low
Disease Outbreak	Damage estimate not available		Frequent	15	Medium
Hazardous Substances	Damage estimate not available		Frequent	15	Medium
Power Outages	Damage estimate not available		Frequent	36	Low
Terrorism	Damage estimate not available		Occasional	24	Low
Transportation Failure	Damage estimate not available		Frequent	36	Low

Notes:

a. *Building damage ratio estimates based on FEMA 386-2 (August 2001)*
b. *The valuation of general building stock and loss estimates was based on custom inventory for the municipality.*
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20
c. *Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the City of Newark.

Table 9.15-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Newark, City of	264	182	$16,729,363.00	12	1	152	189	75

Source: FEMA, 2014

Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.

Note (2) Total building and content losses from the claims file provided by FEMA Region 2.

Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.15-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

Municipality	1% Annual Chance															0.2% Annual Chance														
	Airport	Bus	Chemical Storage	Correctional Institution	Electric Power	Fire	Highway Bridge	Newark Housing Authority	Oil Facility	Police	Port	Safety	School	Train Station	WWTP	Airport	Bus	Chemical Storage	Correctional Institution	Electric Power	Fire	Highway Bridge	Light Rail	Newark Housing Authority	Oil Facility	Police	Port	Safety	School	Train Station
City of Newark	1	1	3	2	3	1	1	2	4	2	4	1	1	1	2	1	2	3	2	3	2	1	1	3	4	3	4	1	5	1

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), the City of Newark is subject to tidal flooding from the Passaic River and Newark Bay. Most of the flood problems occur in the south and eastwardly (Ironbound Section) adjacent to U.S. Route 22 and Frelinghuysen Avenue. Flooding always occurs when an annual peak rainfall coincides with a high tide in Newark Bay. This area is susceptible to flooding because of its flat topography and low elevations (FEMA FIS 2014).

A historic tide record was obtained in Newark during the October 1903 flood. The largest flood on record occurred August 28, 1971, with a peak discharge of approximately 6,500 cfs recorded at the USGS Second River at Belleville gage (no. 1392500). Due to drastic changes in urbanization over the gaging period a meaningful statistical return period could not be computed (FEMA FIS 2014).

Additionally, the municipality has identified the following hazard problems and/or problem areas:

Coastal Storms

Hurricane Irene

During Hurricane Irene, a small section of the East Ward was severely impacted due to flooding. Some of the roadways in the southeast area of the City were closed due to severe flooding. The senior citizen facility and the Ironbound Recreation Center in the East Ward both flooded. Several fire houses sustained water damage due to the heavy amounts of rain. Many commercial entities were closed for several days. Hundreds of flights were either delayed or cancelled in Newark Airport. Overall, the City did not experience any evacuations, injuries, or deaths. The City had over $43,000 in overtime costs for the fire department.

The Passaic Valley Sewerage Commission (PVSC) experienced severe capacity issues due to the large amount of precipitation from Irene. On August 28th, the PVSC recorded a record high flow of 727 million gallons per day (MGD) with a record daily average of 628 MGD, which was the highest recorded flow in PVSC's 109-year history.

Hurricane Sandy

During Hurricane Sandy, the City of Newark experienced extensive damages throughout. The storm deposited vegetative debris throughout the County which posed an immediate threat to lives, public health, and safety. A voluntary evacuation in parts of the East Ward occurred during the storm. The City's largest shelter was activated and staffed by city employees with assistance from the American Red Cross. Fifteen residential homeowners in the City reported significant damage to their homes, specifically in the areas of in the East Ward – Waydell Street, Foundry Street, Esther Street, and Joseph Street; and in the West Ward – Sunset Avenue. Some of the roadways in the southeast portion of the city were closed due to severe flooding. Several commercial entities were closed for several weeks after Sandy. There were three storm-related deaths in the City.

The Newark Fire Department conducted four water rescues that had multiple victims. They also responded to 132 carbon monoxide-related incidents, with some victims transported to area hospitals. The Special Operations Division responded to five structure fires, two building collapses, one crane collapse, and one natural gas explosion. The Newark Fire Department spent 63 hours receiving, offloading, stocking and delivering commercial donations. This included 30 full-size tractor trailers and assisted in the movement/delivery of 21 generators throughout the City.

PVSC sustained substantial damage to their facility during Hurricane Sandy. The facility lost power which resulted in the discharge of untreated waste at flows of up to 500 MGD until November 7th. A four-foot

storm surge flooded utility tunnels and galleries damaged electrical systems and pumping equipment. Ninety-percent of the City lost power (approximately 250,000 people); 85% of the City receives electric service from overhead transmission systems that were disrupted from the high winds and debris. The City's most densely populated neighborhoods and environmentally sensitive areas were hit hard with severe flooding.

Port Newark/Elizabeth sustained substantial damage to its infrastructure that brought all port activity to a halt. The storm surge also disturbed sediment in the Port's shipping channels that prohibited the movement of goods and emergency resources. Ironbound Recreation Center and the Boylan Street Recreation Center sustained substantial flooding damage. Overtime issued to engineering staff to repair buildings, obtain materials and fix damages incurred to City vehicles

The Department of Neighborhood and Recreational Services was responsible for removing an estimated 11,390.65 cubic yards of vegetative debris (which also includes 72 tree stumps) throughout the City that was in the public right of way that posed immediate threats to lives, public safety and property.

October 2011 Nor'Easter

A severe winter storm (also identified as a Nor'Easter) caused localized damage to the City and created a public health and safety risk due to reduced access to commerce, police, fire, medical, and energy services. The storm brought large amounts of heavy, wet snow that caused trees to uproot or branches to collapse on power lines. This led to a severe loss of electricity throughout the City. Several road closures were also a result of downed trees and power lines. The City opened up its largest shelter to the public.

The Department of Neighborhood and Recreational Services initiated a full-scale city-wide vegetative debris removal operation that included the removal of approximately 11,580 cubic yards (CY) (estimated 2,895 CY of mulch) of vegetative debris on public property and public right of ways. This estimated total also includes debris accumulations on private property that were subsequently moved curbside, in the public right of way. The Newark Sanitation Division used 645.5 hours of force labor overtime and 1,366 hours of time force equipment use to aid in the debris cleanup from this storm. This resulted in over $400,000 in costs, labor and supplies.

Power Failure

As previously stated, following Hurricane Sandy, 90% (approximately 250,000 people) of the City lost power; with 85% of the City receiving electricity from overhead electric transmission distribution systems. The October 2011 storm resulted in extensive power loss because the trees still had leaves and made uprooting and limb collapse easier under the weight of the snow.

To address the potential loss of power, quick connect tap boxes, portable generators and fix generators will facilitate the mitigation activities in the unlikely event of an energy disruption. Implementing renewable energy, smart grid technology and alternative back-up generation assets, would also be appropriate solutions to solve or energy related issues (if they arise).

Flooding

Flooding is a major hazard that has adversely affected densely populated areas in the City of Newark, particularly in the East Ward. The East Ward is home to a large population of City residents, where English is a second language, and home to many of Newark's industrial businesses and critical infrastructure assets that are essential for the region. During each of the major flooding events discussed throughout this plan update, damage was sustained to the East Ward. Following Hurricane Irene, Senior Citizen facility and the Ironbound Recreation Center in the East Ward flooded. Several fire houses sustained water damage due to the heavy

amounts of precipitation. Small section of the East Ward was severely impacted due to flooding. Some of the roadways in the South East portion City were closed due to severe flooding. Hurricane Sandy resulted in a voluntary evacuation of the East Ward due to flooding threats. Some of the roadways in the South East portion City were closed due to severe flooding and commercial entities were closed for several weeks. The most densely populated neighborhoods and environmentally sensitive areas were hit hard with severe flooding due to the intense nature of the storm surge that knocked houses off their foundations and turned busy streets into rivers. Ironbound Recreation Center and the Boylan Street Recreation Center sustained substantial flooding damage.

The Joseph G. Minish Passaic River Waterfront Park and Historic Area is located along the west bank of the Passaic River between Bridge and Brill Streets in the City of Newark. This reach of the River is eroded, deteriorated, and environmentally degraded due to past commercial and industrial use and flooding (USACE 2014). The project is comprised of three phases:

- Phase I – 6,000 feet of new bulkhead, 3,200 feet of restored riverbank, and creation of wetlands
- Phase II – 9,200 foot waterfront walkway
- Phase III - park facilities, plaza, and landscaping (USACE 2014)

The project will reduce erosion and provide environmental restoration, recreation, and economic development benefits. The final Design Memorandum and Environmental Assessment were completed in May 1996. The Project Cooperation Agreement (PCA) for Phase I was executed with the NJDEP in May 1999. The first construction contract for the bulkhead at Center Street was completed in September 2000. A second construction contract for the bulkhead from Center Street to Penn Station was completed in March 2003. The third construction contract for the steel bulkhead from Jersey St to Jackson St and site clearing of the wetlands restoration site was completed in June 2006. The fourth construction contract was awarded in January 2008 to construct the concrete cap on the steel bulkhead from Jersey St. to Jackson St. This work was completed in November 2010. Design of the next construction contract was being worked on for bulkhead work from Lombardy St. to past Rector St when the project area was struck by Hurricane Sandy. A limited re-evaluation report is being undertaken with funds received under the P.L. 113-2, The Disaster Relief Appropriations Act, 2013. The draft is expected by the end of the year (USACE 2014).

Debris Management

Debris management has become a large task following disaster events. The costs of debris removal have become very high as storms have occurred quickly requiring removal to occur immediately. Clearing roads, bus stops, walkways, and curbs is vital to the ability of the City to recovery. Debris as a result from Hurricanes Irene and Sandy and the 2011 Nor'Easter are described above.

Emergency Response Services

Recent disasters have presented barriers to effectively delivery emergency response services to the public. Flooding, snowfall, downed trees, and downed power lines have inhibited emergency response services from reaching those in need. Continuity of services is critical and emergency response services personnel must be able to reach all populations impacted by a disaster.

During the December 2010 snowstorm, the Newark Sanitation Division engaged in a "push and clear" operation during the stated time period to eliminate the immediate threat to health and safety of the public and to assist in allowing passage of the public and emergency vehicles. Following the Nor'Easter in October 2011, a public health/safety risk was created due to reduced access to Commerce, Police, Fire, Medical and Energy Services. Responses during Hurricane Sandy are described above.

The City, as part of its participation in the State Hazard Mitigation Grant Program, submitted a Letter of Intent that identified priority mitigation projects/activities for the City, that if funded will enhance our ability to respond and recover from hazards. These projects have been integrated into the updated mitigation strategy for the City of Newark and are described in further detail in Project Action Worksheets. There were seventeen (17) eligible projects identified that address severe/repetitive flooding in vulnerable areas (Riverfront property acquisitions, levees/floodwalls, ditch rehabilitation/restoration, drainage improvements, and stormwater management through green infrastructure), energy resiliency (back-up generators and quick connect tap boxes at designated critical facilities and shelter locations) and community education and outreach activities.

9.15.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the City of Newark.

Table 9.15-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	State & Local	Engineering	State Uniform Construction Code Act (N.J.S. 52:27D-119 et seq.), Ord. 6 S+FH, 4-19-06 § 1
Zoning Ordinance	Y	Local	Economic and Housing Development	R.O. 1966 C.S. § 27:1-1[a], Zoning Regulations Ordinance Title 40
Subdivision Ordinance	Y	Local	Economic and Housing Development	Ord. 6 S+FB, 2-17-82 § 1.1, Land Use Subdivision Ordinance Title 38
NFIP Flood Damage Prevention Ordinance	Y	Local	Engineering	Adopted 2007, Ord. 6 S+FA (S-1), 6-1-07 § 1
NFIP: Cumulative Substantial Damages	Y	Local	Engineering	Adopted 2007, Ord. 6 S+FA (S-1), 6-1-07 § 1
NFIP: Freeboard	Y	Local	Engineering	Adopted 2007, Ord. 6 S+FA (S-1), 6-1-07 § 1
Growth Management	N			
Floodplain Management / Basin Plan	N			
Stormwater Management Plan/Ordinance	Y	Local	Water & Sewer	Adopted 9/9/2012, Ord. Title 38 Ord. 6 PSF-A, 9-19-12, Sewers and Sewage Disposal Title 32 Land Use Subdivision Title 37:10-47
Comprehensive Plan / Master Plan/ General Plan	Y	Local	Economic and Housing Development	No Ord. - Revised every 10 years with a periodic re-examination
Capital Improvements Plan	Y	Local	Engineering	No Ord. - Annual revision by Department Directors
Site Plan Review Requirements	Y	Local	Engineering	N.J.S.A. 40:55D-1 et. Seq., Municipal Land Use Law Ch. 38 – Land Use Procedures
Open Space Plan	Y	Local	Economic and Housing Development	No Ord. - Revision by Department Director

Table 9.15-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Stream Corridor Management Plan	N			
Watershed Management or Protection Plan	Y	Local	Water & Sewer	No Ord. Date of Plan:
Economic Development Plan	Y	Local	Economic and Housing Development	No Ord. - Revision by Department Director
Comprehensive Emergency Management Plan	Y	Local	Newark OEM	Updated 2013 - No Ord.
Emergency Response Plan	Y	Local	Newark OEM	No Ord. Certified on August 9, 2013
Post Disaster Recovery Plan	N			
Post Disaster Recovery Ordinance	N			
Real Estate Disclosure Requirement	N			
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]	N			

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the City of Newark.

Table 9.15-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Engineering, Economic and Housing Development
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineering
Planners or engineers with an understanding of natural hazards	Y	Engineering, Economic and Housing Development
Floodplain Administrator	Y	Engineering
Surveyor(s)	Y	Engineering
Personnel skilled or trained in “GIS” applications	Y	Engineering, Economic and Housing Development, Office of Management and Budget
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Newark OEM
Grant Writer(s)	Y	Economic and Housing Development, Administration
Staff with expertise or training in benefit/cost analysis	Y	Engineering, Economic and Housing Development, Administration
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the City of Newark.

Table 9.15-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes – Administration
Capital Improvements Project Funding	Yes – Administration
Authority to Levy Taxes for specific purposes	Yes – Administration, Office of Partnerships and Grants Management
User fees for water, sewer, gas or electric service	Yes – Water & Sewer Utilities
Impact Fees for homebuyers or developers of new development/homes	Yes – Administration, Economic & Housing Development
Incur debt through general obligation bonds	Yes – Administration, Department of Finance
Incur debt through special tax bonds	Yes – Administration; Office of Special Taxes ex. Rental Car Tax
Incur debt through private activity bonds	Administration, Department of Finance
Withhold public expenditures in hazard-prone areas	
Mitigation Grant Programs	Yes – Administration, Economic and Housing Development, OEM
Other	

Community Classifications

The table below summarizes classifications for community program available to the City of Newark.

Table 9.15-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	N/A
Building Code Effectiveness Grading Schedule (BCEGS)	NP	N/A
Public Protection	4	2011
Storm Ready	NP	N/A
Firewise	-	

N/A = Not applicable. NP = Not participating. - = Unavailable.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Mehdi Mohammadish, P.E., Director, Department of Engineering

Flood Vulnerability Summary

The City's Department of Engineering maintains lists/inventories of properties that have been damaged by floods. The list includes 68 public buildings (all police precincts, fire houses, recreational facilities, City Hall and a court house). During Hurricane Sandy, the majority of damage that occurred was to the roofs and basements of the public buildings; approximately 10 buildings were damaged by the storm. The FPA made Substantial Damage estimates after Sandy; approximately 10 buildings were substantially damaged costing around $300,000.

There are approximately 10 buildings in the City that are interested in mitigation; however, none of those buildings are in the process of mitigation. There are no funding sources for those being mitigated.

Resources

The FPA is the sole person assuming the responsibilities of floodplain administration. Richard Lopez, Manager of Public Buildings assists the FPA. The FPA and their department provides permit review, inspections, damage assessments, record keeping, GIS, and education and outreach within the Department of Engineering and/or outside contractors depending upon the scope of work. Currently, there are no sources to provide any type of education or outreach within the City regarding flood hazards/risk, and flood risk reduction.

The FPA indicated that there are no barriers in running an effective floodplain management program; however, the FPA does not feel adequately supported and trained to fulfill their responsibilities as the City's FPA. He stated that they could use additional support and training materials. The FPA would consider attending continuing education and/or certification training on floodplain management if it were offered.

Compliance History

The City is doing their best with the available sources to be in good-standing with the NFIP. There is no information on the most recent compliance audit.

Regulatory

The City only complies with the FEMA minimum standards for floodplain management regulations/ordinances. The FPA indicated that the City's planning board members always consider and comment flooding issues and prevention when they review site plans.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program; however, the City has considered joining. The FPA stated that the City would attend any meetings, seminars, programs, etc. that would educate the City on flood-related matters and issues.

Other Capabilities Identified

The City, as part of its participation in the State Hazard Mitigation Grant Program, submitted a Letter of Intent that identified priority mitigation projects/activities for the City, that if funded will enhance our ability to respond and recover from hazards. These projects have been integrated into the updated mitigation strategy for the City of Newark and are described in further detail in Project Action Worksheets. There were seventeen (17) eligible projects identified that address severe/repetitive flooding in vulnerable areas (Riverfront property acquisitions, levees/floodwalls, ditch rehabilitation/restoration, drainage improvements, and stormwater management through green infrastructure), energy resiliency (back-up generators and quick connect tap boxes at designated critical facilities and shelter locations) and community education and outreach activities. Refer to Table 9.15-11.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

In the City of Newark's most recent planning undertakings, City Master Plan, Sustainability Action Plan, Emergency Operations Plan and a Local Energy Assurance Plan, appointed and elected officials have incorporated the identification of hazards in our community (industrial, residential and commercial) and developed actionable mitigation activities/policy decisions to ensure the safety and well-being of Newark residents and our business community. These planning initiatives focus particularly on improving the City's ability to manage flooding in the most vulnerable and environmentally sensitive areas in the City, protecting critical infrastructure assets and incorporating best practices to reduce energy use/supply while improving operation efficiency/dexterity. The implementation of the updates to our municipal zoning/permitting procedures is currently a work in progress which is contingent upon the adoption of amendments to Federal/State laws and the ability to secure funding.

The City's Master Plan is the legal roadmap to planning for appropriate and safe land development. According to the City's Master Plan, Newark's capacity to absorb and reuse stormwater with "green infrastructure" has greatly expanded. Scaled-up tree planting, the replacement of pavement with pervious surfaces, and new pocket parks and community gardens all help mitigate flooding and reduce combined sewer overflows.

A lack of pervious surfaces and inadequate drainage facilities has been identified in the City's Master Plan as issues that contribute to street level and basement flooding. One of the objectives of the City's Master Plan is the following in their Utilities and Infrastructure element: *'Maintain sewer infrastructure in an adequate state of repair; reduce the frequency and mitigate the impact of street-level flooding on residents and businesses; and over the long term, improve the health of the Passaic River and Newark Bay.'* The City has identified several stormwater improvement projects in their updated mitigation strategy. Please refer to Table 9.15-11 for details on each action.

The inhabitants of the City of Newark depend on the usual warnings issued through radio, television, and local newspapers for information concerning possible flooding conditions (FEMA FIS 2014). The City has proposed a public outreach strategy as described as new mitigation action Newark-28 in Table 9.15-11.

The City will consider mitigation project funding as part of their municipal/operating and capital improvement budgets.

The City has their ordinances and flood protection measures available on their website. Please visit the City of Newark website at http://www.ci.newark.nj.us for further information (FEMA FIS 2014).

9.15.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.15-10. Past Mitigation Initiative Status

Description	Status	Review Comments
1: McClellen St. stormwater pumping station	In Progress, 20% Completed	Project is still currently under design and will be entering construction in 2015. Project includes widening of the roadway under installation of a new drainage system and a pump. This project has been carried forward and is included in the updated mitigation strategy.
2: Meadowland stormwater pumping station	No Progress	Due to budgetary constraints no progress has been made. The City anticipates a contract for improvements Fall 2014. Port Authority to provide emergency generators. This project has been carried forward and is included in the updated mitigation strategy.
3: North 10th St. stormwater improvements	Completed	CCTV of sewer main, replaced c/b lateral@ No 10th St & Abington Ave in April 2011 to abate flooding. This initiative is complete and will not be included in the updated mitigation strategy.
4: Adams St. stormwater outfall improvements	Completed	The netting facility was completed in April 2005. This initiative is complete and will not be included in the updated mitigation strategy.
5: Peddie St. outfall improvements	No Progress	Due to budgetary constraints, there has not been progress on improvements to the outfalls on Peddie Street. Anticipate Contract for improvements Fall 2014. This initiative will be included in the updated mitigation strategy.
6: Frelinghuysen/Empire/Meeker St. stormwater improvements	In Progress	This project is in the final design stage and under contract. This initiative will be included in the updated mitigation strategy.
7: Hazmat Material Command Vehicles and foam Fire Apparatus	No Progress	Lack of funding, trained personnel, as well as the ability for information and intelligence sharing have restricted the forward progress of this initiative. The Fire Department continues to address the gaps that have been identified within our hazardous materials mitigation capabilities. We have improved with the replacement and upgrade of our decon and spill vehicles as well as adding the capabilities of the foam tender and mobile lab truck to protect from the release of Hazardous Material.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The Township has identified the following mitigation projects/activities that have also been completed but were not identified in the previous mitigation strategy in the 2007 Plan:

- The City of Newark is advising Newark residents and the business community that new structures designated to be built in the City shall adhere to the FEMA Advisory Base Flood Elevation (ABFE) maps. Once the FEMA ABFE maps are adopted, the Department of Engineering will create a new City ordinance that complies with State and Federal regulations. This initiative was part of encouraging compliance with FEMA's ABFE maps, installing flood control measures in flood zone areas of the City, (i.e., levees, trenches, sump pump systems), acquiring properties in the flood zone that have been significantly damaged to be converted to green space and finally, to encourage green infrastructure in those flood areas.
- The inhabitants of the City of Newark depend on the usual warnings issued through radio, television, and local newspapers for information concerning possible flooding conditions (FEMA FIS 2014).
- Flood warnings and predicted flood peaks are issued by NOAA's Flood Forecasting Center, located at Mount Holly, New Jersey (FEMA FIS 2014).
- The City has their ordinances and flood protection measures available on their website. Please visit the City of Newark website at http://www.ci.newark.nj.us for further information (FEMA FIS 2014).

Proposed Hazard Mitigation Initiatives for the Plan Update

The City participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the City participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.15-11 summarizes the comprehensive-range of specific mitigation initiatives the City would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected. Further details on each mitigation action are described in the worksheets presented at the end of this annex.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.15-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.15-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Newark- 1 (Old 1)	McClellen St. stormwater pumping station - Project is still currently under design and will be entering construction in 2015. Project includes widening of the roadway under installation of a new drainage system and a pump	Existing	Flood	1.2 2.1 2.2	Newark Engineering	High	High $4,000,000	Federal, State and Local Grants, Capital funds	Short Term Complete in 2015	High	SIP	SP
Newark- 2 (Old 2)	Meadowland stormwater pumping station and emergency power supply– Installation of emergency backup electric generators so the pump station can remain operational during power outages to prevent flooding at Newark Airport and the low lying areas of the East and South Wards during hurricanes and/or heavy rain events	Existing	Flood	1.2 2.1 2.2	Newark Engineering	High	High $125,000	Grant Funding with Local Share through bonding and/or NJEIT	Short Term DOF 1 year	High	SIP	SP
Newark- 3 (Old 5)	Peddie St. outfall improvements – Replacement of undersized failing netting facility and the removal of sediment from the Peddie Ditch that cause impediments that restrict the flow of water in the existing pipe.	Existing	Flood	1.2 2.3	Newark Engineering	High	High $250,000	State Grant opportunities, Capital funds	Short Term DOF 1 year	High	SIP	SP
Newark- 4 (Old 6)	Frelinghuysen/Empire/ Meeker St. stormwater improvements - This project would remove that blockage and restore capacity of the Queen Ditch so the existing Queen Street Outfall, and the connected upstream sewers, can drain and provide storm water conveyance as	Existing	Flood	1.2 2.1	Newark Engineering	High	High $625,000	Federal and State Grant opportunities	Short Term 1 year	High	SIP	SP

Table 9.15-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	designed.											
Newark- 5 (Old 7)	Hazmat Material Command Vehicles and foam Fire Apparatus – The purchase of a hazardous materials quick response command vehicle and Hazmat/foam fire apparatus to more effectively respond to a hazardous material incident in the City/region.	N/A	Hazardous Materials, Terrorism	1.2 6.2	Newark Fire Department and the Newark Office of Emergency Management	High	High $1,000,000	Federal Homeland Security Grant	On-going	High	SIP	ES
Newark-6 (NEW/AW)	Prevention of leakage, mold, mildew, and collapse of roof in 68 of our public buildings/facilities, particularly 17 of our most critical	Existing	Severe Storms, Severe Winter Storms, Tornado	1.2 2.1	Newark Engineering	High	High	Capital, Federal, and State	On-going	High	SIP	SP
Newark-7 (NEW/AW)	Flood prevention and mitigation in buildings in flood prone areas and on vacant city land in those areas potentially through reduction in Combined Sewer Overflow, implementation of green infrastructure projects and property acquisitions where appropriate.	Existing and Future	Flood	1.2 2.1 2.2	Newark Engineering, Newark Economic Housing and Development	High	High	Capital, Federal, and State	On-going	High	SIP, NSP	PP
Newark-8 (NEW/LOI)	Newark Passaic Riverfront Acquisition	NA	Flood Severe Storm	1.2	Office of Emergency Management, Engineering	High	High $3,900,000	Federal Grants, HMGP, FMA, PDM	Long Term DOF	High	SIP	SP
Newark-9 (NEW/LOI)	Installation of back-up generators at critical municipal buildings/facilities to ensure continuity of operations	Existing	All	1.2 6.1	Office of Emergency Management	High	High $600,000	FEMA Hazard Mitigation Grant Program	Short Term DOF	High	SIP	ES
Newark-10	Installation of back-up	Existing	All	1.2	Office of	High	High	FEMA Hazard	Short Term	High	SIP	ES

Table 9.15-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
(NEW/LOI)	generators at critical designated shelter locations to ensure continuity of operations			6.1	Emergency Management		$1,000,000	Mitigation Grant Program	DOF			
Newark-11 (NEW/LOI)	Newark Back-up Uninterruptible Power Supply (UPS) systems for Critical Traffic Intersections	Existing	All	1.2 6.1	Office of Emergency Management	High	High $600,000	FEMA Hazard Mitigation Grant Program, City budget	Short Term DOF	High	SIP	ES
Newark-12 (NEW/LOI)	Newark Wayne Potable Water Pump Station emergency power supply & SCADA	Existing	All	1.2 6.1	Office of Emergency Management	High	High $2,300,000	Grant Funding with Local Share through bonding and/or NJEIT	Short Term DOF	High	SIP	ES
Newark-13 (NEW/LOI)	Newark Chittenden Road Pump Station Generator & SCADA	Existing	All	1.2 6.1	Office of Emergency Management	High	High $2,300,000	Grant Funding with Local Share through bonding and/or NJEIT	Short Term DOF	High	SIP	ES
Newark-14 (NEW/LOI)	Newark Vailsburg Ditch/Flood Control Mitigation Project	Existing	Flood	1.2 2.1	Office of Emergency Management, Engineering	High	High $30,000,000	Federal, State Grant opportunities	Long Term DOF	High	SIP	SP
Newark-15 (NEW/LOI)	Newark Stormwater Management Through Green Infrastructure Project	Existing	Flood Severe Storm	1.2 2.1	Office of Emergency Management, Engineering	High	High $60,000,000	Grant funding, local [adjustment in utility rate structure (potential)]	Ongoing	High	SIP	SP
Newark-16 (NEW/LOI)	Install Quick Connect Tap Boxes at Critical Facilities/Municipal Building Project	Existing	Flood Severe Storm	1.2 2.1	Office of Emergency Management, Engineering	High	High $720,000	Federal, State Grant Opportunities	Short Term DOF	High	SIP	SP
Newark-17 (NEW/LOI)	Hazard mitigation planning and project identification for Residential Flood Prevention	Existing	Flood Severe Storm	1.2 2.1	Office of Emergency Management, Engineering	High	High $6,000,000	Federal, State Grant Opportunities	DOF	High	SIP, EAP, NSP	PR
Newark-18 (NEW/LOI)	Newark Queen Ditch Drainage Upgrade Project	Existing	Flood Severe Storm	1.2 2.1	Office of Emergency Management, Engineering	High	High $8,000,000	Federal, State Grant Opportunities	Short Term DOF	High	SIP	SP
Newark-19 (NEW/LOI)	Newark Adams South and Wheeler Avenue Drainage Improvements Project	Existing	Flood Severe Storm	1.2 2.1	Office of Emergency Management, Engineering	High	High $31,600,000	Federal, State Grant Opportunities	Short Term DOF	High	SIP	SP

Table 9.15-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Newark-20 (NEW/LOI)	Newark Ironbound Recreation Center Flood Mitigation Project	Existing	Flood Severe Storm	1.2 2.1	Office of Emergency Management, Engineering	High	High $1,300,000	Federal State Grant Opportunities	Short Term DOF	High	SIP	SP
Newark-21 (NEW/LOI)	Newark Community Education and Outreach Project	NA	All	3.1 3.2	Emergency Management	High	High $250,000	Federal, State Grant Opportunities	Short Term DOF	High	SIP, LPR, NSP, EAP	PE
Newark-22 (NEW/LOI)	Newark Cedar Grove Reservoir Improvements Project	Existing	Flood, Severe Storm	1.2 2.1	Office of Emergency Management, Engineering	High	High $75,000,000	Grant Funding with Local Share through bonding and/or NJEIT	Short Term DOF	High	SIP	SP
Newark-23 (NEW/LOI)	Newark Meadowlands Storm Water Pump Station Project	Existing	Flood, Severe Storm	1.2 2.1	Office of Emergency Management, Engineering	High	High $5,700,000	Grant Funding with Local Share through bonding and/or NJEIT	Short Term DOF	High	SIP	SP
Newark-24 (NEW)	Encourage compliance with FEMA's Preliminary Work maps	Both	Flood, Severe Weather, Coastal Storm	4.3	Engineering	High	Low	City	Short	High	LPR	PR
Newark-25 (NEW)	Installing flood control measures in flood zone areas of the City, (i.e., levees, trenches, sump pump systems)	Both	Flood, Severe Weather, Coastal Storm	1.2 2.1	Engineering	High	High	Grant Opportunities	DOF	High	SIP	PP
Newark-26 (NEW)	Implement renewable energy, smart grid technology and alternative back-up generation assets, would also be appropriate solutions to solve or energy related issues (if they arise)	Both	All	2.1 6.1 6.3	Office of Emergency Management, Engineering	High	High	Grant Opportunities	DOF	High	SIP	PP
Newark-27 (NEW)	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable and if possible convert to open space and/or encourage green infrastructure. Phase 1: Identify appropriate candidates and determine most cost-effective mitigation option (in progress). Phase 2: Work with the property owners to implement selected action based on available funding from FEMA and local match availability. Specifically identified are properties in the following areas: Newark Passaic Riverfront Acquisition (refer to Newark-11 above)											
	See above.	Existing	Flood, Coastal Erosion, Coastal Storm,	1.2 2.2	City Engineering via NFIP FPA) with NJOEM,	High	High	FEMA Mitigation Grant Programs and	Ongoing (outreach and specific project	High	SIP	PP

Table 9.15-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
			Severe Storm, Wildfire, Winter Storm		FEMA support			local budget (or property owner) for cost share	identification); Long term DOF (specific project application and implementation)			
Newark-28 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. This program will include: • Providing general natural hazard risk, preparedness and mitigation, and related NFIP information to the community through partnerships with community development corporations or community non-profit organizations. • Including natural hazard risk and risk reduction information through social media channels and email blast systems. • Posting of flyers and other readily available NFIP informational materials at City Hall or distributing at regular community meetings. • Preparation, distribution and analysis of public surveys. • Developing/maintaining a natural hazard risk management webpage on the municipal website where information and mapping can be posted. • Enhance public outreach to residents in NFIP floodplain areas to inform of annual grant opportunities, etc. which may include periodic articles and handouts in the annual newsletter.											
	See above.	N/A	All Hazards	3.1 5.4	City Supervisor's Office	Medium	Low	Municipal Budget; HMA programs with local or county match	Short	High	EAP	PR
Newark-29 (NEW)	Develop and implement a post-event damage assessment program, including the following elements: • Conduct public outreach/education (see Public Education and Awareness Initiatives above) to inform property owners of the need to report property damage and obtain required permitting when making repairs. • Develop and organize local resources to conduct post-event damage assessments, including substantial damage determinations as warranted. • Develop an inventory (file system and/or database) of losses (incl. loss of service, property damage, economic losses, etc.) as reported to and/or identified by the Town/Village (e.g. building permit process).											
	See above.	Existing	Flood; Severe Storm; Severe Winter Storm; Coastal Storm	5.4	Engineering City NFIP FPA; Supervisor's Office	Medium – High (life Safety; Increased eligibility for mitigation grant funding)	Low- Medium	Municipal Budget	Short	High	LPR, EAP	PR PI
Newark-30 (NEW)	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county.	N/A	Flood	5.4	City NFIP FPA, as fully supported by local government officials	Medium - High	Low	Municipal Budget	Short (year 1)	High	LPR, EAP	PR

Table 9.15-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.											
Newark-31 (NEW)	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).	N/A	Flood	4.3	City NFIP FPA	Low - Medium	Low	Municipal Budget	Short (year 1)	High	LPR	
Newark-32 (NEW)	Have designated NFIP Floodplain Administrator (FPA), and other local officials who would benefit, become a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training such as FEMA Benefit-Cost Analysis (BCA) and Substantial Damage Estimation (SDE).	N/A	Flood	3.3 5.2	City NFIP FPA	Medium	Low	Municipal Budget	Short (DOF)	High	EAP	PR PI
Newark-33 (NEW)	Enhance/expand tree maintenance program and coordination with utilities (e.g., PSEG).	Existing	Severe Storm; Severe Winter Storm	6.1	Engineering and DPW, working with contractors and local utilities	Medium – High (reduced risk of utility outages; life safety)	Medium	Local Budget	Short	Medium	NR	NS P
Newark-34 (NEW)	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	N/A	All Hazards	3.2	Municipality with support from County, NJOEM, FEMA and	Medium	Low	Municipal Budget	Short Term	High	LRP	PR

Table 9.15-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
					surrounding communities							

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:
CAV Community Assistance Visit
CRS Community Rating System
DPW Department of Public Works
FEMA Federal Emergency Management Agency
FPA Floodplain Administrator
HMA Hazard Mitigation Assistance
N/A Not applicable
NFIP National Flood Insurance Program
NJDEP New Jersey Department of Environmental Protection
NJOEM New Jersey Office of Emergency Management
OEM Office of Emergency Management

Potential FEMA HMA Funding Sources:
FMA Flood Mitigation Assistance Grant Program
HMGP Hazard Mitigation Grant Program
PDM Pre-Disaster Mitigation Grant Program
RFC Repetitive Flood Claims Grant Program
SRL Severe Repetitive Loss Grant Program

Timeline:
Short 1 to 5 years
Long Term 5 years or greater
OG On-going program
DOF Depending on funding

Costs:
Where actual project costs have been reasonably estimated:
Low < $10,000
Medium $10,000 to $100,000
High > $100,000

Where actual project costs cannot reasonably be established at this time:
Low Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.
Medium Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
High Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:
Low= < $10,000
Medium $10,000 to $100,000
High > $100,000

Where numerical project benefits cannot reasonably be established at this time:
Low Long-term benefits of the project are difficult to quantify in the short term.
Medium Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.
High Project will have an immediate impact on the reduction of risk exposure to life and property.

Mitigation Category:
- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*

- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.15-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Newark- 1 (Old 1)	McClellen St. stormwater pumping station	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Newark- (Old 2)	Meadowland stormwater pumping station emergency power supply and control	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Newark- 3 (Old 5)	Peddie St. outfall improvements	1	1	1	1	1	1	-1	1	-1	1	1	1	1	1	12	High
Newark- 4 (Old 6)	Frelinghuysen/Empire/Meeker St. stormwater improvements	1	1	1	1	1	1	-1	1	-1	1	1	1	1	1	12	High
Newark- 5 (Old 7)	Hazmat Material Command Vehicles and foam Fire Apparatus	1	1	1	1	0	0	1	1	1	0	1	1	0	0	9	High
Newark-6 (NEW/AW)	Prevention of leakage, mold, mildew, and collapse of roof	1	1	1	1	0	1	1	1	1	1	1	1	1	1	13	High
Newark-7 (NEW/AW)	Flood prevention and mitigation	1	1	1	1	0	1	1	1	1	1	1	1	1	1	13	High
Newark-8 (NEW/LOI)	Newark Passaic Riverfront Acquisition	1	1	1	1	1	1	1	1	1	1	1	0	1	1	13	High
Newark-9 (NEW/LOI)	Back-up Generators at Critical Municipal Buildings/Facilities	1	1	1	1	1	1	1	1	1	1	1	0	1	1	13	High
Newark-10 (NEW/LOI)	Newark back-up generators at critical shelter locations	1	0	1	1	1	1	1	1	0	1	1	1	1	1	13	High
Newark-11 (NEW/LOI)	Back-up Uninterruptible Power Supply (UPS) Systems for Critical Traffic Intersections	1	1	1	1	1	1	1	1	-1	1	1	1	1	1	12	High
Newark-12 (NEW/LOI)	Newark Wayne Potable Water Pump Station Emergency Power Supply and SCADA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Newark-13 (NEW/LOI)	Newark Chittenden Road Pump Station Back-up Generator & SCADA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Newark-14 (NEW/LOI)	Newark Vailsburg Ditch/Flood Control Mitigation Project	0	1	0	1	1	1	1	1	1	1	1	1	1	1	12	High
Newark-15	Newark Stormwater Management	1	1	1	1	1	1	1	1	1	1	1	0	1	1	13	High

Table 9.15-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
(NEW/LOI)	Through Green Infrastructure Project																
Newark-16 (NEW/LOI)	Newark Quick Connect Tap Boxes at Critical Facilities/Municipal Building Project	1	1	1	1	1	1	1	1	0	1	1	1	1	1	13	High
Newark-17 (NEW/LOI)	Newark Hazard Mitigation Planning for Residential Flood Prevention	1	1	1	1	1	1	1	1	1	1	1	0	1	1	13	High
Newark-18 (NEW/LOI)	Newark Queen Ditch Drainage Mitigation Project	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Newark-19 (NEW/LOI)	Newark Adams and South Streets and Wheeler Ditch Drainage Improvements	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Newark-20 (NEW/LOI)	Newark Ironbound Recreation Center Flood Mitigation Project	0	1	0	1	1	1	1	1	1	1	1	1	1	1	12	High
Newark-21 (NEW/LOI)	Newark Community Education and Outreach Project	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Newark-22 (NEW/LOI)	Newark Cedar Grove Reservoir Improvements for Regional Sustainability & Resiliency	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Newark-23 (NEW/LOI)	Newark Meadowlands Storm Water Pump Station Project	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Newark-24 (NEW)	Encourage compliance with FEMA's Preliminary Work maps	1	1	1	1	1	1	0	1	1	0	1	1	1	1	12	High
Newark-25 (NEW)	Installing flood control measures in flood zone areas of the City, (i.e., levees, trenches, sump pump systems)	1	1	0	1	1	1	1	1	1	0	1	1	1	1	12	High
Newark-26 (NEW)	Implement renewable energy, smart grid technology and alternative back-up generation assets, would also be appropriate solutions to solve or energy related issues (if they arise)	1	1	1	1	1	1	1	1	-1	1	1	1	1	1	13	High
Newark-27	Support the mitigation of	1	1	1	1	1	1	0	0	1	1	1	0	1	1	11	High

Table 9.15-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
(NEW)	vulnerable structures																
Newark-28 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness	0	1	1	1	1	1	0	0	0	1	1	0	1	1	9	High
Newark-29 (NEW)	Develop and implement a post-event damage assessment program	0	1	1	1	1	1	0	0	0	1	1	0	1	1	9	High
Newark-30 (NEW)	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.	0	1	1	1	1	1	1	0	0	1	1	1	1	1	11	High
Newark-31 (NEW)	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).	0	1	1	1	1	1	1	0	0	1	1	1	1	1	0	High
Newark-32 (NEW)	Have designated NFIP Floodplain Administrator (FPA), and other local officials who would benefit, become a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing	0	1	1	1	1	1	1	0	0	1	1	1	1	1	11	High

Table 9.15-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
	education training such as FEMA Benefit-Cost Analysis (BCA) and Substantial Damage Estimation (SDE).																
Newark-33 (NEW)	Enhance/expand tree maintenance program and coordination with utilities (e.g., PSEG).	0	1	1	1	1	1	0	0	0	1	1	0	1	1	9	Medium
Newark-34 (NEW)	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	0	1	1	1	1	1	0	0	0	1	1	1	1	1	10	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.15.7 Future Needs To Better Understand Risk/Vulnerability

None identified at this time.

9.15.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the City of Newark that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the City of Newark has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.15.9 Additional Comments

None at this time.

Figure 9.15-1. City of Newark Hazard Area Extent and Location Map 1

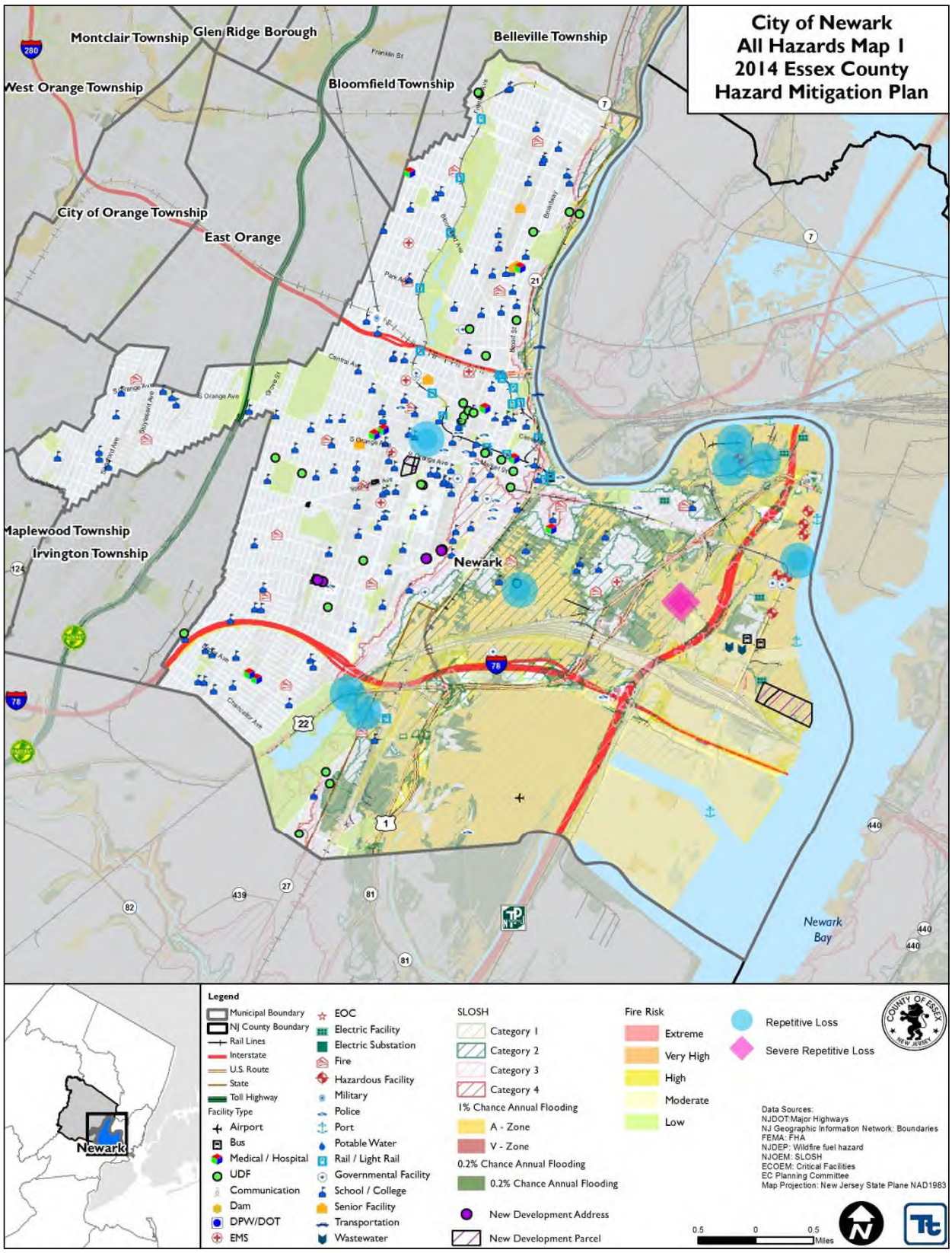
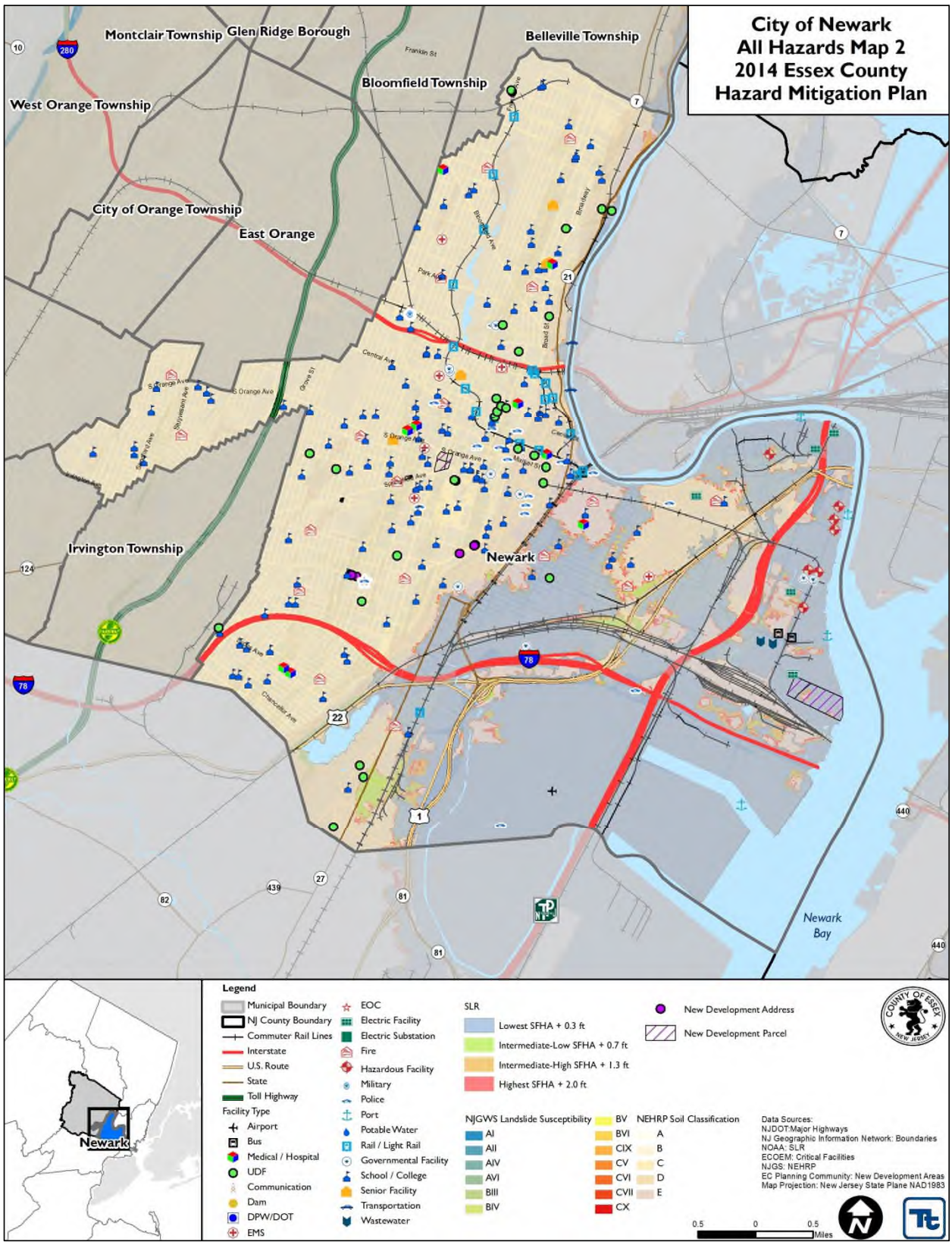


Figure 9.15-2. City of Newark Hazard Area Extent and Location Map 2



Action Number: **Newark-1 (Old 1)**
Mitigation Action/Initiative: McClellan Street stormwater pumping station

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$4,000,000
Priority*	
Plan for Implementation	
Responsible Organization	Newark Engineering
Local Planning Mechanism	
Potential Funding Sources	Federal, State, and Local Capital funds
Timeline for Completion	Expected completion in 2015
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Newark-1 (Old 1)**
Mitigation Action/Initiative: McClellan Street stormwater pumping station

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Newark-2 (Old 2)**

Mitigation Action/Initiative: Meadowland stormwater pumping station Emergency Power Supply and Control

Assessing the Risk	
Hazard(s) addressed:	Loss of Electric Power and consequential flooding
Specific problem being mitigated:	The installation of a Standby Electric Generator and SCADA Control of the Facility will abate the possibility flooding during power interruption/loss and/or inability to access the facility during flood conditions.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Reconstruction of entire pumping station to current standards/Excessive Cost
	2. Portable generator/time delay, limited availability during Sandy type incident, site accessibility not addressed
	3. No action/ would be continue to be subject to power interruption
Action/Project Intended for Implementation	
Description of Selected Action/Project	The Design and installation/construction of an onsite emergency generator with SCADA for remote controls and monitoring
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	The goal and objective of abating the interruption or power and subsequent flooding will be achieved.
Applies to existing, future, or not applicable	Applies to existing storm water system
Benefits (losses avoided)	Completion of this project will abate the possibility of power loss, and the flooding of low lying areas, including Newark Airport, during heavy rain and high tide
Estimated Cost	$5,700,000
Priority*	High/14
Plan for Implementation	
Responsible Organization	Dept. of Water & Sewer Utilities, City of Newark, NJ
Local Planning Mechanism	Design and Construction
Potential Funding Sources	Grant Funding with Local Share through bonding and/or NJEIT
Timeline for Completion	Short term after receipt of Grant Funding
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: ***May 2014*** Progress on Action/Project: ***Not Started or completed/awaiting receipt of Grant Funding***

Refer to prioritization table.

Action Number: **Newark-2 (Old 2)**
Mitigation Action/Initiative: Meadowland stormwater pumping station

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	The need for uninterrupted power supply to abate flooding of low lying areas and Newark Airport during heavy rain and high tides
Property Protection	1	The need for a continuous, uninterrupted power supply to abate flooding of properties
Cost-Effectiveness	1	Yes
Technical	1	Yes/Short Term to achieve goals
Political	1	Yes
Legal	1	Yes/ Necessary permits from NJDEP will be obtained
Fiscal	1	No/New funding source such as bonds and/or NJEIT would be required if approved by LFB.
Environmental	1	NJDEP permits will be obtained and NJDEP Regulations will be satisfied
Social	1	All segments of Newark's Population in the low lying areas in the South and East Wards and Newark Airport will benefit from this action.
Administrative	1	Yes
Multi-Hazard	1	Yes; continuous, uninterrupted power supply to abate flooding and the related hazards
Timeline	1	Yes
Agency Champion	1	Yes; this project is contained in the Sewer System Master Plan but lacked funding source
Other Community Objectives	1	Yes; flooding during heavy rain events will affect the desirability to develop in affected areas
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Newark-3 (Old 5)**
Mitigation Action/Initiative: Peddie Street outfall improvements

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Replacement of undersized failing netting facility and the removal of sediment from the Peddie Ditch that cause impediments that restrict the flow of water in the existing pipe.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$250,000
Priority*	
Plan for Implementation	
Responsible Organization	Newark Engineering
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Newark-3 (Old 5)**
Mitigation Action/Initiative: Peddie Street outfall improvements

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	Improving the outfall will reduce flooding in the streets, neighborhoods and intersections that directly affect the business community and residential property owners.
Cost-Effectiveness	1	These types of infrastructure improvements are costly but are needed to ensure that the City remains compliant with the Clean Water Act and DEP permit requirements.
Technical	1	Yes
Political	1	Yes
Legal	1	Yes
Fiscal	-1	No/New funding source such as bonds and/or NJEIT would be required **if** approved by **LFB**
Environmental	1	Improvement of the outfall will ensure that the City remains in compliance with State and Federal Combined Sewer Outfall and Discharge Regulations
Social	-1	These improvements will not have an adverse effect the Newarkers in the community.
Administrative	1	Yes, consultants will be retained
Multi-Hazard	1	Yes
Timeline	1	Yes
Agency Champion	1	Yes, the Department of Water & Sewer
Other Community Objectives	1	Implementing this mitigation action will advance the Department of Water & Sewer Utilities ability to more effectively manage the storm water system and reduce inundation in commonly-flooded streets and intersections.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Newark-4 (Old 6)**
Mitigation Action/Initiative: Frelinghuysen/Empire/Meeker Street stormwater improvements

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	This project would remove that blockage and restore capacity of the Queen Ditch so the existing Queen Street Outfall, and the connected upstream sewers, can drain and provide storm water conveyance as designed.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$625,000
Priority*	
Plan for Implementation	
Responsible Organization	Newark Engineering
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	1 year
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Newark-4 (Old 6)**
Mitigation Action/Initiative: Frelinghuysen/Empire/Meeker Street stormwater improvements

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	Improving the outfall will reduce flooding in the streets, neighborhoods and intersections that directly affect the business community and residential property owners.
Cost-Effectiveness	1	High priority critical infrastructure project that remove that blockage and restore capacity of the Queen Ditch
Technical	1	Yes
Political	1	Yes
Legal	1	Yes
Fiscal	-1	No/New funding source such as bonds and/or NJEIT would be required **if** approved by **LFB**
Environmental	1	Improvement of the outfall will ensure that the City remains in compliance with State and Federal Combined Sewer Outfall and Discharge Regulations
Social	-1	These improvements will not have an adverse effect the Newarkers in the community.
Administrative	1	Yes, consultants will be retained
Multi-Hazard	1	Yes
Timeline	1	Yes
Agency Champion	1	Yes, the Department of Water & Sewer
Other Community Objectives	1	Implementing this mitigation action will advance the Department of Water & Sewer Utilities ability to more effectively manage the storm water system and reduce inundation in commonly-flooded streets and intersections.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Newark-5 (Old 7)**
Mitigation Action/Initiative: Hazmat Material Command Vehicles and foam Fire Apparatus

Assessing the Risk	
Hazard(s) addressed:	Hazardous Materials Release
Specific problem being mitigated:	To allow for a timely and efficient response to a hazmat release
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Hazmat/foam Fire Apparatus
	2. Hazardous materials quick response command vehicles
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	To more effectively respond to a hazardous materials incident within the City of Newark as well as within the region.
Action/Project Category	LPR, SIP, EAP, NSP This project will help to mitigate the damage done by a hazardous materials release both by protecting the public and fiscal impacts
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing - This will help to enhance the already existing hazardous materials resources within the City of Newark
Benefits (losses avoided)	This equipment will help to lessen the impact to both public and private infrastructure and lessen the monetary impact.
Estimated Cost	$1,000,000 (est.)
Priority*	
Plan for Implementation	
Responsible Organization	Newark Fire Department
Local Planning Mechanism	This helps to mitigate the risk posed by an uncontrolled hazardous materials leak as it aligns with the Cities THIRA (threat and hazard Identification and Risk Assessment)
Potential Funding Sources	Federal/Homeland Security
Timeline for Completion	The timeline is short for implementation, 1 year once grant funding is secured
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 6/30/14 Progress on Action/Project: This project is not completed but all specifications and pricing have been completed. There is a one year timeline for complete implementation

Refer to prioritization table.

Action Number: **Newark-5 (Old 7)**
Mitigation Action/Initiative: Hazmat issues

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	This project will directly impact public and responder life and safety
Property Protection	1	This project will lessen the impact to infrastructure due to a more timely response and mitigation actions at a hazardous materials release
Cost-Effectiveness	1	The cost of this project will rapidly be offset by the monetary value saved due to a rapid response and mitigation of hazmat incidents
Technical	1	There is numerous and particular trainings and qualifications that are required for response to these incidents
Political	0	
Legal	0	
Fiscal	1	Monetary impacts due to hazmat releases will be greatly reduced by implementation of this mitigation project
Environmental	1	By responding to and mitigating a release effectively, early, the impacts to the environment will be greatly reduced
Social	1	This will help to reduce the social impacts through reduced economic impacts as well as safety to the responder and public
Administrative	0	
Multi-Hazard	1	This equipment will help to deal with hazardous materials as well as confined space incidents, flammable liquid fires, and decontamination incidents
Timeline	1	This project can be fully completed and implemented in 1 year
Agency Champion	0	
Other Community Objectives	0	This project allows the Fire Department to respond to, train and educate our private industry partners in regards to capabilities, risk, and safety
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Newark- 6 (NEW/AW)**
Mitigation Action/Initiative: Prevention of leakage, mold, mildew and collapse of roof

Assessing the Risk	
Hazard(s) addressed:	Severe Storm, Hurricane, Severe Winter Storm, Tornado
Specific problem being mitigated:	Roof replacement
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Various Critical Public Buildings/Sheltering location
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Repairing and replacement of the roofs of public buildings
Action/Project Category	*Structure and Infrastructure Project (SIP)*
Goals/Objectives Met	To prevent leakage, mold, mildews and structural failure
Applies to existing, future, or not applicable	Existing and future
Benefits (losses avoided)	Mitigation of health issues related to mold/mildew, structural failure
Estimated Cost	High = > $100,000
Priority*	High
Plan for Implementation	
Responsible Organization	Department of Engineering
Local Planning Mechanism	Design & Construction
Potential Funding Sources	Capital, Federal and State
Timeline for Completion	OG – (5 years – 2019)
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3/21/14 Progress on Action/Project: N/A, acquiring funding to begin design and construction

Refer to prioritization table.

Action Number: **Newark- 6 (NEW/AW)**

Mitigation Action/Initiative: Prevention of leakage, mold, mildew and collapse of roof

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	A newer roof reduces the likelihood of leaks, mold, mildew and a structural collapse that if not mitigated can create serious life safety issues
Property Protection	1	Yes, roof replacements will ensure/enhance the integrity of the building envelope
Cost-Effectiveness	1	Roof replacements are expensive but essential at this point due to the intensity, frequency of storms/events and the cost of damages
Technical	1	Yes
Political	0	There is political support for this essential rehab project
Legal	1	Yes
Fiscal	1	Yes
Environmental	1	Indoor air quality issues will be mitigated through this action
Social	1	Yes
Administrative	1	Yes
Multi-Hazard	1	Multi-hazards are achieved, mostly structural improvement projects
Timeline	1	Yes, currently on-going
Agency Champion	1	Yes, the Department of Engineering
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Newark-7 (NEW/AW)**
Mitigation Action/Initiative: Flood prevention and mitigation

Assessing the Risk	
Hazard(s) addressed:	Flood, Severe Storm
Specific problem being mitigated:	Flooding in vulnerable communities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Residential Flood Prevention
	2. Stormwater Management through Green Infrastructure
	3. Newark Riverfront Flood Mitigation Acquisitions
Action/Project Intended for Implementation	
Description of Selected Action/Project	Implementation of green infrastructure projects and property acquisitions to reduce impact of flooding and storm surges.
Action/Project Category	*Structure and Infrastructure Project (SIP), Natural Systems Protection (NSP)*
Goals/Objectives Met	To reduce Combined Sewer Overflow events that negatively impact the Passaic River and surrounding waterways in addition to mitigating the flood risk in Newark's most vulnerable communities
Applies to existing, future, or not applicable	Existing and future
Benefits (losses avoided)	Mitigation of flooding in vulnerable communities
Estimated Cost	High = > $100,000
Priority*	High
Plan for Implementation	
Responsible Organization	Department of Engineering, Department of Economic & Housing Development
Local Planning Mechanism	Design & Construction
Potential Funding Sources	Capital, Federal and State
Timeline for Completion	OG
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Newark-7 (NEW/AW)**
Mitigation Action/Initiative: Flood prevention and mitigation

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Yes, reduced flooding ensures structures remain sound, reduces likelihood of drowning (a man downed during Hurricane Sandy) and mold/mildew
Property Protection	1	Mitigate flooding in area that has caused severe and repetitive damage to homeowners and businesses
Cost-Effectiveness	1	Yes
Technical	1	Yes
Political	0	
Legal	1	Yes
Fiscal	1	Initiative will be funded entirely through grant funds
Environmental	1	Reductions in CSO events ensures improved water quality
Social	1	No, project implementation will reduce flooding in this area of the City as well as provide much needed green space
Administrative	1	Yes
Multi-Hazard	1	Yes
Timeline	1	Unsure due to availability of funds and cooperation from the landowners/residents
Agency Champion	1	Yes
Other Community Objectives	1	Capital improvements, environmental quality
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Newark-8 (NEW/LOI)**
Mitigation Action/Initiative: Newark Passaic Riverfront Acquisition

Assessing the Risk	
Hazard(s) addressed:	Life safety, property protection and flood mitigation.
Specific problem being mitigated:	Severe and repetitive localized flooding in specific areas of the City.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Flood mitigation through Green Infrastructure Implementation / This mitigation action is included in another mitigation action worksheet as a flood mitigation alterative
	2. Installation of floodwall and/or levee system / Army Corps. Engineering cost-benefit analysis proved the project to be too costly. This mitigation action is included in another mitigation action worksheet as a flood mitigation alterative
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Acquisition of the 4.2 acres along Newark's Passaic Riverfront by creating a green absorbent buffer along the river's edge and remove vulnerable, flood-prone properties from development.
Action/Project Category	Local Plans and Regulations (LPR), Structure and Infrastructure Project (SIP), Natural Systems Protection (NRP), Education and Awareness Programs (EAP)
Goals/Objectives Met	To create a green buffer between the Passaic River and upland development as well as protect vulnerable properties from future development.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Preservation of property, flood mitigation
Estimated Cost	$3,900,000
Priority*	High
Plan for Implementation	
Responsible Organization	City of Newark, Department of Economic and Housing Development
Local Planning Mechanism	
Potential Funding Sources	Grant funding
Timeline for Completion	Long-term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not started or completed/awaiting receipt of grant funds*

Refer to prioritization table.

Action Number: **Newark-8 (NEW/LOI)**
Mitigation Action/Initiative: Newark Passaic Riverfront Acquisition

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Yes, reduced flooding ensures structures remain sound, reduces likelihood of drowning (a man downed during Hurricane Sandy) and mold/mildew
Property Protection	1	Mitigate flooding in area that has caused severe and repetitive damage to homeowners and businesses
Cost-Effectiveness	1	Yes
Technical	1	Yes
Political	1	Strong political support to reduce flooding in the community
Legal	1	Yes
Fiscal	1	Initiative will be funded entirely through grant funds
Environmental	1	NJDEP permits will be obtained for acquisitions
Social	1	No, project implementation will reduce flooding in this area of the City as well as provide much needed green space
Administrative	1	Yes
Multi-Hazard	1	Yes
Timeline	0	Unsure due to availability of funds and cooperation from the landowners/residents
Agency Champion	1	Yes
Other Community Objectives	1	Capital improvements, environmental quality
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Newark-9 (NEW/LOI)**
Mitigation Action/Initiative: Back-up Generators at Critical Municipal Buildings/Facilities

Assessing the Risk	
Hazard(s) addressed:	Loss of electrical power due to a natural disaster or supply disruption
Specific problem being mitigated:	Installation of back-up generators will allow critical Municipal buildings/facilities to remain operational during power interruptions, consistent with COOP/COG planning implementation activities.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Quick Connect Tap Box installation to support portable generator hookup / this mitigation activity is included in another mitigation action worksheet as an alternative to enhance the energy resiliency of key facilities
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of back-up generators at seventeen critical municipal buildings/facilities
Action/Project Category	Structure and Improvement Project (SIP)
Goals/Objectives Met	To enhance the energy resiliency of critical Municipal buildings/facilities during loss of electrical service
Applies to existing, future, or not applicable	Applies to existing electrical system
Benefits (losses avoided)	Installation of back-up generators will ensure that there is a continuity of services and preservation of IT equipment/resources
Estimated Cost	$1,800,000.00
Priority*	High
Plan for Implementation	
Responsible Organization	City of Newark, Department of Engineering, Division of Public Buildings
Local Planning Mechanism	
Potential Funding Sources	Grant funding
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not started or completed/awaiting receipt of grant funds*

Refer to prioritization table.

Action Number: **Newark-9 (NEW/LOI)**
Mitigation Action/Initiative: Back-up Generators at Critical Municipal Buildings/Facilities

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	The installation of back-up generators will reduce/eliminate the damage to the IT infrastructure and mechanical equipment
Cost-Effectiveness	1	Yes
Technical	1	Yes
Political	1	Strong political support to keep the "lights on" to support recovery/restoration activities during natural/manmade disaster or incident
Legal	1	Yes
Fiscal	1	Initiative will be funded entirely through grant funds
Environmental	1	NJDEP permits will be obtained for generator operation and regulations satisfied
Social	0	No, project implementation will enhance the City's ability to provide support to the community during emergency situations
Administrative	1	Yes
Multi-Hazard	1	Yes
Timeline	1	Yes, achievable within approved timeframe
Agency Champion	1	Yes
Other Community Objectives	1	Capital improvements, environmental quality through likely participation in grid energy efficiency incentive programs
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Newark-10 (NEW/LOI)**
Mitigation Action/Initiative: Newark back-up generators at critical shelter locations

Assessing the Risk	
Hazard(s) addressed:	Loss of electrical power due to a natural disaster or supply disruption
Specific problem being mitigated:	Installation of back-up generators at 10 critical shelter locations that require electricity to support mass sheltering of the Newark community during a natural/manmade disaster: Barringer High School, Malcolm X Shabazz, East Side High School, West side High School, Central High School, Science Park High School, First Avenue School, Weequahic High School, Belmont Runyon Elementary School, Park Elementary School
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Quick Connect Tap Box installation to support portable generator hookup / this mitigation activity is included in another mitigation action worksheet as an alternative to enhance the energy resiliency of key facilities
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of back-up generators at critical designated shelter locations. Based on the prioritization of each facility, generators will be installed. Capacity of shelter will be considered.
Action/Project Category	Structure and Improvement Project (SIP)
Goals/Objectives Met	To enhance the energy resiliency of designated critical sheltering locations during loss of electrical service
Applies to existing, future, or not applicable	Applies to existing electrical system
Benefits (losses avoided)	Installation of back-up generators will ensure that there is a continuity of services during loss of electrical service
Estimated Cost	$1,000,000
Priority*	High
Plan for Implementation	
Responsible Organization	City of Newark, Department of Engineering, Division of Public Buildings
Local Planning Mechanism	
Potential Funding Sources	Grant funding
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not started or completed/awaiting receipt of grant funds*

Refer to prioritization table.

Action Number: **Newark-10 (NEW/LOI)**

Mitigation Action/Initiative: Newark back-up generators at critical shelter locations

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Newark-11 (NEW/LOI)**

Mitigation Action/Initiative: Back-up Uninterruptible Power Supply (UPS) Systems for Critical Traffic Intersections

Assessing the Risk	
Hazard(s) addressed:	Loss of electrical power due to a natural disaster or supply disruption at critical traffic intersections
Specific problem being mitigated:	Increased accidents, resulting in property damage and injuries/loss of life due to non-operational traffic and pedestrian signals
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of back-up Uninterruptible Power Supply (UPS) systems at 120 critical intersections in the City of Newark to ensure the safety and well-being of drivers and pedestrians when there is a loss of power due to an energy emergency or natural disaster.
Action/Project Category	Structure and Improvement Project (SIP)
Goals/Objectives Met	Support the continuous operation of traffic signals during power outages essential for establishing and maintaining emergency evacuation and supply routes.
Applies to existing, future, or not applicable	Applies to existing electrical system
Benefits (losses avoided)	Damages to property and life safety incidents are avoided
Estimated Cost	$600,000
Priority*	High
Plan for Implementation	
Responsible Organization	City of Newark, Department of Engineering, Division of Traffic & Signals
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program, City budget
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not started or completed/awaiting receipt of grant funds*

Refer to prioritization table.

Action Number: **Newark-11 (NEW/LOI)**

Mitigation Action/Initiative: Newark back-up UPS system for critical traffic intersections.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Fewer vehicular collisions and pedestrian incidents
Property Protection	1	The installation of back-up generators will reduce/eliminate the damage to mechanical equipment
Cost-Effectiveness	1	Yes
Technical	1	Yes
Political	1	Strong political support to keep the "lights on" to support recovery/restoration activities during natural/manmade disaster or incident
Legal	1	Yes
Fiscal	1	Initiative will be funded entirely through grant funds
Environmental	1	Solar panel installation application for electrical power
Social	-1	No, project implementation will enhance the City's ability to support the community restoration efforts through safe mobility
Administrative	1	Yes
Multi-Hazard	1	Yes
Timeline	1	Yes, achievable within approved timeframe
Agency Champion	1	Yes
Other Community Objectives	1	Capital improvements, environmental quality
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Newark-12 (NEW/LOI)**

Mitigation Action/Initiative: Newark Wayne Potable Water Pump Station Emergency Power Supply and SCADA

Assessing the Risk	
Hazard(s) addressed:	Loss of Electric Power and consequential loss of drinking water
Specific problem being mitigated:	The installation of a Standby Electric Generator and SCADA Control of the Facility will abate the possibility of loss of this drinking water source during power interruption/loss and/or inability to access the facility during flood conditions.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	The Design and **installation/construction** of an onsite emergency generator with SCADA for remote controls and monitoring
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	The goal and objective of abating the interruption/loss of water through this interconnection will be achieved.
Applies to existing, future, or not applicable	Applies to existing water system
Benefits (losses avoided)	Completion of this project will abate the possibility of water loss, reduced availability of water or reduction of water pressure for residential, commercial and industrial use and fire protection.
Estimated Cost	$2,300,000
Priority*	High
Plan for Implementation	
Responsible Organization	Dept. of Water & Sewer Utilities, City of Newark, NJ
Local Planning Mechanism	Design and Construction
Potential Funding Sources	Grant Funding with Local Share through bonding and/or NJEIT
Timeline for Completion	Short term after receipt of Grant Funding
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: ***May 2014*** Progress on Action/Project: ***Not Started or completed/awaiting receipt of Grant Funding***

Refer to prioritization table.

Action Number: **Newark-12 (NEW/LOI)**

Mitigation Action/Initiative: Newark Wayne Potable Water Pump Station Emergency Power Supply and SCADA

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	The need for a continuous, uninterrupted supply of potable water for domestic, commercial and industrial use and fire protection
Property Protection	1	The need for a continuous, uninterrupted supply of potable water for fire protection
Cost-Effectiveness	1	Yes
Technical	1	Yes/Short Term to achieve goals
Political	1	Yes
Legal	1	Yes/ Necessary permits from NJDEP will be obtained
Fiscal	1	No/New funding source such as bonds and/or NJEIT would be required if approved by LFB.
Environmental	1	NJDEP permits will be obtained and NJDEP Regulations will be satisfied
Social	1	All segments of Newark's Population and those communities served by Newark will benefit from this action.
Administrative	1	Yes
Multi-Hazard	1	Yes; continuous, uninterrupted supply of potable water for domestic, commercial and industrial use and fire protection
Timeline	1	Yes
Agency Champion	1	Yes; this project contained in the Water System Master Plan but lacked funding source
Other Community Objectives	1	Yes; the possibility of a loss or interruption of water supply could affect development, will affect environmental quality and could affect fire insurance availability
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Newark-13 (NEW/LOI)**

Mitigation Action/Initiative: Newark Chittenden Road Water Pump Station Back-up Generator and SCADA

Assessing the Risk	
Hazard(s) addressed:	Loss of Electric Power and consequential loss of drinking water
Specific problem being mitigated:	The installation of a Standby Electric Generator and SCADA Control of the Facility will abate the possibility of loss of this drinking water source during power interruption/loss and/or inability to access the facility during Sandy like travel conditions.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Reconstruction of entire pumping station to current standards/Excessive Cost
	2. Portable generator/time delay, limited availability during Sandy type incident, site accessibility not addressed
	3. No action/water system would be continue to be subject to interruption
Action/Project Intended for Implementation	
Description of Selected Action/Project	The Design and **installation/construction** of an onsite emergency generator with SCADA for remote controls and monitoring
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	The goal and objective of abating the interruption/loss of water through this interconnection will be achieved.
Applies to existing, future, or not applicable	Applies to existing water system
Benefits (losses avoided)	Completion of this project will abate the possibility of water loss, reduced availability of water or reduction of water pressure for residential, commercial and industrial use and fire protection.
Estimated Cost	$1,500,000
Priority*	High
Plan for Implementation	
Responsible Organization	Dept. of Water & Sewer Utilities, City of Newark, NJ
Local Planning Mechanism	Design and Construction
Potential Funding Sources	Grant Funding with Local Share through bonding and/or NJEIT
Timeline for Completion	Short term after receipt of Grant Funding
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not Started or completed/awaiting receipt of Grant Funding*

Refer to prioritization table.

Action Number: **Newark-13 (NEW/LOI)**

Mitigation Action/Initiative: Newark Chittenden Road Water Pump Station Back-up Generator and SCADA

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	The need for a continuous, uninterrupted supply of potable water for domestic, commercial and industrial use and fire protection
Property Protection	1	The need for a continuous, uninterrupted supply of potable water for fire protection
Cost-Effectiveness	1	Yes
Technical	1	Yes/Short Term to achieve goals
Political	1	Yes
Legal	1	Yes/ Necessary permits from NJDEP will be obtained
Fiscal	1	No/New funding source such as bonds and/or NJEIT would be required if approved by LFB.
Environmental	1	NJDEP permits will be obtained and NJDEP Regulations will be satisfied
Social	1	All segments of Newark's Population and those communities served by Newark will benefit from this action.
Administrative	1	Yes
Multi-Hazard	1	Yes; continuous, uninterrupted supply of potable water for domestic, commercial and industrial use and fire protection
Timeline	1	Yes
Agency Champion	1	Yes; this project contained in the Water System Master Plan but lacked funding source
Other Community Objectives	1	Yes; the possibility of a loss or interruption of water supply could affect development, will affect environmental quality and could affect fire insurance availability
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Newark-14 (NEW/LOI)**

Mitigation Action/Initiative: Newark Valisburg ditch/flood control mitigation project

Assessing the Risk	
Hazard(s) addressed:	Flood prevention and property protection
Specific problem being mitigated:	Property protection for residential homeowners in the West Ward in close proximity to the Vailsburg Ditch
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Investigate the probable reasons for frequent water intrusion, building vibration and residential structural cracks in houses close to the Vailsburg Ditch and develop solution to reduce impact to residential homeowners.
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	To implement a cost effective flood control measure to prohibit the flow of water during heavy rain events from entering basements of residential homeowners in close proximity of ditch.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Property protection, flood mitigation
Estimated Cost	$30,000,000
Priority*	High
Plan for Implementation	
Responsible Organization	City of Newark, Department of Engineering
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program
Timeline for Completion	Long-term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not started or completed/awaiting receipt of grant funds*

Refer to prioritization table.

A Action Number: **Newark-14 (NEW/LOI)**
Mitigation Action/Initiative: Newark Valisburg ditch/flood control mitigation project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	The installation of flood control measures will preserve property from flood related damages
Cost-Effectiveness	0	
Technical	1	Yes, will be provided by qualified consultant team
Political	1	Political support to enhance neighborhood resiliency
Legal	1	Yes
Fiscal	1	Initiative will be funded almost entirely through grant funds and possible NJEIT
Environmental	1	
Social	1	No, project implementation will reduce impact to residential homeowners due to severe flooding
Administrative	1	Yes
Multi-Hazard	1	Yes
Timeline	1	Unsure do to funding availability and current stage of project development
Agency Champion	1	Yes
Other Community Objectives	1	Capital Improvement
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Newark-15 (NEW/LOI)**
Mitigation Action/Initiative: Newark stormwater management through green infrastructure project

Assessing the Risk	
Hazard(s) addressed:	Life safety, property protection and flood mitigation
Specific problem being mitigated:	Severe and repetitive localized flooding in the East (primarily) and West Wards of the City..
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Green projects manage volumes of stormwater associated with areas much greater than the proposed project area. Filtering stormwater through plants and bioengineered surfaces also has the effect of filtering out many contaminants before they reach the public waterways or residential or commercial structures. The city anticipates managing 20% of its stormwater in this manner.
Action/Project Category	Natural Systems Protection (NRP), Structure and Infrastructure Project (SIP)
Goals/Objectives Met	To create a green buffer between the Passaic River and upland development as well as protect vulnerable properties from future development.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Preservation of property, flood mitigation
Estimated Cost	$60,000,000
Priority*	High
Plan for Implementation	
Responsible Organization	City of Newark, Department of Economic and Housing Development
Local Planning Mechanism	
Potential Funding Sources	Grant funding, local [adjustment in utility rate structure (potential)]
Timeline for Completion	On-going (framework currently in development and small pilot projects underway), Long-term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not started or completed/awaiting receipt of grant funds*

Refer to prioritization table.

Action Number: **Newark-15 (NEW/LOI)**

Mitigation Action/Initiative: Newark stormwater management through green infrastructure project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Yes, reduced flooding ensures structures remain sound, reduces likelihood of drowning (a man downed during Hurricane Sandy) and mold/mildew
Property Protection	1	Mitigate flooding in area that has caused severe and repetitive damage to homeowners and businesses
Cost-Effectiveness	1	Yes
Technical	1	Yes
Political	1	Strong political support to reduce flooding in the community
Legal	1	Yes
Fiscal	1	Initiative will be funded almost entirely through grant funds and possibly an adjustment in the utility rate structure
Environmental	1	All design and construction will adhere to land use and zoning codes/regulations
Social	1	No, project implementation will reduce flooding in this area of the City as well as provide much needed green space
Administrative	1	Yes
Multi-Hazard	1	Ye
Timeline	0	Unsure due to availability of funds and cooperation from the landowners/residents
Agency Champion	1	Yes
Other Community Objectives	1	Capital improvements, environmental quality
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Newark-16 (NEW/LOI)**

Mitigation Action/Initiative: Newark Quick Connect tap boxes at critical facilities/Municipal Building project

Assessing the Risk	
Hazard(s) addressed:	Loss of electrical power due to a natural disaster or supply disruption at critical municipal buildings/facilities
Specific problem being mitigated:	Loss of power at critical facilities and aged electrical infrastructure.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of Quick Connect Tap Boxes to improve the electrical infrastructure of City buildings/facilities to receive temporary power in the event of an energy disruption or emergency.. 50 Quick Connect tap boxes will be installed throughout the city.
Action/Project Category	Structure and Improvement Project (SIP)
Goals/Objectives Met	Standardizing the electrical infrastructure in City buildings/facilities to support the implementation of a portable generator during a power interruption to maintain a continuity of operations in the unlikely event of an energy disruption or emergency.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Continuation of services and preservation of property
Estimated Cost	$720,000
Priority*	
Plan for Implementation	
Responsible Organization	City of Newark, Department of Engineering, Division of Public Buildings
Local Planning Mechanism	
Potential Funding Sources	FEMA Hazard Mitigation Grant Program
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not started or completed/awaiting receipt of grant funds*

Refer to prioritization table.

Action Number: **Newark-16 (NEW/LOI)**

Mitigation Action/Initiative: Newark Quick Connect tap boxes at critical facilities/Municipal Building project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	The installation of quick connect tap boxes will reduce/eliminate the damage to mechanical equipment
Cost-Effectiveness	1	Yes
Technical	1	Yes
Political	1	Strong political support to keep the "lights on" to support recovery/restoration activities during natural/manmade disaster or incident
Legal	1	Yes
Fiscal	1	Initiative will be funded entirely through grant funds
Environmental	1	Installation will adhere to all UCC rules and regulations
Social	0	No, project implementation will enhance the City's ability to support the community's recovery/restoration efforts
Administrative	1	Yes
Multi-Hazard	1	Yes
Timeline	1	Yes, achievable within approved timeframe
Agency Champion	1	Yes
Other Community Objectives	1	Capital improvements, environmental quality
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Newark-17 (NEW/LOI)**
Mitigation Action/Initiative: Newark hazard mitigation planning for residential flood prevention

Assessing the Risk	
Hazard(s) addressed:	Life safety, property protection and flood mitigation.
Specific problem being mitigated:	Severe and repetitive localized flooding in the East Ward.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Hazard mitigation planning in the residential area near the Passaic River will allow residents to engage professionals to assist with identifying which repairs would make their homes more resilient in a future storm event. In some cases it may be advisable to work with residents on relocation rather than reconstruction.
Action/Project Category	Natural Systems Protection (NRP), Education and Awareness (EAP)
Goals/Objectives Met	Provide residents with planning resources, in the residential area near the Passaic River, to assist with identifying which repairs would make their homes more resilient in a future storm event, with the understanding that in some cases it may be advisable to work with residents on relocation rather than reconstruction.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Preservation of property, flood mitigation
Estimated Cost	$6,000,000
Priority*	High
Plan for Implementation	
Responsible Organization	City of Newark, Department of Economic and Housing Development
Local Planning Mechanism	
Potential Funding Sources	Grant funding
Timeline for Completion	Medium-term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not started or completed/awaiting receipt of grant funds*

Refer to prioritization table.

Action Number: **Newark-17 (NEW/LOI)**

Mitigation Action/Initiative: Newark hazard mitigation planning for residential flood prevention

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Yes, reduced flooding ensures structures remain sound, reduces mold/mildew
Property Protection	1	Yes, technical/professional services will ensure safety and security of life and property.
Cost-Effectiveness	1	Yes
Technical	1	Yes
Political	1	Strong political support to enhance neighborhood resiliency
Legal	1	Yes
Fiscal	1	Initiative will be funded almost entirely through grant funds
Environmental	1	All design and construction will adhere to land use and zoning codes/regulations
Social	1	No, project implementation will provide valuable assistance to residents who have been severely inundated by flooding
Administrative	1	Yes
Multi-Hazard	1	Yes
Timeline	0	Unsure due to availability of funds and cooperation from the landowners/residents
Agency Champion	1	Yes
Other Community Objectives	1	Capital improvements, environmental quality
Total	13	
Priority (High/Med/Low)	High	

Action Number: **Newark-18 (NEW/LOI)**
Mitigation Action/Initiative: Newark Queen Ditch Drainage Mitigation Project

Assessing the Risk	
Hazard(s) addressed:	Flooding of commercial and industrial properties and impassible roadways during heavy to medium rain events
Specific problem being mitigated:	Restore drainage capabilities by construction of box culvert
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Installation of new pumped storm drainage system/ excessive cost and potential mechanical failure
	2. Installation of new gravity storm drainage system/ excessive cost
	3. No action/properties would continue to be subject to flooding
Action/Project Intended for Implementation	
Description of Selected Action/Project	The design and construction of a box culvert for drainage restoration
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	The goal and objective of abating flooding in the affected drainage area will be achieved upon project completion
Applies to existing, future, or not applicable	Applies to existing drainage system
Benefits (losses avoided)	Completion of this project will abate the **possibility/occurrence** of flooding at affected roadways and commercial and industrial properties and will allow the passage of emergency vehicles
Estimated Cost	$8,000,000
Priority*	High
Plan for Implementation	
Responsible Organization	Dept. of Water & Sewer Utilities, City of Newark, NJ
Local Planning Mechanism	Construction
Potential Funding Sources	Grant Funding with Local Share through bonding and/or NJEIT
Timeline for Completion	Short term after receipt of Grant Funding and easement acquisition
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Design Substantially completed. Construction not started or completed/awaiting receipt of Grant Funding*

Refer to prioritization table.

Action Number: **Newark-18 (NEW/LOI)**
Mitigation Action/Initiative: Newark Queen Ditch Drainage Mitigation Project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	The abatement of street flooding will allow the passage of emergency **vehicles** such as ambulances and fire **trucks**
Property Protection	1	The abatement of street flooding will reduce the probability of vehicle damage **and** the potential flooding of **properties**
Cost-Effectiveness	1	**Yes**
Technical	1	Yes/Short Term to achieve goals
Political	1	**Yes**
Legal	1	Yes/ Necessary permits from NJDEP are being obtained
Fiscal	1	No/New funding source such as bonds and/or NJEIT would be required **if** approved by **LFB.**
Environmental	1	NJDEP permits will be obtained and NJDEP Regulations will be satisfied
Social	1	The area which currently floods and all who are unable to pass through the **flooded** roadway or are impacted by emergency vehicles that are unable to **pass**
Administrative	1	**Yes**
Multi-Hazard	1	The abatement of flooding will reduce property damage and the restricted **roadway** passage during flood **events**
Timeline	1	**Yes**
Agency Champion	1	Yes; this project contained in the Sewer System Master Plan but lacked **funding source**
Other Community Objectives	1	Yes; the continued flooding of this area will reduce property values and **limit** potential development. The visions of flooding on TV News affects the **perception** to potential **developers**
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Newark-19 (NEW/LOI)**

Mitigation Action/Initiative: Newark Adams and South Streets and Wheeler Ditch Drainage Improvements

Assessing the Risk	
Hazard(s) addressed:	Flooding of residential, commercial and industrial properties and impassible roadways during heavy to medium rain events
Specific problem being mitigated:	Restore drainage capabilities by construction of drainage improvements
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. No action/properties would continue to be subject to flooding
	2. Elevate structures
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	The design and construction of drainage system improvements including new and properly sized pipes and outlets
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	The goal and objective of abating flooding in the affected drainage area will be achieved upon project completion
Applies to existing, future, or not applicable	Applies to existing drainage system
Benefits (losses avoided)	Completion of this project will abate the **possibility/occurrence** of flooding at affected roadways and residential, commercial and industrial properties and will allow the passage of emergency vehicles
Estimated Cost	$31,600,000
Priority*	High
Plan for Implementation	
Responsible Organization	Dept. of Water & Sewer Utilities, City of Newark, NJ
Local Planning Mechanism	Construction
Potential Funding Sources	Grant Funding with Local Share through bonding and/or NJEIT
Timeline for Completion	Short term after receipt of Grant Funding and easement acquisition
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not started or completed/awaiting receipt of Grant Funding*

Refer to prioritization table.

Action Number: **Newark-19 (NEW/LOI)**

Mitigation Action/Initiative: Newark Adams South and Wheeler Avenue drainage improvement s projects

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	The abatement of street flooding will allow the passage of emergency **vehicles** such as ambulances and fire **trucks**
Property Protection	1	The abatement of street flooding will reduce the probability of vehicle damage **and** the potential flooding of **properties**
Cost-Effectiveness	1	**Yes**
Technical	1	Yes/Short Term to achieve goals
Political	1	**Yes**
Legal	1	Yes/ Necessary permits from NJDEP are being obtained
Fiscal	1	No/New funding source such as bonds and/or NJEIT would be required **if** approved by **LFB.**
Environmental	1	NJDEP permits will be obtained and NJDEP Regulations will be satisfied
Social	1	The area which currently floods and all who are unable to pass through the **flooded** roadway or are impacted by emergency vehicles that are unable to **pass**
Administrative	1	**Yes**
Multi-Hazard	1	The abatement of flooding will reduce property damage and the restricted **roadway** passage during flood **events**
Timeline	1	**Yes**
Agency Champion	1	Yes; this project identified in 1975 Pollution Abatement Plan but lacked **funding source**
Other Community Objectives	1	Yes; the continued flooding of this area will reduce property values and **limit** potential development. The visions of flooding on TV News affects the **perception** of potential **developers**
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Newark-20 (NEW/LOI)**
Mitigation Action/Initiative: Newark Ironbound Recreation Center flood mitigation project

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Runoff penetrates and leaks into the building from the Northeast side of the structure at the hockey rink.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Construct flood control prevention structures
	2. Do nothing
	3. Elevate land and area
Action/Project Intended for Implementation	
Description of Selected Action/Project	Create and construct flood control and prevention structures and devices to mitigate and stop rain water outside of the building before reaching the Recreation Center. Methods include levees, spillways and retainage/detention ponds.
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	To implement a cost effective flood control measure to prohibit the flow of water during heavy rain events from entering the facility.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Property protection, flood mitigation
Estimated Cost	$1,300,000
Priority*	High
Plan for Implementation	
Responsible Organization	City of Newark, Department of Engineering, Division of Public Buildings
Local Planning Mechanism	
Potential Funding Sources	Grant funding
Timeline for Completion	Short-term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not started or completed/awaiting receipt of grant funds*

Refer to prioritization table.

Action Number: **Newark-20 (NEW/LOI)**
Mitigation Action/Initiative: Newark Ironbound Recreation Center flood mitigation project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	The installation of flood control measures will preserve property from flood related damages
Cost-Effectiveness	0	The recreation center is located in a flood zone
Technical	1	Yes, can be available if needed.
Political	1	Political support to enhance neighborhood resiliency
Legal	1	Yes
Fiscal	1	Initiative will be funded almost entirely through grant funds
Environmental	1	
Social	1	No, project implementation will allow residents to utilize the recreation center as a shelter location during an event or natural disaster.
Administrative	1	Yes
Multi-Hazard	1	Yes
Timeline	1	Unsure do to funding availability and current stage of project development
Agency Champion	1	Yes
Other Community Objectives	1	Capital improvement
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Newark-21 (NEW/LOI)**
Mitigation Action/Initiative: Newark community education and outreach project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Lack of widely dispersed knowledge and formal education of public on risks to disaster events. Through this mitigation action the City would seek to educate, promote emergency awareness and emergency preparedness
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Developing and implementing a comprehensive community education and outreach program will help inform Newark residents and businesses understand the risks, needs and capabilities of their unique communities prior to an emergency that will ultimately lead to a more efficient use of resources and a stronger more resilient City.
Action/Project Category	Education and Awareness (EAP)
Goals/Objectives Met	To educate and empower local residents and businesses on the importance of preparing, protecting, responding and mitigating the effects of man-made or natural disasters.
Applies to existing, future, or not applicable	Existing and future
Benefits (losses avoided)	Preservation of property, flood mitigation
Estimated Cost	$250,000
Priority*	High
Plan for Implementation	
Responsible Organization	City of Newark, Department of Economic and Housing Development, Newark Office of Emergency Management/Homeland Security and Preparedness
Local Planning Mechanism	
Potential Funding Sources	Grant funding
Timeline for Completion	Short-term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: *May 2014* Progress on Action/Project: *Not started or completed/awaiting receipt of grant funds*

Refer to prioritization table.

Action Number: **Newark-21 (NEW/LOI)**
Mitigation Action/Initiative: Newark community education and outreach project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	By providing preparedness information to residents they will become empowered to enhance their safety or take more precautionary actions during an event or emergency situation.
Property Protection	1	Yes, residents will have a greater understanding of how they can minimize damage to their homes or property during an event.
Cost-Effectiveness	1	Yes, can also be considered a force multiplier if properly implemented
Technical	1	Yes, can be available if needed.
Political	1	Strong political support to enhance neighborhood resiliency
Legal	1	Yes
Fiscal	1	Initiative will be funded almost entirely through grant funds
Environmental	1	
Social	1	No, project implementation will provide valuable educational preparedness information to residents.
Administrative	1	Yes
Multi-Hazard	1	Yes
Timeline	1	Yes, can be accomplished within timeframe
Agency Champion	1	Yes
Other Community Objectives	1	Economic Development, Capital Improvements, Education and Awareness, Social Empowerment
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Newark-22 (NEW/LOI)**

Mitigation Action/Initiative: Newark Cedar Grove Reservoir Improvements for Regional Sustainability & Resiliency

Assessing the Risk	
Hazard(s) addressed:	Loss of potable water supply for Newark , its customers and connected water systems
Specific problem being mitigated:	Abate the potential loss of this critical component of water supply in North Jersey
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. No **action/Elimination** on this important asset for the supply of water
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	The design and construction of covered holding tanks or if approved by NJDEP/USEPA, treatment facilities
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	The goal and objective of providing sustainability and resiliency to Newark's and the region's water supply from catastrophic water system failure
Applies to existing, future, or not applicable	Applies to existing water system
Benefits (losses avoided)	Completion of this project will abate the **possibility/occurrence** of loss of potable water for residential, commercial and industrial use and for fire protection
Estimated Cost	$75,000,000
Priority*	High
Plan for Implementation	
Responsible Organization	Dept. of Water & Sewer Utilities, City of Newark, NJ
Local Planning Mechanism	Construction
Potential Funding Sources	Grant Funding with Local Share through bonding and/or NJEIT
Timeline for Completion	Short term after receipt of Grant Funding and necessary permits
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: May 2014 Progress on Action/Project: Design and Construction not started or completed/awaiting receipt of Grant Funding/permits

Refer to prioritization table.

Action Number: **Newark-22 (NEW/LOI)**
Mitigation Action/Initiative: Newark Cedar Grove Reservoir improvements project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	The need for a continuous, uninterrupted supply of potable water for domestic, commercial and industrial use and fire protection
Property Protection	1	The need for a continuous, uninterrupted supply of potable water for fire protection
Cost-Effectiveness	1	Yes
Technical	1	Yes/Short Term to achieve goals
Political	1	Yes
Legal	1	Yes/ Necessary permits from NJDEP will be obtained
Fiscal	1	No/New funding source such as bonds and/or NJEIT would be required if approved by LFB.
Environmental	1	NJDEP permits will be obtained and NJDEP Regulations will be satisfied
Social	1	All segments of Newark's Population, those communities served by Newark and interconnected water systems will benefit from this action.
Administrative	1	Yes
Multi-Hazard	1	Yes; continuous, uninterrupted supply of potable water for domestic, commercial and industrial use and fire protection
Timeline	1	Yes
Agency Champion	1	Yes; this project identified in Water System Master Plan and the DHS Exit 14 Study but lacked funding source
Other Community Objectives	1	Yes; the possibility of a loss or interruption of water supply could affect development, commerce and safety
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Newark-23 (NEW/LOI)**
Mitigation Action/Initiative: Newark Meadowlands stormwater pump station project

Assessing the Risk	
Hazard(s) addressed:	Loss of Electric Power and consequential flooding
Specific problem being mitigated:	The installation of a Standby Electric Generator and SCADA Control of the Facility will abate the possibility flooding during power interruption/loss and/or inability to access the facility during flood conditions.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Reconstruction of entire pumping station to current standards/Excessive Cost
	2. Portable generator/time delay, limited availability during Sandy type incident, site accessibility not addressed
	3. No action/ would be continue to be subject to power interruption
Action/Project Intended for Implementation	
Description of Selected Action/Project	The Design and installation/construction of an onsite emergency generator with SCADA for remote controls and monitoring
Action/Project Category	Structure and Infrastructure Project (SIP)
Goals/Objectives Met	The goal and objective of abating the interruption or power and subsequent flooding will be achieved.
Applies to existing, future, or not applicable	Applies to existing storm water system
Benefits (losses avoided)	Completion of this project will abate the possibility of power loss, and the flooding of low lying areas, including Newark Airport, during heavy rain and high tide
Estimated Cost	$5,700,000
Priority*	High
Plan for Implementation	
Responsible Organization	Dept. of Water & Sewer Utilities, City of Newark, NJ
Local Planning Mechanism	Design and Construction
Potential Funding Sources	Grant Funding with Local Share through bonding and/or NJEIT
Timeline for Completion	Short term after receipt of Grant Funding
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: ***May 2014*** Progress on Action/Project: ***Not Started or completed/awaiting receipt of Grant Funding***

Refer to prioritization table.

Action Number: **Newark-23 (NEW/LOI)**
Mitigation Action/Initiative: Newark Meadowlands stormwater pump station project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	The need for uninterrupted power supply to abate flooding of low lying areas and Newark Airport during heavy rain and high tides
Property Protection	1	The need for a continuous, uninterrupted power supply to abate flooding of properties
Cost-Effectiveness	1	Yes
Technical	1	Yes/Short Term to achieve goals
Political	1	Yes
Legal	1	Yes/ Necessary permits from NJDEP will be obtained
Fiscal	1	No/New funding source such as bonds and/or NJEIT would be required if approved by LFB.
Environmental	1	NJDEP permits will be obtained and NJDEP Regulations will be satisfied
Social	1	All segments of Newark's Population in the low lying areas in the South and East Wards and Newark Airport will benefit from this action.
Administrative	1	Yes
Multi-Hazard	1	Yes; continuous, uninterrupted power supply to abate flooding and the related hazards
Timeline	1	Yes
Agency Champion	1	Yes; this project is contained in the Sewer System Master Plan but lacked funding source
Other Community Objectives	1	Yes; flooding during heavy rain events will affect the desirability to develop in affected areas
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Newark-24 (NEW/LOI)**
Mitigation Action/Initiative: Newark floodwall and levee system project

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	**SIP**
Goals/Objectives Met	
Applies to existing, future, or not applicable	**New**
Benefits (losses avoided)	
Estimated Cost	$30,000,000
Priority*	
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

9.16 Borough of North Caldwell

This section presents the jurisdictional annex for the Borough of North Caldwell.

9.16.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Frank Zichelli, Engineer/Engineering DPW 141 Gould Avenue, North Caldwell, NJ 07006 Phone: 973-228-6410 ext.107 E-mail: ncdpw@northcaldwell.org	John D'Ascensio, OEM Coordinator/Fire Chief 141 Gould Avenue, North Caldwell, NJ 07006 Phone: 973-477-0051 E-mail: erif@gmail.com

9.16.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Borough of North Caldwell was 6,183.

Location

According to the U.S. Census Bureau, the Borough has a total land area of 3.016 square miles, of which 3.011 square miles is land and 0.005 square miles is water.

Brief History

The land of North Caldwell was originally part of a tract of land known as Horseneck in 1701. The Borough of North Caldwell was incorporated in 1898. Well known for its beautiful homes, wooded roads, and healthy climate, the area is known as the "Denver of the East" (Borough of North Caldwell New Jersey, 2014).

Governing Body Format

North Caldwell operates using the Mayor and Council government set-up (Borough of North Caldwell New Jersey, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.16.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.16-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Valentine	Residential	5	Allen Road & Grandview Avenue	Flood Zone	5 single family homes/ Approved
Block 50, Lots 1&2	Residential	5 units	600 Mountain Avenue	None	5 single family homes/ Approved
Hilltop Drive	Residential	62 units	B: 101 L: 3	Wildfire: High 0.2% Flood	62 single family homes/Planning
Block 101, Lot 3.01	Residential	50	White Rock Road	ND	50 affordable rental apartments/ Planning

** Only location-specific hazard zones or vulnerabilities identified.*
Note: ND = Not determined because potential new development could not be located.

9.16.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.16-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
March 13, 2010	Snow Storm	N/A	N/A	Overtime in DPW and PD, depleted road salt.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	Overtime in DPW and PD. Exhausted road salt reserves and experienced vehicle breakdowns.
August 26 – September 5, 2011	Hurricane Irene	DR-4021	Yes	Experienced $19,000 in FEMA approved damages for overtime and debris removal.
October 29, 2011	Severe Storm	DR-4048	Yes	Experienced $241,304 in FEMA approved damages for overtime, debris removal, etc.
October 26 – November 8, 2012	Hurricane Sandy	DR-4086	Yes	Experienced $133,000 in FEMA approved damages for overtime, debris removal, clean up etc.

9.16.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Borough of North Caldwell. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Borough of North Caldwell.

Table 9.16-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $819,537 2,500-year MRP: $17,865,017	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	18	Medium
Flood	1% Annual Chance: $256,105	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $4,372,600	Occasional	12	Low
Severe Storm	100-Year MRP: $1,158,985 500-year MRP: $6,762,057 Annualized: $69,593	Frequent	48	High
Winter Storm	1% GBS: $9,077,630 5% GBS: $45,388,150	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $4,014,400	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. *Building damage ratio estimates based on FEMA 386-2 (August 2001)*
b. *The valuation of general building stock and loss estimates was based on custom inventory for the municipality.*
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20
c. *Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Borough of North Caldwell.

Table 9.16-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
North Caldwell, Borough of	31	13	$60,230.00	1	0	4	5	26

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The municipality does not have any critical facilities located in the 1% or 0.2% annual chance flood boundaries.

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), due to the steep terrain through which it passes; the floodplain of Green Brook is confined and causes no major flood problems in the Borough.

Additionally, the municipality has identified the following hazard problems and/or problem areas:

Flood

The Borough identified the drainage culverts at Grandview Avenue and Fairfield Road as problem areas for flooding. These culverts get clogged and cause flooding.

Most of the land adjacent to Green Brook is owned by the borough and the Green Brook Country Club. There has been limited development in the flood plain to date. There are five small dams along Green Brook that fall within the limits of detailed study, but none provide flood protection (FEMA FIS 2014).

Power Outage

Recent large storm events have caused significant power outages at Borough Hall and Community Center/DPW Building. This disrupts the continuity of government services. The two way radio communication system was also down as a result of power outages further complicating the continuity of government services.

Infrastructure Failure

Throughout the Borough of North Caldwell, there is a significant issue with Corrugated Metal Pipe Arch (CMPA). On Brookside Terrace, Old Farm Road, and Timber Drive the deteriorating CMPA will eventually cause road failure. This will create hazards not only for motorists but during evacuations as well.

9.16.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Borough of North Caldwell.

Table 9.16-5. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	State/Local	Building Dept.	Borough Code Chapt. 34, Page 3401, Adopted 12/28/76
Zoning Ordinance	Y	Local	Zoning Dept.	Borough Code Chapt. 107 Page 10701
Subdivision Ordinance	Y	Local	Planning Board	Borough Code Chapt. 107 Page 3401
NFIP Flood Damage Prevention Ordinance	Y	Local	Building Dept.	Borough Code Sect. 107-30 Page 10773, Adopted 6/26/07
Cumulative Substantial Damages				
Freeboard				
Growth Management	Y	Local	Planning Board	Borough Code and Redevelopment Plan Chapt. 107
Floodplain Management / Basin Plan				
Stormwater Management Plan/Ordinance	Y	Local	Engineering	Adopted 9/19/05
Comprehensive Plan / Master Plan/ General Plan	Y	Local	Planning Board	Re-examination scheduled for 2014; Adopted 2/7/05
Capital Improvements Plan	Y	Local	All Dept. Heads	Capital Budget revised annually; Adopted 7/30/13
Site Plan Review Requirements	Y	Local	Engineering	Chapt. 107
Open Space Plan				
Stream Corridor Management Plan				
Watershed Management or Protection Plan				
Economic Development Plan				
Comprehensive Emergency Management Plan	Y	Local	OEM	Office of Emergency Management
Emergency Response Plan				
Post Disaster Recovery Plan				
Post Disaster Recovery Ordinance				
Real Estate Disclosure Requirement				
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]				

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Borough of North Caldwell.

Table 9.16-6. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Engineering
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineering
Planners or engineers with an understanding of natural hazards	Y	Engineering
NFIP Floodplain Administrator	Y	Len Mendola, Building Inspector
Surveyor(s)	N	Outsourced as needed
Personnel skilled or trained in "GIS" applications	N	Outsourced as needed
Scientist familiar with natural hazards in the municipality.	N	Outsourced as needed
Emergency Manager	Y	OEM
Grant Writer(s)	Y	Engineering/Department Heads
Staff with expertise or training in benefit/cost analysis	N	
Professionals trained in conducting damage assessments	N	

Fiscal Capability

The table below summarizes financial resources available to the Borough of North Caldwell.

Table 9.16-7. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes – Borough generally does not meet grant qualifications
Capital Improvements Project Funding	Yes – Finance
Authority to Levy Taxes for specific purposes	Yes – Mayor and Council
User fees for water, sewer, gas or electric service	Yes – Mayor and Council/Water and Sewer
Impact Fees for homebuyers or developers of new development/homes	
Incur debt through general obligation bonds	Yes – Mayor and Council
Incur debt through special tax bonds	Yes – Mayor and Council
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	
Mitigation grant programs	
Other	

Community Classifications

The table below summarizes classifications for community program available to the Borough of North Caldwell.

Table 9.16-8. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	
Building Code Effectiveness Grading Schedule (BCEGS)	NP	
Public Protection	NP	
Storm Ready	NP	
Firewise	NP	

NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Len Mendola, Building Inspector

Flood Vulnerability Summary

The Borough does not maintain lists/inventories of properties that have been damaged by floods. During Sandy and other events, there was no structural damage to buildings in the municipality. The FPA has made substantial damage estimates for other events, but not for Sandy. There are currently no properties interested in mitigation.

Resources

The FPA is the sole person assuming the responsibilities of floodplain administration in the Borough. The NFIP administration services and functions that the FPA conducts include permit review and inspections. It is noted that the FPA is also the Borough building inspector. The Borough does not provide any education or outreach to the community regarding flood hazard/risk, and flood risk reductions. The FPA indicated that there are no barriers to running an effective floodplain management program. He also noted that any additional training/education is acceptable and that he would consider attending continuing education and/or certification training on floodplain management if offered.

Compliance History

The Borough is currently in good standing in the NFIP. It is unknown of the most recent compliance audit.

Regulatory

The Borough's floodplain management regulations/ordinances do not exceed the FEMA and State minimum requirements. There are no other local ordinances, plans or programs that support floodplain management and meet NFIP requirements.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program. The municipality has not considered joining CRS.

Other Capabilities Identified

None identified at this time.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

The Borough has a Master Plan which is the legal roadmap to planning for appropriate and safe land development. The Borough Zoning Code includes sections that control development in flood prone areas and excessive slope areas. The Borough Code also includes a Stormwater Controls section to regulate the impact of new construction on stormwater quality and flooding.

The Borough currently has a line item for mitigation project funding in their capital improvement budget and has integrated mitigation into their Continuity of Operations Plan. In the future, the Borough will consider adding a line item for mitigation project funding to their municipal operating budget.

The Borough has their ordinances and flood protection measures available on their website. Please visit the Borough of North Caldwell website at http://northcaldwell.org for further information (FEMA FIS 2014).

9.16.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.16-9. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Dam evacuation plan	No Progress	Borough is actively negotiating to purchase property that includes the dam. Once property is purchased, the Borough will develop a dam inundation plan. This initiative will be removed from the 2015 plan update.
2: Project with Fairfield to look at flooding	Completed	This initiative is considered complete as stormwater was rerouted through a new pipe system.
3: Purchase of additional snow removal equipment and construction of salt dome	Complete	Salt dome is complete. Due to administrative functions to purchase additional snow removal equipment, this initiative will be removed from the 2015 plan update.
4: Bridge and dam projects	Discontinued	This action is too general and should be abandoned in favor of specific projects. This initiative will not be included in the current mitigation strategy.
5: Mountain Ave. culvert	Discontinued	The Borough of North Caldwell has no jurisdiction over this facility; it is owned and operated by the County of Essex. This initiative will not be included in the current mitigation strategy.
6: Forest Ave. culvert	Discontinued	The Borough of North Caldwell has no jurisdiction over this facility; it is owned and operated by the County of Essex. This initiative will not be included in the current mitigation strategy.
7: Sanitary system	Continuous	Improvements and repair of the Borough sanitary sewer system remains ongoing. This initiative will be included in the current mitigation strategy.
8: Grandview Ave. drainage ditch	Completed	This initiative is complete. NJDEP provided funding.
9: Utility substation	Discontinued	This action is too general and should be abandoned in favor of specific projects. This initiative will not be included in the current mitigation strategy.
10: JCMUA aqueduct	Discontinued	The Borough of North Caldwell has no jurisdiction over this facility; consideration will be given to including an emergency response plan in the next update of the Borough's Emergency Management Plan. This initiative will not be included in the current mitigation strategy.

Table 9.16-9. Past Mitigation Initiative Status

11: Transco high pressure 36" diameter gas main with potential to leak/fire/explode	Discontinued	The Borough of North Caldwell has no jurisdiction over this facility; consideration will be given to including an emergency response plan in the next update of the Borough's Emergency Management Plan. This initiative will not be included in the current mitigation strategy.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The Borough has identified the following mitigation projects/activities that have also been completed but were not identified in the previous mitigation strategy in the 2008 Plan:

- Preliminary design of backup power supplies for Borough Hall, Community Center/DPW Building and two way radio system.
- A section of the Corrugate Metal Pipe Arch at Timber Drive has been replaced. This improvement will assist with flooding in the area and public safety issues.

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.16-10 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.16-11 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.16-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
North Caldwell-1 (NEW/LOI)	Connect electric system at Community Center/DPW Building on Gould Avenue to existing generator at Police Station.	Existing	All	1.2 6.1	Fire Dept	High	High $101,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
North Caldwell-2 (NEW/LOI)	Obtain backup power at critical facilities to ensure continuity of operations. Specifically identified at this time: 1. North Caldwell Borough Hall/EOC generator; 2. North Caldwell Stephanie Drive pump station generator 3. North Caldwell Birch Avenue sewer pump station generator	Existing	All	1.2 6.1	Borough Manager	High	Medium $60,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
North Caldwell-3 (NEW/AW)	Provide electric backup power to Borough two way radio communication system at Skyline Drive	Existing	All	1.2 6.1	Borough Manager	High	High	Bond ordinance and FEMA allocation	Short	High	SIP	ES
North Caldwell-4 (NEW/AW)	Culvert repair in the area of Timber Drive, Deer Trail Road and Brookside Terrace. Replace and repair sections of corrugated metal pipe	Existing	Flood Severe Storm	1.2 2.2	Borough of North Caldwell Engineering Dept	High	Medium	Capital improvement plan	Short	High	SIP	SP
North Caldwell-5 (NEW/AW)	Replace pumper truck Fire Department	Existing	All Hazards	1.2 6.2	Fire Department	High	High $498,000	Bond ordinance, grants	Short	High	SIP	ES
North Caldwell-6 (OLD 7)	Upgrade pumping stations and add alarm systems to current Borough wide sanitary system	Existing	Flood		Engineering Department		$100,000		1 year		SIP	
North Caldwell-7	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.											

Table 9.16-10. Proposed Hazard Mitigation Initiatives

(NEW)	Phase 1: Identify appropriate candidates, conduct outreach/public education. Phase 2: Work with the property owners to implement selected action based on available funding from FEMA and local match availability. Specifically identified are properties in the following areas: • Grandview Avenue • Green Brook Area											
	See above.	Existing	Flood, Coastal Erosion, Coastal Storm, Severe Weather, Wildfire, Winter Storm		Engineering via NFIP FPA) with NJOEM, FEMA support	High	High	FEMA Mitigation Grant Programs and local budget (or property owner) for cost share	Ongoing (outreach and specific project identification); Long term DOF (specific project application and implementation)	High	SIP	PP

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*
OEM	*Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Costs:
Where actual project costs have been reasonably estimated:

Low	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low	*Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium	*Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High	*Would require an increase in revenue via an alternative source (i.e., bonds,*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low	*Long-term benefits of the project are difficult to quantify in the short term.*
Medium	*Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High	*Project will have an immediate impact on the reduction of risk exposure to*

Costs:

grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.

Benefits:

life and property.

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.16-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
North Caldwell-1 (NEW/LOI)	Connect electric system at Community Center/DPW Building on Gould Avenue to existing generator at Police Station.	1	0	1	1	1	1	1	1	1	1	0	1	1	0	11	High
North Caldwell-2 (NEW/LOI)	Obtain backup power at critical facilities to ensure continuity of operations.	1	0	1	1	1	1	1	1	1	1	0	1	1	0	11	High
North Caldwell-3	Provide electric backup power to Borough two way radio communication system at Skyline Drive	1	0	1	1	1	1	1	1	1	1	0	1	1	0	11	High
North Caldwell-4 (NEW/AW)	Culvert repair in the area of Timber Drive, Deer Trail Road and Brookside Terrace. Replace and repair sections of corrugated metal pipe	1	1	1	1	1	1	1	1	1	1	1	1	1	0	13	High
North Caldwell-5 (NEW/AW)	Replace pumper truck	1	1	1	1	0	1	0	0	1	1	0	1	1	0	9	High
North Caldwell-6 (OLD 7)	Upgrade pumping stations and add alarm systems to current Borough wide sanitary system	0	1	1	1	0	0	0	1	0	0	1	0	0	0	5	Medium
North Caldwell-7	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or	1	1	1	1	1	1	0	0	1	1	1	0	0	0	9	High

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
	acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.																

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.16.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.16.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Borough of North Caldwell that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Borough of North Caldwell has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.16.9 Additional Comments

None at this time.

Figure 9.16-1. Borough of North Caldwell Hazard Area Extent and Location Map 1

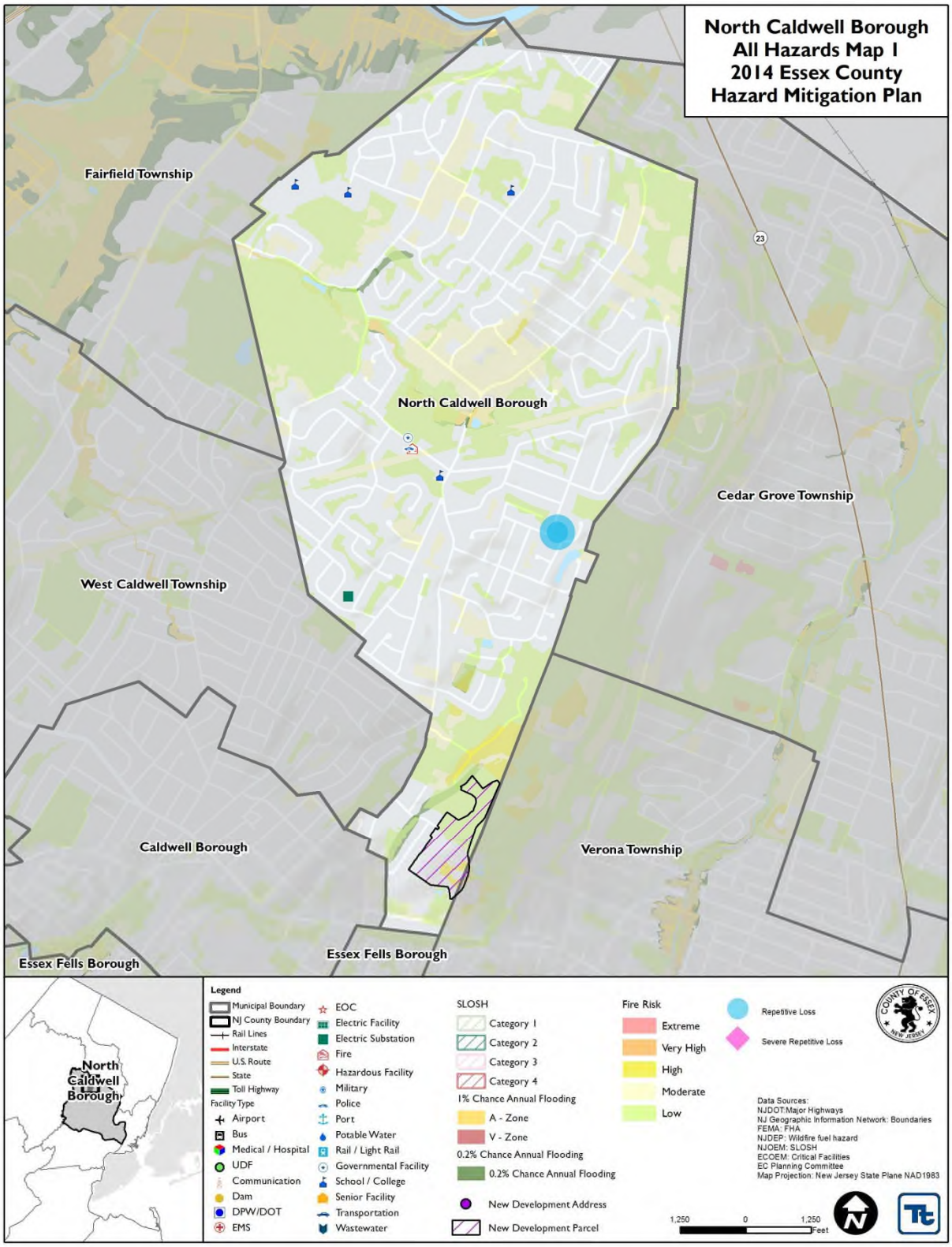
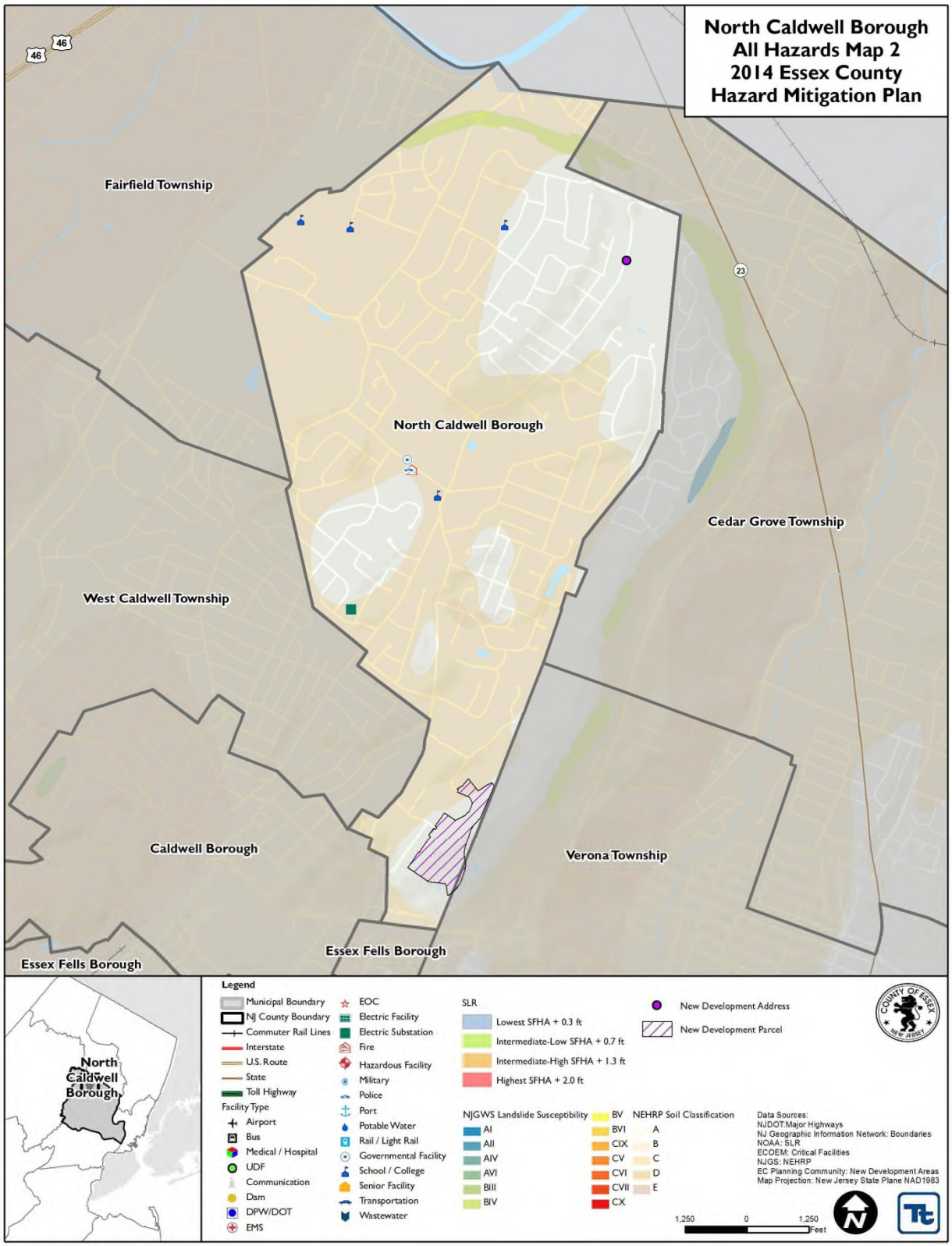


Figure 9.16-2. Borough of North Caldwell Hazard Area Extent and Location Map 2



Action Number: **North Caldwell-2 (NEW/LOI)**
Mitigation Action/Initiative: North Caldwell Stephanie Drive and Birch Avenue pump station generator

Assessing the Risk	
Hazard(s) addressed:	Power Loss
Specific problem being mitigated:	Loss of power to waste water pump station'
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	Provide portable emergency power source to pump stations.
	2. Do nothing. This is an unacceptable option.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Provide portable backup generator with quick connections.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$45,000
Priority*	
Plan for Implementation	
Responsible Organization	Borough of North Caldwell
Local Planning Mechanism	Capital Improvement
Potential Funding Sources	Bond Ordinance
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **North Caldwell-2 (NEW/LOI)**

Mitigation Action/Initiative: North Caldwell Stephanie Drive and Birch Avenue pump station generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	In House design
Political	1	
Legal	1	
Fiscal	1	Local Finance
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	11	
Priority (High/Med/Low)	Med	

Action Number: **North Caldwell-2 (NEW/LOI)**
Mitigation Action/Initiative: North Caldwell Birch Avenue sewer pump station generator

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$20,000
Priority*	
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **North Caldwell-1, 2 (NEW/AW)**
Mitigation Action/Initiative: Emergency back-up power

Assessing the Risk	
Hazard(s) addressed:	Power Loss
Specific problem being mitigated:	Loss of power to Borough Hall, Community Center/DPW Building and two way radio communications system.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	Provide emergency power source at each affected location.
	Do nothing. This is an unacceptable option.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Provide permanent backup generator at Borough Hall, connect electric system at Community Center/DPW Building to existing generator at the Public Safety Building and provide solar charged battery backup at two way radio system.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Will prevent power loss to Borough Hall, Community Center/DPW Building and two way radio system. This will assure the continuity of government and DPW functions, provide a warming station and continued communication among emergency responders.
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Borough of North Caldwell
Local Planning Mechanism	Capital Improvement Plan
Potential Funding Sources	Bond Ordinance and FEMA allocation.
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **North Caldwell-2 (NEW/AW)**
Mitigation Action/Initiative: Emergency back-up power

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	Preliminary design completed
Political	1	
Legal	1	Borough owns all involved properties
Fiscal	1	Local financing and FEMA allocation
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **North Caldwell-4 (NEW/AW)**
Mitigation Action/Initiative: Culvert repair

Assessing the Risk	
Hazard(s) addressed:	Roadway failure, flooding
Specific problem being mitigated:	Repair/replace deteriorated corrugated metal pipe arch (CMPA) in Deer Trail Road, Timber Drive and Brookside Terrace
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	Repair/replace the failing sections of CMPA
	Do nothing. This is an unacceptable option.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Repair or replace sections of existing deteriorated CMPA located in Deer Trail Road, Timber Drive and Brookside Terrace to prevent catastrophic failure.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Will prevent roadway collapse and potential flooding.
Estimated Cost	Medium
Priority*	
Plan for Implementation	
Responsible Organization	Borough of North Caldwell
Local Planning Mechanism	Capital Improvement Plan
Potential Funding Sources	Bond Ordinance
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **North Caldwell-4 (NEW/AW)**
Mitigation Action/Initiative: Culvert repair

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	All work to be performed in public right of ways.
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	Prevent roadway failure and flooding
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	13	
Priority (High/Med/Low)	High	

Action Number: **North Caldwell-5 (NEW/AW)**
Mitigation Action/Initiative: Replace pumper truck

Assessing the Risk	
Hazard(s) addressed:	Inability of the North Caldwell Volunteer Fire Department to effectively respond to fire and other emergencies.
Specific problem being mitigated:	Replace older unit with maintenance and safety issues.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	Purchase new pumper truck.
	Repair existing unit. This option is temporary solution at best.
	Do nothing. This is an unacceptable option.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase a new pumper truck.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Will assure the North Caldwell Volunteer Fire Department maintains the current level of equipment.
Estimated Cost	$498,000
Priority*	High
Plan for Implementation	
Responsible Organization	Borough of North Caldwell
Local Planning Mechanism	Borough of North Caldwell Volunteer Fire Department
Potential Funding Sources	Bond Ordinance, grants
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **North Caldwell-5 (NEW/AW)**
Mitigation Action/Initiative: Replace pumper truck

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	1	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	

Action Number: **North Caldwell-6 (OLD 7)**

Mitigation Action/Initiative: Upgrade pumping stations and add alarm systems to current Borough wide sanitary system

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$100,000
Priority*	
Plan for Implementation	
Responsible Organization	Engineering Department
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **North Caldwell-6 (OLD 7)**

Mitigation Action/Initiative: Upgrade pumping stations and add alarm systems to current Borough wide sanitary system

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety		
Property Protection		
Cost-Effectiveness		
Technical		
Political		
Legal		
Fiscal		
Environmental		
Social		
Administrative		
Multi-Hazard		
Timeline		
Agency Champion		
Other Community Objectives		
Total		
Priority (High/Med/Low)		

9.17 Township of Nutley

This section presents the jurisdictional annex for the Township of Nutley.

9.17.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Salvatore Ferraro, Engineering/Department of Public Works Engineering Cordinator 1 Kennedy Drive, Nutley, NJ 07110 Phone: 973-284-4958 Fax: 973-284-4905 sferraro@nutleynj.org	Thomas Nicolette, Nutley Fire Dept./OEM Coordinator 1 Kennedy Drive, Nutley, New Jersey 07110 Phone: 973-727-2925 tnicolette@nutleynj.org

9.17.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of Nutley was 28,370.

Location

According to the U.S. Census Bureau, the Township has a total land area of 3.428 square miles, of which 3.384 square miles is land and 0.044 square miles is water.

Brief History

Nutley changed its name from Franklin in 1902 when the increase in population required a change in government operations from Township to Mayor/Council. The name comes from the Satterthwaite family estate established in 1844 (Township of Nutley, 2014).

Governing Body Format

Nutley Township operates under the Commission form of government.

Growth/Development Trends

The following table summarizes major areas for potential residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the Figure 9.17-2 and Figure 9.17-3 which illustrates the hazard areas along with the location of potential new development.

Table 9.17-1. Potential Growth and Development

Property or Development Name	Type (e.g. Res., Comm.)	# of Units / Structures	Location (address and/or Parcel ID)	Known Hazard Zone(s)	Description/Status
E. Centre St	Residential	3 structures	B: 9604 L: 13	None	Project completed
E. Centre St	Residential	4 structures	B: 9700 L: 1	SLOSH: Category 4	Project initiated
Hillside Avenue	Mixed-Use	Unknown	B: 2000 L: 27	1% Flood: A Zone	Project not yet determined
River Road	Residential	2 structures	B: 9701 L: 7	SLOSH: Category 3,4 1% Flood: A Zone 0.2% Flood SFHA +0.3 ft., +0.7 ft., +1.3 ft. NEHRP: E	Project completed
Roche	Mixed-Use	Unknown	B: 102 L: 2	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2101 L: 1	1% Flood: A Zone	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2000 L: 4	1% Flood: A Zone	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2000 L: 5	1% Flood: A Zone	Project not yet determined
Roche	Mixed-Use	Unknown	B: 200 L: 2	1% Flood: A Zone	Project not yet determined
Roche	Mixed-Use	Unknown	B: 200 L: 24	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 102 L: 9	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 201 L: 1	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 200 L: 3	1% Flood: A Zone	Project not yet determined
Roche	Mixed-Use	Unknown	B: 300 L: 1	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 200 L: 6	1% Flood: A Zone	Project not yet determined
Roche	Mixed-Use	Unknown	B: 200 L: 5	1% Flood: A Zone	Project not yet determined
Roche	Mixed-Use	Unknown	B: 200 L: 4	1% Flood: A Zone	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2304 L: 18 Q: C0001	Flood	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2304 L: 18 Q: C0002	Flood	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2304 L: 18 Q: C0003	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2100 L: 9 Q: C0101	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2100 L: 9 Q: C0102	None	Project not yet determined

Table 9.17-1. Potential Growth and Development

Property or Development Name	Type (e.g. Res., Comm.)	# of Units / Structures	Location (address and/or Parcel ID)	Known Hazard Zone(s)	Description/Status
Roche	Mixed-Use	Unknown	B: 2100 L: 9 Q: C0103	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2100 L: 9 Q: C0104	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2100 L: 9 Q: C0105	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2100 L: 9 Q: C0106	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2100 L: 9 Q: C0107	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2100 L: 9 Q: C0110	None	Project not yet determined
Roche	Mixed-Use	Unknown	B: 2100 L: 9 Q: C0111	None	Project not yet determined

** Only location-specific hazard zones or vulnerabilities identified.*
Please note these locations/areas are indicated because they may potentially be developed in the future but new development has not been approved at this time and may not be approved in the future..

9.17.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.17-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
March 12 – April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	In the Township, there were evacuations and flooding throughout. There were roadway closings and detours around low-lying floodprone areas. Several homes, businesses and Township facilities near flood areas were damaged and closed. Severe flooding occurred within the township park system. Damages in the Township included roadway damages (uplifting of asphalt layer, debris accumulation, soil erosion). Damages to the Township's park system included debris accumulation, soil erosion, damage to pathways and orphan bridges. The Township's police and fire facilities and the municipal building all flooded. Overall, the Township had approximately $80,000 in damages for emergency protective services, costs of cleanup, debris removal, emergency repair to facilities, etc.
October 1, 2010	Strong Wind	N/A	N/A	Strong winds caused downed trees and limbs in the Township. Downed trees, limbs, and power lines closed roadways and forced detours. Downed trees caused utility outages in specific areas within the Township along with extensive tree and debris removal. There was damage to public roadways and sidewalks. Damage to public facilities included soil erosion, fences, ball fields, playground equipment from downed trees/limbs. The Township incurred approximately $50,000 in damage for emergency protective services, costs of cleanup, debris removal, emergency repair to facilities, etc.
October 16, 2010	Strong Wind	N/A	N/A	Strong winds caused downed trees and limbs; roadway closings and detours around the area as a result of downed trees/limbs and power lines. Downed trees caused utility outages in specific areas within the Township along with extensive tree and debris removal. Roadways, sidewalks, private structures, and public facilities all experienced damages from this event. The Township incurred damages for emergency protective services, costs of cleanup, debris removal, emergency repair to facilities, etc.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	Strong winds and heavy snow caused downed trees, limb and power outages. Roadway closing and detours resulted from heavy snowfall. Strong winds caused damage within the Township requiring tree and debris removal. The Township incurred numerous power outages due to downed utility lines. The Township incurred approximately $111,000 in damage for emergency protective services, costs of cleanup, debris removal, etc.

Table 9.17-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
June 17, 2011	Lightning	N/A	N/A	Strong winds caused downed trees and limbs. Roadways were closed and detoured. There were also utility outages in different parts of the Township. There was minor damage to public roadways and sidewalks. The Township incurred damages for emergency protective services, costs of cleanup and debris removal, etc.
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Hurricane Irene caused flooding and evacuations in the Township. Numerous roads were closed and detoured that were located in low lying floodprone areas. Several homes, businesses and Township facilities near flood areas damaged and closed. Heavy winds caused downed trees, limbs and power outages. There was severe flooding within the Township park system. Roadway damages included uplifting of asphalt layer, debris accumulation, and soil erosion. The Park System had damages that included debris accumulation, soil erosion, damage to pathways and orphan bridges. The Township's police and fire facilities and the municipal building all flooded. Minor home damage resulting from electrical damage from downed trees, limbs and severe winds. Township incurred approximately $310,000 in damage for emergency protective services, costs of cleanup, debris removal, emergency repair to facilities, etc.
October 29, 2011	Severe Storm	DR-4048	Yes	Heavy snow fall across areas caused damage to trees and limbs which resulted in power and communication outages. Many parts of the Township were without power for several days. Residents self-evacuated during power outages. The Township incurred approximately $381,000 in damage for emergency protective services, costs of cleanup, debris removal, emergency repair to facilities, etc.
October 26 – November 8, 2012	Superstorm Sandy	EM-3354 DR-4086	Yes Yes	Superstorm Sandy brought heavy winds to the Township which caused power and communication outages along with damages from downed trees. There were roadway closings and detours. Many parts of the Township were without power for an extensive period of time. Residents evacuated their property as a result of no power. Strong winds caused damage within the Township requiring tree and debris removal. Township facilities were closed for a period of several days and affected continuity of government duties and functions. Damages to public roadways and sidewalks resulting from downed trees/limbs. Damages to public facilities, i.e. soil erosion, fences, ball fields, playground equipment from downed trees/limbs. Extensive damage to electrical utility system from heavy winds and downed trees/limbs. Township incurred approximately $750,000 in damage for emergency protective services, costs of cleanup, debris removal, emergency repair to facilities, etc.

9.17.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of Nutley. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Township of Nutley.

Table 9.17-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a, c]		Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA:	$0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: Category 2 SLOSH: Category 3 SLOSH: Category 4 SLOSH:	$0 $38,358,400 $89,749,333 $120,574,633	Occasional	16	High
Drought	Damage estimate not available		Occasional	18	Medium
Earthquake	500-year MRP: 2,500-year MRP:	$2,240,045 $50,907,888	Occasional	12	Low
Extreme Temperature	Damage estimate not available		Frequent	27	Medium
Flood	1% Annual Chance:	$20,594,918	Frequent	18	High
Geological Hazards	Exposed to Class B and Class C:	$5,155,800	Occasional	12	Low
Severe Storm	100-Year MRP: 500-year MRP: Annualized:	$3,282,860 $16,236,761 $258,587	Frequent	48	High
Winter Storm	1% GBS: 5% GBS:	$21,406,300 $107,031,499	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High:	$0	Frequent	18	Medium
Civil Disorder	Damage estimate not available		Occasional	24	Low
Cyber Attack	Damage estimate not available		Occasional	10	Low
Disease Outbreak	Damage estimate not available		Frequent	15	Medium
Hazardous Substances	Damage estimate not available		Frequent	15	Medium
Power Outages	Damage estimate not available		Frequent	36	Low
Terrorism	Damage estimate not available		Occasional	24	Low
Transportation Failure	Damage estimate not available		Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. *Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract.*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of Nutley.

Table 9.17-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Nutley, Township of	209	192	$1,646,681.00	14	2	134	143	66

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.17-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

Municipality	1%	0.2%			
	Government	EMS	Government	Health Care	Safety
Township of Nutley	1	1	1	1	1

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), flooding along the streams within the Township of Nutley is mainly attributable to runoff water from storm drains and culverts. Flooding that occurs from the culvert between Elm Street and Hillside Avenue on St. Pauls Branch and Third River area at Passaic Avenue/Rutgers Avenue is of particular concern to the Township. The narrow, rocky channel and flat

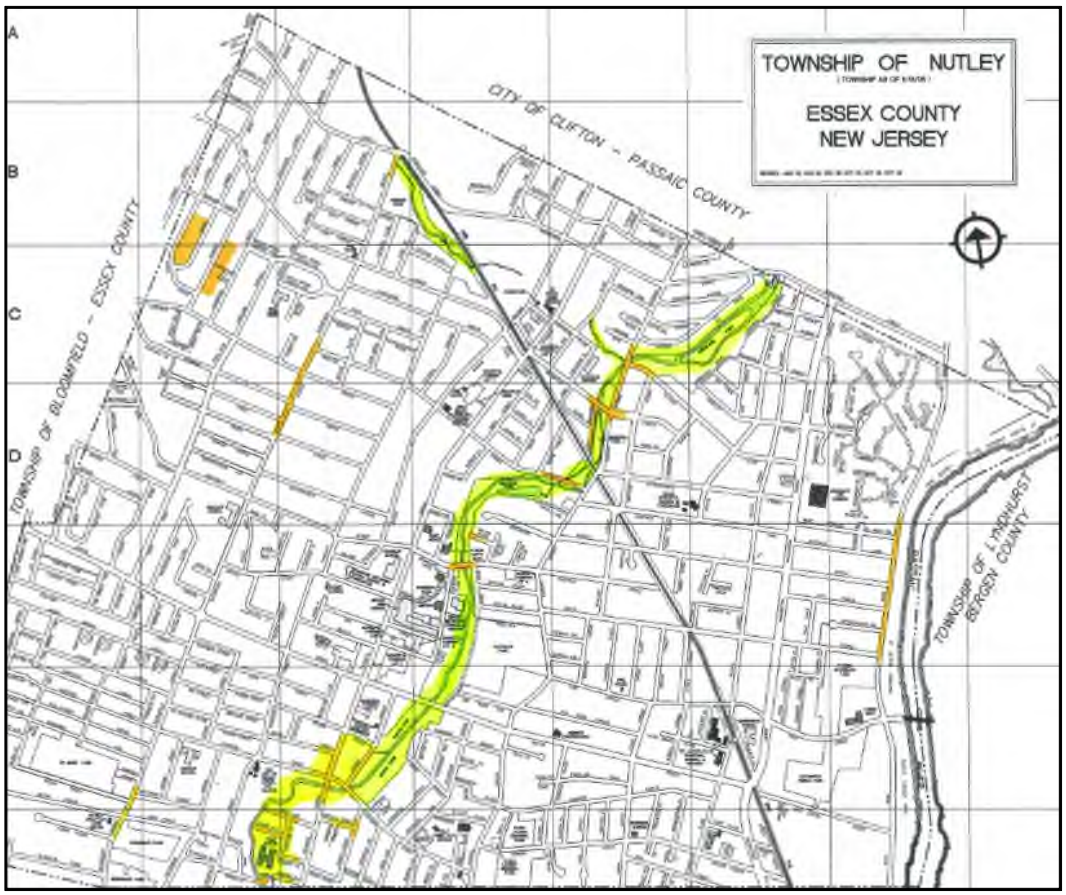
overbanks with heavy vegetation also contribute to the flooding problem. Even though some storms may last only a short period of time, heavy rainfall affects most of the adjacent land area along the streams within the community. Certain areas of River Road, which are parallel to the Passaic River, are subject to flooding during a rainstorm of high intensity (FEMA FIS 2014).

There are several other areas within the Township of Nutley that, although not adjacent to a body of water, experience flooding during heavy rain events due to runoff water and the lack of storm water drainage system capacity. Problems also occur due to flooding conditions in the Third River and St. Paul's Branch, causing backwater in the storm drainage system.

Additionally, the Township identified the following vulnerabilities in the municipality. See Figure 9.17-1 provided by the municipality for known flood areas in the Township.

- The dam on St. Paul's Branch in the Township of Nutley, located approximately 600 ft. upstream from the Erie-Lackawanna Railroad provides little flood protection (FEMA FIS 2014).
- Flooding to Government Structures/Facilitates – Police and Fire Departments and Municipal Building (Public Works, Revenue and Finance, Information Technology are located within close proximately to Third River which floods during heavy rain storms.
- Flooding of roadways
- Flooding of Township parks/playgrounds and recreational facilities
- Lack of backup generator systems to government buildings, warming centers, shelters, etc.

Figure 9.17-1. Known Flood Areas in the Township



9.17.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of Nutley.

Table 9.17-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	Local	Building Department State of NJ	Township Code Chapter 272, December 1971 N.J.S.A 52:27D-119 adopted Jan. 1, 1977
Zoning Ordinance	Y	Local	Building Department	Township Code Chapter 700, 1978
Subdivision Ordinance	Y	Local	Building Department Planning Board	Township Code Chapter 630, November 1988
NFIP Flood Damage Prevention Ordinance	Y	Local	DPW & Building Department	Township Code Chapter 349; adopted May 2007
Cumulative Substantial Damages	Y	Local	DPW & Building Department	Township in progress of updating/modifying to meet current flood map updates
Freeboard	Y	Local	DPW & Building Department	Township in progress of updating/modifying to meet current flood map updates
Growth Management				
Floodplain Management / Basin Plan	Y	Local	DPW	Township in progress of updating/modifying to meet current flood map updates
Stormwater Management Plan/Ordinance	Y	Local	DPW	Township Code Chapter 622 – adopted July 2007
Comprehensive Plan / Master Plan/ General Plan	Y	Local	Planning Board Board of Commissioners	2012
Capital Improvements Plan	Y	Local	Board of Commissioners	

Table 9.17-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Site Plan Review Requirements	Y	Local	Building Department Board of Adjustment	Township Code Chapter 600, October 2002
Open Space Plan				
Stream Corridor Management Plan	Y	Local	DPW	
Watershed Management or Protection Plan	Y	Local	DPW	
Economic Development Plan				
Comprehensive Emergency Management Plan	Y	Local	Nutley OEM	2012
Emergency Response Plan	Y	Local	Nutley OEM	2012
Post Disaster Recovery Plan	Y	Local	Nutley OEM	2012
Post Disaster Recovery Ordinance	Y	Local	Nutley OEM	Under development
Real Estate Disclosure Requirement				
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]				

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of Nutley.

Table 9.17-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	DPW-Engineering, Consultants
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	DPW-Engineering, Consultants
Planners or engineers with an understanding of natural hazards	Y	DPW-Engineering, Consultants
NFIP Floodplain Administrator	Y	DPW-In-house
Surveyor(s)	Y	DPW-Engineering, Consultants
Personnel skilled or trained in “GIS” applications	Y	DPW-Engineering, Consultants
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Public Safety, In-house
Grant Writer(s)	Y	Revenue and Finance, Consultants
Staff with expertise or training in benefit/cost analysis	Y	DPW-Engineering, In-house
Professionals trained in conducting damage assessments	Y	DPW/Engineering and Building Department

Fiscal Capability

The table below summarizes financial resources available to the Township of Nutley.

Table 9.17-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for specific purposes	Yes
User fees for water, sewer, gas or electric service	Yes
Impact Fees for homebuyers or developers of new development/homes	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activity bonds	Yes
Withhold public expenditures in hazard-prone areas	
Mitigation grant programs	Yes
Other	

Community Classifications

The table below summarizes classifications for community program available to the Township of Nutley.

Table 9.17-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	N/A
Building Code Effectiveness Grading Schedule (BCEGS)	-	
Public Protection	-	
Storm Ready	NP	N/A
Firewise	NP	N/A

N/A = Not applicable. NP = Not participating. - = Unavailable.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual

- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

The Township of Nutley, Engineering/Department of Public Works has an in-house duly registered and certified flood plain manager as per the Association of State Floodplain Managers and New Jersey Association of Flood Plain Managers .

Flood Vulnerability Summary

The Township of Nutley does not maintain a list/inventory of properties that have been flood damaged. Most of the flood areas within Township of Nutley are located within the Park System/Open space away from structures/properties. However, the Township is aware of flood-prone areas which might impact properties.

Damage within Nutley during Superstorm Sandy and other recent disasters resulted from strong winds, electrical outages and downed trees making structures unsafe for dwelling. The total amount of Unsafe Structure Notices sent out following Sandy was nine and 17 during Irene. The Township of Nutley did not make any substantial Damage estimates following Sandy.

There are not currently any properties seeking out mitigation projects. A mitigation project was completed (demolition) through RFP and FMA grant from FEMA. This project was completed in 2013 and consisted of the acquisition and demolition of three properties on Donna Court in Nutley. The Township received two grants through FEMA – RFP and FMA. The project area was converted to open space following demolition of properties.

Resources

The Department of Public Works along with the Code Enforcement Department work jointly on floodplain management within Nutley Township. Their responsibilities include reviewing site plans for floodplain compliance, maintaining GIS, seeking flood mitigation grants/projects, reviewing and updating local flood maintenance ordinances, and attend FEMA/NJ/Essex County meetings to review and discuss flood/emergency events. Though Nutley Township is not currently a member of the Community Rating System (CRS) program, discussions have begun to consider joining.

Township personnel within the Department of Public Works and Code Enforcement feel they are adequately supported and trained to fulfill their responsibilities. There are no barriers to running an effective floodplain management program in Nutley Township. Additional training and seminars on floodplain management would be encouraged and welcomed.

Compliance History

Nutley Township is currently in good standing in the NFIP. The current floodplain management is unsure of when the most recent Community Assistance Visit (CAV) took place. There is no current need to have a CAV conducted.

Regulatory

Nutley Township floodplain management regulations meet minimum FEMA and New Jersey requirements. Current ordinances are being reviewed and updated based on recent storm events and legislative recommendations. The Site Plan Review process further supports the implementation of floodplain management by reviewing for floodplain issues.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

None at this time.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

Master Plan: The Township's Master Plan (December 2012) considers hazard areas as part of the Land Use Element. The Conservation Plan and Green Plan Master Plan Elements acknowledge the impacts of global climate changes, a significant increase in cost of energy and the potentially environmentally destructive nature of our carbon footprint.

The Passaic and Third Rivers and their tributaries are important natural features of Nutley's landscape and provide needed drainage for the community, as well as scenic views and habitat areas. The Master Plan recognizes the need to manage the Passaic River on a regional basis. Specific areas are identified as having local flooding problems and therefore development is limited in these areas: Passaic Avenue/Rutgers Place; Kingsland Street/Bloomfield Avenue; Bloomfield Avenue/Mountainview Avenue; and Franklin Avenue/ Harrison Street.

The Township has identified a new mitigation action, Nutley-14 in Table 9.17-12 below to mitigate flooding on Passaic Avenue and Rutgers Place; an area identified in their Master Plan as subject to flooding.

Proper stormwater management contributes to improved water quality and the preservation of floodplains maintains the natural paths for stormwater to flow. In 2005, the Township adopted a Stormwater Management Element of the Master Plan. It was updated in 2008. The Plan provides a strategy for Nutley to plan for and manage increased runoff associated with development and changes in land use.

The Township has identified a new mitigation action (Nutley-9) to review and update Township ordinances pertaining to stormwater and floodplain management.

Building and Zoning Ordinances: Prior to land use, zoning changes or development permitting, the Township reviews the hazard mitigation plan to ensure consistent and compatible land use. The permit review process includes addressing hazards and the Township recommends the incorporation of hazard-resistant construction standards into the design and location of projects. Further, the Township's rezoning procedures recognize hazard areas as limits on zoning changes.

FEMA NFIP: The Township is currently in the process of updating/modifying the following ordinances to meet current FEMA flood map updates: Cumulative Substantial Damage; Freeboard; and Floodplain Management Plan. The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Nutley's website at http://www.nutleynj.org for further information (FEMA FIS 2014).

In the next five years, the Township will consider enforcing codes and standards beyond the minimum FEMA and State requirements to reduce risk further. Further, the Township is interested in joining the Community Rating System and attending workshops regarding this topic (see new mitigation action Nutley-16 in Table 9.17-12 below).

Budgets: The Township has funded mitigation projects through their operating and capital improvement budgets in the past. The Township will look at the hazard mitigation actions documented in this HMP update when allocating funding in the future.

Day-to-Day Operations: The Township will consider having a community resilience committee or advisor in the future.

Training: The Township offers training on the following: best practices for mitigation; grant applications; hazard identification and conducts outreach on hazards of concern. The Township works closely with the local school district.

9.17.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.17-10. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Third River study	25% Completed, Continuous	Township engineer consultant performed hydrological and hydraulic study of Third River with regard to key historical flood areas to determine impacts to flood prone structures. As a result of study Township applied and received FEMA/NJOEM Mitigation grant (RFP and FMA) to acquire and demolish three properties along the Third River. Project completed in 2013. Based on study, Township is pursuing additional FEMA/NJOEM Mitigation grant opportunities in identified areas. Township received grant through FEMA to have Army Corp. of Engineers perform study of Third River. Essex County is the lead agency for this project; therefore, this initiative will be not carried over by Nutley. Please refer

Table 9.17-10. Past Mitigation Initiative Status

Description	Status	Review Comments
		to Essex County Annex (Section 9.1).
2: Bridges over river need to be elevated and several need of repair	75% Completed, Continuous	Township continues to work on repairing and raising its orphan bridges over the Third River within Township Park system that are under its jurisdiction. All other bridges located on roadway ROW fall within jurisdiction of Essex County which is the lead agency. Please refer to Essex County Annex (Section 9.1).
3: Better drainage on Bloomfield Ave.	No Progress	Still under evaluation. Studies have shown additional storm piping and inlets required in certain areas during higher frequency storm events. However, given age of infrastructure along with costs it has been difficult to implement. This initiative will be carried over to the current mitigation strategy.
4: Train bridges need to be repaired	Continuous	Bridges are the responsibility of the train carrier. Township of Nutley continues to notify train company regarding maintenance responsibilities. Essex County is the lead agency for this project; therefore, this initiative will not be not carried over by Nutley. Please refer to Essex County Annex. (Section 9.1)
5: Installation of solid manhole covers to prevent water infiltration into sanitary system	80% Completed, Continuous	Township has installed manhole insert in key flood prone areas to prevent/reduce infiltration of surface water into sanitary sewer system. This initiative will be carried over to the current mitigation strategy.
6: Dredging of Third River	Continuous	Township performed dredging of river in key areas. However, new NJDEP FHA regulations and costs have hindered further dredging. Township received grant through FEMA to have Army Corp. of Engineers perform study of Third River. No grant money was provided to Township but rather to State/Army Corp. of Engineers. Although grant has been approved funding has not been approved in State budget. Essex County is the lead agency for this project; therefore, this initiative will be not carried over by Nutley. Please refer to Essex County Annex. (Section 9.1)
7: Maintenance of storm sewer system	Continuous	Township continuous to perform maintenance and repair of storm sewer system pursuant to its MS4 Permit. Repair items include, retrofitting heads and installation of bicycle safe grates, cleaning of storm debris, rebuilding storm walls and piping, etc. This initiative will be carried over to the current mitigation strategy.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The municipality identified the following mitigations that have been completed; however, these initiatives were not identified in the previous mitigation strategy:

- A mitigation project was completed in fall of 2013 (demolition) through RFP and FMA grant from FEMA. This project consisted of the acquisition and demolition of three properties on Donna Court in Nutley. These properties were located in the flood zone and experienced significant damage during heavy rain/flood events. The Township received two grants through FEMA – RFP and FMA. The project area was converted to open space following demolition of properties.
- Township of Nutley looking at future Hazard Mitigation grants to assist with:
    - Home Elevations
    - River Bank Stabilizations
    - Dredging
    - INI Studies
- Township of Nutley has raised/updated orphan bridges under its authority that span over Third River
- Township of Nutley has installed gabion walls along certain portion of Third River as part of bank stabilization.
- Township has installed man-hole inserts within flood prone areas to prevent flood water from inundating sanitary sewer system.

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township of Nutley participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.17-11 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.17-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.17-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Nutley-1 (NEW/LOI)	Install generators at all essential government facilities to ensure that necessary services and facility operations are operational during emergency events. The following locations have been identified at this time: 1. Energy allocation-generator, 4 sites; 2. Nutley Park Avenue shelter generator 3. Nutley Fire House generator 4. Nutley Rescue Squad generator	Existing	All	1.2 6.1	Office of Emergency Management	High	High 1. $556,240 2. $150,000 3. $150,000 4. $130,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Nutley-2 (NEW/LOI)	Nutley Township EOC/Fresh Water well pump generator	Existing	All	1.2 2.1	Office of Emergency Management	High	High $200,000	FEMA Hazard Mitigation Grant Program, Township budget	Short Term DOF	High	SIP	ES
Nutley-3 (NEW/LOI)	Nutley minor flood control project. Install gabion walls along Third River near Passaic Avenue bridge with Rutgers Place	Existing	Flood	1.2 2.2	Township	High	High $1,247,484	HMGP, FMA, PDM	Long Term DOF	High	SIP, NSP	SP
Nutley-4	Cleaning and repairing of culverts within the Township carrying stormwater from various locations to discharge points	Existing	Flood	1.2 2.2	Engineering Department, Essex County Engineering	High	Medium	County, State, Grant funding through FEMA	OG	High	SIP	SP
Nutley-5	Perform infiltration and inflow study of sanitary system to identify dedicated and non-dedicated material entering system	N/A	Flood	1.2	Township DPW	High	Medium	NJDEP, Federal grant opportunities and local capital budgets	OG	High	SIP	PR

Table 9.17-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Nutley-6	Install gabion walls at specific flood-prone locations along Third River in the Township	Existing	Flood	1.2 2.1	Township	High	High	State, NJDEP, FEMA grant opportunities	OG	High	SIP	SP
Nutley-7	Implement flood proofing measures to the Township's sanitary sewer pump station	N/A	Flood Severe Storm	1.2 2.2 6.1	Township DPW	High	High	State FEMA, NJDEP grant opportunities	OG	Medium	SIP	SP
Nutley-8	Dredging of Third River within the Township	N/A	Flood Severe Storm	1.2 2.2 6.1	State, Township and County	High	High	State, FEMA, NJDEP grant opportunities	OG	High	SIP, NSP	NR
Nutley-9	Review Township ordinances pertaining to stormwater and floodplain management	New and Existing	Flood	1.2 1.3 4.1 4.2	Township DPW Code Enforcement	High	Low	Local Budgets	OG	High	LPR	PR
Nutley-10	Perform study of Passaic River flooding onto River Road in Nutley Township	N/A	Flood	1.3	Federal, State, NJDEP, County, Township	Medium	Medium	Federal, State, County, NJDEP	OG	High	SIP, NSP	PR
Nutley-11 (OLD 3)	Improve drainage on Bloomfield Ave.	Existing	Flood	1.2	Township DPW	Medium	High	State FEMA, NJDEP grant opportunities	2-5 years	Low	SIP	PP
Nutley-12 (OLD 5)	Installation of solid manhole covers and inserts to prevent water infiltration into sanitary system	New and Existing	Flood	1.2	Township DPW	Medium	Low	Local Budgets	5-8 years	Medium	SIP	PP
Nutley-13 (OLD 7)	Maintenance of storm sewer system	Existing	Flood	2.1	Township DPW			Township	Ongoing	High	SIP	NR
Nutley-14 (NEW)	Assess and prioritize flood hazard mitigation alternatives for at risk properties within the floodplain, including those that have been identified as repetitive loss, such as acquisition/relocation, or elevation depending on feasibility. The parameters for feasibility	Existing	Flood, Coastal Erosion, Hurricane, Nor'easter, Severe Storm, Wildfire, Winter Storm	1.2 2.1 2.2	Township Engineering via NFIP FPA) with NJOEM, FEMA support	High	High	FEMA Mitigation Grant Programs and local budget (or property owner) for cost share	Ongoing (outreach and specific project identification); Long term DOF (specific project application and implementation)	MEDIUM	SIP	PP

Table 9.17-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	for this initiative would be: funding, benefits versus costs and willing participation of property owners. Implement as funding becomes available. Specifically identified are properties in the following areas: • Passaic Avenue and Rutgers Place											
Nutley-15 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. This program will include: • Providing general natural hazard risk, preparedness and mitigation, and related NFIP information in regular newsletter and mailings	N/A	All Hazards	3.1 4.1	Township	Medium	Low	Municipal Budget; HMA programs with local or county match	Short	High	EAP	PI
Nutley-16 (NEW)	Support participation in the NFIP CRS program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be	N/A	Flood	1.3 4.1 5.2 5.4	Township NFIP FPA, as fully supported by local government officials	Medium - High	Low	Municipal Budget	Short (year 1)	High	LPR, EAP	PR

Table 9.17-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	dedicated.											
Nutley-17 (NEW)	Enhance/expand tree maintenance program and coordination with utilities (e.g., PSEG).	Existing	Severe Storm; Severe Winter Storm	1.2 2.1 2.3	Township - Parks Dept. working with contractors and local utilities	Medium – High (reduced risk of utility outages; life safety)	Medium	Local Budget	Short	Medium	NSP	PP

Notes:
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Costs:
Where actual project costs have been reasonably estimated:

Low	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low	*Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium	*Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High	*Would require an increase in revenue via an alternative source (i.e., bonds,*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low	*Long-term benefits of the project are difficult to quantify in the short term.*
Medium	*Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High	*Project will have an immediate impact on the reduction of risk exposure to*

Costs:

grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.

Benefits:

life and property.

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.17-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Nutley-1 (NEW/LOI)	Install generators at all essential government facilities to ensure that necessary services and facility operations are operational during emergency events.	1	1	1	1	1	1	1	0	1	1	1	1	1	1	13	High
Nutley-2 (NEW/LOI)	Nutley Township EOC/Fresh Water well pump generator	1	1	1	1	1	1	1	0	1	1	1	1	1	1	13	High
Nutley-3 (NEW/LOI)	Nutley minor flood control project: Install gabion walls along Third River near Passaic Avenue bridge with Rutgers Place	1	1	1	1	1	1	1	0	1	1	1	1	1	1	13	High
Nutley-4	Cleaning and repairing of culverts within the Township carrying stormwater from various locations to discharge points	1	1	1	1	1	0	0	1	1	0	1	1	1	0	10	High
Nutley-5	Perform infiltration and inflow study of sanitary system to identify dedicated and non-dedicated material entering system	1	1	1	1	1	1	0	1	0	1	1	1	1	1	12	High
Nutley-6	Install gabion walls at specific flood-prone locations along Third River in the Township	1	1	1	1	-1	-1	1	1	1	1	1	0	1	1	9	High
Nutley-7	Implement flood proofing measures to the Township's sanitary sewer pump station	0	1	1	1	1	1	0	1	0	1	1	0	1	1	10	Medium
Nutley-8	Dredging of Third River within the Township	1	1	1	1	1	0	0	1	1	1	1	0	0	1	10	High
Nutley-9	Review Township ordinances pertaining to stormwater and floodplain management	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Nutley-10	Perform study of Passaic River flooding onto River Road in Nutley Township	1	1	1	1	1	-1	-1	0	1	0	1	0	0	1	6	High
Nutley-11 (OLD 3)	Better drainage on Bloomfield Ave.	1	1	1	1	1	1	-1	-1	1	0	1	-1	1	1	7	Low
Nutley-12 (OLD 5)	Installation of solid manhole covers and inserts to prevent water infiltration into sanitary system	0	1	1	1	1	1	1	1	0	1	0	1	1	1	11	Medium
Nutley-13 (OLD 7)	Maintenance of storm sewer system	0	1	0	1	1	1	0	1	1	1	1	0	1	1	10	High
Nutley-14 (NEW)	Assess and prioritize non-structural flood hazard mitigation alternatives for at risk properties within the floodplain, including those that have been identified as repetitive loss, such as acquisition / relocation, or elevation depending on feasibility. The parameters for feasibility for this initiative would be: funding, benefits versus costs and willing participation of property owners. Implement as funding becomes available. Specifically identified are properties in the following areas: • Passaic Avenue and Rutgers Place	1	1	1	1	-1	0	-1	0	0	0	1	0	1	1	5	Medium

Table 9.17-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Nutley-15 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance. This program will include: • Providing general natural hazard risk, preparedness and mitigation, and related NFIP information in regular newsletter and mailings	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Nutley-16 (NEW)	Support participation in the NFIP CRS program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related CAV initiative.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Nutley-17 (NEW)	Enhance/expand tree maintenance program and coordination with utilities (e.g., PSEG).	1	1	1	1	1	-1	1	1	1	-1	1	1	0	1	11	Medium

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.17.7 Future Needs To Better Understand Risk/Vulnerability

No comments at this time.

9.17.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of Nutley that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of Nutley has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.17.9 Additional Comments

None at this time.

Figure 9.17-2. Township of Nutley Hazard Area Extent and Location Map 1

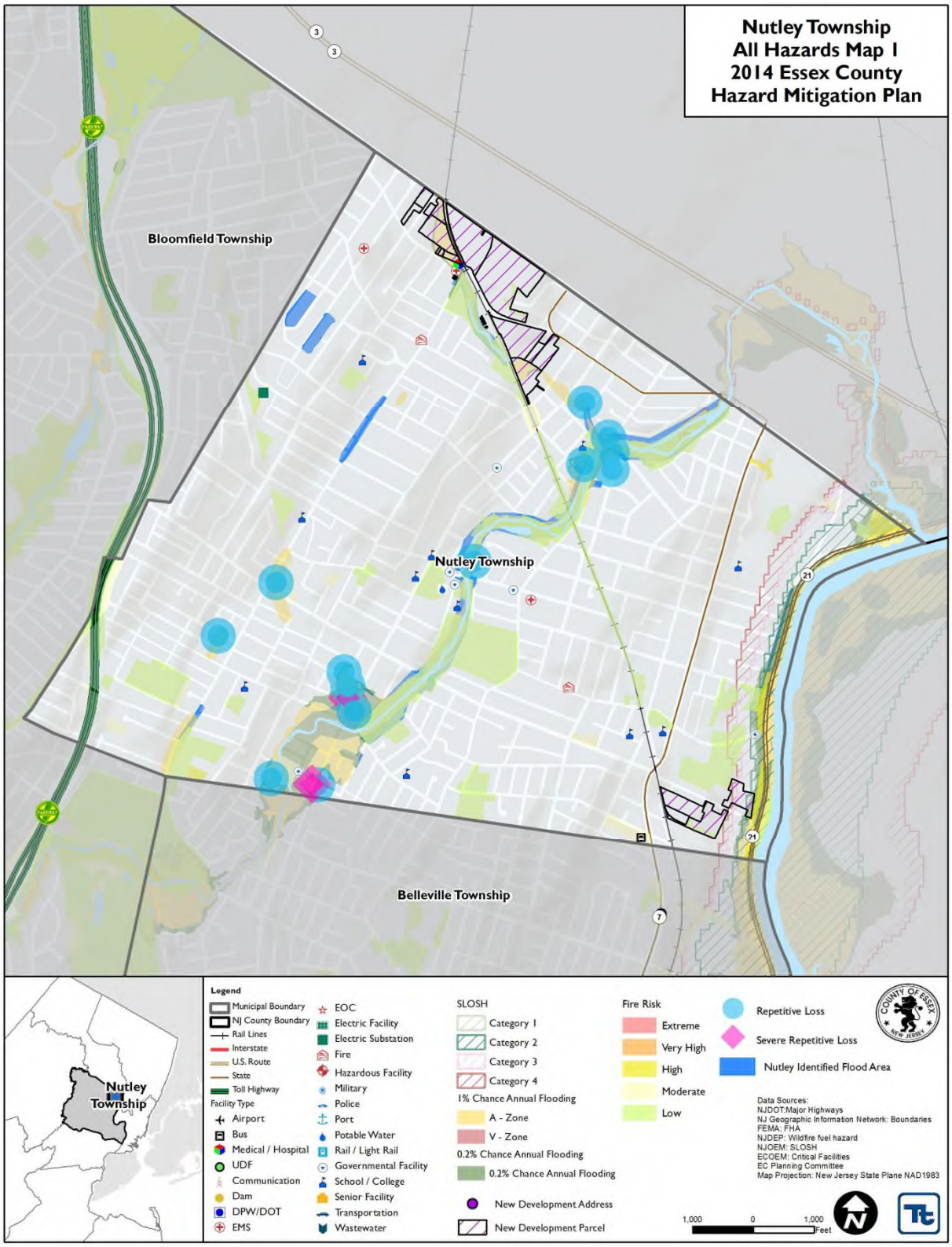
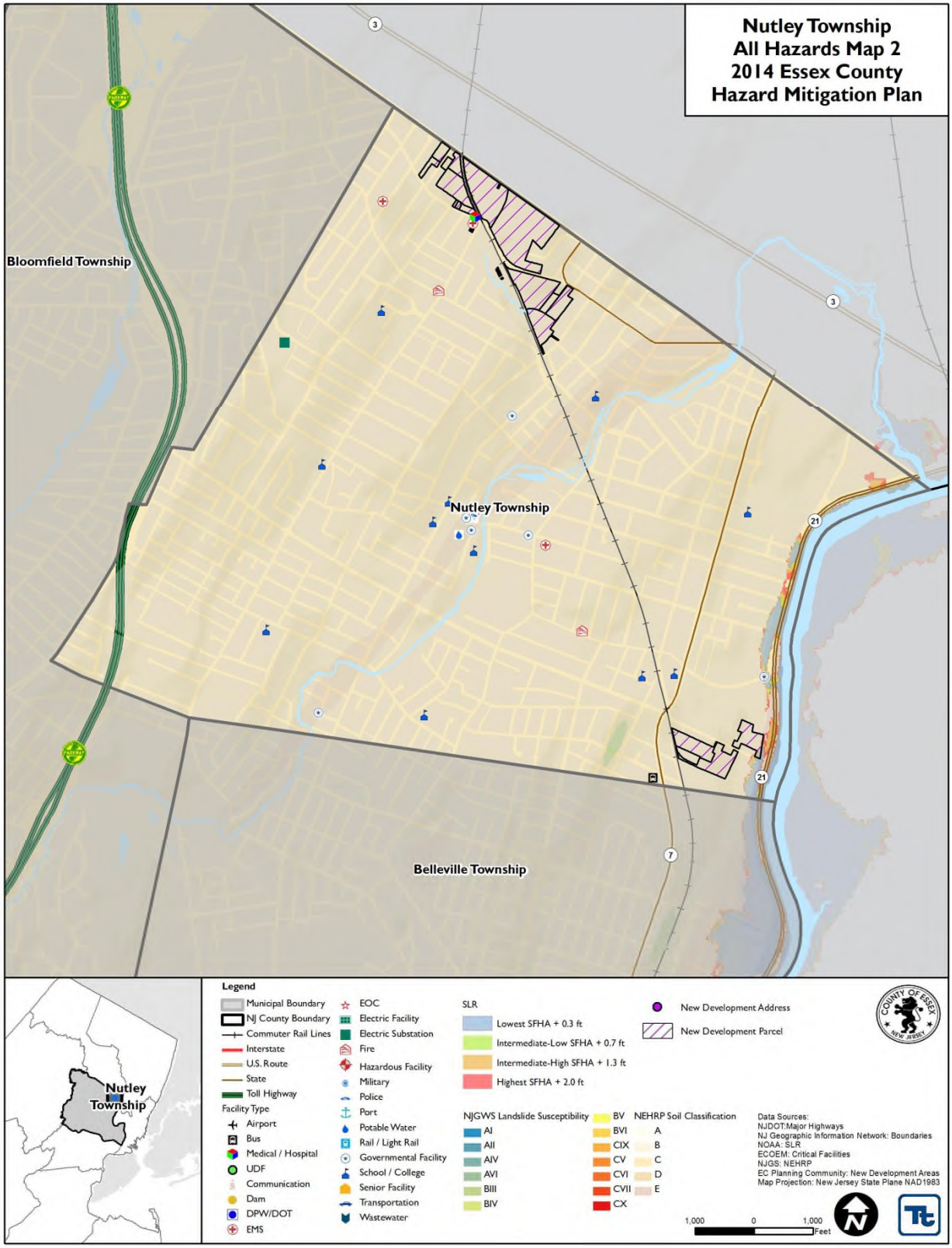


Figure 9.17-3. Township of Nutley Hazard Area Extent and Location Map 2



Action Number: **Nutley-1**
Mitigation Action/Initiative: Back-Up Emergency Power Generators (general initiative)

Assessing the Risk	
Hazard(s) addressed:	Loss of Electrical Power to Government Facilities/Functions/Services
Specific problem being mitigated:	Loss of use to public facilities and services
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Diesel Generators
	2. Natural Gas generators – cost
	3. Solar System – lack of function and space
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of Emergency backup generators to all essential government facilities
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	Support continuity of operations pre-, during and post hazard events
Applies to existing and or new development, or not applicable	existing
Benefits (losses avoided)	Prevent the loss of government functions and services
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Nutley
Local Planning Mechanism	Township of Nutley
Potential Funding Sources	State of NJ, FEMA grant opportunities and local capital budgets
Timeline for Completion	OG
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 6/30/14 Progress on Action/Project: Waiting State approvals

Refer to prioritization table.

Action Number: **Nutley-1**
Mitigation Action/Initiative: Back-Up Emergency Power Generators (general initiative)

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Facility is used to shelter persons during disasters
Property Protection	1	Need to support employees and equipment to complete tasks at hand
Cost-Effectiveness	1	
Technical	1	Power required to be able to review plans and maps during disasters.
Political	1	Mounting pressure on elected officials to function during disasters.
Legal	1	Liabilities
Fiscal	1	Continuity of Government
Environmental	0	No impact
Social	1	Avoid psychological disaster
Administrative	1	Continuity of Government
Multi-Hazard	1	
Timeline	1	Needs to be completed ASAP; waiting State approvals.
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	High

Action Number: **Nutley-1 (NEW/LOI)**
Mitigation Action/Initiative: Energy allocation- generator, 4 sites

Assessing the Risk	
Hazard(s) addressed:	Loss of electricity
Specific problem being mitigated:	Loss of electricity that cause is lack of continuity when governing the Township.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Generator
	2. Solar – not selected because of lack of space and function
	3. Mini Grid – lack of understanding and time to review
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of 4 generators
Action/Project Category	
Goals/Objectives Met	Supply back up electrical power to critical sites used during disasters
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Continue to operate during a power loss.
Estimated Cost	$556,240
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Nutley
Local Planning Mechanism	
Potential Funding Sources	HMGP and some budgeted funds
Timeline for Completion	Pending State approval
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 6/30/14 Progress on Action/Project: waiting State approval of application

Refer to prioritization table.

Action Number: **Nutley-1 (NEW/LOI)**
Mitigation Action/Initiative: Energy allocation- generator, 4 sites

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	28,500 people lives are at risk.
Property Protection	1	Need to support employees and equipment to complete tasks at hand.
Cost-Effectiveness	1	
Technical	1	Power required to be able to review plans and maps during disasters.
Political	1	Mounting pressure on elected officials to function during disasters.
Legal	1	Liabilities
Fiscal	1	Continuity of Government
Environmental	0	No impact
Social	1	Avoid psychological disaster
Administrative	1	Continuity of Government
Multi-Hazard	1	
Timeline	1	Needs to be completed ASAP; waiting State approvals.
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	High

Action Number: **Nutley-1 (NEW/LOI)**
Mitigation Action/Initiative: Nutley Park Avenue shelter generator

Assessing the Risk	
Hazard(s) addressed:	Power Loss at the Emergency Evacuation Shelter
Specific problem being mitigated:	Loss of Power
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Diesel Generator
	2. Natural Gas Generator – too expensive
	3. Solar – lack of function during emergency
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of diesel generator
Action/Project Category	Provide emergency backup power to facility
Goals/Objectives Met	Provide emergency backup power to facility
Applies to existing, future, or not applicable	Existing facility
Benefits (losses avoided)	Avoid the probability of a loss of power at a critical facility
Estimated Cost	$150,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township Of Nutley
Local Planning Mechanism	HMGP
Potential Funding Sources	Energy Allocation, some local funding
Timeline for Completion	Pending approval from the State
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 6/30/14 Progress on Action/Project: waiting State approval of Application

Refer to prioritization table.

Action Number: **Nutley-1 (NEW/LOI)**
Mitigation Action/Initiative: Nutley Park Avenue shelter generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Facility is used to shelter persons during disasters.
Property Protection	1	Need to support employees and equipment to complete tasks at hand.
Cost-Effectiveness	1	
Technical	1	Power required to be able to review plans and maps during disasters.
Political	1	Mounting pressure on elected officials to function during disasters.
Legal	1	Liabilities
Fiscal	1	Continuity of Government
Environmental	0	No impact
Social	1	Avoid psychological disaster
Administrative	1	Continuity of Government
Multi-Hazard	1	
Timeline	1	Needs to be completed ASAP waiting State approvals
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	High

Action Number: **Nutley-1 (NEW/LOI)**
Mitigation Action/Initiative: Nutley Public Safety Building EOC generator

Assessing the Risk	
Hazard(s) addressed:	Loss of Power
Specific problem being mitigated:	Loss of power at this critical facility – system upgrades
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Diesel Generator
	2. Natural Gas Generator – cost did not fit budget
	3. Solar – lack of function
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of a new generator that will be able to supply facility
Action/Project Category	Provide emergency backup power
Goals/Objectives Met	Provide emergency backup power
Applies to existing, future, or not applicable	Existing and any future expansion
Benefits (losses avoided)	Allow Public Safety Operations to continue to function, EOC, Dispatch
Estimated Cost	$150,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township Of Nutley
Local Planning Mechanism	HMGP
Potential Funding Sources	Energy Allocation, local funds
Timeline for Completion	Pending State Approvals
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 6/30/14 Progress on Action/Project: Waiting State Approvals

Refer to prioritization table.

Action Number: **Nutley-1 (NEW/LOI)**
Mitigation Action/Initiative: Nutley Fire House generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Facility is used to shelter persons during disasters.
Property Protection	1	Need to support employees and equipment to complete tasks at hand.
Cost-Effectiveness	1	
Technical	1	Power required to be able to review plans and maps during disasters.
Political	1	Mounting pressure on elected officials to function during disasters.
Legal	1	Liabilities
Fiscal	1	Continuity of Government
Environmental	0	No impact
Social	1	Avoid psychological disaster
Administrative	1	Continuity of Government
Multi-Hazard	1	
Timeline	1	Needs to be completed ASAP; waiting State approvals.
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	High

Action Number: **Nutley-1 (NEW/LOI)**
Mitigation Action/Initiative: Nutley Rescue Squad generator

Assessing the Risk	
Hazard(s) addressed:	Loss of power to critical facility
Specific problem being mitigated:	Loss of electrical power
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Diesel Generator
	2. Natural Gas Generator – cost
	3. Solar – no space, lack of function
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of diesel generator
Action/Project Category	Provide emergency backup power
Goals/Objectives Met	Provide emergency backup power
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Continuity of EMS life safety operations
Estimated Cost	$130,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Nutley
Local Planning Mechanism	HMGP
Potential Funding Sources	Energy Allocation, local funding
Timeline for Completion	Pending State approvals
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 6/30/14 Progress on Action/Project: Waiting State approvals

Refer to prioritization table.

Action Number: **Nutley-1 (NEW/LOI)**
Mitigation Action/Initiative: Nutley Rescue Squad generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Facility is used to shelter persons during disasters.
Property Protection	1	Need to support employees and equipment to complete tasks at hand.
Cost-Effectiveness	1	
Technical	1	Power required to be able to review plans and maps during disasters.
Political	1	Mounting pressure on elected officials to function during disasters.
Legal	1	Liabilities
Fiscal	1	Continuity of Government
Environmental	0	No impact
Social	1	Avoid psychological disaster
Administrative	1	Continuity of Government
Multi-Hazard	1	
Timeline	1	Needs to be completed ASAP waiting State approvals
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	High

Action Number: **Nutley-2 (NEW/LOI)**
Mitigation Action/Initiative: Nutley Township Hall/EOC/Fresh Water Well pump generator

Assessing the Risk	
Hazard(s) addressed:	Loss of Power, Continuity of Government, Fresh Water
Specific problem being mitigated:	Power loss and the ability to utilize fresh water well, large rest room facility
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Diesel Generator
	2. Natural Gas Generator – cost
	3. Solar System – no space and lack of function during disasters
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of diesel generator to supply power during disaster
Action/Project Category	Provide backup emergency power
Goals/Objectives Met	Provide backup emergency power
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Alternate EOC, Continuity of Government, drinking water, restrooms
Estimated Cost	$200,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Nutley
Local Planning Mechanism	HMGP
Potential Funding Sources	Energy Allocation and local funds
Timeline for Completion	Pending State approval
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 6/30/14 Progress on Action/Project: Waiting State Approvals

Refer to prioritization table.

Action Number: **Nutley-2 (NEW/LOI)**
Mitigation Action/Initiative: Nutley Township Hall/EOC/Fresh Water Well pump generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Facility is used to shelter persons during disasters.
Property Protection	1	Need to support employees and equipment to complete tasks at hand.
Cost-Effectiveness	1	
Technical	1	Power required to be able to review plans and maps during disasters.
Political	1	Mounting pressure on elected officials to function during disasters.
Legal	1	Liabilities
Fiscal	1	Continuity of Government
Environmental	0	No impact
Social	1	Avoid psychological disaster
Administrative	1	Continuity of Government
Multi-Hazard	1	
Timeline	1	Needs to be completed ASAP waiting State approvals
Agency Champion	1	
Other Community Objectives	1	
Total	13	
Priority (High/Med/Low)	High	High

Action Number: **Nutley-3 (NEW/LOI)**
Mitigation Action/Initiative: Nutley minor flood control project

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Currently, bank is unstable in a non-channelized section of the Third River in Kingsland Park.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Complete gabion walls and remove sheet pile and wall.
Action/Project Category	SIP
Goals/Objectives Met	Protect Life and Property
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Roadway Closures and Detours/Reduce manpower/Residential Flooding
Estimated Cost	$1,247,484
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Nutley
Local Planning Mechanism	Township of Nutley
Potential Funding Sources	State of NJ, FEMA, DEP grant opportunities
Timeline for Completion	OG
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Nutley-3 (NEW/LOI)**
Mitigation Action/Initiative: Nutley minor flood control project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	-1	Need NJ EP approval, permits, etc.
Fiscal	-1	Unable to fund through local governmental budgets.
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	Unable to complete without funding and State approvals.
Agency Champion	1	
Other Community Objectives	1	
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Nutley-4**
Mitigation Action/Initiative: Cleaning and repairing culverts within the Township

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Down-/Up-Stream flooding, damage to properties(public & private)
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Clean culverts
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Cleaning and repairing of culverts within Township carrying storm water from various locations to discharge points.
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	Protect Life and Property
Applies to existing and or new development, or not applicable	N/A
Benefits (losses avoided)	Minimize Flooding, Damage to Physical property, Road Closures/Detours, Manpower, Cleanup
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	County of Essex, NJ
Local Planning Mechanism	County of Essex, NJ
Potential Funding Sources	County of Essex, Grant Funding through FEMA, State of NJ
Timeline for Completion	OG
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Nutley-4**
Mitigation Action/Initiative: Cleaning and repairing culverts within the Township

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	Jurisdiction of County of Essex
Fiscal	0	Jurisdiction of County of Essex
Environmental	1	
Social	1	
Administrative	0	Jurisdiction of County of Essex
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	Jurisdiction of County of Essex
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Nutley-5**
Mitigation Action/Initiative: Infiltration and inflow study of sanitary system

Assessing the Risk	
Hazard(s) addressed:	Minimize amount of unaccounted sewage/water entering receiving system. Minimize/Prevent sewage overflows.
Specific problem being mitigated:	Excess ground/unaccounted material entering sewer system
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Perform Study
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Perform I & I Study of Sanitary System to identify dedicated and non-dedicated material entering system.
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	Protect Life and Property
Applies to existing and or new development, or not applicable	N/A
Benefits (losses avoided)	Minimize Damage to property, manpower, cleanup, prevent overflows,
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Nutley-DPW
Local Planning Mechanism	Township of Nutley-DPW
Potential Funding Sources	State of NJ, DEP, Federal Grant opportunities and local capital budgets
Timeline for Completion	OG
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Nutley-5**
Mitigation Action/Initiative: Infiltration and inflow study of sanitary system

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Nutley-6**
Mitigation Action/Initiative: River Embankment Stabilization

Assessing the Risk	
Hazard(s) addressed:	Flooding, Damage to Property
Specific problem being mitigated:	Stabilize River/Stream Embankments from erosion
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Install gabion walls
	2. Do nothing
	3. Elevate structures in area
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install gabion walls at specific flood prone locations along third river within Township
Action/Project Category	Natural Systems Protection, Structure and Infrastructure Project
Goals/Objectives Met	Protect Life and Property
Applies to existing and or new development, or not applicable	N/A
Benefits (losses avoided)	Minimize River Bank Erosion, Flooding, Physical Property, Road Closings/Detours, Manpower
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Nutley
Local Planning Mechanism	Township of Nutley
Potential Funding Sources	State of NJ, FEMA, DEP grant opportunities
Timeline for Completion	OG
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Nutley-6**

Mitigation Action/Initiative: River Embankment Stabilization

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	-1	Need NJ DEP approval, permits, etc.
Fiscal	-1	Unable to fund through local government budgets.
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	Unable to complete without funding.
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Nutley-7**
Mitigation Action/Initiative: Flood Protection to Sanitary Sewer Pump Station

Assessing the Risk	
Hazard(s) addressed:	Flood, Severe Storm
Specific problem being mitigated:	Damage to Property and infrastructure; Excess ground/unaccounted material entering sewer system
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Flood proof sanitary sewer pump station
	2. Do nothing
	3. Design and build new pump station
Action/Project Intended for Implementation	
Description of Selected Action/Project	Implement flood proofing measures to Township of Nutley Sanitary Sewer Pump Station
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	1.2, 2.2, 6.1
Applies to existing and or new development, or not applicable	N/A
Benefits (losses avoided)	High - Protection of property, Life Safety, Environmental
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	Township of Nutley-DPW
Local Planning Mechanism	Township of Nutley-DPW
Potential Funding Sources	State of NJ, FEMA, DEP grant opportunities
Timeline for Completion	OG
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Nutley-7**
Mitigation Action/Initiative: Flood Protection to Sanitary Sewer Pump Station

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	Unable to fund through local government budgets
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	0	Unable to complete without funding
Agency Champion	1	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	Medium	

Action Number: **Nutley-8**
Mitigation Action/Initiative: Dredging of Third River

Assessing the Risk	
Hazard(s) addressed:	Flooding, Severe Storm
Specific problem being mitigated:	Flooding
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Dredge River
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Dredging of Third River within Township
Action/Project Category	Natural Systems Protection, Structure and Infrastructure Project
Goals/Objectives Met	1.2, 2.2, 6.1
Applies to existing and or new development, or not applicable	N/A
Benefits (losses avoided)	High - Minimize River Bank Erosion, Flooding, Damage to Physical Property, Road Closings/Detours, Manpower
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	State of NJ, County of Essex, Municipality
Local Planning Mechanism	State of NJ, County of Essex, Municipality
Potential Funding Sources	State of NJ, FEMA, DEP grant opportunities
Timeline for Completion	OG
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Nutley-8**
Mitigation Action/Initiative: Dredging of Third River

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	Requires NJ DEP approval and permits
Fiscal	0	Unable to fund through local governmental funds
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	Unable to complete with funding and State approvals
Agency Champion	0	Non Local Jurisdiction
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Nutley-9**
Mitigation Action/Initiative: Stormwater and Flood Plain Ordinance Review

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Flood Mitigation
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Review Township Ordinances pertaining to Stormwater and Flood Plain Management
Action/Project Category	Local Plans and Regulations (LPR)
Goals/Objectives Met	1.2, 1.3, 4.1, 4.2
Applies to existing and or new development, or not applicable	Applies to Existing and New Development
Benefits (losses avoided)	Minimize Flooding, Damage to Physical Property, Protect Life
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Nutley – DPW/Code Enforcement
Local Planning Mechanism	Township of Nutley - DPW/Code Enforcement
Potential Funding Sources	Local Budgets
Timeline for Completion	OG
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Nutley-9**
Mitigation Action/Initiative: Stormwater and Flood Plain Ordinance Review

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Nutley-10**
Mitigation Action/Initiative: Passaic River Flooding

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Flooding of Passaic River Waters onto River Road in Nutley
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Perform Study of Passaic River Flooding onto River Road in Nutley
Action/Project Category	Natural Systems Protection, Structure and Infrastructure Project
Goals/Objectives Met	1.3
Applies to existing and or new development, or not applicable	N/A
Benefits (losses avoided)	Minimize Flooding, Damage to Property, Road Closures/Detours. Manpower, Cleanup
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	Federal, State of NJ, DEP, County of Essex
Local Planning Mechanism	Federal, State of NJ, DEP, County of Essex
Potential Funding Sources	Federal, State of NJ, DEP, County of Essex
Timeline for Completion	OG
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: Nutley-10
Mitigation Action/Initiative: Passaic River Flooding

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	-1	
Fiscal	-1	
Environmental	0	
Social	1	
Administrative	0	
Multi-Hazard	1	
Timeline	0	
Agency Champion	0	
Other Community Objectives	1	
Total	8	
Priority (High/Med/Low)	High	

Action Number: **Nutley-11 (OLD 3)**
Mitigation Action/Initiative: Better drainage on Bloomfield Ave

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	1.2
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Medium
Estimated Cost	High
Priority*	Low
Plan for Implementation	
Responsible Organization	Township of Nutley - DPW
Local Planning Mechanism	Township of Nutley
Potential Funding Sources	State, FEMA, NJDEP grant opportunities
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table

Action Number: **Nutley-11 (OLD 3)**

Mitigation Action/Initiative: Better drainage on Bloomfield Ave

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	-1	
Environmental	-1	
Social	1	
Administrative	0	
Multi-Hazard	1	
Timeline	-1	
Agency Champion	1	
Other Community Objectives	1	
Total	7	
Priority (High/Med/Low)	Low	

Action Number: **Nutley-12 (OLD 5)**

Mitigation Action/Initiative: Installation of solid manhole covers to prevent water infiltration into sanitary system

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Flood water entering sanitary lines
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install solid manhole covers and inserts to sanitary system in flood prone areas
Action/Project Category	SIP
Goals/Objectives Met	1.2
Applies to existing, future, or not applicable	New and Existing
Benefits (losses avoided)	Medium
Estimated Cost	Low
Priority*	Medium
Plan for Implementation	
Responsible Organization	Township of Nutley - DPW
Local Planning Mechanism	Township of Nutley
Potential Funding Sources	Local budgets
Timeline for Completion	Long Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table

Action Number: **Nutley-12 (OLD 5)**

Mitigation Action/Initiative: Installation of solid manhole covers to prevent water infiltration into sanitary system

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	Medium	

Action Number: **Nutley-13 (OLD 7)**
Mitigation Action/Initiative: Nutley maintenance of storm sewer system

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	2.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Nutley - DPW
Local Planning Mechanism	Township of Nutley
Potential Funding Sources	Township
Timeline for Completion	Ongoing
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table

Action Number: **Nutley-13 (OLD 7)**

Mitigation Action/Initiative: Nutley maintenance of storm sewer system

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	0	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Nutley-14**
Mitigation Action/Initiative: Assess vulnerable structures in flood areas

Assessing the Risk	
Hazard(s) addressed:	Flooding, Coastal Storms, Coastal Erosion, Severe Storm, Wildfire, Winter Storm
Specific problem being mitigated:	Assess vulnerable structures in flood areas
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Assess vulnerable structures in flood areas; specifically those along Passaic Avenue and Rutgers Place
Action/Project Category	Structure and Infrastructure Project
Goals/Objectives Met	Protect Life and Property
Applies to existing and or new development, or not applicable	N/A
Benefits (losses avoided)	Minimize damage to property and structure
Estimated Cost	HIGH
Priority*	Medium
Plan for Implementation	
Responsible Organization	Township Engineering via NFIP FPA with NJOEM, FEMA Support
Local Planning Mechanism	Federal, State of NJ, DEP, County of Essex
Potential Funding Sources	FEMA Mitigation Grant Programs and local budget (or property owner) for cost share
Timeline for Completion	Ongoing (outreach and specific project identification); Long Term DOF (specific project application and implementation)
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Nutley-14**

Mitigation Action/Initiative: Assess vulnerable structures in flood areas

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	-1	
Legal	0	
Fiscal	-1	Unable to fund through local government budgets
Environmental	0	
Social	0	
Administrative	0	
Multi-Hazard	1	
Timeline	0	Unable to fund through local government budgets
Agency Champion	1	
Other Community Objectives	1	
Total	5	
Priority (High/Med/Low)	Medium	

Action Number: **Nutley-15**
Mitigation Action/Initiative: Develop and Implement Flood outreach program to residents

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Hazard informational outreach
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Provide general natural hazard risk, preparedness and mitigation, and related NFIP information in regular newsletter and mailings
Action/Project Category	Education and Awareness Programs
Goals/Objectives Met	3.1, 4.1
Applies to existing and or new development, or not applicable	N/A
Benefits (losses avoided)	Informational/Educational
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Township of Nutley
Local Planning Mechanism	Township of Nutley
Potential Funding Sources	Municipal Budget; HMA programs with local or County match
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Nutley-15**

Mitigation Action/Initiative: Develop and Implement Flood outreach program to residents

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Nutley-16**
Mitigation Action/Initiative: Participation in NFIP CRS Program

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Participation in NFIP CRS Program
Action/Project Category	LPR and EAP
Goals/Objectives Met	1.3, 4.1, 5.2, 5.4
Applies to existing and or new development, or not applicable	N/A
Benefits (losses avoided)	Protection of Property
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Township NFIP FPA, as fully supported by local government officials
Local Planning Mechanism	Township of Nutley
Potential Funding Sources	Municipal Budget
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Nutley-16**

Mitigation Action/Initiative: Participation in NFIP CRS Program

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	High	

Action Number: **Nutley-17**
Mitigation Action/Initiative: Tree Maintenance Program with Utility Co's.

Assessing the Risk	
Hazard(s) addressed:	Winter Storm/Severe Storm
Specific problem being mitigated:	Reduce risk of loss of power/utilities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Tree Maintenance Program with Utility Co's.
Action/Project Category	NSP
Goals/Objectives Met	1.2, 2.1, 2.3
Applies to existing and or new development, or not applicable	Existing
Benefits (losses avoided)	Protection of Property
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	Township of Nutley Parks Dept. working with contractors and local utilities
Local Planning Mechanism	PSE&G/Utility Co. - Township of Nutley(Parks & Public Property)
Potential Funding Sources	Local Budget
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Nutley-17**

Mitigation Action/Initiative: Tree Maintenance Program with Utility Co's.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	-1	Non Local Jurisdiction regarding Utility lines
Fiscal	1	
Environmental	1	
Social	1	
Administrative	-1	Non Local Jurisdiction regarding Utility lines
Multi-Hazard	1	
Timeline	1	
Agency Champion	0	Non Local Jurisdiction regarding Utility lines
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	Medium	

9.18 City of Orange Township

This section presents the jurisdictional annex for the City of Orange Township.

9.18.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
John Wade, Dep.OEM Coordinator 419 Central Avenue, Orange, NJ 07052 Phone: 973-266-4229 E-mail: wadej@ci.organge.nj.us	Raymond Wingfield 29 N. Day Street, Orange, NJ Phone: 973-266-4000 rwingfield@ci.orange.nj.us

9.18.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the City of Orange Township was 30,134.

Location

According to the U.S. Census Bureau, the City has a total land area of 2.2.01 square miles, of which 2.199 square miles is land and 0.002 square miles is water.

Brief History

Originally known as the "Newark Mountains", the City of Orange Township officially renamed in 1780 and became incorporated in 1860. Orange was once known as the hat manufacturing capital of the world. The location attracts small to medium sized businesses who find it affordable to operate and easy access to desirable markets (Welcome to the City of Orange Township, 2014).

Governing Body Format

The City of Orange Township operates with a directly elected Mayor, four- member City Council, and three at-large representatives (Welcome to the City of Orange Township, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.18.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.18-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Berg Hat Factory-HANDS	Mixed-Use	38 units	475 S. Jefferson Street	1% Flood: A Zone	App.
Franklin Development Group, LLC	Residential	14 units	B: 2201 L: 21	None	Approved
Franklin Development Group, LLC	Residential	136 units	B: 2201 L: 19	None	App.
Franklin Development Group, LLC	Residential	136 units	B: 2201 L: 20	None	App.
Harvard Development Association	Residential	128 units	550 Central Avenue	Historic Fill, Groundwater 1% Flood: A Zone	Remediation plan approved
L&M Development	Mixed-Use	74 units	50 S. Essex Avenue	Historic Fill, Groundwater	Under construction
L&M Development	Mixed-Use	74 units	55 S. Essex Avenue	Historic Fill, Groundwater	Under construction
Living Fountain	Mixed-Use	40 units	169-177Central Avenue	Historic Fill	Site plans approved
Nat West Realty	Mixed-Use	19 units	555Central Avenue	1% Flood: A Zone	Under construction
Orange Housing	Residential	42	PArrow Street/Oakwood Place	Historic Fill, Groundwater	Under construction
Tony Galento Plaza (RPM)	Mixed	113	Lackawanna Place	Historic Fill, Groundwater	Funding approved, Building in 2014
Tony Galento Plaza (RPM)	Residential	30	Lincoln Avenue	Historic Fill, Groundwater	Funding approved, Building in 2014

** Only location-specific hazard zones or vulnerabilities identified.*

9.18.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.18-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
April 14-20, 2007	Severe Storms and Inland and Coastal Flooding	DR-1694	Yes	No damages reported specific to the municipality
June 10, 2008	Severe Storms	N/A	N/A	No damages reported specific to the municipality
August 15, 2008	Lightning	N/A	N/A	No damages reported specific to the municipality
July 26, 2009	TSTM/Wind	N/A	N/A	No damages reported specific to the municipality
August 12, 2009	Heavy Rain	N/A	N/A	No damages reported specific to the municipality
March 12 – April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	No damages reported specific to the municipality
October 1, 2010	Strong Wind	N/A	N/A	No damages reported specific to the municipality
October 16, 2010	Strong Wind	N/A	N/A	No damages reported specific to the municipality
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	No damages reported specific to the municipality
June 17, 2011	Lightning	N/A	N/A	No damages reported specific to the municipality
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	No damages reported specific to the municipality
October 29, 2011	Severe Storm	DR-4048	Yes	No damages reported specific to the municipality
October 26 – November 8, 2012	Hurricane Sandy	EM-3354 DR-4086	Yes Yes	No damages reported specific to the municipality

9.18.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the City of Orange Township. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the City of Orange Township.

Table 9.18-3. Hazard Risk/Vulnerability Risk Ranking

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a,c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $1,165,594 2,500-year MRP: $26,572,651	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	18	Medium
Flood	1% Annual Chance: $22,359,052	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $0	Rare	6	Low
Severe Storm	100-Year MRP: $1,451,993 500-year MRP: $10,018,790 Annualized: $115,767	Frequent	48	High
Winter Storm	1% GBS: $11,342,043 5% GBS: $56,710,215	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $0	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. *Building damage ratio estimates based on FEMA 386-2 (August 2001)*
b. *The valuation of general building stock and loss estimates was based on custom inventory for the municipality.*
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20
c. *Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the City of Orange Township.

Table 9.18-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Orange, City of	269	117	$954,986.00	11	0	223	236	33

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.18-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

Municipality	1% Annual Chance					0.2% Annual Chance				
	Bus	Electric Substation	Potable Water Supply	School	Transportation	Bus	Electric Substation	Potable Water Supply	School	Transportation
City of Orange Township	1	1	1	2	1	1	1	1	2	1

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), the floodplains of Wigwam Brook, the East Branch Rahway River, and the East Fork of East Branch Rahway River in the City of Orange Township have been encroached upon to the point where most of them are developed. This encroachment has caused flood problems and damage from storms with recurrence intervals of less than one year (FEMA FIS 2014).

The principal flood problems in the City of Orange Township are due to a combination of urbanization in the floodplain, manmade restrictions within the streams, and inadequate storm drainage. In a report prepared for the City of Orange Township and the Township of West Orange, it was determined that the approximate capacity of the East Fork of East Branch Rahway River between Forest Street and Central Avenue is only 90 cfs. The 1-percent-annual-chance flood at this location produces a flow of 560 cfs (FEMA FIS 2013).

A significant flood along the East Fork of East Branch Rahway River occurred on August 28-29, 1971 (Tropical Storm Doria), and produced a discharge of 385 cfs at Mitchell Street. This discharge is equivalent to a flood with a recurrence interval of approximately 30 years. Flooding along Wigwam Brook is rather extensive throughout its length within the City of Orange Township corporate limits. Due to its highly developed floodplain, even minor flooding produces damage to residential and commercial structures (FEMA FIS 2013).

Additionally, the municipality has identified the following hazard problems and/or problem areas:

Flooding

Flooding issues in the City include the following:

- An aging Storm Water Runoff system in need of major repair, i.e. relining, installation of catch basins, larger piping installation
- The need to complete a major cleanout of our Storm Water Runoff system
- The need to install filtration devices throughout the system
- The need to coordinate such efforts with East Orange and West Orange, both of whom share the same Storm Runoff system with the City of Orange Township

The City has identified four areas that are directly affected by flooding issues:

- East Ward
    - Central Avenue/ Orange Park area, which includes Central Avenue, Oakwood Avenue, Orange Park, and Hickory Street. This is the eastern end of a designated evacuation route.
    - Central Avenue (West Orange Border). This is the western end of a designated evacuation route.
- North Ward
    - Lakeside Avenue/ High Street area, which includes Cleveland Street, and Gist Place. High Street is the northern end of a designated evacuation route.
- South Ward - the Valley section. Flooding in this area has called for evacuations, and is responsible for past incidents of damage to homes and cars. Flooding has been known to last for several days in this area of the City.

The aforementioned affected areas continuously incur flash-flooding during major thunderstorms with prolonged or heavy rain storms. In addition, during and after Hurricane Irene, the aforementioned affected areas experienced major flooding that required a vast amount of limited local resources to address the situation.

Power Failure

During and after Hurricane Sandy, the City experienced a loss of electrical power. The City was unable to use the following locations as points of distribution, immunization services, DPW central communications, or centralized older adult services for nine days:

- Orange City Hall, 29 North Day Street - Located within City Hall are the Department of Health and Older Adult Services, and central communications for the Department of Public Works. The Department of Health and Older Adult Services has a medicine/ immunization storage area that requires 24-hour refrigeration.

- Orange Fire Department Headquarters, 419 Central Avenue - There is currently an older generator providing backup electrical power to this location that is more than 20 years old, and in need of

replacement. A loss of power at this location will remove our ability to activate our secondary Emergency Operation Center in the event that our primary Emergency Operations Center is unreachable, and to provide adequate Emergency Shelter for First Responders. In addition, a loss of power at this location will hamper our ability to provide adequate fire suppression service, and backup Emergency Medical Services.

- Orange Fire Department Station #2, 257 Washington Street - There is currently no generator to provide backup power to this location. Due to the loss of electrical power at this location during and after Hurricane Sandy, we were unable to utilize this location for Emergency Shelter for First Responders, backup Emergency Medical Services, or staging for nine days.

- City of Orange Township Water Well Pumps 2, 3, 4, South Mountain Reservation - There is currently no generator to provide backup power to these locations.

The winds generated by Hurricane Irene and Hurricane Sandy, as well as the increased weights of ice and snow on the trees during the Halloween Storm of 2011, and the Halloween Storm of 2012, were responsible for the downing of aging and very large trees.

During Hurricane Sandy and Hurricane Irene, because of those down trees, which led to a total loss of power, the City lost all water pumping capabilities from these wells.

The loss of these pumps caused the City to have to operate on a three-day supply of water reserves from within their main pumping station in the City of Orange Township, which does have a generator for backup power. In addition, the falling trees, hampered the ability to access these pumping facilities, and presented a safety hazard to Water Department personnel who were attempting to reach those pump locations with rented/ portable commercial generators.

The City was down to less than one and half days of water supply by the time the City was able to reach these three pumping stations, and was able to get two of the three stations working with rented/ portable commercial generators.

The aforementioned lack of back-up power to these facilities ultimately hampered our efforts to maintain operational efficiency, quality of life, and the delivery of a key city service (water supply).

Contaminated Sites

The City of Orange shares a Brownfield Development area (BDA) with the Township of West Orange. The Central Valley Brownfield Development Area identifies 25 properties that have either been remediated or need to be.

9.18.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the City of Orange Township.

Table 9.18-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	Local	Construction Official	
Zoning Ordinance	Y	Local	Construction Official	
Subdivision Ordinance	Y	Local	Construction Official	
NFIP Flood Damage Prevention Ordinance				
Cumulative Substantial Damages				
Freeboard				
Growth Management				
Floodplain Management / Basin Plan				
Stormwater Management Plan/Ordinance	Y	Local	DPW	
Comprehensive Plan / Master Plan/ General Plan	Y	Local	Planning	
Capital Improvements Plan	Y	Local	DPW	
Site Plan Review Requirements	Y	Local	Construction Official	
Open Space Plan	Y	Local	Planning	
Stream Corridor Management Plan				
Watershed Management or Protection Plan	Y	Local	Planning	
Economic Development Plan	Y	Local	Planning	
Comprehensive Emergency Management Plan				
Emergency Response Plan				
Post Disaster Recovery Plan				
Post Disaster Recovery Ordinance				

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Real Estate Disclosure Requirement				
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]				

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the City of Orange Township.

Table 9.18-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Richard G. Arago, P.E., Executive Vice President Remington, Vernick + Arango Engineers, Secaucus, NJ
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Richard G. Arago, P.E., Executive Vice President Remington, Vernick + Arango Engineers, Secaucus, NJ
Planners or engineers with an understanding of natural hazards	Y	Richard G. Arago, P.E., Executive Vice President Remington, Vernick + Arango Engineers, Secaucus, NJ
NFIP Floodplain Administrator	Y	Richard G. Arago, P.E., Executive Vice President Remington, Vernick + Arango Engineers, Secaucus, NJ
Surveyor(s)	Y	Richard G. Arago, P.E., Executive Vice President Remington, Vernick + Arango Engineers, Secaucus, NJ
Personnel skilled or trained in “GIS” applications	Y	Richard G. Arago, P.E., Executive Vice President Remington, Vernick + Arango Engineers, Secaucus, NJ
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Ray Wingfield, OEM Coordinator, City of Orange
Grant Writer(s)	Y	Richard G. Arago, P.E., Executive Vice President Remington, Vernick + Arango Engineers, Secaucus, NJ
Staff with expertise or training in benefit/cost analysis	Y	Richard G. Arago, P.E., Executive Vice President Remington, Vernick + Arango Engineers, Secaucus, NJ
Professionals trained in conducting damage assessments	Y	Richard G. Arago, P.E., Executive Vice President Remington, Vernick + Arango Engineers, Secaucus, NJ

Fiscal Capability

The table below summarizes financial resources available to the City of Orange Township.

Table 9.18-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for specific purposes	Yes
User fees for water, sewer, gas or electric service	Yes
Impact Fees for homebuyers or developers of new development/homes	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	No
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	No
Mitigation grant programs	Yes
Other	

Community Classifications

The table below summarizes classifications for community program available to the City of Orange Township.

Table 9.18-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	N/A
Building Code Effectiveness Grading Schedule (BCEGS)	NP	N/A
Public Protection	NP	N/A
Storm Ready	NP	N/A
Firewise	NP	N/A

N/A = Not applicable. NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule

- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Brian Johnson, Muncipal Engineering Contractor, Carroll Engineering

Flood Vulnerability Summary

City of Orange Township currently have 290 NFIP policies in force. Insured properties are worth $61,83,500 and total in-force premiums are $527,751. As of August 31, 2013, 158 claims have been filed with 117 closed, 0 open losses, and 41 Closed With Out Pay (CWOP). The total amount in claims paid out was $954,986. Records of damage are well-kept and maintained.

Resources

As per the Flood Damage Prevention Ordinance, the Construction Code official is the floodplain manager. Responsibilities include reviewing permits for new development are compliant with floodplain ordinances. Current barriers to running an effective floodplain management program include insufficient, funding, staffing, and training.

Compliance History

City of Orange Township is in good standing in the NFIP. The current floodplain manager, Brian Johnson, is unsure when the most recent Community Assistance Visit (CAV) took place. He does not see a need to schedule a CAV at this time.

Regulatory

Current floodplain management ordinances and regulations meet FEMA and New Jersey minimum requirements. Additional training and information on running a floodplain management program and joining the Community Rating System (CRS) would be welcomed.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

None at this time.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

The City of Orange shares a Brownfield Development Area (BDA) with the Township of West Orange. The Central Valley BDA identifies 25 properties that have either been remediated or need to be.

The City has a Master Plan which is the legal roadmap to planning for appropriate and safe land development. The City has no mitigation element in its Master Plan. The hazard mitigation plan will be used to guide the addition of hazard information for inclusion in the next Master Plan update. See new mitigation action 'Orange-17' in Table 9.18-11.

9.18.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.18-10. Past Mitigation Initiative Status

Description	Status	Review Comments
1: PSE&G substations at Lakeside and Cleveland	Discontinue	A study has been conducted as to the issues surrounding the flooding in this area by the local water utility. PSE&G is the lead for this initiative and the City will continue to work with PSE&G to understand the status of this project.
2: PSE&G substation at Nassue and S. Jefferson	Discontinue	A study has been conducted as to the issues surrounding the flooding in this area by the local water utility. PSE&G is the lead for this initiative and the City will continue to work with PSE&G to understand the status of this project.
3: Orange Park wells	Continuous	A study has been conducted as to the issues surrounding the flooding and terrorism in this area by OEM and the local water utility. The City will continue to work with United Water to secure funding for target hardening of this facility and area flooding.
4: Gist Place wells	Continuous	A study has been conducted as to the issues surrounding the flooding and terrorism in this area by OEM and the local water utility. The City will continue to work with United Water to secure funding for target hardening of this facility and area flooding.
5: Civil disturbances at high school	Discontinue	Although there continues an off and on problem, this issue does not rise to the level of involvement by OEM. Ongoing collaboration continues between OPD and the Or Bd. of Ed with regards to this matter. This initiative will not be carried over into the current mitigation strategy.
6: NJ Transit power substation	Discontinue	This property is owned and managed by New Jersey Transit, and should be addressed by their OEM Department. This initiative will not be carried over into the current mitigation strategy.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

None at this time.

Proposed Hazard Mitigation Initiatives for the Plan Update

The City participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone

Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.18-11 summarizes the comprehensive-range of specific mitigation initiatives the City would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.18-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.18-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Orange City-1 (NEW/LOI)	City of Orange water well pumps	Existing	Drought	2.1 6.1	OEM, Engineering	High	High $120,000	Hazard Mitigation Grant Program	Long Term DOF	High	PR	PR
Orange City-2 (NEW/LOI)	City of Orange flood easement project to address stormwater runoff	Existing	Flood	1.2	OEM, Engineering	High	High $1,400,000	Hazard Mitigation Grant Program	Long Term DOF	Medium	SIP	SP
Orange City-3 (NEW/LOI)	Obtain back-up power and install to ensure continuity of operations. The following facilities are identified at this time: 1. Orange City Hall generator 2. City of Orange Fire Department generator 3. Water pumping station #2 4. Water pumping station #3 5. Water pumping station #4 6. City Hall 7. Orange Fire Headquarters 8. Orange Fire Station #2	Existing	All	1.2 6.1	OEM, City of Orange Department of Public Works	High	1.$40,000 2. $80,000 3. $25,000 4. $25,000 5. $25,000 6. $75,000 7. $50,000 8.$50,000	Hazard Mitigation Grant Program	Short Term DOF	High	SIP	ES, SP
Orange City-4 (NEW/AW)	Obtain flood easements. 1. Lakeside Avenue/High Street 2. Valley Area 3. Central Avenue (West Orange border) 4. Central Avenue (East Orange border)	Existing	Flood Severe Storm	1.2 2.2	City of Orange Department of Public Works	High	High $2,000,000 ($500,000 each)	Hazard Mitigation Grant Program	5 years	High	SIP	SP
Orange City-5 (OLD-3 and	Further secure Orange Park wells and Gist	Existing	Terrorism	2.1 6.1	United Water Company,	Medium	Medium	United Water	1 year	Medium	SIP	SP

Table 9.18-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
OLD-4)	Place wells (such as cameras, security, etc.)				City Engineering Department			Company, Grants				
Orange City-6	The hazard mitigation plan will be used to guide the addition of hazard information for inclusion in the next Master Plan update.	Both	All	All	City Planning Department	High	Low	Municipal funds	Long	Medium	SIP	SP
Orange City - 7	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable. Assess and prioritize non-structural flood hazard mitigation alternatives for at risk properties within the floodplain, including those that have been identified as repetitive loss, such as acquisition/relocation, or elevation depending on feasibility. The parameters for feasibility for this initiative would be: funding, benefits versus costs and willing participation of property owners. Implement as funding becomes available.											
	See above.	Existing	Flood, Severe Weather, Winter Storm	1.2 2.2	Engineering via NFIP FPA) with NJOEM, FEMA support	High	High	FEMA Mitigation Grant Programs and local budget (or property owner) for cost share	Long term DOF (specific project application and implementation)	High	SIP	PP

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*
OEM	*Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Costs:
Where actual project costs have been reasonably estimated:

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology)

Costs:

Low	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low	*Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium	*Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High	*Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:

has been evaluated against the project costs, and is presented as:

Low=	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low	*Long-term benefits of the project are difficult to quantify in the short term.*
Medium	*Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High	*Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.18-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Orange City-1 (NEW/LOI)	City of Orange water well pumps	1	1	1	1	1	0	1	1	-1	1	1	1	1	1	11	High
Orange City-2 (NEW/LOI)	City of Orange flood easement project to address stormwater runoff	1	1	1	0	1	0	1	1	1	1	1	0	1	0	10	High
Orange City-3 (NEW/LOI)	Obtain back-up power and install to ensure continuity of operations.	1	0	1	1	1	1	0	1	1	1	1	1	1	1	12	High
Orange City-4 (NEW/AW)	Obtain flood easements.	1	1	1	1	1	0	1	1	-1	1	1	1	1	1	11	High
Orange City-5 (OLD-3 and OLD-4)	Further secure Orange Park wells and Gist Place wells (such as cameras, security, etc.)	1	1	1	1	1	0	0	1	0	1	0	0	1	1	9	Medium
Orange City-6	The hazard mitigation plan will be used to guide the addition of hazard information for inclusion in the next Master Plan update.	1	1	1	1	1	1	1	1	0	0	1	0	0	0	10	High
Orange City-7	Support the mitigation of vulnerable structures.	1	1	1	1	1	0	0	1	1	1	1	0	0	1	10	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.18.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.18.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the City of Orange Township that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the City of Orange Township has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.18.9 Additional Comments

None at this time.

Figure 9.18-1. City of Orange Township Hazard Area Extent and Location Map 1

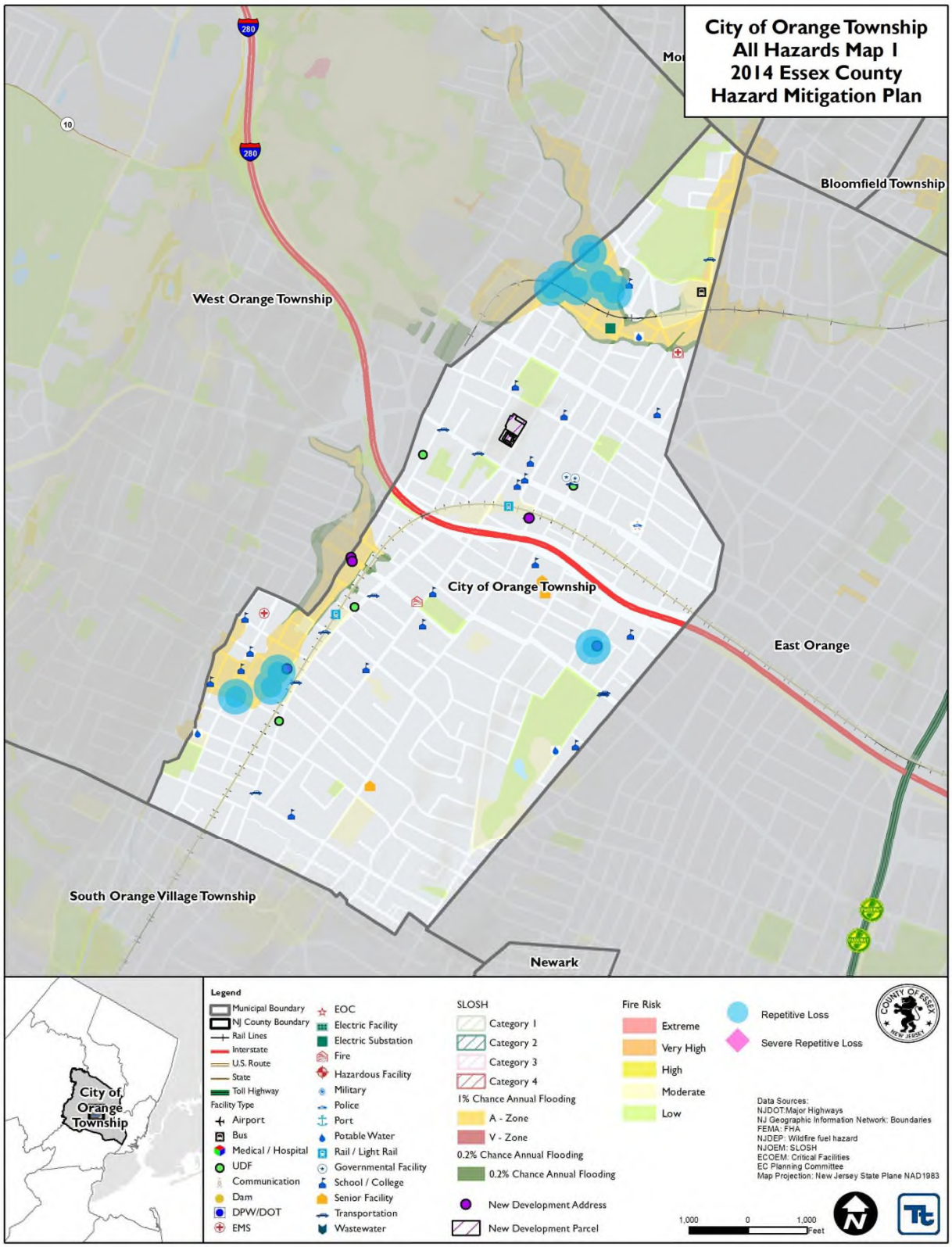
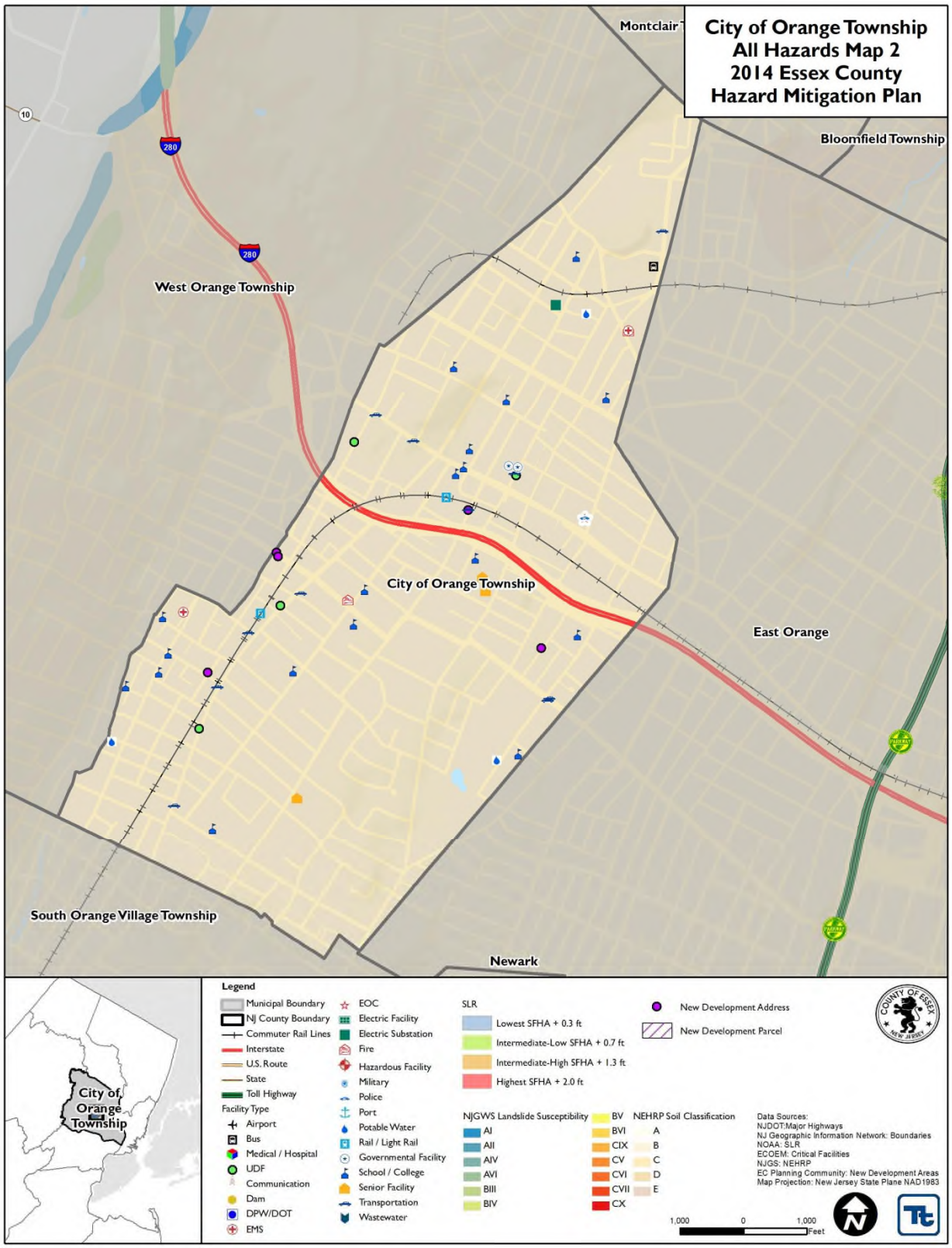


Figure 9.18-2. City of Orange Township Hazard Area Extent and Location Map 2



Action Number: **Orange City-1 (NEW/LOI)**
Mitigation Action/Initiative: City of Orange water well pumps

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	
Estimated Cost	*$120,000*
Priority*	
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Orange City-1 (NEW/LOI)**
Mitigation Action/Initiative: City of Orange water well pumps

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	-1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Orange City-2 (NEW/LOI)**
Mitigation Action/Initiative: City of Orange flood easement project

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	
Estimated Cost	*$1,400,000*
Priority*	
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Orange City-2 (NEW/LOI)**
Mitigation Action/Initiative: City of Orange flood easement project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	0	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Orange City-3 (NEW/LOI)**
Mitigation Action/Initiative: Orange City Hall generator

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	
Estimated Cost	*$40,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Orange City-3 (NEW/LOI)**
Mitigation Action/Initiative: Orange City Hall generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Orange City-3 (NEW/LOI)**
Mitigation Action/Initiative: City of Orange Fire Department generator

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	
Estimated Cost	*$80,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Orange City-3 (NEW/LOI)**
Mitigation Action/Initiative: City of Orange Fire Department generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **Orange City-3 (NEW/AW)**
Mitigation Action/Initiative: Back-up power generator installation for water pumping station #2

Assessing the Risk	
Hazard(s) addressed:	*Loss of water pumping capabilities*
Specific problem being mitigated:	*Continuance of water supply*
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	**Installation of a back- up power generator**
Action/Project Category	**Structure/ Infrastructure**
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	**Loss of function/ provision**
Estimated Cost	*$ 25,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	*City of Orange Department of Public Works*
Local Planning Mechanism	
Potential Funding Sources	*Hazard Mitigation Grant Program*
Timeline for Completion	*3 years*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3-14-14 Progress on Action/Project: Funding source identified. Funding allocated. Grant application/ spending plan being prepared at this time.

Refer to prioritization table.

Action Number: **Orange City-3 (NEW/AW)**

Mitigation Action/Initiative: Back-up power generator installation for water pumping station #2

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	-1	
Fiscal	1	
Environmental	1	
Social	-1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Orange City-3 (NEW/AW)**
Mitigation Action/Initiative: Back-up power generator installation for water pumping station #3

Assessing the Risk	
Hazard(s) addressed:	*Loss of water pumping capabilities*
Specific problem being mitigated:	*Continuance of water supply*
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	**Installation of a back- up power generator**
Action/Project Category	**Structure/ Infrastructure**
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	**Loss of function/ provision**
Estimated Cost	*$ 25,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	*City of Orange Department of Public Works*
Local Planning Mechanism	
Potential Funding Sources	*Hazard Mitigation Grant Program*
Timeline for Completion	*3 years*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3-14-14 Progress on Action/Project: Funding source identified. Funding allocated. Grant application/ spending plan being prepared at this time.

Refer to prioritization table.

Action Number: **Orange City-3 (NEW/AW)**

Mitigation Action/Initiative: Back-up power generator installation for water pumping station #3

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	-1	
Fiscal	1	
Environmental	1	
Social	-1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Orange City-3 (NEW/AW)**
Mitigation Action/Initiative: Back-up power generator installation for water pumping station #4

Assessing the Risk	
Hazard(s) addressed:	*Loss of water pumping capabilities*
Specific problem being mitigated:	*Continuance of water supply*
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	**Installation of a back- up power generator**
Action/Project Category	**Structure/ Infrastructure**
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	**Loss of function/ provision**
Estimated Cost	*$ 25,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	*City of Orange Department of Public Works*
Local Planning Mechanism	
Potential Funding Sources	*Hazard Mitigation Grant Program*
Timeline for Completion	*3 years*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3-14-14 Progress on Action/Project: Funding source identified. Funding allocated. Grant application/ spending plan being prepared at this time.

Refer to prioritization table.

Action Number: **Orange City-3 (NEW/AW)**

Mitigation Action/Initiative: Back-up power generator installation for water pumping station #4

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	-1	
Fiscal	1	
Environmental	1	
Social	-1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **Orange City- 3 (NEW/LOI)**
Mitigation Action/Initiative: Back-up power generator installation for City Hall

Assessing the Risk	
Hazard(s) addressed:	*Loss of municipal services*
Specific problem being mitigated:	*Continuance of municipal services*
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	**Installation of a back- up power generator**
Action/Project Category	**Structure/ Infrastructure**
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	**Loss of function/ provision**
Estimated Cost	*$ 75,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	*City of Orange Department of Public Works*
Local Planning Mechanism	
Potential Funding Sources	*Hazard Mitigation Grant Program*
Timeline for Completion	*3 years*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3-14-14 Progress on Action/Project: Funding source identified. Funding allocated. Grant application/ spending plan being prepared at this time.

Refer to prioritization table.

Action Number: **Orange City- 3 (NEW/LOI)**

Mitigation Action/Initiative: Back-up power generator installation for City Hall

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	-1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Orange City- 3 (NEW/AW)**
Mitigation Action/Initiative: Replacement of back-up power generator for Orange Fire Headquarters

Assessing the Risk	
Hazard(s) addressed:	*Interrupted municipal fire service*
Specific problem being mitigated:	*Continuance of municipal services*
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	**Installation of a back- up power generator**
Action/Project Category	**Structure/ Infrastructure**
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	**Loss of function/ provision**
Estimated Cost	*$ 50,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	*City of Orange Department of Public Works*
Local Planning Mechanism	
Potential Funding Sources	*Hazard Mitigation Grant Program*
Timeline for Completion	*3 years*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3-14-14 Progress on Action/Project: Funding source identified. Funding allocated. Grant application/ spending plan being prepared at this time.

Refer to prioritization table.

Action Number: **Orange City- 3 (NEW/AW)**

Mitigation Action/Initiative: Replacement of back-up power generator for Orange Fire Headquarters

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	-1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Orange City-3 (NEW/AW)**
Mitigation Action/Initiative: Replacement of back-up power generator for Orange Fire Station #2

Assessing the Risk	
Hazard(s) addressed:	*Interrupted municipal fire service*
Specific problem being mitigated:	*Continuance of municipal services*
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Response from Orange Fire HQ - Response time
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	**Installation of a back- up power generator**
Action/Project Category	**Structure/ Infrastructure**
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	**Loss of function/ provision**
Estimated Cost	*$ 50,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	*City of Orange Fire Department*
Local Planning Mechanism	
Potential Funding Sources	*Hazard Mitigation Grant Program*
Timeline for Completion	*3 years*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3-14-14 Progress on Action/Project: Funding source identified. Funding allocated. Grant application/ spending plan being prepared at this time.

Refer to prioritization table.

Action Number: **Orange City-3 (NEW/AW)**

Mitigation Action/Initiative: Replacement of back-up power generator for Orange Fire Station #2

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	-1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Orange City-4 (NEW/AW)**
Mitigation Action/Initiative: Flooding easement- Lakeside Avenue/High Street area

Assessing the Risk	
Hazard(s) addressed:	*Flooding*
Specific problem being mitigated:	*Property damage, Potential substation power disruption, and Evacuation route clearance*
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	**Storm water channel debris/ vegetation removal, debris filter installation and infrastructure repair**
Action/Project Category	**Structure/ Infrastructure**
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	**Property damage, electrical power, damage to evacuation road**
Estimated Cost	*$ 500,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	*City of Orange Department of Public Works*
Local Planning Mechanism	
Potential Funding Sources	*Hazard Mitigation Grant Program*
Timeline for Completion	*5 years*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3-14-14 Progress on Action/Project: Flooding Cause/ Cost Study Conducted. Funding source identified. Letter of Intent to Apply for Funding submitted.

Refer to prioritization table.

Action Number: **Orange City-4 (NEW/AW)**
Mitigation Action/Initiative: Flooding easement- Lakeside Avenue/High Street area

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	-1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Orange City- 4 (NEW/AW)**
Mitigation Action/Initiative: Flooding easement- Valley Area

Assessing the Risk	
Hazard(s) addressed:	*Flooding*
Specific problem being mitigated:	*Property damage, Potential substation power disruption, and Evacuation clearance*
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	**Storm water channel debris/ vegetation removal, debris filter installation and infrastructure repair**
Action/Project Category	**Structure/ Infrastructure**
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	**Property damage, electrical power loss, hindrance of evacuation efforts**
Estimated Cost	*$ 500,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	*City of Orange Department of Public Works*
Local Planning Mechanism	
Potential Funding Sources	*Hazard Mitigation Grant Program*
Timeline for Completion	*5 years*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3-14-14 Progress on Action/Project: Flooding Cause/ Cost Study Conducted. Funding source identified. Letter of Intent to Apply for Funding submitted.

Refer to prioritization table.

Action Number: **Orange City- 4 (NEW/AW)**
Mitigation Action/Initiative: Flooding easement- Valley Area

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	-1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Orange City-4 (NEW/AW)**
Mitigation Action/Initiative: Flooding easement- Central Avenue (West Orange border)

Assessing the Risk	
Hazard(s) addressed:	*Flooding*
Specific problem being mitigated:	*Property damage, and Evacuation road clearance*
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	**Storm water channel debris/ vegetation removal, debris filter installation and infrastructure repair**
Action/Project Category	**Structure/ Infrastructure**
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	**Property damage, hindrance of evacuation efforts**
Estimated Cost	*$ 500,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	*City of Orange Department of Public Works*
Local Planning Mechanism	
Potential Funding Sources	*Hazard Mitigation Grant Program*
Timeline for Completion	*5 years*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3-14-14 Progress on Action/Project: Flooding Cause/ Cost Study Conducted. Funding source identified. Letter of Intent to Apply for Funding submitted.

Refer to prioritization table.

Action Number: **Orange City-4 (NEW/AW)**

Mitigation Action/Initiative: Flooding easement- Central Avenue (West Orange border)

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	-1	
Administrative	-1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Orange City- 4 (NEW/AW)**
Mitigation Action/Initiative: Flooding easement- Central Avenue (East Orange border)

Assessing the Risk	
Hazard(s) addressed:	*Flooding*
Specific problem being mitigated:	*Property damage, and Evacuation road clearance*
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	**Storm water channel infrastructure repair**
Action/Project Category	**Structure/ Infrastructure**
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	**Property damage, hindrance of evacuation efforts**
Estimated Cost	*$ 500,000*
Priority*	*High*
Plan for Implementation	
Responsible Organization	*City of Orange Department of Public Works*
Local Planning Mechanism	
Potential Funding Sources	*Hazard Mitigation Grant Program*
Timeline for Completion	*5 years*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3-14-14 Progress on Action/Project: Flooding Cause/ Cost Study Conducted. Funding source identified. Letter of Intent to Apply for Funding submitted.

Refer to prioritization table.

Action Number: **Orange City- 4 (NEW/AW)**

Mitigation Action/Initiative: Flooding easement- Central Avenue (East Orange border)

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	
Social	-1	
Administrative	-1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Orange City-4 (OLD 3)**
Mitigation Action/Initiative: Orange Park wells

Assessing the Risk	
Hazard(s) addressed:	*Terrorism*
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	**SIP**
Goals/Objectives Met	
Applies to existing, future, or not applicable	**Existing**
Benefits (losses avoided)	
Estimated Cost	
Priority*	
Plan for Implementation	
Responsible Organization	*United Water Company, City Engineering Department*
Local Planning Mechanism	
Potential Funding Sources	*United Water Company, Grants*
Timeline for Completion	*1 year*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Orange City-4 (OLD 3)**
Mitigation Action/Initiative: Orange Park wells

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	Medium	

Action Number: **Orange City-4 (OLD 4)**
Mitigation Action/Initiative: Gist Place wells

Assessing the Risk	
Hazard(s) addressed:	*Flood and Terrorism*
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	**SIP**
Goals/Objectives Met	
Applies to existing, future, or not applicable	**Existing**
Benefits (losses avoided)	
Estimated Cost	
Priority*	
Plan for Implementation	
Responsible Organization	*United Water Company, City Engineering Department*
Local Planning Mechanism	
Potential Funding Sources	*United Water Company, Grants*
Timeline for Completion	*1 year*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Orange City-4 (OLD 4)**
Mitigation Action/Initiative: Gist Place wells

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	0	
Timeline	0	
Agency Champion	1	
Other Community Objectives	1	
Total	9	
Priority (High/Med/Low)	Medium	

9.19 Borough of Roseland

This section presents the jurisdictional annex for the Borough of Roseland.

9.19.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Tom Jacobsen, Construction Official/Floodplain Manager 300 Eagle Rock Avenue, Roseland, NJ 07068 Phone: (973) 403-6048 E-mail: construction@roselandnj.org	Gary Schall, Superintendent Public Works 300 Eagle Rock Avenue, Roseland, NJ 07068 Phone: (973) 226-6565 E-mail: gschall@roselandnj.org

9.19.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Borough of Roseland was 5,819.

Location

According to the U.S. Census Bureau, the Borough has a total land area of 3.56 square miles, of which 3.539 square miles is land and 0.021 square miles is water.

Brief History

Roseland became independent of Livingston in 1908 with the assistance of Bill Teed. With the increasing size of Roseland's population, the people needed more resources than Livingston was willing to provide. The development of Roseland is attributed to the impact of the Becker Farm with the nearly 1,200 acres it once occupied. This area is now home to many large corporate office complexes and Residential Condominium Complexes (Borough of Roseland, 2014).

Governing Body Format

Roseland Borough operates using a Borough form of government with a Mayor, Council, and Administrator (Borough of Roseland, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.19.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.19-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Avalon Bay Communities, Inc.	Residential	136 units	B: 32 L: 13	Wildfire: Moderate 0.2% Flood	App.

Table 9.19-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Avalon Bay Subdivision, Locust Avenue	Residential	130	55 Locust Avenue B: 32 L: 13	Wildfire: Low	130 unit apartment complex rentals
Eagle Rock Avenue B-1 zone office development	Commercial	1	161 Eagle Rock Avenue B: 38 L: 56	NEHRP: D	Multi-office; 6,000 square feet
Woodland Road redevelopment office site	Unknown	Unknown	9 Woodland Road B: 21 L: 1.1	None	Unknown

** Only location-specific hazard zones or vulnerabilities identified.*

9.19.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.19-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
April 14-20, 2007	Severe Storms and Inland and Coastal Flooding	DR-1694	Yes	Numerous road closures in the Borough
August 15, 2008	Lightning	N/A	N/A	Power outages throughout the Borough; lightning struck and damaged the First Aid Building and the Fire/DPW building. There was also damage to the Canoe Brook Pump Station.
March 12 – April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	Road closures throughout the Borough; some residual damage noted to footing of Second Avenue culvert and at the head wall to Locust Avenue culvert. Several homes flooded on Martha Road, Thackeray Drive, Second Avenue, Passaic Avenue, Gates Avenue, Mitchell Avenue, and Monroe Avenue. Some Commercial area flooding such as Woodland Road and Steel Court affecting structures and flooding various businesses.
December 26-27, 2010	Winter Storm and Snowstorm	DR-1954	Yes	Road closures throughout the Borough with flooding occurring on Steel Court and woodland Road affecting Businesses.
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Evacuations of several homes and moved the residents to a regional shelter. Numerous road closures. The sewer station was incapacitated due to inflow and infiltration. There was damage to the footings of the Second Avenue culvert as well. The municipal building and residents flooded. There were damages to

Table 9.19-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
				municipal structures due to roof leaks. With Commercial businesses affected and flooded in the Woodland Road Steel Court area.
October 29, 2011	Severe Storm (Snow and Ice)	DR-4048	Yes	Several residents were evacuated from their homes to alternate living arrangements. Numerous road closures throughout the Borough. Power outages to the entire Borough for up to seven days and fourteen days for residents along Pine Road. There was damage to the Canoe Brook pump station and damaged communication systems from water tank to Essex Fells Well House 1. The generator shed at the first aid building was damaged by a fallen tree. Many homes damaged or crushed due to trees.
October 26 – November 8, 2012	Hurricane Sandy	EM-3354 DR-4086	Yes Yes	Several residents were evacuated and moved to a regional shelter. Power outages throughout; roads closed; pump houses damaged from electrical surges; and tree damage to several and residential locations along Pine Road affected no power for two weeks.

9.19.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Borough of Roseland. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Borough of Roseland.

Table 9.19-3. Hazard Risk/Vulnerability Risk Ranking

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a,c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $930,976 2,500-year MRP: $20,194,012	Occasional	22	Medium
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $21,002,571	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $628,200	Rare	6	Low
Severe Storm	100-Year MRP: $526,209 500-year MRP: $4,361,507 Annualized: $45,941	Frequent	48	High
Winter Storm	1% GBS: $8,116,137 5% GBS: $40,580,685	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $41,306,200	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+

Low = Total hazard risk ranking below 20

c. Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.

d. Loss estimates for the flood and earthquake hazards represent both structure and contents.

e. The HAZUS-MH earthquake model results are reported by Census Tract

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Borough of Roseland.

Table 9.19-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Roseland, Borough of	40	16	$102,124.00	0	0	18	23	17

Source: FEMA, 2014

Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.

Note (2) Total building and content losses from the claims file provided by FEMA Region 2.

Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.19-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

Municipality	1% Annual Chance Event		0.2% Annual Chance Event	
	County Building	Potable Water Plant	County Building	Potable Water Plant
Borough of Roseland	1	1	1	1

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), Flooding within the Borough of Roseland occurs as a consequence of heavy rains usually resulting from localized thunderstorms and hurricanes during the summer and fall months. Due to the low permeability of certain soils, the high degree of development and less than adequate storm sewers in the borough, some areas are subject to frequent flooding and ponding of surface water. A damaging storm occurred on August 2, 1973, creating considerable overbank flooding along Passaic River, Foulerton's Brook, North Branch Foulerton's Brook, and Canoe Brook. This flood on Passaic River had an estimated return period of 83 years. Flooding associated with this storm caused

traffic interruptions, property damage, siltation of streambeds, and erosion of embankments. Hurricane Irene on August 29-30, 2011, caused flooding on Passaic River and was estimated to have a 16-year return period (FEMA FIS 2014).

Problem flooding locations in Roseland identified at various times include area along Foulerton's Brook at Locust, Second, Third, and Fourth Avenues, all of which have experienced flooding during severe rainstorms. There are other areas along North Branch Foulerton's Brook at Gates, Mitchell, and Godfrey Avenues, Plymouth Place, Freeman Street, and Condit Court where overbank erosion occurred during the August 1973 storm (FEMA FIS 2014).

Additionally, the municipality has identified the following hazard problems and/or problem areas:

Flood

Roseland Borough experiences flooding that affect commercial, residential and Borough-owned properties. Properties previously damaged during flood and wind events have been identified in the East, Central, and West ends of the Borough. Undersized culverts and the inability for floodwaters to pass through the areas contribute to flood issues. Properties located along the South Branch of the Foulerton Brook in the West end have experienced repetitive flood losses.

Other areas of flooding in the Borough include:

- The east end of the Borough has experienced repeated flooding in localized areas affecting both residential and borough-owned properties. These areas are identified flood areas (Zone X and AE) by the NFIP FIRM maps. Several losses re-occurred to multiple dwellings in this area related to major storms and associated flooding.

- The central area of the Borough has also experienced repeated flooding of several residential properties along the Zone X and Zone AE class areas as indicated by the NFIP FIRM maps. Several losses reported in this area as both flooding and wind damage due to storm events on a re-occurring basis.

- The west end of the Borough has repeated flooding occurring along particular sections of the brook corridor, identified as the South Branch of Foulerton Brook, and depicted within the Zone AE and Zone X on the NFIP maps. Several homes in this lower elevation of the Borough and positioned along the Brook have experienced reoccurring flooding from major storm events over the past years. Certain homes have reoccurring flooding due to an undersized channel that causes flooding of neighboring properties.

- Undersized culvert on Birch Drive in the Borough and flooding is promoted during heavy storm events. This area has been subject to repeat flooding of certain properties during various storm events due to this undersized culvert.

- Flooding along Woodland Road and Steel Court affects businesses in the Borough and various residential properties in the neighboring town of West Caldwell. This is predominately due to a run of undersized pipe.

Hurricane

As a result of both Hurricanes Irene and Sandy, flooding and high winds caused power lines to fall, trees to fall onto houses, and close roads throughout Roseland Borough. Damage was sustained at both municipal-owned properties and private residences.

9.19.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Borough of Roseland.

Table 9.19-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	Local	Construction	
Zoning Ordinance	Y	Local	Zoning	
Subdivision Ordinance	Y	Local	Borough	
Special Purpose Ordinances	N			
Growth Management	Y	Local	Planning Board	Master Plan
Floodplain Management / Basin Plan	Y	State	State	
Stormwater Management Plan/Ordinance	Y	Local, State	DPW, Eng.	Storm Water Management Plan
Comprehensive Plan / Master Plan	Y	Local	Planning Board	Master Plan and Updates
Capital Improvements Plan	Y	Local	Administration	
Site Plan Review Requirements	Y	Local, County	Zoning , Planning Board	
Habitat Conservation Plan	N			
Economic Development Plan	N			
Emergency Response Plan	Y	Local, County	OEM	
Shoreline Management Plan	N			
Post Disaster Recovery Plan	N			
Post Disaster Recovery Ordinance	N			
Real Estate Disclosure req.				
Other Codes/Ordinances: (e.g. steep slope ordinance, local waterfront revitalization plan)	Y	Local	Engineering	

Table 9.19-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Reformulation Study	Y	Local	Council	
Environmental Study	Y	Local	Councl, Planning Board	
NFIP Flood Damage Protection Ordinance				
NFIP - Freeboard				
NFIP - Cumulative Substantial Damages				
Other Plans:				

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Borough of Roseland.

Table 9.19-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	DPW Engineering
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Consulting Engineer, Construction official
Planners or engineers with an understanding of natural hazards	Y	Borough Engineer-Consultant
NFIP Floodplain Administrator	Y	Ralph Tango, P.E., Borough Engineer
Surveyor(s)	N	
Personnel skilled or trained in “GIS” applications	Y	Consulting Engineer
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	John Matheis, OEM Coordinator
Grant Writer(s)	Y	Consulting Engineer
Staff with expertise or training in benefit/cost analysis	N	
Professionals trained in conducting damage assessments	Y	Construction official

Fiscal Capability

The table below summarizes financial resources available to the Borough of Roseland.

Table 9.19-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for specific purposes	Through Specific Assessment
User fees for water, sewer, gas or electric service	No
Impact Fees for homebuyers or developers of new development/homes	No
Incur debt through general obligation bonds	
Incur debt through special tax bonds	
Incur debt through private activity bonds	
Withhold public expenditures in hazard-prone areas	
Mitigation grant programs	Yes
Other	

Community Classifications

The table below summarizes classifications for community program available to the Borough of Roseland.

Table 9.19-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	N/A
Building Code Effectiveness Grading Schedule (BCEGS)	NP	
Public Protection	NP	
Storm Ready	NP	N/A
Firewise	NP	N/A

N/A = Not applicable. NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html

- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Ralph Tango, P.E., Borough Engineer

Flood Vulnerability Summary

Roseland Borough currently has 40 NFIP policies in force with 44 residential units affected by previous flood events. Previous losses have included cars and portions of dwellings. Vulnerable structures in residential, commercial, and Borough-owned properties located in both X and AE zones. 21 claims have been made of which 17 have been closed out. Payments totaled $134,220.

Resources

Chapter X of the Local Code identifies the Construction Code Official as the floodplain manager. Responsibilities of the floodplain administrator include permit reviews for new development. Barrier to running an effective floodplain management program include not enough staff, lack of formal training in floodplain management, and budgetary constraints.

Compliance History

Not available at this time.

Regulatory

Not available at this time.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

Not identified a this time.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

The Borough has incorporated flood protection and stormwater management measures with the Master Plan, and subsequent re-examination reports, and land development ordinances. These municipal provisions reference NJDEP and FEMA regulations and standards. The Land Use Ordinances are implemented during the review of Land Development applications and building permit acquisitions.

The Township has their ordinances and flood protection measures available on their website. Please visit the Borough of Roseland's website at http://www.roselandnj.org for further information (FEMA FIS 2014).

The Borough will consider hazard mitigation projects identified in this HMP when constructing upcoming operating and capital improvement budgets.

9.19.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.19-9. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Birch Drive Culvert Replacement project. Please provide additional information outlining this project.	No Progress. Discontinued.	This project was investigated by the Borough and brought to the NJDEP for a preliminary review of the project to obtain the likelihood of permit acquisition for the replacement of the culvert. Unfortunately, NJDEP indicated a permit for increasing the culvert to a correctable size would not be obtainable. Therefore, this project will be discontinued.
2: Eagle Rock Avenue Bridge Replacement Project over Passaic River.	No Progress. Carried forward.	Funding was given to Morris County to replace the bridge but it will not be elevated under this project. This initiative will be carried over to the current mitigation strategy.
3: Steel Court and Woodland Road Drainage System Improvement.	No Progress. Carried forward.	No progress in physical replacement but channel was cleaned and a bar rack installed to prevent future clogging internal to pipe. This initiative will be carried over to the current mitigation strategy.
4: Second Avenue Flooding Relief Project.	No Progress. Carried forward.	Channel clearing completed and County and Borough have performed structural review of Culvert. Boswell did a Preliminary Study for most effective method improvements on behalf of the County. This initiative will be carried over to the current mitigation strategy.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The municipality identified the following mitigation initiatives that have been completed; however, they were not included in the previous mitigation strategy:

- The raising of the Passaic River Bridge at Eagle Rock Avenue, joining Essex County to Morris County, and to eliminate roadway closures of Eagle Rock Avenue during severe rain events. The bridge is scheduled to be repaired, the bridge is not being raised to eliminate the flooding conditions to which occur. Morris County was given the funding to handle the reconstruction of the bridge, not Essex County. This project was a regional project as it would assist in continued use of a major commuter traffic conveyance through the County Roadway and by-pass for Route 280. Given the

investment of funds already issued by the government for the repair of the bridge, with insufficient change in elevation that will not help in abating flooding conditions in this area, and whereas further adjustment and modification to the bridge would have to be done requiring additional funding for alternate construction and floodway modifications to prevent flooding during heavy storm conditions. This project shall be reduced and the request modified to changes to the embankments boarding the roadway immediately on the Roseland side of the bridge to hold back floodwaters from entering the road and block the access to traffic for extended periods of time after a given heavy rain event.

- Roseland has recognized the need for proper floodplain management, and the community adopted a resolution on April 15, 1975. This resolution established land use and control measures to reduce all new construction or substantial improvements, including prefabricated and mobile homes. Any new construction or substantial improvements are to be made reasonably safe from flooding and to be located so as to minimize flood damage (FEMA FIS 2014).

Proposed Hazard Mitigation Initiatives for the Plan Update

The Borough participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.19-11 summarizes the comprehensive-range of specific mitigation initiatives the Borough would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.19-12 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.19-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Roseland-1 (NEW/LOI)	Obtain backup power to ensure continuity of operations of transportation/infrastructure. The following has been identified at this time: Roseland traffic signal generators.	NA	All	1.2 2.1	OEM	High	Medium $15,500	HMGP	Short Term DOF	High	SIP	ES
Roseland-2 (NEW/LOI)	Roseland critical facilities fuel storage tanks upgrade.	NA	All	1.2 2.1	OEM	High	High $104,700	HMGP	Short Term DOF	High	SIP	SP
Roseland-3 (OLD 2)	Eagle Rock Avenue Bridge Replacement Project over Passaic River. See accompanying action worksheet later in this annex.	Existing	Flood	1.2 2.1	Counties of Essex and Morris, Roseland Borough	High	High	FEMA mitigation and 25% County matching	Depends on funding	Medium	SIP	SP
Roseland-4 (OLD 3)	Address the severe flooding conditions in the area of Woodland Road and Steel Court which effects both Roseland and West Caldwell properties; installation of a second pipe for a distance of 150 feet	Existing	Flood, Severe Storm	1.2	OEM, Engineering Department	High	High	HMGP, FMA, PDM, State Grant opportunities	Long Term DOF	Medium	SIP	SP
Roseland-5 (OLD 4)	Second Avenue Flooding Relief Project. See accompanying action worksheet later in this annex.	Existing	Flood	1.2 2.1	County of Essex, Roseland Borough	High	High	FEMA mitigation and 25% County matching share.	Depends on funding	High	SIP	SP
Roseland-6	Regional stream corridor study through the lower elevations of the South Branch of Foulteron Brook encompassing three county-owned culverts at road crossings.	NA	Flood	1.2 2.2	OEM Engineering Dept	High	Medium	HMGP, FMA, PDM	Long Term DOF	Medium	LPR	PR
Roseland-7	Obtain backup power to ensure continuity of operations at critical facilities. The following	Existing	All	1.2 6.1	OEM	High	Medium	HMGP	Short Term DOF	High	SIP	ES

Table 9.19-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	have been identified at this time: Emergency back-up power for the OEM building (140 Eagle Rock Avenue).											
Roseland-8	The Borough will consider hazard mitigation projects identified in this HMP when constructing upcoming operating and capital improvement budgets.	Both	All	All	Borough	High	High-Low	Depends on the project	Short	Medium	LPR	PR

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*
OEM	*Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Costs:
Where actual project costs have been reasonably estimated:

Low	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low	*Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium	*Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High	*Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low	*Long-term benefits of the project are difficult to quantify in the short term.*
Medium	*Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High	*Project will have an immediate impact on the reduction of risk exposure to life and property.*

Costs: *Benefits:*

adequate to cover the costs of the proposed project.

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.19-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Roseland-1 (NEW/LOI)	Obtain backup power to ensure continuity of operations of transportation/infrastructure: Roseland traffic signal generators.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Roseland-2 (NEW/LOI)	Roseland critical facilities fuel storage tanks upgrade.	1	1	1	1	1	1	1	1	1	1	1	1	1	0	13	High
Roseland-3 (OLD 2)	Eagle Rock Avenue Bridge Replacement Project over Passaic River.	1	1	1	1	1	1	0	0	0	1	1	0	1	0	10	Medium
Roseland-4 (OLD 3)	Address the severe flooding conditions in the area of Woodland Road and Steel Court which effects both Roseland and West Caldwell properties; installation of a second pipe for a distance of 150 feet	1	1	1	1	1	1	0	0	1	1	1	0	1	0	10	Medium
Roseland-5 (OLD 4)	Second Avenue Flooding Relief Project.	1	1	1	1	1	1	1	1	1	1	1	1	1	0	13	High
Roseland-6	Regional stream corridor study through the lower elevations of the South Branch of Foulteron Brook encompassing three county-owned culverts at road crossings.	1	1	1	1	1	1	0	0	0	1	1	0	1	1	10	Medium
Roseland-7	Obtain backup power to ensure continuity of operations at critical facilities. The following have been identified at this time: Emergency back-up power for the OEM building (140 Eagle Rock Avenue).	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High
Roseland-8	The Borough will consider hazard mitigation projects identified in this HMP when constructing upcoming	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	High

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
	operating and capital improvement budgets.																

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.19.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.19.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Borough of Roseland that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Borough of Roseland has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.19.9 Additional Comments

None at this time.

Figure 9.19-1. Borough of Roseland Hazard Area Extent and Location Map 1

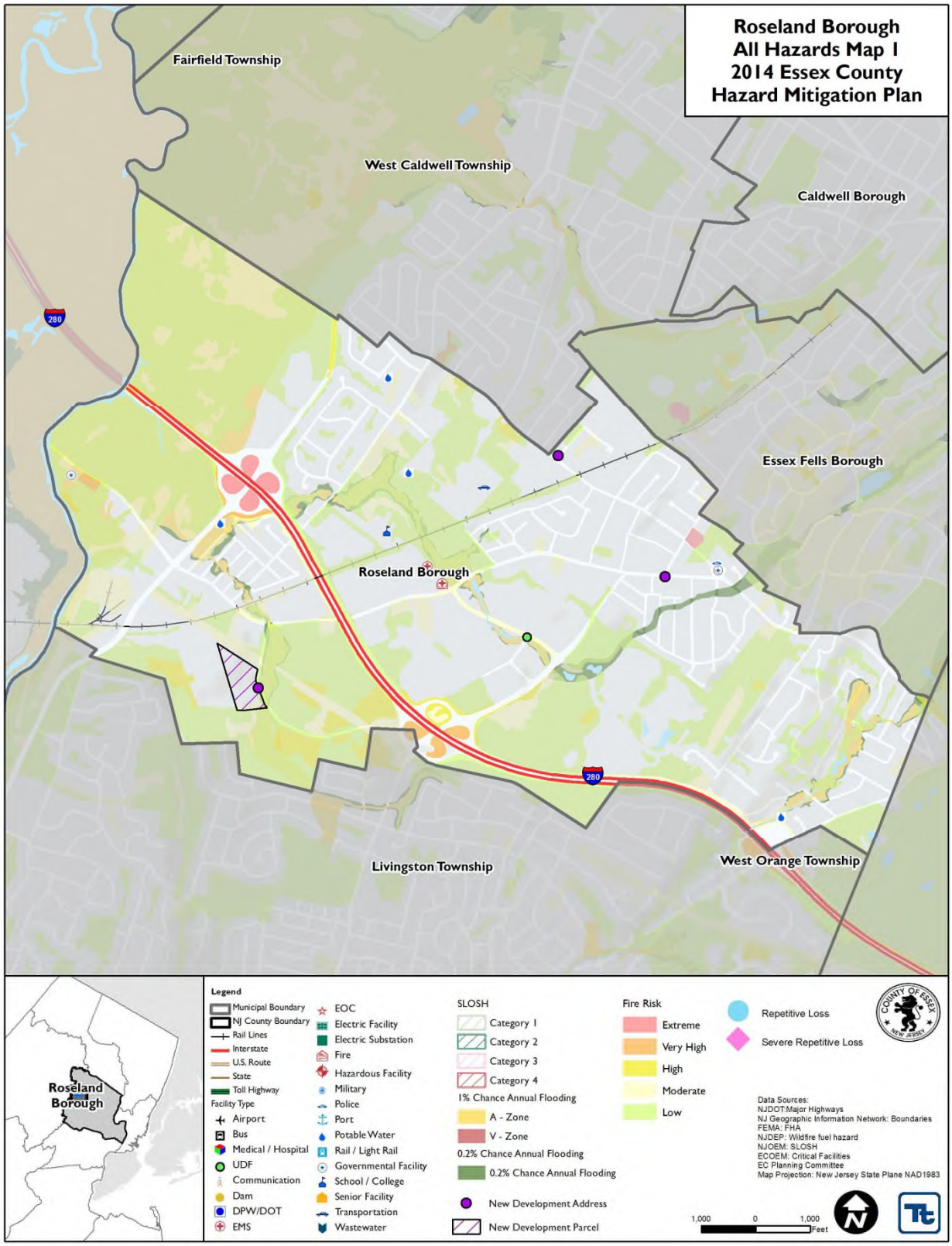
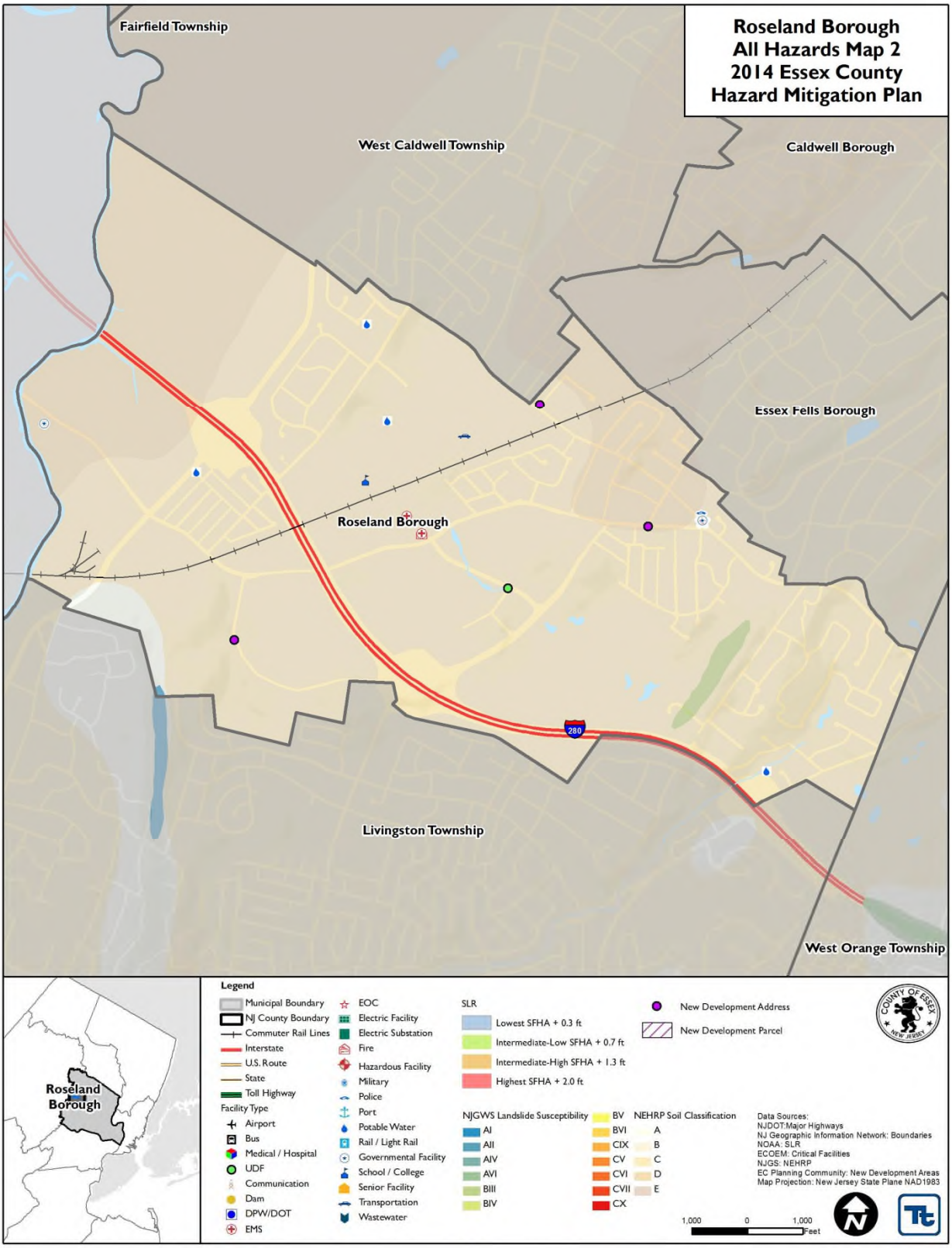


Figure 9.19-2. Borough of Roseland Hazard Area Extent and Location Map 2



Action Number: Roseland-1 (NEW/LOI)

Mitigation Action/Initiative: Roseland traffic signal generators

Assessing the Risk	
Hazard(s) addressed:	Multiple Within Roseland
Specific problem being mitigated:	Traffic Control During Extended Power Outages Storm events have caused accidents and required police personnel to direct traffic following a storm event. During such storms Police are needed elsewhere to support public safety of life threatening situations, requiring their specific training.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Retain in OEM Inventory 5400 Watt Gasoline Powered Generators one for each location deemed critical by the OEM Office and Police Chief where Major County Roads intersect within Roseland and experience heavy volumes of traffic daily.
Action/Project Category	SIP
Goals/Objectives Met	Yes with the acquisition of the generators power can be restored to these critical signal locations keeping manpower from our Police and OEM office free to do the emergency tasks during a particular condition.
Applies to existing, future, or not applicable	Yes to Existing and Future
Benefits (losses avoided)	Critical manpower saved, no accidents due to flashing or completely dead signals during power outages and heavy periods of traffic and restoration of the original signal timing that is critical in so densely congested roadways
Estimated Cost	$15,500
Priority*	High
Plan for Implementation	
Responsible Organization	Police – OEM - DPW
Local Planning Mechanism	OEM Disaster Recovery and Mitigation Plan
Potential Funding Sources	FEMA Grant
Timeline for Completion	ASAP upon receipt of funding
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

**Refer to prioritization table.*

Action Number: Roseland-1 (NEW/LOI)

Mitigation Action/Initiative: Roseland traffic signal generators

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Safety for all motoring public traveling on the over crowded roadways
Property Protection	1	Property of Vehicles and Adjacent property is protected when controlling major intersections
Cost-Effectiveness	1	Very Cost Effective based on cost verses results of safety to motorists
Technical	1	Not Technical in any form, no draw backs
Political	1	Nothing Political about it
Legal	1	No Legal Issue
Fiscal	1	
Environmental	1	No Environmental issue, the generators are removable from the site and not stored on site, and used only during an event.
Social	1	No Social Impact
Administrative	1	No Administrative Oversight Needed. Administration is agreeable provided we receive the grant funding for the generators
Multi-Hazard	1	Solves manpower issue as well as safety to motorists. Helps many individuals not only from Roseland but transient commuters including protection of private and public property including immediate motorists
Timeline	1	Would like to move forward with the purchase ASAP provided funding is issued, and retain the generators in stock and make ready for every next power loss affecting traffic control.
Agency Champion	1	OEM, Police, DPW
Other Community Objectives	1	Assists with the Evacuation Plan designed by OEM
Total	14	
Priority (High/Med/Low)	High	

Action Number: Roseland-2 (NEW/LOI)

Mitigation Action/Initiative: Roseland critical facilities fuel storage tanks upgrade

Assessing the Risk	
Hazard(s) addressed:	Multiple Sewer Pump Stations and Water Distribution Storage Tank with Pumps
Specific problem being mitigated:	Recent storm events have depleted resources for fuel due to damage and power outage.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Ensure fuel is available following an event. This includes all three sewer pump stations and the water storage tank with distribution pumps Install additional diesel fuel storage tanks to operate stationary generators on site at each of the locations to increase the capacity between deliveries during disasters affecting power loss to these facilities. Or Increase the size of the main Diesel and Gasoline Tank on site at DPW yard 300 Eagle Roc Avenue from which the other tanks may be fueled by jocky tanks run by DPW workers. Increase in size of both Gasoline and Diesel tanks on site at the DPW will allow greater storage and longer support of all emergency vehicles and critical facilities such as sewer pump stations and water distribution from central tank location via pumps.
Action/Project Category	SIP
Goals/Objectives Met	Yes but more so under the upgrade to the central storage tank scenario rather than individual tanks on each independent location of each pump station or water storage site.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Property Damage, Environmental Damage, Life Safety, Loss of Critical Care and life sustaining element.
Estimated Cost	$104,700
Priority*	High
Plan for Implementation	
Responsible Organization	OEM, DPW
Local Planning Mechanism	OEM Disaster Mitigation Plan and Recovery Plan
Potential Funding Sources	FEMA Grant
Timeline for Completion	ASAP
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

**Refer to prioritization table.*

Action Number: Roseland-2 (NEW/LOI)

Mitigation Action/Initiative: Roseland critical facilities fuel storage tanks upgrade

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Water distribution is critical during all conditions as often is sanitary sewer conveyance.
Property Protection	1	Protection of Environment and Associated Property on many levels
Cost-Effectiveness	1	Very Cost Effective for the price and a great number of individuals benefit from the improvement
Technical	1	Somewhat Technical requires plans by engineer
Political	1	Not Political
Legal	1	Not Legal
Fiscal	1	
Environmental	1	Will not harm environment, but not installing them can lead to environmental damage
Social	1	
Administrative	1	Already Approved by Administrative if we receive Grant for upgrade of tanks
Multi-Hazard	1	Yes, Services all parties and users of both Water and Sewer services including public safety which are needed on a continual basis during any of our recent disasters.
Timeline	1	ASAP
Agency Champion	1	OEM, DPW, Police, Fire, First Aid
Other Community Objectives	0	Meets the intent of the OEM Hazard Mitigation Plan and Disaster Recovery Plan
Total	`13	
Priority (High/Med/Low)	High	

Action Number: Roseland-3 (OLD 2)
Mitigation Action/Initiative: Eagle Rock Avenue bridge replacement project over Passaic River

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1 Morris County has been awarded funding to replace the bridge but it will not be any higher, just rebuilt. The bridge should have been elevated to accommodate greater capacity to avoid roadway flooding and block access through this major corridor used by both emergency services and general commuters
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Adding elevation to the existing roadway surface and adjacent road side earthen shoulders along the existing low point at the approach to the Passaic River bridge will permit traffic to continue using the road during major storm events. Roadway has been closed for up to seven days during most major rain events, requiring constant use of live police officers for traffic control due to excessively heavy traveled County route and alternate route for Route 280.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	
Estimated Cost	High
Priority*	
Plan for Implementation	
Responsible Organization	County of Essex, Roseland Borough
Local Planning Mechanism	
Potential Funding Sources	FEMA mitigation and 25% County matching share.
Timeline for Completion	Depends on funding
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

*Refer to prioritization table.

Action Number: Roseland-3 (OLD 2)

Mitigation Action/Initiative: Eagle Rock Avenue bridge replacement project over Passaic River

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	0	
Environmental	0	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	Medium	

Action Number: Roseland-4 (OLD 3)

Mitigation Action/Initiative: Steel Court and Woodland Road drainage system improvement

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Duplicating an existing pipe and adding a second pipe of equal size to the discharge point of the open channel drainage conveyance will aid in containing storm water below grade and within the MS drain system reducing the surface flooding currently affecting both Roseland properties and West Caldwell properties. Adding a trash rack to this head wall water source to intercept the debris will also help in maintain adequate flow of the stormwater.
Action/Project Category	SIP
Goals/Objectives Met	Getting all storm water below grade and off the open street will prevent major flooding of businesses in the area, which are greatly affected with each passing storm.
Applies to existing, future, or not applicable	Existing Flood Condition
Benefits (losses avoided)	Avoids major financial loss to businesses in the area where storm water affects their building and disrupts tenants on a regular basis.
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	County of Essex, Roseland Borough
Local Planning Mechanism	
Potential Funding Sources	FEMA mitigation and 25% County matching share.
Timeline for Completion	Depends on funding
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

*Refer to prioritization table.

Action Number: Roseland-4 (OLD 3)

Mitigation Action/Initiative: Steel Court and Woodland Road drainage system improvement.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Cause access issues to several businesses in the area restricting ease of access to the area and most buildings along steel court and some portions of Woodland Road.
Property Protection	1	Much damages is caused to several buildings including residential homes located in West Caldwell, each time a moderate to heavy storm occurs
Cost-Effectiveness	1	Very Cost effective compared to the results of the mitigation benefit
Technical	1	Will need Engineer Planning
Political	1	Would help settle complaints to Political groups in Both Roseland and West Caldwell
Legal	1	Not
Fiscal	1	
Environmental	1	Helps the Environment
Social	1	Creates social grace and harmony between West Caldwell and Roseland on several levels
Administrative	1	Approved provided grant is issued covering funding needed
Multi-Hazard	1	Multi Hazard due to affects on dwelling units in both municipalities.
Timeline	1	ASAP provided funding is issued
Agency Champion	1	OEM, DPW, Police and Fire
Other Community Objectives		
Total	13	
Priority (High/Med/Low)	High	

Action Number: Roseland-5 (OLD 4)

Mitigation Action/Initiative: Second Avenue flooding relief project

Assessing the Risk	
Hazard(s) addressed:	Flooding of Residential Homes and Businesses during moderate to heavy rain events.
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Removing - Repairing – Replacing the Second Avenue Culvert reduces the measure of flooding due to the undersized culvert at this location during major storm events. Increasing the capacity of conveyance through this culvert and corridor will reduce or eliminate flooding of seven homes currently affected. Re-establishing the embankment retainage of gabions which have fallen into the water way in the upper reaches of the corridor would prevent further erosion.
Action/Project Category	SIP
Goals/Objectives Met	Eliminate restriction of flow and update broken and washed out barrel type culvert bridging Borough access to critical exist points during a disaster as well as eliminate the flooding conditions affecting residential and commercial sites
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Damages and loss to residential properties and business
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	County of Essex, Roseland Borough
Local Planning Mechanism	Roseland and County OEM, Engineering, DPW
Potential Funding Sources	FEMA mitigation and 25% County matching share.
Timeline for Completion	Depends on funding
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

*Refer to prioritization table in the following subsection.

Action Number: Roseland-5 (OLD 4)

Mitigation Action/Initiative: Second Avenue flooding relief project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Can affect Life Safety based on severity of flow which surpasses 10' per second and approaches 14' per second in this corridor with some storms, water overtops banks and travels at a high velocity down streets and driveways into homes and has surrounded businesses
Property Protection	1	Would protect loss of property
Cost-Effectiveness	1	Based on Anticipated Results – County has performed advanced study of condition and the need to replace or remove the culvert in its entirety
Technical	1	Every, Requires Engineer Design and Permitting from the NJDEP
Political	1	Yes but passed that point as everyone has approved this
Legal	1	No
Fiscal	1	
Environmental	1	No effect on Environment, all water shall be contained within the brook corridor
Social	1	
Administrative	1	Accepted project, just require source of funding.
Multi-Hazard	1	Affects both residential and business
Timeline	1	County would like to act on it as soon as grant finding comes through and DEP permits are in hand (expected shortly).
Agency Champion	1	Borough of Roseland Mayor and Council, Residents, Business Owners, County of Essex, OEM County and Local, Local DPW
Other Community Objectives	0	
Total	13	
Priority (High/Med/Low)	High	

9.20 Township of South Orange Village

This section presents the jurisdictional annex for the Township of South Orange Village.

9.20.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Adam D. Loehner, Dep. Emergency Management Coordinator/Dep. Village Administrator 101 South Orange Avenue, South Orange, NJ 973-378-7715 ext. 7719 aloehner@southorange.org	Salvatore Renda, Village Engineer 101 South Orange Avenue, South Orange, NJ 973-378-7715 ext. 3990 srenda@southorange.org

9.20.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of South Orange Village was 16198.

Location

According to the U.S. Census Bureau, the Township has a total land area of 2.857 square miles, of which 2.855 square miles is land and 0.002 square miles is water.

Brief History

The land of South Orange Village Township was originally part of property acquired by Robert Treat in 1666 from the Lenape Tribe. As the population grew, the rail lines on New Jersey transit expanded to South Orange allowed commuters to get directly to Penn Station in New York City 30 minutes. Seton Hall University is in the Township of South Orange Village (The Township of South Orange Village, 2014).

Governing Body Format

The Township of South Orange Village operates using a Board of Trustees with six members and a Village President (The Township of South Orange Village, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.20.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.20-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
The Gateway	Residential	57 units	9-25 W. South Orange Avenue Block 1904, Lot 8 & 10	None	57 Apartments / 9100ft retail space
Third & Valley Urban Renewal, LLC	Mixed-Use	215 units	B: 2304 L: 8	None	App/Rej.
Third & Valley Urban Renewal, LLC	Mixed-Use	215 units	B: 2304 L: 6	None	App/Rej.
Third & Valley Urban Renewal, LLC	Mixed-Use	215 units	B: 2304 L: 7	None	App/Rej.
Third & Valley Urban Renewal, LLC	Mixed-Use	215 units	B: 2304 L: 3	Wildfire: Moderate	App/Rej.
Third & Valley Urban Renewal, LLC	Mixed-Use	215 units	B: 2304 L: 9	Wildfire: Moderate	App/Rej.
Third & Valley Urban Renewal, LLC	Mixed-Use	215 units	B: 2304 L: 5	None	App/Rej.
Third & Valley Urban Renewal, LLC	Mixed-Use	215 units	B: 2304 L: 4	None	App/Rej.

** Only location-specific hazard zones or vulnerabilities identified.*

9.20.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.20-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Extensive Village-wide utility outages, downed trees, road closures.
October 29, 2011	Severe Storm	DR-4048	Yes	Daytime sheltering, extensive Village-wide road closures and utility outages.
October 26 – November 8, 2012	Hurricane Sandy	EM-3354 DR-4086	Yes Yes	Sheltering, extensive Village-wide utility outages for 9-14 days, extensive fallen trees and road closures, damage to sidewalks, curbs and roads from trees, numerous homes and buildings damaged by fallen trees.

9.20.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of South Orange Village. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Township of South Orange Village.

Table 9.20-3. Hazard Risk/Vulnerability Risk Ranking

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a,c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $2,260,413 2,500-year MRP: $52,656,109	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $146,547	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $1,869,000	Rare	6	Low
Severe Storm	100-Year MRP: $2,450,633 500-year MRP: $14,352,353 Annualized: $172,024	Frequent	48	High
Winter Storm	1% GBS: $18,871,123 5% GBS: $94,355,613	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $16,598,600	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. *Building damage ratio estimates based on FEMA 386-2 (August 2001)*
b. *The valuation of general building stock and loss estimates was based on custom inventory for the municipality.*
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20
c. *Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of South Orange Village.

Table 9.20-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
South Orange, Township of	67	15	$106,783.00	0	0	0	0	67

Source: FEMA, 2014

Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.

Note (2) Total building and content losses from the claims file provided by FEMA Region 2.

Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case

Critical Facilities

The municipality does not have any critical facilities located in the 1% or 0.2% annual chance flood boundaries.

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), due to the topography of the East Branch Rahway River, and the Township of South Orange Village's proximity to the headwaters of the river, flood peaks occur rapidly. The flood cycle usually lasts a matter of hours, and, in most cases, lasts less than a day. Local drainage area flooding in Township of South Orange Village follows the same pattern. The major flood damage has occurred in the business community, where the flood waters have entered first-floor levels of retail and service type establishments and businesses; in addition, flood damage has occurred to the basements of residences. Because the Village is highly congested, even minor flooding causes damage to both public and private property and create traffic hazards (FEMA FIS 2014).

The Rahway River and its tributaries are located in the North Atlantic Storm Belt and flooding of the East Branch Rahway River in South Orange occurs frequently. Overflow of the East Branch Rahway River causes a flood problem in the Township of South Orange Village, between the northern and southern boundaries of the village, for residential, commercial, industrial, and public facilities. The principal cause of the flooding is the inability of the existing channel to accommodate the precipitation runoff. This is partly due to bridge constrictions and low channel capacities caused by encroaching development (FEMA FIS 2014).

The Township of South Orange Village has sustained damages from floods; the historic floods occurred during July 1901, February 1902, October 1903, August 1927, July 1938, August 1955, May 1968, September 1971, and August 1973. The damaging storms on record occurred in South Orange during the floods of July 1938. The historic flooding occurred during the storm of October 1903; however, because of the absence of

development in the community, damages were not as great as those that occurred during the August 1973 flood (FEMA FIS 2014).

Additionally, the municipality has identified the following hazard problems and/or problem areas:

Flood

Ludington Brook poses localized flooding threats to neighboring properties. There are currently discussions with West Orange, Essex County and South Orange to address the issues.

The Department of Public Works garage and office continuously flood as a result of the property being in the floodplain.

9.20.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of South Orange Village.

Table 9.20-5. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y		Building	UCC
Zoning Ordinance	Y		Engineering and Zoning	Chapter 92 Village Ordinance
Subdivision Ordinance	Y		Planning / Zoning Board	Chapter 92 Village Ordinance
NFIP Flood Damage Prevention Ordinance				
Cumulative Substantial Damages				
Freeboard				
Growth Management				
Floodplain Management / Basin Plan	Y		US Army Corp of Engineers	Adopted in the early 1970s
Stormwater Management Plan/Ordinance	Y		Engineering	Adopted March 28, 2005
Comprehensive Plan / Master Plan/ General Plan	Y		Village Planner	Adopted November 2006
Capital Improvements Plan				
Site Plan Review Requirements	Y		Village Planner	Adopted 2010
Open Space Plan	Y		Village Planner	Adopted December 6, 2004
Stream Corridor Management Plan	Y		Engineering / DPW	Adopted February 2007
Watershed Management or Protection Plan				
Economic Development Plan	Y		Village Planner	Adopted October 2007
Comprehensive Emergency Management Plan	Y			
Emergency Response Plan				
Post Disaster Recovery Plan				
Post Disaster Recovery Ordinance				

Table 9.20-5. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (Code Chapter, date of adoption, name of plan, explanation of authority, etc.)
Real Estate Disclosure Requirement				
Other: Redevelopment Plan	Y		Village Planner	Adopted November 2009

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of South Orange Village.

Table 9.20-6. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Engineering & Planner
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineering & Building
Planners or engineers with an understanding of natural hazards	Y	Engineering
NFIP Floodplain Administrator	Y	Sal Renda, Engineer
Surveyor(s)	N	
Personnel skilled or trained in “GIS” applications	Y	Engineering
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Administration/Public Safety
Grant Writer(s)	Y	Administration
Staff with expertise or training in benefit/cost analysis	N	
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the Township of South Orange Village.

Table 9.20-7. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don’t Know)
Community development Block Grants (CDBG)	Yes – Administration
Capital Improvements Project Funding	Yes – Administration / Board of Trustees
Authority to Levy Taxes for specific purposes	Yes – Village Board of Trustees
User fees for water, sewer, gas or electric service	Yes – East Orange Water Commission/Tax Collector/PSE&G
Impact Fees for homebuyers or developers of new development/homes	No
Incur debt through general obligation bonds	Yes – Administration/Board of Trustees
Incur debt through special tax bonds	No
Incur debt through private activity bonds	No

Table 9.20-7. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Withhold public expenditures in hazard-prone areas	No
Mitigation grant programs	No
Other	

Community Classifications

The table below summarizes classifications for community program available to the Township of South Orange Village.

Table 9.20-8. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	N/A
Building Code Effectiveness Grading Schedule (BCEGS)	-	
Public Protection	-	
Storm Ready	NP	N/A
Firewise	NP	N/A

N/A = Not applicable. NP = Not participating. - = Unavailable.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Sal Renda, Engineer

Flood Vulnerability Summary

Township of South Orange Village does ot currently maintain a list or inventory of flood-damaged properties or the interest expressed by property owners to complete mitigation projects at flood-damaged properties.

Resources

The position of floodplain manager is a shared responsibility between the Engineering, Department of Public Works, and Administration in Township of South Orange Village. The Engineering Department provides both permit review and inspection services. Currently there is no formal education and outreach program to support the NFIP within Township of South Orange Village. The floodplain manager, Sal Renda, feels he is adequately supported and trained to fulfill the position. There are currently no barriers to running an effective floodplain management program. Additional training and information on floodplain management would be welcomed.

Compliance History

Township of South Orange Village is currently in good standing in the NFIP. There is no knowledge of when the most recent Community Assistance Visit (CAV) took place. At this time, the current floodplain manager does not see a need to schedule a CAV.

Regulatory

Floodplain management regulations and ordinances meet FEMA and New Jersey minimum requirements. There are additional local ordinances, plans, and programs that support the enforcement of floodplain management in Township of South Orange Village. Though Township of South Orange Village is not currently a participating community in the Community Rating System (CRS), receiving additional information would be welcomed.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

Previous actions that are now on-going programs and capabilities are described below. Refer to Table 9.20-11 presented later in this annex.

The municipality has identified the following mitigation projects/activities that have been completed:

Continued maintenance on the East Branch of the Rahway River. Area improved by the Army CORP of Engineers.

Ongoing storm system cleaning and monitoring.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

The Township of South Orange Village has a Master Plan which is the legal roadmap to planning for appropriate and safe land development. In addition, the Township has a Smart Growth Plan. The Smart Growth Plan considers the locations of floodplains and steep slopes and discusses them in text. Further projects are considered and discussed for flood control and flood storage.

During this planning process, the Township was in the process of soliciting proposals for the preparation of a new Master Plan which is expected to address planning and land use mechanisms. The Township will be using the hazard mitigation plan as a guide when updating their Master Plan. Please refer to Table 9.20-10 regarding additional details.

The Township has their ordinances and flood protection measures available on their website. Please visit the Township of South Orange Village's website at http://www.southorange.org for further information (FEMA FIS 2014).

The Township will develop a public outreach program to inform citizens of hazards as an additional way to integrate mitigation into day-to-day operations. Refer to their new mitigation action in Table 9.20-10.

9.20.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.20-9. Past Mitigation Initiative Status

Description	Status	Review Comments
1: DPW building flooding.	No Progress	No funding available / Reviewing options to raise or relocate facility This is included as a new action in the updated mitigation strategy below.
2: Sewer system problems – joint I&I study with adjacent communities and Essex and Union Counties.	No Progress / Discontinued	Much larger project than originally expected. Should be done on a county-wide scale. No funding available. This initiative will not be included in the new mitigation strategy.
3: Flooding and severe winter storm impact South Orange Ave., cuts off major route for emergency vehicles.	No Progress / Discontinued	A more concentrated cleanup effort on major emergency routes. This initiative will not be included in the new mitigation strategy.
4: Major university, electrical substations, railway stations, telephone switching stations affected by flooding.	No Progress / Discontinued	Working closely with our partners to protect our infrastructure. Each partner is taking individual steps to mitigate floor related issues. This initiative will not be included in the new mitigation strategy.
5: Forest fire issues	No Progress / Discontinued	Has not been an issue. This initiative will not be included in the new mitigation strategy.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The Township has completed the following initiatives; however, these were not identified in the previous mitigation strategy:

- 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 Township of South Orange Village, New Jersey (FEMA FIS 2014).

- The area around the Township of South Orange Village 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 (FEMA FIS 2014).

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.20-10 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.20-11 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.20-9. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Township of South Orange Village-1 (NEW/LOI)	Obtain back up power to ensure continuity of operations. The following have been identified at this time: Local infrastructure-Generators at 2 sites: South Orange Village Hall & South Orange Rescue Squad Buildings	Existing	All	1.2 6.1	Village Manager OEM	High	High $242,500	HMGP	Short Term DOF	High	SIP	ES
Township of South Orange Village-2 (OLD 1)	South Orange Village retrofit/elevation DPW building which is located in a floodplain.	New and Existing	Flood	2.1 6.1 2.1	Village Engineering Department DPW	High	High $450,000	HMGP, FMA, PDM	Long Term DOF	High	SIP	SP PP
Township of South Orange Village-3	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what they can do in the way of mitigation and preparedness, including flood insurance.	N/A	All Hazards		Town/Village Supervisor's Office	Medium	Low	Municipal Budget; HMA programs with local or county match	Short	High	EAP	PR
Township of South Orange Village-4	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable. Phase 1: Identify appropriate candidates and determine most cost-effective mitigation option (in progress). Phase 2: Work with the property owners to implement selected action based on available funding from FEMA and local match availability.											
	See above.	Existing	Flood, Coastal Erosion, Coastal Storm, Severe Storm, Wildfire, Winter Storm		Town/Village Engineering via NFIP FPA) with NJOEM, FEMA support	High	High	FEMA Mitigation Grant Programs and local budget (or property owner) for cost share	Ongoing (outreach and specific project identification); Long term DOF (specific project application and implementation)	High	SIP	PP
Township of South	Develop and implement a post-event damage assessment program, including the following elements: • Conduct public outreach/education (see Public Education and Awareness Initiatives above) to inform property owners of the need to report property damage and obtain required											

Table 9.20-9. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Orange Village-5	permitting when making repairs. • Develop and organize local resources to conduct post-event damage assessments, including substantial damage determinations as warranted. • Develop an inventory (file system and/or database) of losses (incl. loss of service, property damage, economic losses, etc.) as reported to and/or identified by the Village (e.g. building permit process).											
	See above.	Existing	Flood; Severe Storm; Severe Winter Storm; Coastal Storm		Engineering (Town/Village NFIP FPA); Town/Village Supervisor's Office	Medium – High (life Safety; Increased eligibility for mitigation grant funding)	Low-Medium	Municipal Budget	Short	High	LPR, EAP	PR
Township of South Orange Village-6	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.	N/A	Flood		Town/Village NFIP FPA, as fully supported by local government officials	Medium - High	Low	Municipal Budget	Short (year 1)	High	LPR, EAP	PR
Township of South Orange Village-7	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).	N/A	Flood		Town/Village NFIP FPA	Low - Medium	Low	Municipal Budget	Short (year 1)	High	LPR	PR
Township	Enhance/expand the	Existing	Severe		Engineering	Medium –	Medium	Local	Short	Medium	NRP	NSP

Table 9.20-9. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
of South Orange Village-8	Village's tree maintenance program and coordination with utilities (PSEG).		Storm; Severe Winter Storm		and DPW, working with contractors and local utilities	High (reduced risk of utility outages; life safety)		Budget				
Township of South Orange Village-9	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	N/A	All Hazards	3-2	Municipality with support from County, NJOEM, FEMA and surrounding communities	Medium	Low	Municipal Budget	Short Term	High	LPR	PR
Township of South Orange Village-10	Township will use the HMP as a guide when updating their Master Plan	Both	All Hazards		Township Planner (consultant)	High	Low	Municipal Budget	Short Term	High	LPR	PR

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV *Community Assistance Visit*
CRS *Community Rating System*
DPW *Department of Public Works*
FEMA *Federal Emergency Management Agency*
FPA *Floodplain Administrator*
HMA *Hazard Mitigation Assistance*
N/A *Not applicable*
NFIP *National Flood Insurance Program*
NJDEP *New Jersey Department of Environmental Protection*
NJOEM *New Jersey Office of Emergency Management*
OEM *Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA *Flood Mitigation Assistance Grant Program*
HMGP *Hazard Mitigation Grant Program*
PDM *Pre-Disaster Mitigation Grant Program*
RFC *Repetitive Flood Claims Grant Program*
SRL *Severe Repetitive Loss Grant Program*

Timeline:

Short *1 to 5 years*
Long Term *5 years or greater*
OG *On-going program*
DOF *Depending on funding*

Costs:
Where actual project costs have been reasonably estimated:
Low *< $10,000*
Medium *$10,000 to $100,000*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:
Low= *< $10,000*

Costs:

High *> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low *Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*

Medium *Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*

High *Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:

Medium *$10,000 to $100,000*

High *> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low *Long-term benefits of the project are difficult to quantify in the short term.*

Medium *Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*

High *Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP) - These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.20-10. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Township of South Orange Village-1 (NEW/LOI)	Local infrastructure-Generators at 2 sites: South Orange Village Hall & South Orange Rescue Squad Buildings	1	0	1	1	0	1	1	0	1	1	1	1	1	1	11	High
Township of South Orange Village-2 (OLD/LOI)	South Orange Village retrofit/elevation DPW building which is located in a floodplain.	0	1	1	1	0	0	1	1	0	1	1	0	1	0	9	High
Township of South Orange Village-3	Develop public outreach program	1	1	1	0	0	0	0	0	1	0	1	0	0	0	5	Medium
Township of South Orange Village-4	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.	1	1	1	1	1	1	0	0	1	0	1	1	1	0	10	High
Township of South Orange Village-5	Develop and implement a post-event damage assessment program	1	1	1	0	1	1	0	0	1	0	1	1	1	0	9	High

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Township of South Orange Village-6	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.	1	1	1	0	1	1	0	0	0	0	1	1	1	0	9	High
Township of South Orange Village-7	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).	1	1	1	0	1	1	0	0	1	0	1	1	0	0	8	Medium
Township of South Orange Village-8	Enhance/expand the Village's tree maintenance program and coordination with utilities (PSEG).	1	1	1	1	1	1	1	1	0	0	1	1	1	1	12	High
Township of South Orange Village-9	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	1	1	1	0	1	1	0	0	0	0	1	1	1	0	9	High

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
Township of South Orange Village-10	Township will use the HMP as a guide when updating their Master Plan	0	1	1	1	1	1	1	0	0	1	1	1	1	1	11	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.20.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.20.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of South Orange Village that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of South Orange Village has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.20.9 Additional Comments

None at this time.

Figure 9.20-1. Township of South Orange Village Hazard Area Extent and Location Map 1

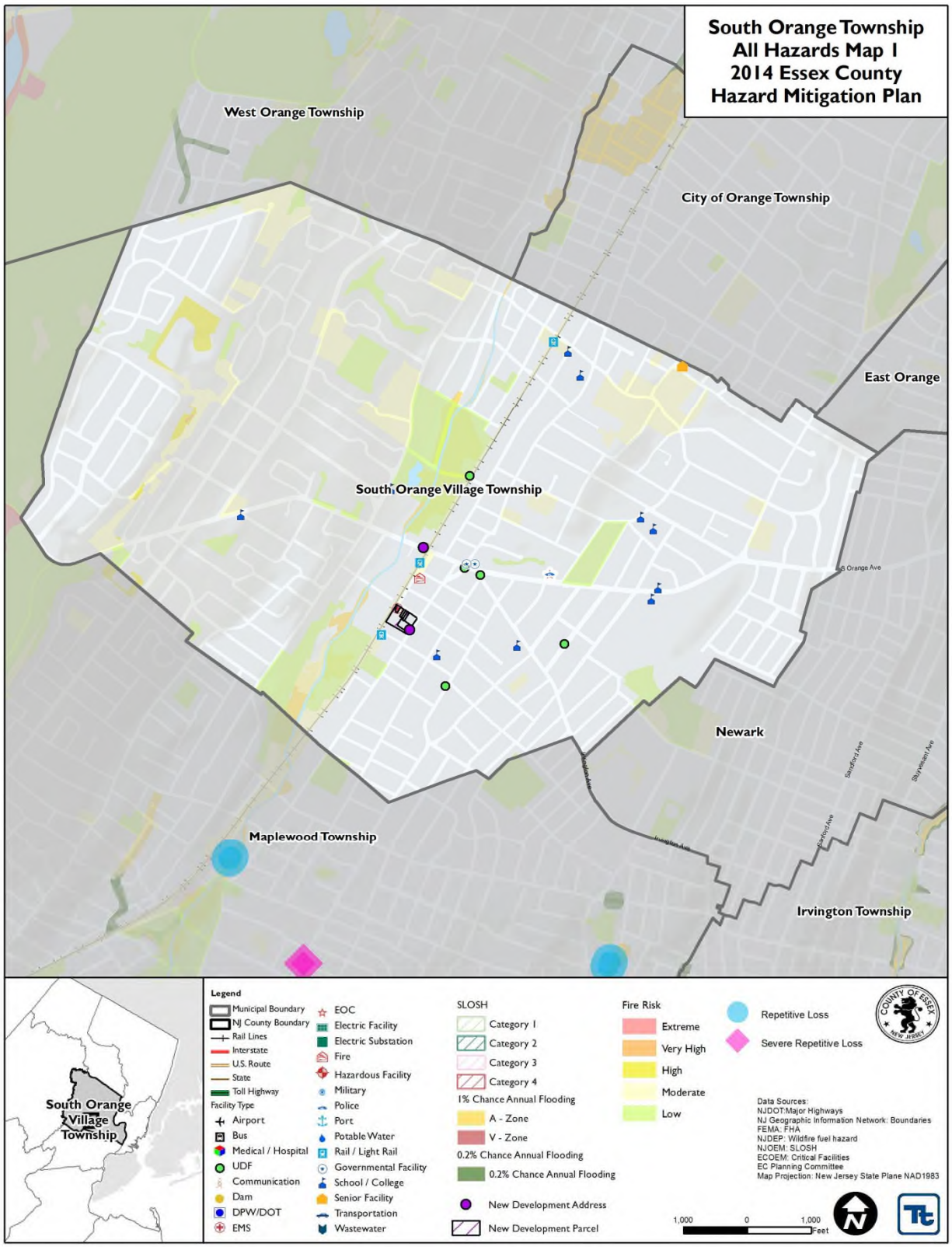
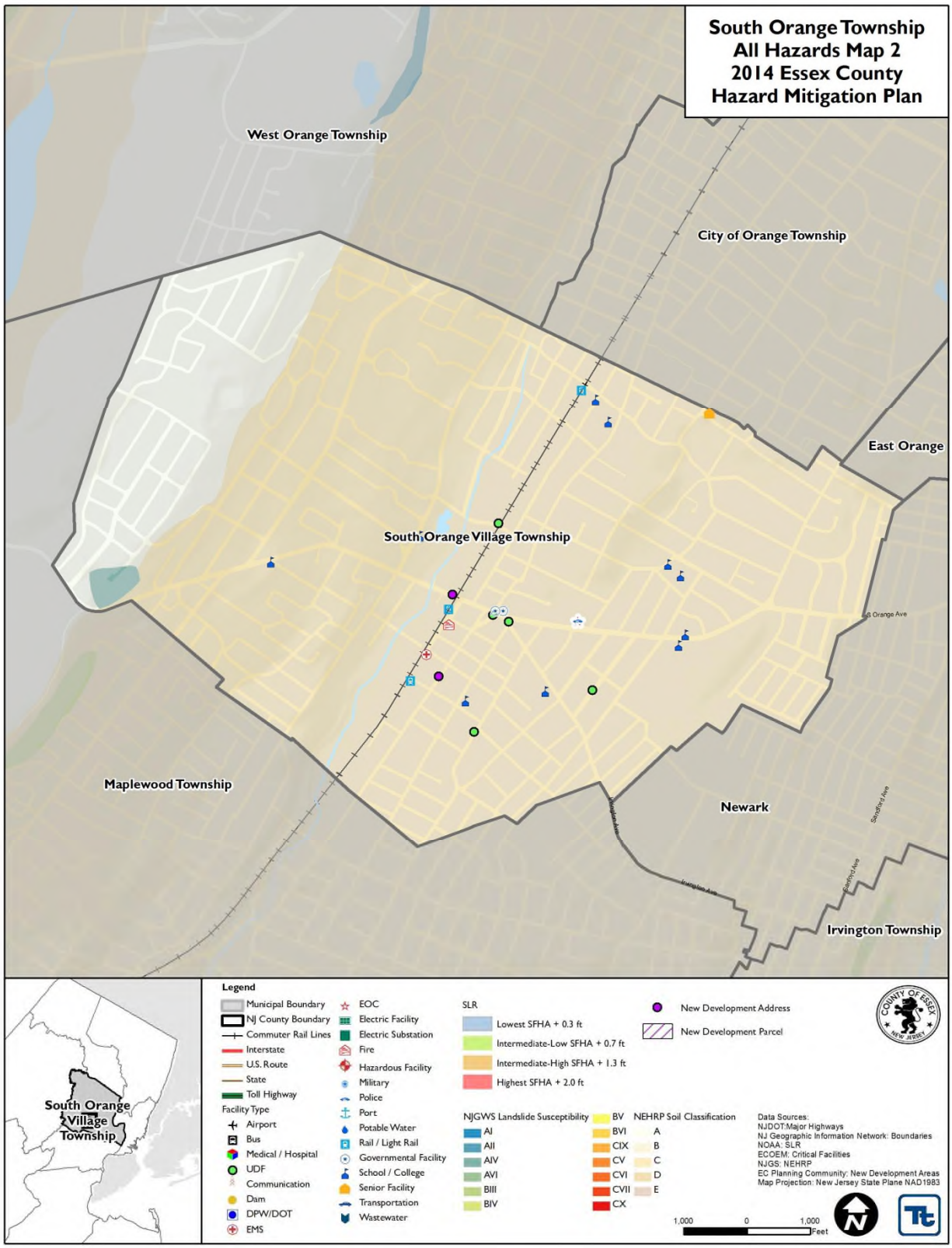


Figure 9.20-2. Township of South Orange Village Hazard Area Extent and Location Map 2



Action Number: **Township of South Orange Village-1 (NEW/LOI)**

Mitigation Action/Initiative: Local Infrastructure – Generators at 2 sites: South Orange Village Hall & South Orange Rescue Squad Buildings

Assessing the Risk	
Hazard(s) addressed:	101 South Orange Avenue & 62 Sloan Street, South Orange, NJ 07079
Specific problem being mitigated:	Power loss at critical facilities. (OEM Administrative Site &First Aid Location)
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Provide power at critical facilities
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Installation of backup power will ensure continuity of operations before, during, and after a storm event.
Action/Project Category	
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing / Future Process
Benefits (losses avoided)	
Estimated Cost	$450,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of South Orange Village's Administration
Local Planning Mechanism	Engineering
Potential Funding Sources	Capital Funding and Grants
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Township of South Orange Village-1 (NEW/LOI)**

Mitigation Action/Initiative: Local Infrastructure – Generators at 2 sites: South Orange Village Hall & South Orange Rescue Squad Buildings

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	0	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	1	
Fiscal	1	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Township of South Orange Village-2 (OLD/LOI)**

Mitigation Action/Initiative: South Orange Village retrofit / elevation DPW building which is located in a floodplain.

Assessing the Risk	
Hazard(s) addressed:	300 Walton Avenue, South Orange, NJ 07079
Specific problem being mitigated:	DPW building is in a flood zone.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Avoid losses generated by flooding
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	By adding a second floor for administrative office and/or elevating this building, losses due to flooding are avoided.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$450,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township of South Orange Village's Administration
Local Planning Mechanism	Engineering
Potential Funding Sources	Capital and Grant Funds
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Township of South Orange Village-2 (NEW/LOI)**

Mitigation Action/Initiative: South Orange Village retrofit / elevation DPW building which is located in a floodplain.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	1	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	0	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	

9.21 Township of Verona

This section presents the jurisdictional annex for the Township of Verona.

9.21.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Jeff Hayes, Director IT, OEM, Administration 600 Bloomfield Avenue, Verona, NJ Phone: 973-857-4756 E-mail: Jhayes@veronanj.org	Doug Huber, Police Chief 600 Bloomfield Avenue, Verona, NJ Phone: 973-239-5000 E-mail: doug.huber@veronapolice.org

9.21.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of Verona was 13,332.

Location

Verona Township is located east of Caldwell, west of Montclair, north of the Eagle Rock Reservation, and south of Cedar Grove.

Brief History

In 1702, settlers left Newark and bought land from the Lenni Lenape Native Americans to form what would eventually become the Borough of Verona in 1892. It was not until 1982 that Verona became a Township. Township of Verona is registered as a Sustainable Jersey community which means they are committed to going green, saving money, and sustaining their quality of life (Verona Township of Verona, New Jersey, 2014).

Governing Body Format

The Township of Verona has five Council Members who are elected at-large. The Mayor and Deputy Mayor are selected to serve two year terms (Verona Township of Verona, New Jersey, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.21.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.21-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
163 Bloomfield Ave	Mixed-Use	Unknown	163 Bloomfield Ave B: 9 L:15	None	Planning stage
200 Bloomfield Ave	Mixed-Use	Unknown	200 -210 Bloomfield Ave B: 8 L: 1	Wildfire: Low	Planning stage
623-625 Bloomfield Ave	Commercial	Unknown	623-625 Bloomfield Ave B: 92 L: 14	NEHRP: D	Planning stage
860 Bloomfield Ave	Commercial	Unknown	860 Bloomfield Ave B: 81 L: 1	None	Planning stage
DMH 2, LLC	Mixed-Use	15 units/7000 SF Commercial	B: 8 L: 23	Wildfire: Moderate	App.
DMH 2, LLC	Mixed-Use	14 units/7000 SF Commercial	B: 8 L: 1	Wildfire: Moderate	App.
US Home Corporation d/b/a Lennar	Residential	33 units	Durrell St B: 72 L: 1	NEHRP: D	In progress. Multiple townhouses and single family homes have been built.

** Only location-specific hazard zones or vulnerabilities identified.*

9.21.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.21-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	The Township experienced downed trees, utility outages, roof damage, damage to the sanitary sewer system, building damage, and destroyed sidewalks. Overtime and contracted services in the Township exceeded $234,000.
October 29, 2011	Severe Weather	DR-4048	Yes	In the Township, losses of services from this storm included utility outages, secondary and tertiary roads blocked, and the well/pump stations were down due to lack of power. Trees, sidewalks, buildings, and well pumps were damaged. The wastewater treatment plant flooded and sustained damages. Overtime and contracted services in the Township exceeded $635,000.
October 26 – November 8, 2012	Superstorm Sandy	EM-3354 DR-4086	Yes Yes	During Superstorm Sandy, the Township OEM provided emergency services responses to downed trees and power lines, hazardous conditions, trees into buildings, road closures, police activities at gasoline stations, emergency power for critical systems, clean-up crews, fuel supply for back-up generators, daily updates to staff, media and residents. Extensive power outages led to loss of telephone, cable TV, internet, gas stations, water systems and wells, wastewater treatment plan, and closure of schools and government buildings. Overtime and contracted services in the Township exceeded $571,000.

9.21.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of Verona. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for Township of Verona.

Table 9.21-3. Hazard Risk/Vulnerability Risk Ranking

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a,c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $1,002,944 2,500-year MRP: $22,167,503	Occasional	22	Medium
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $3,429,678	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $2,507,200	Rare	6	Low
Severe Weather	100-Year MRP: $1,335,306 500-year MRP: $7,757,815 Annualized: $87,159	Frequent	48	High
Winter Storm	1% GBS: $9,908,172 5% GBS: $49,540,858	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $102,500	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. *Loss estimates for the Severe Weather and severe winter storm hazards are structural values only and do not include the value of contents.*
d. *Loss estimates for the flood and earthquake hazards represent both structure and contents.*
e. *The HAZUS-MH earthquake model results are reported by Census Tract*

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the municipality.

Table 9.21-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
Verona, Township of	75	30	$195,146.00	3	0	34	38	37

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case

Critical Facilities

The Verona Waste Water Treatment Plant (WWTP) facility is located adjacent to the Peckman River upstream from Ozone Bridge which is listed for evaluation for flooding.

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), the Township is subject to flooding from the Peckman River and its tributaries. All flooding sources flow in well-defined channels, within adjacent low-lying areas. Flooding occurs during times of excessive and prolonged rainfall, particularly in residential areas having steep slopes. The flooding is a result of high runoff combined with insufficient carrying capacity of bridge openings and culverts (FEMA FIS 2014).

Additionally, the municipality has identified the following hazard problems and/or problem areas:

Infrastructure

The Township of Verona would like to increase its capacity to handle stormwater and decrease the risk of flooding. An area in particular the Township would like to address is from Bloomfield Avenue to the Peckman River (Verona Park).

Flood

The Township of Verona Wastewater Treatment Plant has sustained damages during the recent flood events. Equipment failures have also been attributed to power outages as a result of the flooding. The flood waters

have also displaced manhole covers throughout the Township. In the area of the Eagle Rock Reservation near Afterglow Avenue, Verona Road, and Cole Road there is heavy storm water run-off that causes flooding. Poor drainage on State Route 23 Pompton, Westover, and Bloomfield Avenue at Verona Park, and the east end of Personette Street have been flooded. Both secondary and tertiary roads were flooded out during Hurricane Irene and Tropical Storm Lee as well as the Nor'easter in October 2011.

Peckman River Basin

The Peckman River Basin is located in Essex and Passaic Counties. The Peckman River is a tributary to the Passaic River and originates in the Township of West Orange and flows northeasterly through Verona, Cedar Grove, and Little Falls to its confluence with the Passaic River in West Paterson (USACE 2014).

Extensive development in this Basin has resulted in damages from flooding and ecosystem degradation. The Peckman River Basin experiences frequent flooding from intense thunderstorms and heavy rain events. These storms can deposit large amounts of precipitation in the watershed, producing significant runoff, which quickly surpasses the capacity of the river channel, and bridge and culvert openings. Significant degradation of the ecology of the Basin has occurred as a result of extensive erosion at specific locations along the Peckman River. The development of the watershed has reduced the water-holding capacity of the landscape and altered the natural flow dynamics within the river system. As a result, the habitat suitability and ecological complexity of the River have been moderately impaired (USACE 2014).

A favorable reconnaissance report was completed in July 2001. The report recommended a feasibility study to develop alternatives for flood damage reduction and ecosystem restoration in the Peckman River Basin. On March 14, 2002, a Feasibility Cost Sharing Agreement was executed between the USACE and the NJDEP. A draft feasibility report is expected to be completed by July 2015 (USACE 2014).

Power Failure

Recent storms have led to extensive power failure within the Township of Verona. Residences, commercial businesses, wastewater treatment plants, schools, and government facilities were left without power and unable to operate for several days. To ensure continuity of services and government, it is critical back-up generators ben installed at key facilities.

9.21.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of Verona.

Table 9.21-5. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y		Verona Planning Board	Updated 2012, Part of Master Plan, Master Plan and Ordinance in final review.
Zoning Ordinance	Y		Verona Planning Board	Updated 2012, Part of Master Plan, Master Plan and Ordinance in final review.
Subdivision Ordinance	Y		Verona Planning Board	Updated 2012, Part of Master Plan, Master Plan and Ordinance in final review.
NFIP Flood Damage Prevention Ordinance	Y			Chapter 77, Adopted 5/7/2007, Updated 2010, Internal updates needed.
Cumulative Substantial Damages				
Freeboard				
Growth Management	Y		Verona Planning Board	Part of Master Plan, Master Plan and Ordinance in final review.
Floodplain Management / Basin Plan	Y		Township Engineer	FEMA, In progress
Stormwater Management Plan/Ordinance	Y		Township Engineer	Updated in 2010, State requirements met.
Comprehensive Plan / Master Plan/ General Plan	Y		Verona Planning Board	Updated 2012, Master Plan and Ordinance in final review.
Capital Improvements Plan	Y		Township Manager	Will be updated in June 2014, budget process underway.
Site Plan Review Requirements	Y		Verona Planning Board	Part of Master Plan, Master Plan and Ordinance in final review. Part of Master Plan, Master Plan and Ordinance in final review.
Open Space Plan	Y		Verona Planning Board	Updated 2012,
Stream Corridor Management Plan	Y		Township engineer	Army Corps of Engineers, Internal updates needed.

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Watershed Management or Protection Plan	Y		Verona Planning Board	Part of Master Plan, Master Plan and Ordinance in final review.
Economic Development Plan	Y		Township Manager	Constantly updated
Comprehensive Emergency Management Plan	Y		OEM	Updated 1/4/2013, EOP, Plan updated as needed
Emergency Response Plan	Y		OEM	Updated 1/4/2013, EOP, Plan updated as needed.
Post Disaster Recovery Plan	Y		OEM	Updated 1/4/2013, EOP, Plan updated as needed.
Post Disaster Recovery Ordinance	Y		OEM	Updated 1/4/2013, EOP, Plan updated as needed.
Real Estate Disclosure Requirement	N/A			Relator/Seller
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]	N/A			

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of Verona.

Table 9.21-6. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Township/Administration
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Township/Administration
Planners or engineers with an understanding of natural hazards	Y	Township/Administration
NFIP Floodplain Administrator	Y	Engineering
Surveyor(s)	Y	Engineering
Personnel skilled or trained in “GIS” applications	Y	Engineering
Scientist familiar with natural hazards	N	
Emergency Manager	Y	Township/Administration
Grant Writer(s)	Y	Township/Administration
Staff with expertise or training in benefit/cost analysis	Y	Township/Administration
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the Township of Verona.

Table 9.21-7. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community Development Block Grants (CDBG)	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for specific purposes	Yes
User fees for water, sewer, gas or electric service	Yes
Impact Fees for homebuyers or developers of new development/homes	Yes
Incur debt through general obligation bonds	No
Incur debt through special tax bonds	No
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	No
State mitigation grant programs	No
Other	Yes

Community Classifications

The table below summarizes classifications for community program available to the Township of Verona.

Table 9.21-8. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	N/A
Building Code Effectiveness Grading Schedule (BCEGS)	-	
Public Protection	-	
Storm Ready	NP	N/A
Firewise	NP	N/A

N/A = Not applicable. NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within five road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html

- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator:

Jim Helb, Engineer

Flood Vulnerability Summary

The community's Flood Damage Prevention Ordinance (FDPO), found at Chapter 77of the local code, was last updated in 2010.

Following Superstorm Sandy, residential, commercial and Township-owned structures were damaged. The Township keeps limited records of flood-damaged properties and the property owners' interest in mitigation. Currently no property owners are interested in mitigation. Funding to repair damages structures has come from private flood and wind insurance. Substantial Damage estimates were conducted on public buildings by the Township Engineer, Jim Helb.

Resources

The local NFIP Floodplain Administrator is the Township Engineer. Jim Helb currently serves as the NFIP Floodplain Administrator.

In addition to the NFIP FPA, the community has supplementary staff for which NFIP is an auxiliary duty; personnel including the Building Department staff.

Duties and responsibilities of the NFIP Administrator are permit review, inspections, damage assessments, and education and outreach.

Jim Helb feels he is adequately supported and trained to fulfill his responsibilities as the municipal floodplain administrator. There have never been any issues within the Village where support or lack thereof would be an issue. Jim Helb is not certified in floodplain management, however attends regular continuing education programs. Additional training on floodplain management would be welcomed.

Education and outreach is conducted at public meetings where all floodplain issues and concerns are fully disclosed.

Compliance History

The community is currently in good standing in the NFIP and has no outstanding compliance issues. The current NFIP Floodplain Administrator has no knowledge of when the last CAV was performed. The municipality sees no specific need for a CAV at this time.

Regulatory

The communities Flood Damage Prevention Ordinance (FDPO) was last updated in 2010, and is found at Chapter 77 of the local code.

Floodplain regulations and ordinances are aligned with FEMA and New Jersey State requirements. There are additional ordinances and regulations that further support the implementation of the NFIP within the Township.

Community Rating System

The Township of Verona does not currently participate in the Community Rating System (CRS). There is an interest in attending a seminar on CRS to determine if membership is a viable option for the Township of Verona.

Other Capabilities Identified

With strong leadership from the Township Manager along with the empowerment of the workgroup leaders to do the job; success is guaranteed following a disaster in the Township of Verona. The organizations responsible for response and recovery have had overcome many obstacles to ensure a quick recovery and to return to "normal" soon after an event. A recent success story was seen in October 2012. During Superstorm Sandy, the Verona Office of Emergency Management coordinated storm activities. The Police, Fire and Department of Public Works, as always, are key to the success of the storm activities. The proper management of available resources is what makes the difference between success and failure. The use of a common radio communications platform brings our workgroups together. The Department of Public Works handles most of the storm related activities. This group, comprised of managed resources, is the first responders to almost every incident during a storm of this type. This department has the resources to assess the incidents and report back to the EOC. With contracts in place with responsible vendors / contractors, necessary additional and specialized resources are available to get the work done. The Fire Department and Emergency Medical group is an all-volunteer inventory of resources. These groups are an important element in the successful response to emergencies and unplanned events. The Police Department working with all of the groups mentioned above complete the team that is needed to work a storm such as Superstorm Sandy.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

Day-to-Day Operations: To prevent flooding, the Township of Verona regularly cleans brooks, streams, and tributaries to the Peckman River. Catch basins and storm sewers are checked during heavy rains to prevent debris from entering watercourses. On an annual basis, Peckman River is cleared of trees, large debris, and shoal material as needed (FEMA FIS 2014). The Township has an Environmental Commission and Shade Tree Commission established.

Master Plan: The Township has a Master Plan which is the legal roadmap to planning for appropriate and safe land development. The 2009 Master Plan & Reexamination Report's Section 4 (Environmental Features) discusses flood-prone areas in the Township.

Currently the Township considers hazard zones prior to land use, zoning changes and development permitting. The Township will use the HMP as a guide during rezoning procedures. The Township will also use the HMP as a guide when updating their transportation plan to limit access to hazard areas. Refer to their mitigation strategy for further details.

The Township has their ordinances and flood protection measures available on their website. Please visit the Township of Verona's website at http://www.veronanj.org for further information (FEMA FIS 2014).

9.21.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.21-9. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Infiltration of storm water into Verona Waste Water Collection Systems.	Continuous	Planning for potential solutions to reduce the amount of storm water infiltrating the Township of Verona Waste Water collections systems. During storms where localized street flood occurs storm water infiltrates the local Waste Water collection system causing an increase in Waste Water Treatment Plat flow from 2.1 Million gallons per day to as high as 21 million gallons per day. This initiative will be carried forward into the updated mitigation strategy.
2: Impassable roadways during storm events – Bloomfield Ave and Mt Prospect Ave which are County roadways.	Continuous	Need storm water system upgrades under a County Roadway, Bloomfield Ave, to increase capacity of underground storm water drainage to the Peckman river. Currently during frequent heavy rain storms the storm water run-off flows down both side of the Valley which Verona is comprised of. The existing underground storm water systems do not have the capacity to capture all of the storm water that flows to the Peckman river. The storm water flows on the surface of Bloomfield Ave causing flooding into store fronts along the way toward the Peckman River. This causes damage, traffic problems and displacement of manhole covers. The open manholes are a safety issue for people and automobiles. Need planning and solutions for roadway treatment for ice and snow conditions along Bloomfield Ave and Mt Prospect Ave in Verona during ice and snow storms. Each of these roadways has steep inclines and declines. Each of these roadways is a primary route to and from hospitals for EMS and Paramedic units. Each of these roadways is a primary route for all traffic. Once these roadways become impassable traffic stops and these arterial roadways are under grid lock. This situation causes emergency workarounds for local DPW, emergency service personnel, Police and other support departments. Studies, planning and implementation of solutions are required. Essex County has repaired Ground water problem Mt Prospect Ave near Sunset Ave. Since Essex County DPW is the lead agency for this project, this initiative will be not carried over by Verona. Please refer to Essex County Annex (Section 9.1)
3: Stream culvert work in residential areas storm water run-off– Eagle Rock Reservation area including Afterglow Ave and Ravine Rd and Flooding of Cole Rd.	No Progress, Continuous	Storm water run-off from Essex County Eagle Rock Reservation causing localized flooding on local street and local properties. Storm water system planning, design, and implementation is required to remedy to situation. Need studies to identify storm water run-off paths from County lands on to local streets and properties. Need solutions to

Table 9.21-9. Past Mitigation Initiative Status

Description	Status	Review Comments
		problems along with implementation planning. Since this is a County-led project and under the jurisdiction of Verona, it will not be carried over by the Township. Please refer to Essex County Annex (Section 9.1), action Essex-16
4: Linden Ave bridge repair.	Completed	Essex County rebuilt the bridge and completed this project. Since this is a County-led project, it will not be carried over by the Township. Please refer to Essex County Annex (Section 9.1)
5: Possible dam failure at Verona Park.	Completed	Essex County performed dam enhancements required and completed this project. Since this is a County-led project, it will not be carried over by the Township. Please refer to Essex County Annex (Section 9.1)

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The Township has identified the following mitigation projects/activities that have also been completed:

- To prevent flooding, the Township of Verona regularly cleans brooks, streams, and tributaries to the Peckman River (FEMA FIS 2014).

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.21-10 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.21-11 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.21-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Verona-1 (Old 1)	Infiltration of storm water into Verona Waste Water Collection Systems – Conduct a study and identify the points of infiltration, causes and solutions to problems. From this information a plan to mitigate will be developed then implemented.	Existing	Flood	1, 2.1	Verona WWTP Engineering	High	High		DOF	High	SIP	PP
Verona-2 (NEW/APRW)	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable. At the time of this update the following has been identified specific to the Ozone Avenue bridge. The Ozone Avenue bridge needs to be evaluated due to age. The goal is to open up the waterway under the bridge to mitigate flooding as a result of limited water flow. Phase 1: Evaluate the Ozone Ave Bridge over the Peckman River for proper flow and capacity. Phase 2: Develop action plan based on evaluation of the Ozone Bridge. Phase 3: Re-assess the current FEMA flood plain maps to take into account that the Bloomfield Ave and Linden Ave bridges have been re-configured to include a substantial improvement in the flow of storm water and the Peckman River. This along with a future enhancement of the Ozone Ave Bridge potentially will reduce the flooding of adjacent properties to the Peckman River. The result of these efforts is a potential decrease in required flood insurance to the residential properties in this "flood Zone" Specifically identified are properties in the following areas: Peckman river basin from Verona Park north to Ozone Ave / Cedar Grove											
	See above	Existing	Flood, Coastal Erosion, Coastal Storm, Severe Weather, Wildfire, Winter Storm	1.2, 2.1, 2.2	Township Engineering via NFIP FPA) with NJOEM, FEMA support	High	High	FEMA Mitigation Grant Programs and local budget (or property owner) for cost share	Ongoing (outreach and specific project identification); Long term DOF (specific project application and implementation)	High	SIP	PP
Verona-3 (NEW/APRW)	Bloomfield at Verona Park flooding/pooling of storm water– Current storm water drainage system is not able to handle the storm water runoff. A solution	Existing	Flood	1, 2	Essex County supported by Verona	High	High	FEMA Mitigation Grant programs, local budget	DOF	High	SIP	PP

Table 9.21-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	to increase the storm water drainage underground needs to be developed thus reducing flooding of Bloomfield Ave. The underground storm water system needs to be evaluated for proper flow and capacity. See County action in Section 9.1 Essex-15											
Verona-4 (NEW/APRW)	Claremont Ave, Derwent Ave, and Bloomfield Avenue need to enhance storm water system capacity. This area of town during heavy rain storms is an area in which manhole covers pop off and cause areas of risk. The underground storm water system needs to be evaluated for proper flow and capacity.	Existing	Flood	1.2	Verona Engineering Dept.	High	High	HMGP, FMA, PDM	Long Term DOF	High	SIP	SP
Verona-5 (NEW/APRW)	Emergency back-up generators DPW garage, B&G garage, pump stations Linn Drive and Hillwood Terrace, High School, Community Center and Verona WWTP. See also Verona-8, Verona-9	Existing	All	1.2 6.1	OEM, Township Manager	High	High	HMGP	Short Term DOF	High	SIP	ES
Verona-6 (NEW/APRW)	In Verona, Fairview Ave and Crest Hill Road area flood from storm water run-off County Hilltop Park. – Identify and study current storm water system for proper	Existing	Flood	1, 2	Township Engineering	High	High	FEMA HMA	DOF	Low	SIP	PP

Table 9.21-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	sizing for existing storm water flow. Currently storm water runoff causes flooding in adjacent residential properties on the east side of Fairview Ave down to the old railroad bed. The underground storm water system needs to be evaluated for proper flow and capacity.											
Verona-7 (NEW/LOI)	Verona Township shelter generators to add additional back-up power for cooling and heating centers as well as sheltering. Part of Verona-6	Existing	All Hazards	1.2 6.1	OEM Township Manager	High	High $420,000	HMGP	Short Term DOF	High	SIP	ES
Verona-8 (NEW/AW)	Verona Township water pump station has no back-up generator. This pump station is a major component in the Verona water system. Part of Verona-6	New	All Hazards	1.2 6.1	Township	High	$857,142	HMGP	DOF	High	SIP	PP
Verona-9 (NEW)	The Township will use the HMP as a guide during rezoning procedures and when updating their transportation plan to limit access to hazard areas.	Both	All	All	Township	High	Low	Township	Ongoing	High	LPR	PR
Verona-10 (NEW)	Install backup power generators at the following critical facilities in the Township to ensure continuity of operations: • DPW garage • B&G garage • Pump stations Linn Drive and Hillwood Terrace • High School • Community Center • Verona Waste Water Treatment Plant (WWTP)											

Table 9.21-10. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	See above.	Existing	Severe Weather; Severe Winter Storm; Coastal Storm		Engineering and DPW	High (reduced interruption of critical facilities and services; life safety)	Medium - High	Local Budget; Emergency Management grants as available	Short (DOF)	High	SIP	PP
Verona-11 (NEW)	Create/Enhance/Maintain Mutual Aid agreements with neighboring communities for continuity of operations	N/A	All Hazards	3-2	Municipality with support from County, NJOEM, FEMA and surrounding communities	Medium	Low	Municipal Budget	Short Term	High	LPR	PR

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*
OEM	*Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Costs:
Where actual project costs have been reasonably estimated:

Low	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Costs:

Where actual project costs cannot reasonably be established at this time:

Low	*Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium	*Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High	*Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:

Where numerical project benefits cannot reasonably be established at this time:

Low	*Long-term benefits of the project are difficult to quantify in the short term.*
Medium	*Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High	*Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.21-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High/ Medium/ Low
Verona-1 (Old 1)	Infiltration of storm water into Verona Waste Water Collection Systems.	0	1	0	0	0	1	0	1	0	0	1	1	1	0	6	Medium
Verona-2 (NEW/APRW)	Support the mitigation of vulnerable structures: Ozone Avenue Bridge	0	1	1	1	0	0	0	1	0	0	1	1	1	0	7	Medium
Verona-3 (NEW/APRW)	Bloomfield at Verona Park flooding/pooling of storm water	1	1	1	1	1	0	0	1	0	0	1	1	1	0	9	High
Verona-4 (NEW/APRW)	Claremont, Derwent, and Bloomfield Avenue need to enhance storm water system capacity.	1	1	1	1	1	0	0	1	0	0	1	1	1	0	9	High
Verona-5 (NEW/APRW)	Emergency back-up generators DPW garage, B&G garage, pump stations Linn Drive and Hillwood Terrace, High School, Community Center and Verona WWTP.	1	1	1	1	1	0	0	0	1	1	1	1	1	1	11	High
Verona-6 (NEW/APRW)	In Verona Fairview and Crest Hill Road area flood from storm water run-off County Hilltop Park.	0	1	1	1	0	0	0	1	1	0	0	1	1	0	7	Medium/ low
Verona-7 (NEW/LOI)	Verona Township shelter generators	1	1	1	1	1	0	0	0	1	0	0	1	1	0	8	High
Verona-8 (NEW/AW)	Verona Township pump station	1	1	1	1	1	0	0	1	1	0	0	1	1	0	9	High
Verona-9 (NEW)	The Township will use the HMP as a guide during rezoning procedures and when	0	1	1	1	1	1	1	0	0	1	1	1	1	1	11	High

Table 9.21-11. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High/ Medium/ Low
	updating their transportation plan to limit access to hazard areas.																
Verona-10 (NEW)	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.	1	1	1	1	1	0	0	0	0	1	1	0	1	1	9	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.21.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.21.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of Verona that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of Verona has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.21.9 Additional Comments

None at this time.

Figure 9.21-1. Township of Verona Hazard Area Extent and Location Map 1

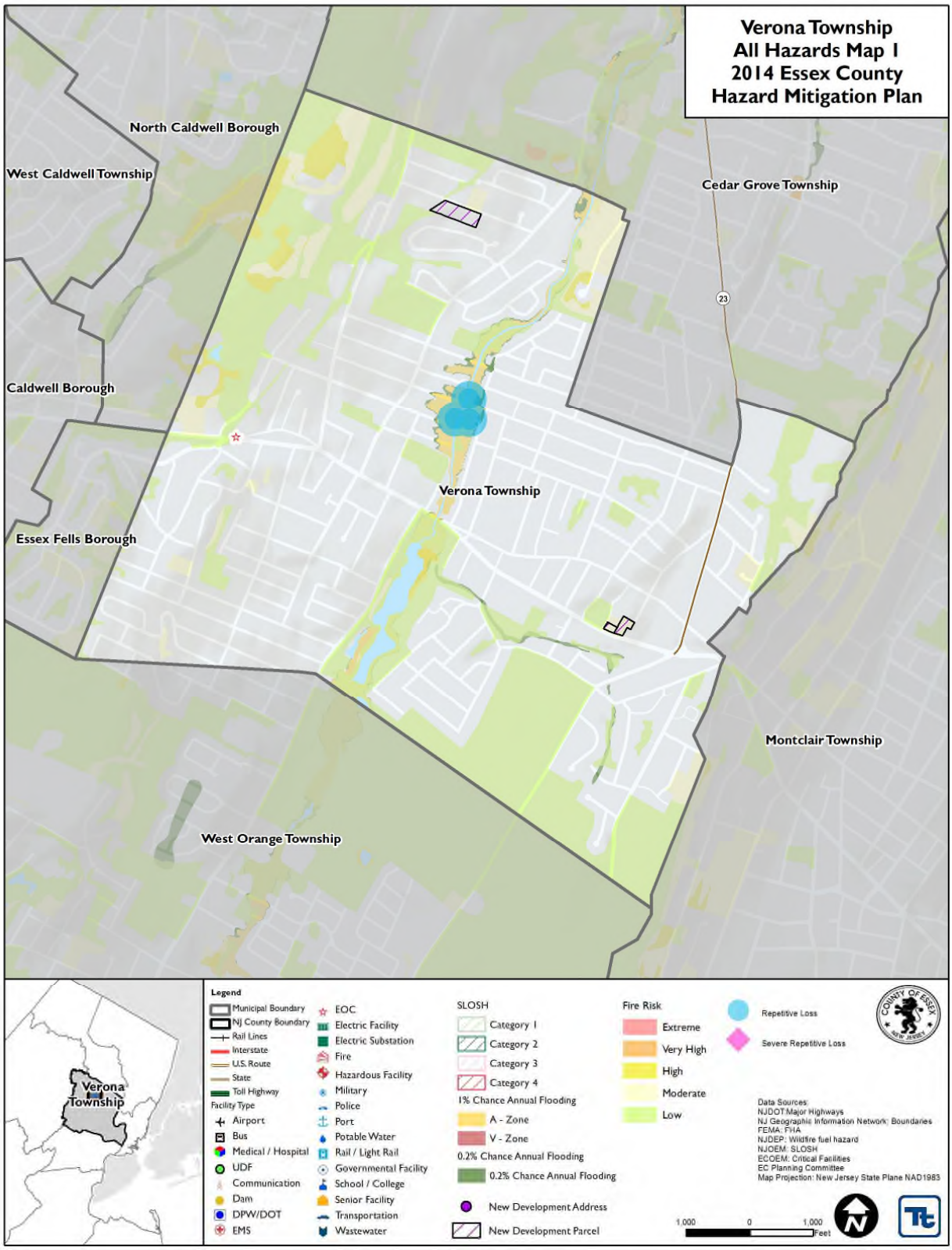
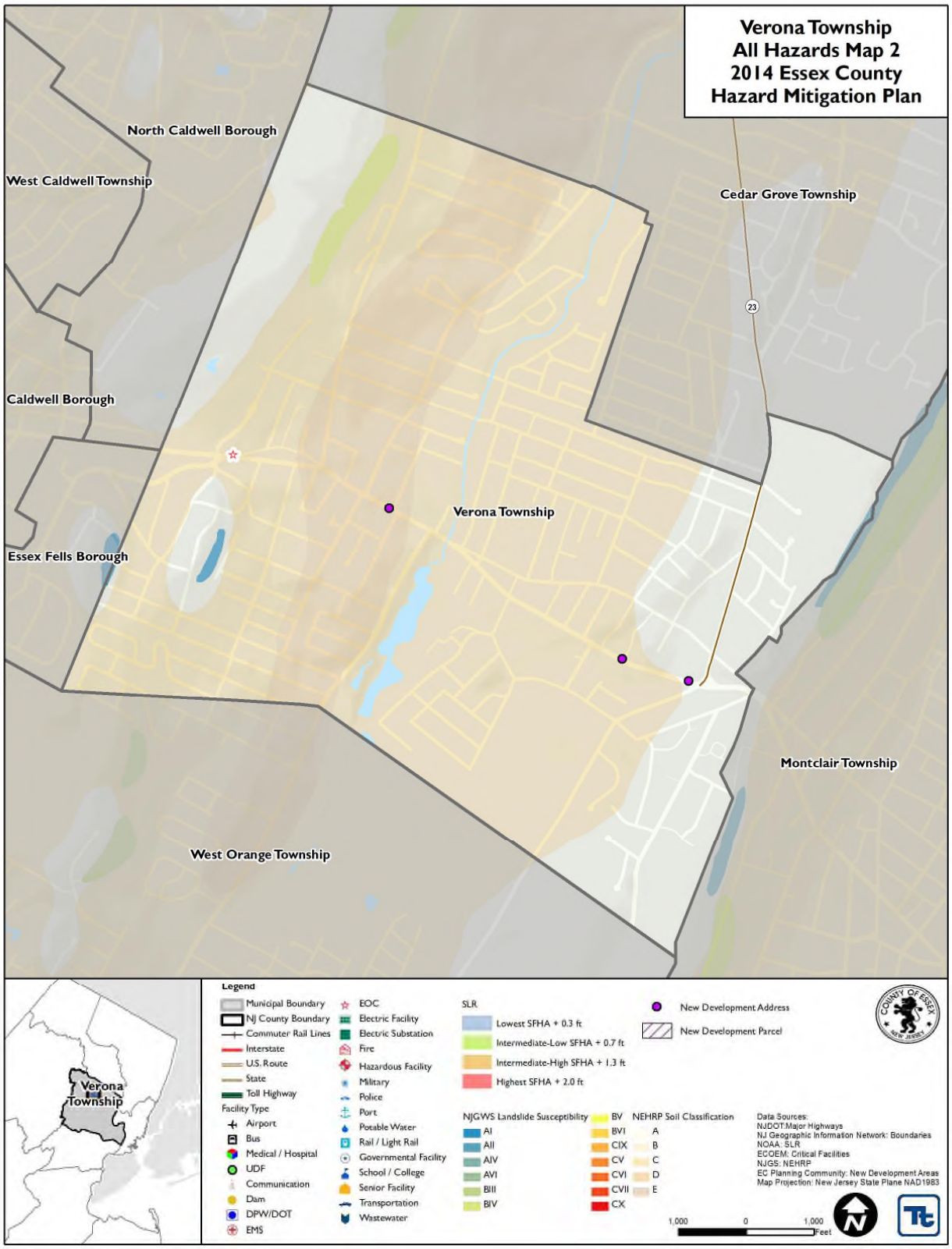


Figure 9.21-2. Township of Verona Hazard Area Extent and Location Map 2



Action Number: **Verona-1 (Old 1)**

Mitigation Action/Initiative: Infiltration of storm water into Verona Waste Water Collection Systems.

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	WWTP running over flow capacity and being overloaded by storm water infiltration.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Identify sewer lines in need of repair 2. Identify solutions to reduce infiltration 3. Identify future controls for infiltration
Action/Project Intended for Implementation	
Description of Selected Action/Project	Planning for potential solutions to reduce the amount of storm water infiltrating the Township of Verona Waste Water collections systems. During storms where localized street flood occurs storm water infiltrates the local Waste Water collection system causing an increase in Waste Water Treatment Plat flow from 2.1 Million gallons per day to as high as 21 million gallons per day.
Action/Project Category	SIP
Goals/Objectives Met	Reduce Flow through Waste Water treatment plant during storms
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Reduced stress on the Waste Water Treatment processes and equipment
Estimated Cost	Unknown at this time – estimated high
Priority*	Medium
Plan for Implementation	
Responsible Organization	Verona WWTP Engineering
Local Planning Mechanism	Verona WWTP Engineering.
Potential Funding Sources	Unknown at this time
Timeline for Completion	Unknown at this time
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: TBD Progress on Action/Project: TBD

Refer to prioritization table.

Action Number: **Verona-1 (Old 1)**

Mitigation Action/Initiative: Infiltration of storm water into Verona Waste Water Collection Systems.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	0	
Technical	0	
Political	0	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	1	
Timeline	1	Long-Term
Agency Champion	1	Verona WWTP Engineering
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	Medium	

Action Number: **Verona-2 (NEW/APRW)**

Mitigation Action/Initiative: Support the mitigation of vulnerable structures : Ozone Avenue Bridge

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Peckman River flooding of Verona Waste Water Treatment Plant and properties along the Peckman river basin.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Enhance storm water flow of the Peckman River
	2. Reduce flooding in the area and entire Peckman River Basin
	3. Reduce number of properties that are required to have flood insurance.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Need to enhance storm water flow of the Peckman River to reduce flooding of Verona Waste Water Treatment Plant and the Peckman river basin. During heavy rains the Ozone Ave Bridge appears to be a restriction point to the flow of the Peckman River. The bridge has been in place for many years. A redesign and widening of the bridge will reduce flow restrictions on this Peckman River.
Action/Project Category	SIP
Goals/Objectives Met	Reduce Flooding of adjacent properties which potentially reduces flood zone area.
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Reduction of equipment damages and building flooding
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Essex County
Local Planning Mechanism	Essex County and Township of Verona
Potential Funding Sources	Unknown at this time
Timeline for Completion	Unknown at this time
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: TBD Progress on Action/Project: TBD

Refer to prioritization table.

Action Number: **Verona-2 (NEW/APRW)**

Mitigation Action/Initiative: Ozone Avenue Bridge

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	7	
Priority (High/Med/Low)	Medium	

Action Number: **Verona-3 (NEW/APRW)**

Mitigation Action/Initiative: Bloomfield at Verona Park flooding/pooling of storm water

Assessing the Risk	
Hazard(s) addressed:	Street flooding and safety issues.
Specific problem being mitigated:	Increase capacity of underground storm water systems
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. The underground storm water system needs to be evaluated for proper flow and capacity.
	2. Reduce street flooding and roadway closures
	3. Decrease risk of damages due to manhole covers dislodged.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Increase storm water system capacities along Bloomfield Ave. Need storm water system upgrades under a County Roadway, Bloomfield Ave (RT 506), to increase capacity of underground storm water drainage to the Peckman river. Currently during frequent heavy rain storms the storm water run-off flows down both side of the Valley which Verona is comprised of. The existing underground storm water systems do not have the capacity to capture all of the storm water that flows to the Peckman river. The storm water flows on the surface of Bloomfield Ave causing flooding into store fronts along the way toward the Peckman River. This causes damage, traffic problems and displacement of manhole covers. The open manholes are a safety issue for people and automobiles. Bloomfield at Verona Park flooding / pooling of storm water. Claremont, Derwent and Bloomfield Ave. Need to enhance storm water system capacity Stream culvert work in residential areas storm water run-off– Eagle Rock Reservation area including Afterglow Ave. and Ravine Rd and Flooding of Cole Rd. In Verona Fairview and Crest Hill Rd area storm water flooding from storm water run-off from Essex County Hilltop Park. The problem appears to be excessive storm water run-off form the Hilltop Park area. There is a storm water collection system in place appears to be insufficient to handle the storm water run-off. Studies, planning and implementation of plans are necessary to remedy this situation.
Action/Project Category	SIP
Goals/Objectives Met	Improve storm system water capacity, reduce street flooding and street closures, reduce risk
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	Unknown – High
Priority*	High
Plan for Implementation	
Responsible Organization	Essex County
Local Planning Mechanism	Essex County and Township of Verona
Potential Funding Sources	Unknown

Timeline for Completion	Unknown at this time
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: TBD Progress on Action/Project: TBD

Refer to prioritization table.

Action Number: **Verona-3 (NEW/APRW)**

Mitigation Action/Initiative: Bloomfield at Verona Park flooding/pooling of storm water

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Verona-4 (New/APRW)**

Mitigation Action/Initiative: Claremont, Derwent and Bloomfield Avenue need to enhance storm water system capacity.

Assessing the Risk	
Hazard(s) addressed:	Street flooding and safety issues.
Specific problem being mitigated:	Increase capacity of underground storm water systems
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. The underground storm water system needs to be evaluated for proper flow and capacity. 2. Reduce street flooding and roadway closures 3. Decrease risk of damages due to manhole covers dislodged.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Increase storm water system capacities along Bloomfield Ave. Need storm water system upgrades under a County Roadway, Bloomfield Ave (RT 506), to increase capacity of underground storm water drainage to the Peckman river. Currently during frequent heavy rain storms the storm water run-off flows down both side of the Valley which Verona is comprised of. The existing underground storm water systems do not have the capacity to capture all of the storm water that flows to the Peckman river. The storm water flows on the surface of Bloomfield Ave causing flooding into store fronts along the way toward the Peckman River. This causes damage, traffic problems and displacement of manhole covers. The open manholes are a safety issue for people and automobiles. Bloomfield at Verona Park flooding / pooling of storm water. Claremont, Derwent and Bloomfield Ave. Need to enhance storm water system capacity Stream culvert work in residential areas storm water run-off– Eagle Rock Reservation area including Afterglow Ave. and Ravine Rd and Flooding of Cole Rd. In Verona Fairview and Crest Hill Rd area storm water flooding from storm water run-off from Essex County Hilltop Park. The problem appears to be excessive storm water run-off form the Hilltop Park area. There is a storm water collection system in place appears to be insufficient to handle the storm water run-off. Studies, planning and implementation of plans are necessary to remedy this situation.
Action/Project Category	SIP
Goals/Objectives Met	Improve storm system water capacity, reduce street flooding and street closures, reduce risk
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	TBD
Estimated Cost	TBD
Priority*	
Plan for Implementation	
Responsible Organization	Essex County
Local Planning Mechanism	Essex County and Township of Verona
Potential Funding Sources	Unknown at this time
Timeline for Completion	Unknown at this time
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: TBD Progress on Action/Project: TBD

Refer to prioritization table.

Action Number: **Verona-4 (New/APRW)**

Mitigation Action/Initiative: Claremont, Derwent and Bloomfield Avenue need to enhance storm water system capacity.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	0	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	

Action Number: **Verona-5 (NEW/APRW)**

Mitigation Action/Initiative: Emergency back-up generators DPW Garage, B&G Garage, pump stations Linn Drive and Hillwood Terrace, High School, Community Center and Verona WWTP.

Assessing the Risk	
Hazard(s) addressed:	Continue municipal services and operations during power outages.
Specific problem being mitigated:	Maintain Coop and COG
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Develop plans for Generator Installs
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	As a result of continued heavy storms and routine extended power outages the need for back-up generators has become necessity. The Township of Verona has reviewed the needs of and for Back-up generators. The Township of Verona has obtained a consultant report for purchase and install of back-up generators for various Verona Buildings. There is an open application for funding under the Hazard Mitigation Grant program under DR4086.
Action/Project Category	
Goals/Objectives Met	Maintain Coop and COG
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	unknown
Estimated Cost	$1.5 million (estimated)
Priority*	
Plan for Implementation	
Responsible Organization	Township of Verona
Local Planning Mechanism	Township of Verona
Potential Funding Sources	Grants (HMGP grants) and local funding
Timeline for Completion	TBD
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: TBD Progress on Action/Project: TBD

Refer to prioritization table.

Action Number: **Verona-5 (NEW/APRW)**

Mitigation Action/Initiative: Emergency back-up generators DPW Garage, B&G Garage, pump stations Linn Drive and Hillwood Terrace, High School, Community Center and Verona WWTP.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	1	
Agency Champion	1	
Other Community Objectives	1	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **Verona-6 (New/APRW)**

Mitigation Action/Initiative: In Verona Fairview and Crest Hill Road area flood from storm water run-off Count Hilltop Park

Assessing the Risk	
Hazard(s) addressed:	Reduce storm water flooding
Specific problem being mitigated:	Flooding due to storm water runoff from Essex County Property
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Evaluate current storm water systems
	2. Develop plan from evaluation
	4. Implement pans
Action/Project Intended for Implementation	
Description of Selected Action/Project	There is a storm water run-off problem in the area of Fairview Ave and Cresthill Rd in Verona. The problem appears to be storm water run-off form the Hilltop Park area. There is a storm water collection system in this which appears to be insufficient to handle the storm water run-off. Studies, planning, and implementation of plans are necessary to remedy this situation.
Action/Project Category	
Goals/Objectives Met	Reduce flooding of residential properties
Applies to existing, future, or not applicable	
Benefits (losses avoided)	Reduction of flooding
Estimated Cost	Unknown
Priority*	Medium
Plan for Implementation	
Responsible Organization	Essex County
Local Planning Mechanism	Essex County and the Township of Verona
Potential Funding Sources	Unknown
Timeline for Completion	Unknown
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: TBD Progress on Action/Project: TBD

Refer to prioritization table.

Action Number: **Verona-6 (New/APRW)**

Mitigation Action/Initiative: In Verona Fairview and Crest Hill Road area flood from storm water run-off Count Hilltop Park

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	0	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	0	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	7	
Priority (High/Med/Low)	Medium/ Low	

Action Number: **Verona-7 (NEW/LOI)**

Mitigation Action/Initiative: Verona Township shelter generator

Assessing the Risk	
Hazard(s) addressed:	See Verona-6
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Continue to use shelter during disasters and upgrade the generator.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$420,000
Priority*	
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Verona-7 (NEW/LOI)**

Mitigation Action/Initiative: Verona Township shelter generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	0	
Social	1	
Administrative	0	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	8	
Priority (High/Med/Low)	High	

Action Number: **Verona-8 (NEW/LOI)**

Mitigation Action/Initiative: Verona Township pump station

Assessing the Risk	
Hazard(s) addressed:	See Verona -6
Specific problem being mitigated:	Linn Drive Well station generator upgrade
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Ensure continuity of services my upgrading generators at various pump stations throughout the Township
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	New
Benefits (losses avoided)	
Estimated Cost	$857,142
Priority*	
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **Verona-8 (NEW/LOI)**

Mitigation Action/Initiative: Verona Township pump station

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	1	
Administrative	0	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	9	
Priority (High/Med/Low)	High	

9.22 Township of West Caldwell

This section presents the jurisdictional annex for the Township of West Caldwell.

9.22.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Larry Peter, Emergency Management Coordinator 30 Clinton Road, West Caldwell, NJ 07006 Phone: (973) 747-9946 E-mail: lpeter@westcaldwell.com	John Medina, Deputy Emergency Management Coordinator 30 Clinton Road, West Caldwell, NJ 07006 Phone: (862) 881-6308 E-mail: jmedina@westcaldwell.com

9.22.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of West Caldwell was 10,759.

Location

According to the U.S. Census Bureau, the Township has a total land area of 5.07 square miles, of which 5.055 square miles is land and 0.015 square miles is water.

Brief History

The Township of West Caldwell was part of the original land known as Horseneck. In 1798, Horseneck was renamed Caldwell Township for James Caldwell- an aid to George Washington's men during the Revolutionary War. In 1904, the population of Caldwell Township had grown so significantly that forming smaller governing bodies was essential. As a result, West Caldwell Township was formed. The first mayor of West Caldwell Township was Caleb Crane (Township of West Caldwell, 2014).

Governing Body Format

West Caldwell operates with a Mayor and Council consisting of six members in the Borough form of government. The Mayor is elected to a four year term and each of the six Council members is elected to a three year term. Each Council member chairs one of the Township's six committees (Township of West Caldwell, 2014).

Growth/Development Trends

West Caldwell Township did not note any major residential or commercial development, or major infrastructure development planned for the next five years in the municipality.

Table 9.22-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
None identified at this time.					

** Only location-specific hazard zones or vulnerabilities identified.*

9.22.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.22-2. Hazard Event History

Date(s) of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
April 14-20, 2007	Severe Storms and Inland and Coastal Flooding	DR-1694	Yes	Clean-up costs totaled over $20,000 in the Township
March 12 – April 15, 2010	Severe Storms and Flooding	DR-1897	Yes	Large amounts and tree and limb damage resulted in vegetative debris throughout the Township. The Township also experienced flooding; power outages, sewer backups, and the sewer pump station over flowing. Total damages in the Township exceeded $233,000.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	Clean-up costs totaled over $31,000 in the Township.
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Clean-up costs and debris removal totaled over $50,000 in the Township.
October 29, 2011	Severe Storm	DR-4048	Yes	The Township was without power for approximately two to five days. Clean-up costs and debris removal totaled over $300,000 in the Township.
October 26 – November 8, 2012	Superstorm Sandy	EM-3354 DR-4086	Yes Yes	The Township was without power approximately three to seven days. The roofs of the DPW building and old town hall were damaged. Total damages, including clean-up costs and debris removal, exceeded $300,000 in the Township.

9.22.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of West Caldwell. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Township of West Caldwell.

Table 9.22-3. Hazard Risk/Vulnerability Risk Ranking

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a,c]		Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA:	$0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: Category 2 SLOSH: Category 3 SLOSH: Category 4 SLOSH:	$0 $0 $0 $0	Occasional	12	Low
Drought	Damage estimate not available		Occasional	18	Medium
Earthquake	500-year MRP: 2,500-year MRP:	$2,365,287 $40,332,819	Occasional	32	High
Extreme Temperature	Damage estimate not available		Frequent	27	Medium
Flood	1% Annual Chance:	$4,135,824	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C:	$0	Rare	6	Low
Severe Storm	100-Year MRP: 500-year MRP: Annualized:	$1,046,815 $8,003,704 $81,045	Frequent	48	High
Winter Storm	1% GBS: 5% GBS:	$11,937,802 $59,689,008	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High:	$101,800	Frequent	18	Medium
Civil Disorder	Damage estimate not available		Occasional	24	Low
Cyber Attack	Damage estimate not available		Occasional	10	Low
Disease Outbreak	Damage estimate not available		Frequent	15	Medium
Hazardous Substances	Damage estimate not available		Frequent	15	Medium
Power Outages	Damage estimate not available		Frequent	36	Low
Terrorism	Damage estimate not available		Occasional	24	Low
Transportation Failure	Damage estimate not available		Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. Loss estimates for the severe storm and severe winter storm hazards are structural values only and do not include the value of contents.

d. Loss estimates for the flood and earthquake hazards represent both structure and contents.
e. The HAZUS-MH earthquake model results are reported by Census Tract

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of West Caldwell.

Table 9.22-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
West Caldwell, Township of	83	32	$1,984,652.00	2	0	17	17	66

Source: FEMA, 2014
Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.
Note (2) Total building and content losses from the claims file provided by FEMA Region 2.
Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.
Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case

Critical Facilities

The municipality does not have any critical facilities located in the 1% or 0.2% annual chance flood boundaries.

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), flooding in West Caldwell is a result of heavy rainfall produced by hurricanes moving up the coast, large frontal storms from the west and south, and local thunderstorms. Historic floods affecting the Township of West Caldwell occurred in 1902, 1903, 1936, and 1945. The 1903 flood, with an estimated peak discharge of 39,800 cubic feet per second (cfs) at the confluence of the Passaic River and Newark Bay, inundated large areas, causing damage to buildings and disruption of transportation and utility lines. A storm similar to the one which caused the flood of 1903 would result today in a significantly larger area of inundation and greater discharges, due to the increased percentage of impervious areas. Flooding has occurred in 1968 and 1971, resulting in estimated damages in excess of $1 million in this locality (FEMA FIS 2014).

The Passaic River flows along the western boundary of West Caldwell. The low areas in West Caldwell, adjacent to the Passaic River, are subject to flooding. Areas subject to inundation include residential, commercial, and park lands. The low flat areas adjacent to Pine, Green, and Kane Brooks in the lower reaches are also subject to flooding (FEMA FIS 2014).

Additionally, the municipality has identified the following hazard problems and/or problem areas:

Flood

Sewerage pumping station inundated by rain and ground water has caused localized flooding. Roads have been closed due to flooding in adjoining jurisdictions.

Power Outage

High wind and snow events have caused electrical infrastructure to become compromised and fall. Trees and limbs have fallen as a result of the wind and snow events.

9.22.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of West Caldwell.

Table 9.22-5. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	Local	Building Dept	Ordinance 1689, Adopted 9/7/10
Zoning Ordinance	Y	Local	Building Dept	Ordinance 890, Adopted 12/1982
Subdivision Ordinance	Y	Local	Building Dept	Ordinance 1284, Adopted 9/19/95
NFIP Flood Damage Prevention Ordinance				
Cumulative Substantial Damages				
Freeboard				
Growth Management				
Floodplain Management / Basin Plan	Y	Local	Building Dept	Ordinance 1605 Amends Flood Plain Management (§§ 21-2, 21-3.2, 21-6.2, 21-7.3), Adopted 5/1/07
Stormwater Management Plan/Ordinance	Y	Local	Engineering	Amends Flood Plain Management (§§ 21-2, 21-3.2, 21-6.2, 21-7.3), Adopted 5/1/07
Comprehensive Plan / Master Plan/ General Plan	Y		Engineering	Resolution adopted 11/26/2007
Capital Improvements Plan	Y		Engineering	Ord. No. 1687 § 3, Adopted 8/17/10
Site Plan Review Requirements				
Open Space Plan	Y		Engineering	Ord. No. 890 § 20-5.1; Ord. No. 1209 § 4; Ord. No. 1561 § 1; Ord. No. 1639 § 1, Adopted 12/21/1982
Stream Corridor Management Plan				
Watershed Management or Protection Plan				
Economic Development Plan				
Comprehensive Emergency Management Plan	Y		OEM	3/6/13
Emergency Response Plan	Y		OEM	3/6/13
Post Disaster Recovery Plan	Y		OEM	3/6/13
Post Disaster Recovery Ordinance				
Real Estate Disclosure Requirement				

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept. /Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]				

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of West Caldwell.

Table 9.22-6. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Engineering
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineering
Planners or engineers with an understanding of natural hazards	Y	Engineering
NFIP Floodplain Administrator	Y	Robert McLoughlin, Construction Official, Building Department
Surveyor(s)	Y	Engineering
Personnel skilled or trained in "GIS" applications	Y	Engineering
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	OEM
Grant Writer(s)	N	
Staff with expertise or training in benefit/cost analysis	Y	Finance
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the Township of West Caldwell.

Table 9.22-7. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community development Block Grants (CDBG)	YES
Capital Improvements Project Funding	YES
Authority to Levy Taxes for specific purposes	YES
User fees for water, sewer, gas or electric service	YES
Impact Fees for homebuyers or developers of new development/homes	YES

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Incur debt through general obligation bonds	YES
Incur debt through special tax bonds	YES
Incur debt through private activity bonds	NO
Withhold public expenditures in hazard-prone areas	N/A
Mitigation grant programs	YES
Other	

Community Classifications

The table below summarizes classifications for community program available to the Township of West Caldwell.

Table 9.22-8. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	
Building Code Effectiveness Grading Schedule (BCEGS)	NP	
Public Protection	NP	
Storm Ready	NP	
Firewise	NP	

NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within five road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Robert McLoughlin, Construction Official

Flood Vulnerability Summary

Eight properties reported damage following Superstorm Sandy. A majority of the damage was caused by trees falling on the dwellings. Two structures were deemed unsafe for occupation. There are no records kept of properties damaged by flooding or an interest in mitigation projects.

Resources

The Construction Official coordinates the responsibilities and duties of floodplain manager with OMLAND Engineering staff member Frank Russo. Their responsibilities include permit review, inspections, damage assessments, record-keeping, and GIS. There is a link on the municipal website directing residents to the FEMA website. Additional training and information on floodplain management would be welcomed.

Compliance History

West Caldwell Township is currently unsure of its standing in the NFIP. The current floodplain manager has no record of when the most recent Community Assistance Visit (CAV) took place and does not feel there is a need to schedule one at this time.

Regulatory

Floodplain management regulations and ordinances meet FEMA and New Jersey minimum requirements. There are additional local ordinances, plans, and programs that support the enforcement of floodplain management in West Caldwell Township. Though West Caldwell Township is not currently a participating community in the Community Rating System (CRS), receiving additional information would be welcomed.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program.

Other Capabilities Identified

None at this time.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

Due to the severity of recent events, mitigation has become a priority in the Township. Currently, the Township limits development in high hazard areas, incorporates hazard resistant construction standards into the design and location of projects, and prior to land use zoning or development permitting, hazard areas are considered. It is not considered in many decisions and will become more evident in zoning/permitting procedures in the future. The Township also conducts outreach; their municipal website directs residents to the FEMA website for more information regarding hazards.

More ways to incorporate mitigation into day-to-day operations will be evaluated. For example, the Township would like to pursue more information about becoming a certified Firewise Community due to the potential for forest fires in the community. Refer to Table 9.22-10 action West Caldwell-20. In addition, the Township will look at mitigation actions when allocating funds from the municipal operating budget in the future.

9.22.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.22-9. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Stream culvert between all municipalities.	Continuous	Sediment/debris removal at various culverts accomplished. Action added to annual maintenance activities. This initiative will be carried over into the current mitigation strategy.
2: Mitigate Forest Avenue streams against flooding.	Discontinued	Essex County is the lead agency for this project; therefore, this initiative will not be carried over by West Caldwell.
3: Kirkpatrick Lane wastewater pumping stations.	In Progress	
4: Passaic Avenue and Bloomfield Avenue are both evacuation routes impacted by flooding.	Discontinued	These roads are Essex County thoroughfares. The County is the lead agency for this project; therefore, this initiative will not be carried over by West Caldwell. Please refer to Essex County Annex (Section 9.1)
5: Road raising on Essex Place.	Discontinued	Contributing factor determined to be related to storm water conduit and outfall deficiencies. This initiative will not be carried over into the current mitigation strategy.
6: Infiltration study for sanitary sewer system- old pipes, back flow.	Continuous	Developer funded and completed study performed along Forest Avenue. Comprehensive investigations of public system still required. This initiative will be carried over into the current mitigation strategy.
7: Comprehensive ordinances regulating storm water and floodplain management.	Completed	Required ordinances have been adopted. This initiative will not be carried over into the current mitigation strategy.
8: Potential for forest fires.	No Progress	Statement of fact. This initiative will be revised and carried over into the current mitigation strategy.
9: Sanitary sewer system back-ups and overflows.	Continuous	Repairs of infiltration and inflow deficiencies along Forest Ave. Sanitary manhole subject to inflow at Dougal Place repaired. This initiative will be carried over into the current mitigation strategy.

Table 9.22-9. Past Mitigation Initiative Status

Description	Status	Review Comments
10: Continuing care facility.	Completed	Statement of fact. This initiative will not be carried over into the current mitigation strategy.
11: New age restricted retirement facility.	Completed	Facility has been completed.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The municipality identified the following initiatives that have been completed; however, they were not included in the previous mitigation strategy:

- Improvements to the sewerage pumping station are currently underway.

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.22-10 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.22-11 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.22-9. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
West Caldwell-1 (NEW/LOI)	Obtain backup power to ensure continuity of operations. The following have been identified to date: 1.West Caldwell Police station generator project 2. West Caldwell West Essex First Aid Building 3. West Caldwell Municipal 4. West Caldwell Department of Public Works	Existing	All	1.2 6.1	OEM	High	Medium 1.$68,000 2. $35,000 3. $98,000 4. $61,200	HMGP	Short Term DOF	High	SIP	ES
West Caldwell-2 (NEW/AW)	Increase stream dumping enforcement	New and Existing	Flood	1.2 2.3	Code Enforcement	Medium	Low	Annual operations budget	Short Term DOF	High	EAP	NSP
West Caldwell-3 (NEW/AW)	Stream channel clearing and de-snagging	New and Existing	Flood	1.2 2.3	Governing body	Medium	High	Annual operations budget, capital funding	Long-term	High	NSP, SIP	NSP
West Caldwell-4 (NEW/AW)	Construction of a chlorine booster station	New	All Hazards	1.2 2.1 6.1	West Caldwell Township	High	High	Grant funding with local cost share	Short	High	LPR, SIP	SP
West Caldwell-5 (NEW/AW)	Purchase and replace emergency stand-by generator	New and Existing	All Hazards	1.2 6.1	West Caldwell Township	Medium	Medium	Grant funding	Short	High	SIP	SP
West Caldwell-6 (NEW/AW)	Police/Fire/EMS radio system (Police Department).	New	All Hazards	1.1 1.3	Police Department	High	High	Grant funding	Short	Medium	SIP	ES
West Caldwell-7 (NEW/AW)	Police headquarters building security locks and video monitoring (Police Department).	New	All Hazards	1.1 6.1	Police Department	High	High	Grant funding	Short	Medium	SIP	ES
West Caldwell-8 (NEW/AW)	Purchase remote monitoring system for certain roads and intersections (Police Department).	New	All Hazards	1.1 1.2	Police Department	High	High	Grant funding	Short	Medium	SIP	ES

Table 9.22-9. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
West Caldwell-9 (NEW/AW)	Message sign board (Police Department).	New	All Hazards	1.1 1.2	Police Department	High	Medium	Grant funding	Short	Medium	EAP	ES
West Caldwell-10 (NEW/AW)	Vehicular traffic lane diversion equipment (Police Department).	New	All Hazards	1.1 1.2	Police Department	High	Medium	Grant funding	Short	Medium	EAP	ES
West Caldwell-11 (NEW/AW)	Laser mapping equipment (Police Department).	New	All Hazards	1.1 1.2 3.2	Police Department	High	Medium	Grant funding	Short	Medium	EAP	ES
West Caldwell-12 (NEW/AW)	Patrol car awning (Police headquarters). (Police Department).	New	All Hazards	1.3	Police Department	Medium	Medium	Grant funding	Short	Medium	EAP	ES
West Caldwell-13 (NEW/AW)	Equip the department classroom (Police Department).	New	All Hazards	5.2	Police Department	Medium	Medium	Grant funding	Short	Medium	EAP	ES
West Caldwell-14 (OLD 1)	Clean and maintain stream culvert between all municipalities.	Existing	Flood	2.3	OEM, FPA	Medium	Medium	Municipal budget	Short Term DOF	Medium	NRP	NSP
West Caldwell-15 (OLD 6)	Infiltration study for sanitary sewer system-old pipes, back flow.	New and Existing	Flood	1.2 2.2 3.1	FPA, Engineering Department	Medium	Medium	Grant funding, municipal budget	Short Term DOF	High	SIP, NSP, EAP	SP
West Caldwell-16 (OLD 8)	Obtain information about becoming a certified Firewise Community due to the potential for forest fires.	New and Existing	Wildfire	1.2 3.1	Fire Department OEM	Medium	Low	Municipal budget	Long Term DOF	Medium	SIP, EAP, LPR, NSP	PR
West Caldwell-17 (OLD 9)	Upgrade sanitary sewer system back-ups and overflows.	New and Existing	Flood	1.2 2.2	Engineering Department	High	High	Grant funding, municipal budget	Short Term DOF	High	SIP, EAP, LPR	SP
West Caldwell-18 (OLD 3)	Kirkpatrick Lane wastewater pumping stations.	New	Flood	1.2 2.1	West Caldwell Township	High	High	Grant funding with local cost share	Short	High	LPR	PP
West Caldwell-19	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable. Assess and prioritize non-structural flood hazard mitigation alternatives for at risk properties within the floodplain, including those that have been identified as repetitive loss, such as acquisition/relocation, or elevation depending on feasibility. The parameters for feasibility for this initiative would be: funding, benefits versus costs and willing participation of property owners. Implement as funding becomes available.											
	See above.	Existing	Flood, Severe Weather,	1.2 2.2	Engineering via NFIP FPA) with	High	High	FEMA Mitigation Grant	Long term DOF (specific project application and	High	SIP	PP

Table 9.22-9. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
			Winter Storm		NJOEM, FEMA support			Programs and local budget (or property owner) for cost share	implementation)			

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:
CAV Community Assistance Visit
CRS Community Rating System
DPW Department of Public Works
FEMA Federal Emergency Management Agency
FPA Floodplain Administrator
HMA Hazard Mitigation Assistance
N/A Not applicable
NFIP National Flood Insurance Program
NJDEP New Jersey Department of Environmental Protection
NJOEM New Jersey Office of Emergency Management
OEM Office of Emergency Management

Potential FEMA HMA Funding Sources:
FMA Flood Mitigation Assistance Grant Program
HMGP Hazard Mitigation Grant Program
PDM Pre-Disaster Mitigation Grant Program
RFC Repetitive Flood Claims Grant Program
SRL Severe Repetitive Loss Grant Program

Timeline:
Short 1 to 5 years
Long Term 5 years or greater
OG On-going program
DOF Depending on funding

Costs:
Where actual project costs have been reasonably estimated:
Low < $10,000
Medium $10,000 to $100,000
High > $100,000

Where actual project costs cannot reasonably be established at this time:
Low Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.
Medium Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
High Would require an increase in revenue via an alternative source (i.e., bonds,

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:
Low= < $10,000
Medium $10,000 to $100,000
High > $100,000

Where numerical project benefits cannot reasonably be established at this time:
Low Long-term benefits of the project are difficult to quantify in the short term.
Medium Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.
High Project will have an immediate impact on the reduction of risk exposure to

Costs:

grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.

Benefits:

life and property.

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.22-10. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
West Caldwell-1 (NEW/LOI)	Obtain backup power to ensure continuity of operations.	1	1	1	1	1	0	1	1	1	1	0	1	1	0	11	High
West Caldwell-2 (NEW/AW)	Stream dumping enforcement	0	1	1	1	1	0	1	1	0	1	1	1	1	1	11	High
West Caldwell-3 (NEW/AW)	Stream channel clearing and de-snagging	0	1	1	1	1	0	0	1	0	1	1	1	1	1	10	High
West Caldwell-4 (NEW/AW)	Construction of a chlorine booster station	1	0	0	1	0	1	1	1	1	0	0	0	0	0	6	High
West Caldwell-5 (NEW/AW)	Purchase and replace emergency stand-by generator	1	1	1	1	1	0	0	1	-1	0	1	1	0	0	7	High
West Caldwell-6 (NEW/AW)	Police/Fire/EMS radio system (Police Department).	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Medium
West Caldwell-7 (NEW/AW)	Police headquarters building security (Police Department).	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Medium
West Caldwell-8 (NEW/AW)	Remote monitoring system for certain roads and intersections (Police Department).	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Medium
West Caldwell-9 (NEW/AW)	Message sign board (Police Department).	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Medium
West Caldwell-10 (NEW/AW)	Vehicular traffic lane diversion equipment (Police Department).	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Medium
West Caldwell-11 (NEW/AW)	Laser mapping equipment (Police Department).	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Medium
West Caldwell-12 (NEW/AW)	Patrol car awning (Police headquarters). (Police Department).	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Medium
West Caldwell-13 (NEW/AW)	Equip the department classroom (Police Department).	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Medium
West Caldwell-14	Clean and maintain	0	1	1	1	0	0	0	1	1	0	1	1	0	0	7	Medium

Table 9.22-10. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
(OLD 1)	stream culvert between all municipalities.																
West Caldwell-15 (OLD 6)	Infiltration study for sanitary sewer system-old pipes, back flow.	1	1	1	1	0	1	1	1	1	0	1	1	0	0	10	High
West Caldwell- 16 (OLD 8)	Firewise Community	1	1	1	0	1	1	0	1	1	0	0	1	0	0	8	Medium
West Caldwell- 17 (OLD 9)	Upgrade sanitary sewer system back-ups and overflows.	1	1	1	0	1	1	0	1	1	0	1	0	1	1	10	High
West Caldwell-18 (OLD 3)	Kirkpatrick Lane wastewater pumping stations.	0	1	1	1	0	1	1	1	1	1	0	1	1	0	10	High
West Caldwell-19	Support the mitigation of vulnerable structures	1	1	1	1	1	0	0	1	1	1	1	0	0	1	10	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.22.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.22.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of West Caldwell that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of West Caldwell has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.22.9 Additional Comments

None at this time.

Figure 9.22-1. Township of West Caldwell Hazard Area Extent and Location Map 1

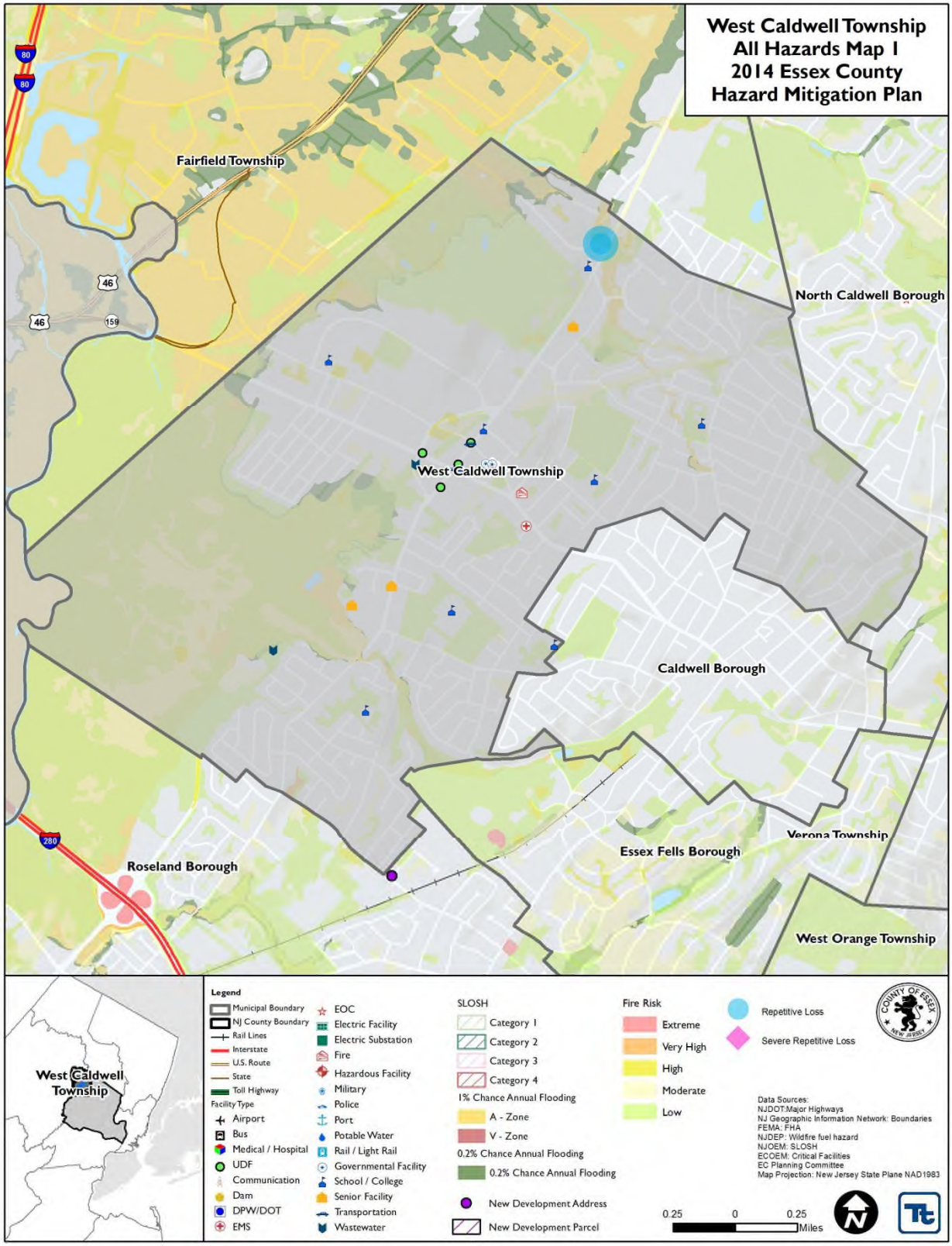
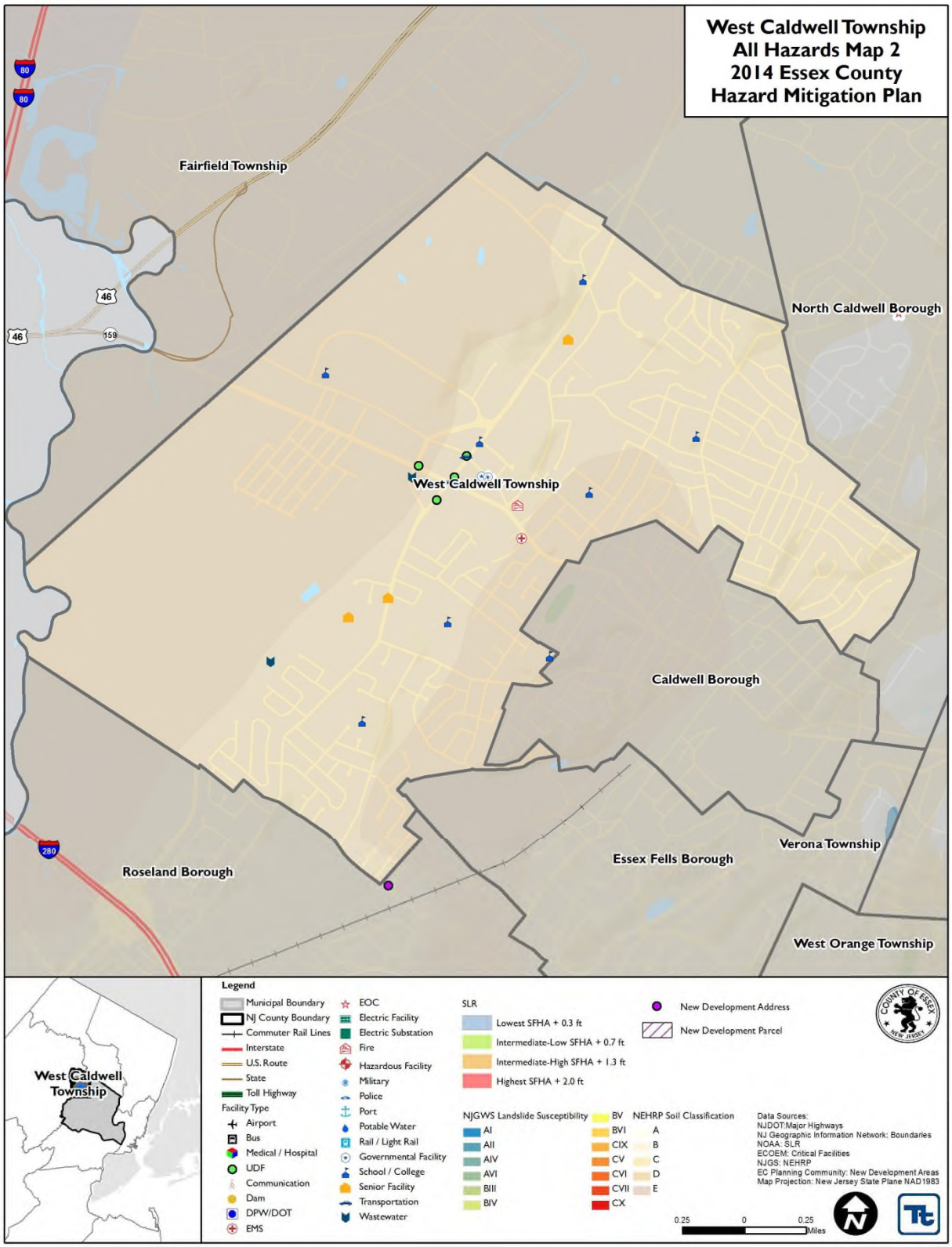


Figure 9.22-2. Township of West Caldwell Hazard Area Extent and Location Map 2



Action Number: **West Caldwell-1 (NEW/LOI)**
Mitigation Action/Initiative: West Caldwell Police station generator project

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	When the Police station loses power, the efficiency of the station drops by 50%. The current generator is no longer reliable. Backup power is needed to ensure continuity if operations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Replace current generator to ensure continuity of services and protection for the community.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	New and Existing
Benefits (losses avoided)	
Estimated Cost	$68,000
Priority*	High
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: Completed 2013

Refer to prioritization table.

Action Number: **West Caldwell-1 (NEW/LOI)**
Mitigation Action/Initiative: West Caldwell Police station generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	With an increase of power outages in the area, it is necessary to install generators at critical facilities within the Township for continuity of operations for emergency responders
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	It is technically feasible and meets the Township long-term goals.
Political	1	
Legal	0	Neutral
Fiscal	1	
Environmental	1	The Generator will be permitted and will comply with State Environmental Rules
Social	1	This project will not negatively affect the population.
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **West Caldwell- 1 (NEW/LOI)**
Mitigation Action/Initiative: West Caldwell West Essex First Aid Building generator project

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	Backup power is needed to ensure continuity of operations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	
Estimated Cost	$35,000
Priority*	High
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell- 1 (NEW/LOI)**
Mitigation Action/Initiative: West Caldwell West Essex First Aid Building generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	With an increase of power outages in the area, it is necessary to install generators at critical facilities within the Township for continuity of operations for emergency responders
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	It is technically feasible and meets the Township long-term goals.
Political	1	
Legal	0	Neutral
Fiscal	1	
Environmental	1	The Generator will be permitted and will comply with State Environmental Rules
Social	1	This project will not negatively affect the population.
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	
Other Community Objectives	0	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **West Caldwell-1 (NEW/LOI/AW)**

Mitigation Action/Initiative: West Caldwell Municipal Building generator project

Assessing the Risk	
Hazard(s) addressed:	Loss of Electrical Power
Specific problem being mitigated:	The Township of West Caldwell is seeking funding to purchase and install a permanent natural gas generator for the Municipal Town hall so that it can provide power to critical infrastructure in the event of a power outage. The Municipal Town hall will act as the Emergency Operation Center in the event that the primary EOC (Municipal Police Department) is over whelmed or if the incident expands in scope and size. Neither building can remain open in the event of power failures. The purchase of the generator will allow the Township to manage emergencies more efficiently, therefore, allowing for a smooth coordination of our emergency services.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Solar Generator – cost, power output
	2. Fuel cells - cost
	3. Combined Heat and Power - cost
Action/Project Intended for Implementation	
Description of Selected Action/Project	(1) 175 KW (or more) diesel GENERAC Automatic Standby Generator with tank capacity of 380 gallons, 24 Hour run time via a 600A 3PH 4W 240/120/3/60 Automatic Transfer Switch.
Action/Project Category	Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.
Goals/Objectives Met	Continuity of operations for emergency responders / With an increase of power outages in the area, it is necessary to install generators at critical facilities within the Township.
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Loss of Electrical Power - With an increase of power outages in the area, it is necessary to install generators at critical facilities within the Township for continuity of operations for emergency responders.
Estimated Cost	Medium =$10,000 to $100,000
Priority*	High
Plan for Implementation	
Responsible Organization	Township Of West Caldwell
Local Planning Mechanism	
Potential Funding Sources	Grant funding with local cost share /Federal and local sources
Timeline for Completion	OG = On-going program
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: 3/26/14 Progress on Action/Project: HMGP Application #206 is in progress of completion. LOI and MOU has been signed and completed. Engineering services have been retained and design work has begun. Funding for local share has been secured. Project is on pace for completion by Fall 2014.

Refer to prioritization table.

Action Number: **West Caldwell-1 (NEW/LOI/AW)**
Mitigation Action/Initiative: West Caldwell Municipal Building generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	With an increase of power outages in the area, it is necessary to install generators at critical facilities within the Township for continuity of operations for emergency responders.
Property Protection	1	Having the ability to keep the Township EOC with power, during power outages, will allow our emergency dispatchers to keep better track of emergency responders and better allocated resources to secure, reduce and eliminate hazards to infrastructure and damage to structures.
Cost-Effectiveness	1	For the small investment of $121,000; hundreds of thousands of dollars can be saved by the better allocation of resources to secure, reduce and eliminate hazards to infrastructure and damage to structures.
Technical	1	It is technically feasible and meets the Township long-term goals.
Political	1	The Township has applied for HMGP Grant (Application #206 – Project #4086) and is moving through the process. The Township's Governing Body has already funded the full amount of the project, as it is a reimbursement grant.
Legal	0	Neutral
Fiscal	1	The Township has applied for HMGP Grant (Application #206 – Project #4086) and is moved through the process. The Township's Governing Body has already funded the full amount of the project, as it is a reimbursement grant.
Environmental	1	The Generator will be permitted and will comply with State Environmental Rules.
Social	1	This project will not negatively affect the population.
Administrative	1	The Township has the administrative capabilities to implement this action and will not require outside help.
Multi-Hazard	0	Loss of Power
Timeline	1	Project is on-going and should be completed by Fall 2014
Agency Champion	1	Project has been assigned a manager and is being supported by administration. The Township's Governing Body has already funded the full amount of the project, as it is a reimbursement grant.
Other Community Objectives	0	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **West Caldwell-1 (NEW/LOI)**
Mitigation Action/Initiative: West Caldwell Department of Public Works generator

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	Backup power is needed to ensure continuity of operations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	$61,200
Priority*	High
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-1 (NEW/LOI)**
Mitigation Action/Initiative: West Caldwell Department of Public Works generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	With an increase of power outages in the area, it is necessary to install generators at critical facilities within the Township for continuity of operations for emergency responders.
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	Highly supported
Legal	0	Neutral
Fiscal	1	
Environmental	1	The Generator will be permitted and will comply with State Environmental Rules
Social	1	
Administrative	1	
Multi-Hazard	1	
Timeline	0	Actions can begin immediately
Agency Champion	1	Department of Public Works
Other Community Objectives	0	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **West Caldwell-1 (NEW/LOI)**
Mitigation Action/Initiative: Energy Allocation Grant- generators, 2 sites

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	Backup power is needed to ensure continuity of operations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Completion of the application for the Energy Allocation Grant
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	
Estimated Cost	
Priority*	High
Plan for Implementation	
Responsible Organization	*Governing Body*
Local Planning Mechanism	
Potential Funding Sources	*HMGP*
Timeline for Completion	*Short*
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: In Progress

Refer to prioritization table.

Action Number: **West Caldwell-1 (NEW/LOI)**
Mitigation Action/Initiative: Energy Allocation Grant- generators, 2 sites

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	With an increase of power outages in the area, it is necessary to install generators at critical facilities within the Township for continuity of operations for emergency responders
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	0	
Fiscal	1	
Environmental	1	The Generator will be permitted and will comply with State Environmental Rules
Social	1	This project will not negatively affect the population.
Administrative	1	
Multi-Hazard	0	
Timeline	1	Actions can begin immediately
Agency Champion	1	
Other Community Objectives	0	
Total	11	
Priority (High/Med/Low)	High	

Action Number: **West Caldwell-2 (NEW/AW)**
Mitigation Action/Initiative: Stream dumping enforcement

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Dumping of yard debris into stream channels
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Bi-annual mailings to affected residents
	2. Enforcement/summonses
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Provide informational mailings to residents along waterways reminding them to properly dispose of yard debris.
Action/Project Category	EAP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Stream bank erosion, property damage, road closures associated with overtopping, loss of channel capacity
Estimated Cost	Low
Priority*	High
Plan for Implementation	
Responsible Organization	Governing body
Local Planning Mechanism	Existing ordinances
Potential Funding Sources	Annual operating funds
Timeline for Completion	Bi-annual (spring and fall)
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-2 (NEW/AW)**
Mitigation Action/Initiative: Stream dumping enforcement

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	No known injuries reported due to inaction.
Property Protection	1	Eliminating potential stream/culvert blockages will reduce erosion to adjacent properties.
Cost-Effectiveness	1	Bi-annual mailings of several hundred dollars can help prevent emergency repair actions of thousands and reduce annual maintenance costs.
Technical	1	Technically feasible and enforces long-term goals.
Political	1	Residents support initiative and governing body endorses.
Legal	0	Local jurisdiction unless NJDEP is contacted for violations.
Fiscal	1	Costs for mailings included in operations budget.
Environmental	1	Resolve/eliminate stream channel blockages.
Social	0	No impact
Administrative	1	Mailing list has been generated, advisory documents completed
Multi-Hazard	1	Reduce erosion, property damage, and flooding hazards
Timeline	1	Immediate accomplishment
Agency Champion	1	DPW, Township Engineer's office
Other Community Objectives	1	Supports environmental quality by reducing stream channel erosion and capital improvements by reducing annual maintenance activities.
Total	11	
Priority (High/Med/Low)	High	

Action Number: **West Caldwell-3 (NEW/AW)**
Mitigation Action/Initiative: Stream channel clearing and de-snagging

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Reduction of stream channel capacity and outfall blockages
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Removal of accumulated stream channel sedimentation
Action/Project Category	NSP, SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	Property damage, road closings
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	Governing body
Local Planning Mechanism	Existing ordinances, Flood Hazard Area Control Act rules
Potential Funding Sources	Annual operating budget, capital funding
Timeline for Completion	Long-term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-3 (NEW/AW)**
Mitigation Action/Initiative: Stream channel clearing and de-snagging

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	No known injuries reported due to inaction.
Property Protection	1	Restoring stream channel elevations and capacities to original conditions reduces flooding impact.
Cost-Effectiveness	1	Actions now will provide immediate relief and extend for extended period.
Technical	1	Technically feasible and will provide long-term benefits by restoring design capacities.
Political	1	Residents support initiative and governing body endorses.
Legal	0	NJDEP permitting will be required for certain actions.
Fiscal	0	Capital and operating funding will be required
Environmental	1	Reduce/eliminate stream cleaning and outfall blockages.
Social	0	Temporary impacts associated with access.
Administrative	1	Township has personnel and professionals to implement actions.
Multi-Hazard	1	Reduce erosion, property damage, and flooding
Timeline	1	Actions can begin immediately
Agency Champion	1	DPW and Township Engineer's office
Other Community Objectives	1	Restores drainage system capacities, reduces stream channel erosion.
Total	10	
Priority (High/Med/Low)	High	

Action Number: **West Caldwell-4 (NEW/AW)**
Mitigation Action/Initiative: Construction of a chlorine booster station

Assessing the Risk	
Hazard(s) addressed:	Treatment of potable water.
Specific problem being mitigated:	Quality of drinking water.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. To construct a booster station with accessories allowing treatment.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Construct a size adequate booster facility to allow injection of chlorine to the system in the event levels require it.
Action/Project Category	Local plans and regulations.
Goals/Objectives Met	Continuous quality of potable water supply.
Applies to existing, future, or not applicable	Future.
Benefits (losses avoided)	In bulk purchasing our water, we do not have control of the chlorine levels of the water we purchase. This would allow us some level of control.
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-4 (NEW/AW)**
Mitigation Action/Initiative: Construction of a chlorine booster station

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Maintain continuous safe, chlorinated potable water throughout the system.
Property Protection	0	
Cost-Effectiveness	0	Would allow us the ability to adjust and continue supplying the system with quality drinking water without changing systems or suppliers.
Technical	1	
Political	0	
Legal	1	
Fiscal	1	
Environmental	1	
Social	1	This project will not negatively affect the population
Administrative	0	
Multi-Hazard	0	
Timeline	0	Actions can begin immediately
Agency Champion	0	Water Department
Other Community Objectives	0	
Total	6	
Priority (High/Med/Low)	Medium	

Action Number: **West Caldwell-5 (NEW/AW)**
Mitigation Action/Initiative: Purchase and replace emergency stand-by trailer generator

Assessing the Risk	
Hazard(s) addressed:	Power loss at critical stations
Specific problem being mitigated:	Loss of power/ Loss of functions at our stations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. To provide an alternative power source.
	2. Installation of a stand-by generator. Cost prohibited.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase a 60 kw. generator trailer.
Action/Project Category	NSP- Minimize damage and prevent losses from power loss from sanitary and water pumping stations.
Goals/Objectives Met	To provide sufficient power to energize sewer and potable water pumping stations.
Applies to existing, future, or not applicable	Existing and future.
Benefits (losses avoided)	Loses avoided would be damage to property, structures, and possible damage to water system.
Estimated Cost	Medium
Priority*	High
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-5 (NEW/AW)**

Mitigation Action/Initiative: Purchase and replace emergency stand-by trailer generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Maintain water distribution system pressures and flows
Property Protection	1	Ability to maintain sewer pumping station
Cost-Effectiveness	1	Benefits property protection
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	-1	
Administrative	0	
Multi-Hazard	1	Trailer has many uses
Timeline	1	Instant
Agency Champion	0	Department of Public Works
Other Community Objectives	0	
Total	7	
Priority (High/Med/Low)	High	

Action Number: **West Caldwell-6 (NEW/AW)**
Mitigation Action/Initiative: Police/Fire/EMS Radio System (Police Department)

Assessing the Risk	
Hazard(s) addressed:	Radio communications
Specific problem being mitigated:	Poor radio communications between emergency services
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase a new radio system. Not implemented due to cost
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Improve radio/dispatch system for emergency services
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-6 (NEW/AW)**
Mitigation Action/Initiative: Police/Fire/EMS Radio System (Police Department)

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Better communications leads to faster response
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	Feasible as a long term solution
Political	1	
Legal	1	Legally permitted
Fiscal	1	
Environmental	1	
Social	1	This project will not negatively affect the population
Administrative	1	
Multi-Hazard	1	Covers Police, Fire and EMS services
Timeline	1	Actions can begin immediately
Agency Champion	1	Police Department
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	Medium	

Action Number: **West Caldwell-7 (NEW/AW)**
Mitigation Action/Initiative: Police Headquarters building security (Police Department)

Assessing the Risk	
Hazard(s) addressed:	Access to police headquarters
Specific problem being mitigated:	Unauthorized access to police headquarters building and surrounding structures.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Improvements to recoding system and physical barriers. Not implemented due to cost
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Upgrades to building security through monitoring systems and physical barriers.
Action/Project Category	SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Security to all emergency communications for Police/Fire/EMS
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-7 (NEW/AW)**
Mitigation Action/Initiative: Police Headquarters building security (Police Department)

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Security for employees and visitors of the building
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	No issue
Social	1	This project will not negatively affect the population
Administrative	1	
Multi-Hazard	1	
Timeline	1	Actions can begin immediately
Agency Champion	1	Police Department
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	Medium	

Action Number: **West Caldwell-8 (NEW/AW)**

Mitigation Action/Initiative: Remote monitory system for certain roads and intersections (Police Department)

Assessing the Risk	
Hazard(s) addressed:	Monitoring the flow of vehicular traffic
Specific problem being mitigated:	Incidents disrupting the flow of traffic, motor vehicle crashes.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Install cameras at certain roads/intersections and a monitoring system in police headquarters. Not implemented due to cost.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Install remote monitoring cameras at certain roads and intersections that will be monitored in police headquarters.
Action/Project Category	SIP, EAP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	Early intervention in incidents at monitored roads and intersections.
Estimated Cost	High
Priority*	Medium
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-8 (NEW/AW)**

Mitigation Action/Initiative: Remote monitory system for certain roads and intersections (Police Department)

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Real time monitoring of selected locations provides additional security
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	No issue
Social	1	This project will not negatively affect the population
Administrative	1	Township has personnel and professionals to implement actions.
Multi-Hazard	1	
Timeline	1	Actions can begin immediately
Agency Champion	1	Police Department
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	Medium	

Action Number: **West Caldwell-9 (NEW/AW)**
Mitigation Action/Initiative: Message Sign Board (Police Department)

Assessing the Risk	
Hazard(s) addressed:	Public information
Specific problem being mitigated:	Immediate information about local conditions
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase message sign board. Not implemented due to cost.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Inform public of local conditions.
Action/Project Category	EAP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-9 (NEW/AW)**
Mitigation Action/Initiative: Message Sign Board (Police Department)

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Messages can provide important information to residents and visitors
Property Protection	1	
Cost-Effectiveness	1	Can be used my multiple Township Departments
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	No issue
Social	1	This project will not negatively affect the population
Administrative	1	Township has personnel and professionals to implement actions.
Multi-Hazard	1	Changeable message can be used for multiple purposes
Timeline	1	Actions can begin immediately
Agency Champion	1	Police Department
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	Medium	

Action Number: **West Caldwell-10 (NEW/AW)**
Mitigation Action/Initiative: Vehicular traffic lane diversion equipment (Police Department)

Assessing the Risk	
Hazard(s) addressed:	Vehicular lane closures
Specific problem being mitigated:	Lane closures and detours
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase traffic cones, barricades, signs. Not implemented due to cost.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Assist with traffic safety, divert vehicular traffic
Action/Project Category	EAP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-10 (NEW/AW)**
Mitigation Action/Initiative: Vehicular traffic lane diversion equipment (Police Department)

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Provide safe and efficient movement of vehicular traffic
Property Protection	1	Provide safe and efficient movement of vehicular traffic
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	No issue
Social	1	This project will not negatively affect the population
Administrative	1	Township has personnel and professionals to implement actions.
Multi-Hazard	1	
Timeline	1	Actions can begin immediately
Agency Champion	1	Police Department
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	Medium	

Action Number: **West Caldwell-11 (NEW/AW)**
Mitigation Action/Initiative: Laser mapping equipment (Police Department)

Assessing the Risk	
Hazard(s) addressed:	Motor vehicle crashes
Specific problem being mitigated:	Accurately document motor vehicle crashes
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase laser mapping equipment. Not implemented due to cost
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Investigators to accurately map a crash scene.
Action/Project Category	EAP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Future
Benefits (losses avoided)	
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-11 (NEW/AW)**
Mitigation Action/Initiative: Laser mapping equipment (Police Department)

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	No issue
Social	1	This project will not negatively affect the population
Administrative	1	Township has personnel and professionals to implement actions.
Multi-Hazard	1	
Timeline	1	Actions can begin immediately
Agency Champion	1	Police Department
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	Medium	

Action Number: **West Caldwell-12 (NEW/AW)**
Mitigation Action/Initiative: Patrol car awning (Police Department)

Assessing the Risk	
Hazard(s) addressed:	Cover parked patrol vehicles while at police headquarters
Specific problem being mitigated:	Protection from inclement weather
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase awning. Not implemented due to cost.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Keep patrol vehicles out of inclement weather and ready for immediate use.
Action/Project Category	EAP, SIP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-12 (NEW/AW)**
Mitigation Action/Initiative: Patrol car awning (Police Department)

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	Protect vehicles from adverse weather
Cost-Effectiveness	1	Awning is lower cost compared to building construction
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	No issue
Social	1	This project will not negatively affect the population
Administrative	1	Township has personnel and professionals to implement actions.
Multi-Hazard	1	
Timeline	1	Actions can begin immediately
Agency Champion	1	Police Department
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	Medium	

Action Number: **West Caldwell-13 (NEW/AW)**
Mitigation Action/Initiative: Equip the department classroom (Police Department)

Assessing the Risk	
Hazard(s) addressed:	Tables and dry erase boards, chairs, and conference table
Specific problem being mitigated:	A space to conduct meetings and preparation for major events
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Purchase classroom equipment. Not implemented due to cost
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	A space to conduct large meetings and preparation for major events.
Action/Project Category	
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-13 (NEW/AW)**
Mitigation Action/Initiative: Equip the department classroom (Police Department)

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	
Property Protection	1	
Cost-Effectiveness	1	Ability to conduct in-house training
Technical	1	
Political	1	
Legal	1	
Fiscal	1	
Environmental	1	No issue
Social	1	This project will not negatively affect the population
Administrative	1	Township has personnel and professionals to implement actions.
Multi-Hazard	1	
Timeline	1	Actions can begin immediately
Agency Champion	1	Police Department
Other Community Objectives	1	
Total	14	
Priority (High/Med/Low)	Medium	

Action Number: **West Caldwell-14 (OLD 1)**
Mitigation Action/Initiative: Stream culvert between all municipalities

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Clearing culverts of debris
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP, NSP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	
Estimated Cost	
Priority*	
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-14 (OLD 1)**
Mitigation Action/Initiative: Stream culvert between all municipalities

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	
Cost-Effectiveness	1	Actions now will provide immediate relief and extend for extended period
Technical	1	
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	Residents support initiative and governing body endorses
Administrative	1	
Multi-Hazard	1	
Timeline	1	Actions can begin immediately
Agency Champion	1	Engineering Department
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **West Caldwell-15 (OLD 6)**

Mitigation Action/Initiative: Infiltration study for sanitary sewer system- old pipes, back flow.

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Study storm water infiltration into system
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP, NSP, EAP
Goals/Objectives Met	
Applies to existing, future, or not applicable	
Benefits (losses avoided)	
Estimated Cost	
Priority*	
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-15 (OLD 6)**

Mitigation Action/Initiative: Infiltration study for sanitary sewer system- old pipes, back flow.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	Prevent untreated sewage from entering waterways
Cost-Effectiveness	1	
Technical	1	Long term solution to infiltration problem
Political	1	
Legal	0	
Fiscal	0	
Environmental	1	Reduce infiltration
Social	0	Residents support initiative and governing body endorses
Administrative	1	
Multi-Hazard	1	
Timeline	1	Actions can begin immediately
Agency Champion	1	Engineering Department
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **West Caldwell-16 (OLD 8)**
Mitigation Action/Initiative: Firewise Community

Assessing the Risk	
Hazard(s) addressed:	Wildfires
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Homeowner and Community Protection
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP, EAP, LPR, NSP
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	
Estimated Cost	
Priority*	
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-16 (OLD 8)**
Mitigation Action/Initiative: Firewise Community

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Reduce risk of fire injuries in the Township
Property Protection	1	Reduce risk of fire damage in the Township
Cost-Effectiveness	0	
Technical	0	
Political	1	
Legal	1	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	0	Township has personnel and professionals to implement actions
Multi-Hazard	1	
Timeline	0	
Agency Champion	0	Fire Prevention Bureau
Other Community Objectives	1	
Total	7	
Priority (High/Med/Low)	Medium	

Action Number: **West Caldwell-17 (Old 9)**
Mitigation Action/Initiative: Upgrade sanitary sewer system back-ups and overflows.

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Replace aging sections
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	SIP, EAP, LPR
Goals/Objectives Met	
Applies to existing, future, or not applicable	Existing and Future
Benefits (losses avoided)	
Estimated Cost	
Priority*	
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Caldwell-17 (Old 9)**

Mitigation Action/Initiative: Upgrade sanitary sewer system back-ups and overflows.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	Prevent untreated sewage from entering waterways
Cost-Effectiveness	1	
Technical	1	Would be a long term solution
Political	1	Residents support initiative and governing body endorses
Legal	0	
Fiscal	0	
Environmental	1	
Social	0	
Administrative	1	
Multi-Hazard	1	
Timeline	1	Actions can begin immediately
Agency Champion	1	Water Department
Other Community Objectives	1	
Total	10	
Priority (High/Med/Low)	High	

Action Number: **West Caldwell-18 (Old 3)**
Mitigation Action/Initiative: Kirkpatrick Lane Wastewater Pumping Station

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Pumping of sewage to treatment facility
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. To reconstruct and update facility
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Replace pumps, motors, shafts, and control panels
Action/Project Category	LPR
Goals/Objectives Met	1.2, 2.2, Continuous ability to handle sewage
Applies to existing, future, or not applicable	New
Benefits (losses avoided)	High - Update station to handle larger capacity and prevent bypass of the station. Bypass involves allowing untreated sewage into waterways.
Estimated Cost	High
Priority*	High
Plan for Implementation	
Responsible Organization	West Caldwell Twp
Local Planning Mechanism	West Caldwell Twp
Potential Funding Sources	Grant funding with local cost share
Timeline for Completion	Short
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project: Plans have been developed and will be going out for bid.

Refer to prioritization table.

Action Number: **West Caldwell-18 (Old 3)**
Mitigation Action/Initiative: Kirkpatrick Lane Wastewater Pumping Station

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	
Property Protection	1	Prevent untreated sewage from entering waterways
Cost-Effectiveness	1	
Technical	1	
Political	0	
Legal	1	Reduce DEP violations
Fiscal	1	
Environmental	1	Prevent untreated sewage from entering waterways
Social	1	
Administrative	1	
Multi-Hazard	0	
Timeline	1	
Agency Champion	1	Water Department
Other Community Objectives	0	
Total	10	
Priority (High/Med/Low)	high	

9.23 Township of West Orange

This section presents the jurisdictional annex for the Township of West Orange.

9.23.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Fire Chief Peter F. Smeraldo, Jr., OEM Coordinator 415 Valley Road, West Orange, NJ (973) 325-4185 WO-OEM@westorange.org	Leonard Lepore, PE, Municipal Engineer 25 Lakeside Avenue, West Orange, NJ (973) 325-4160 llepore@westorange.org

9.23.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Township of West Orange was 46,207.

Location

According to the U.S. Census Bureau, the Township has a total land area of 12.171 square miles, of which 12.046 square miles is land and 0.125 square miles is water.

Brief History

West Orange was part of the City of Newark until November of 1806. The first planned community in America, Llewellyn Park, is located in West Orange (Township of West Orange, 2014).

Governing Body Format

West Orange operates under the Mayor-Council form of municipal government. Every four years in even-numbered years, two or three Council seats along with the Mayoral seat are up for re-election. The current Mayor and two Council members are up for re-election in 2014 (Township of West Orange, 2014).

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.23.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.23-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
Colonial Woods North	Residential	27 lots	Colonial Woods Drive Extension	ND	New Development

Table 9.23-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Location (address and/or block/lot)	Known Hazard Zone*	Description / Status
West Essex Highlands Area 2	Residential	130 units	Warner Road	ND	New Development
Harvard Development Urban Renewal Associates	Residential	228 Units	B: 9 L: 56	1% Flood: A Zone	See Orange SP 061113
Harvard Development Urban Renewal Associates	Residential	228 Units	B: 9 L: 50	1% Flood: A Zone	See Orange SP 061113
Harvard Development Urban Renewal Associates	Residential	228 Units	B: 9 L: 1	1% Flood: A Zone	See Orange SP 061113
Harvard Development Urban Renewal Associates	Residential	228 Units	B: 9 L: 7	1% Flood: A Zone	See Orange SP 061113
Harvard Development Urban Renewal Associates	Residential	228 Units	B: 9 L: 44	1% Flood: A Zone	See Orange SP 061113
Prism Green Urban Renewal Associates	Residential	334 units	B: 66 L: 5	None	App/Rej.
Prism Green Urban Renewal Associates	Residential	334 units	B: 66 L: 1	1% Flood: A Zone	App/Rej.
Prism Green Urban Renewal Associates	Residential	334 units	B: 66 L: 7	None	App/Rej.

** Only location-specific hazard zones or vulnerabilities identified.*
Note: ND = Not determined because potential new development could not be located.

9.23.3 Natural Hazard Event History Specific to the Municipality

Essex County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. For the purpose of this plan update, events that have occurred in the County from 2007 to present were summarized to indicate the range and impact of hazard events in the community. Information regarding specific damages is included, if available, based on reference material or local sources. This information is presented in the table below. For details of these and additional events, refer to Volume I, Section 5.0 of this plan.

Table 9.23-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
April 14-20, 2007	Severe Weathers and Inland and Coastal Flooding	DR-1694	Yes	Residential basement flooding. Emergency protection measures utilized. $20K
March 12 – April 15, 2010	Severe Weathers and Flooding	DR-1897	Yes	Residential basement flooding. $88K for emergency protection measures.
December 26-27, 2010	Severe Winter Storm and Snowstorm	DR-1954	Yes	Excessive snow removal, snow clearing, 133 people sheltered and emergency protective measures utilized. $151K
August 26 – September 5, 2011	Hurricane Irene	EM-3332 DR-4021	Yes Yes	Approx. 220 homes, 10 apt. units, 10 businesses, 1 public park, 1 water control facility and 1 public building affected. Emergency protective

Table 9.23-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
				measures utilized. $243K
October 29, 2011	Severe Weather	DR-4048	Yes	Approx. 1,000 homes, 1 public park and public utility system. Emergency protective measures utilized. $441K
October 26 – November 8, 2012	Hurricane Sandy	EM-3354 DR-4086	Yes Yes	Approx. 12,000 homes, 2,000 apt units, roadway damage, 1 public park and generator fuel affected. Emergency protective measures utilized. $1.1M

9.23.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the Township of West Orange. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for the Township of West Orange.

Table 9.23-3. Hazard Risk/Vulnerability Risk Ranking

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a,c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Coastal Erosion	RCV in CEHA: $0	Rare	6	Low
Coastal Storm	Category 1 SLOSH: $0 Category 2 SLOSH: $0 Category 3 SLOSH: $0 Category 4 SLOSH: $0	Occasional	12	Low
Drought	Damage estimate not available	Occasional	18	Medium
Earthquake	500-year MRP: $2,710,857 2,500-year MRP: $61,868,132	Occasional	12	Low
Extreme Temperature	Damage estimate not available	Frequent	27	Medium
Flood	1% Annual Chance: $18,895,034	Frequent	18	Medium
Geological Hazards	Exposed to Class B and Class C: $35,372,000	Occasional	12	Low
Severe Weather	100-Year MRP: $4,369,898 500-year MRP: $26,484,651 Annualized: $302,472	Frequent	48	High
Winter Storm	1% GBS: $33,798,959 5% GBS: $168,994,794	Frequent	54	High
Wildfire	Estimated Value Exposed to Extreme, Very High and High: $3,840,300	Frequent	18	Medium
Civil Disorder	Damage estimate not available	Occasional	24	Low
Cyber Attack	Damage estimate not available	Occasional	10	Low
Disease Outbreak	Damage estimate not available	Frequent	15	Medium

Table 9.23-3. Hazard Risk/Vulnerability Risk Ranking

Hazard Type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard [a,c]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking [b]
Hazardous Substances	Damage estimate not available	Frequent	15	Medium
Power Outages	Damage estimate not available	Frequent	36	Low
Terrorism	Damage estimate not available	Occasional	24	Low
Transportation Failure	Damage estimate not available	Frequent	36	Low

Notes:

a. Building damage ratio estimates based on FEMA 386-2 (August 2001)

b. The valuation of general building stock and loss estimates was based on custom inventory for the municipality.
High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. Loss estimates for the Severe Weather and severe winter storm hazards are structural values only and do not include the value of contents.

d. Loss estimates for the flood and earthquake hazards represent both structure and contents.

e. The HAZUS-MH earthquake model results are reported by Census Tract

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the Township of West Orange.

Table 9.23-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in 1% Flood Boundary (3)	# Polices in 0.2% Flood Boundary (3)	# Policies Outside the 1% and 0.2% Flood Hazard (3)
West Orange, Township of	274	147	$853,080.00	5	0	136	151	123

Source: FEMA, 2014

Note (1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA and are current as of March 31, 2014 and are summarized by Community Name. Please note the total number of repetitive loss properties excludes the severe repetitive loss properties. The number of claims represents claims closed by 3/31/2014.

Note (2) Total building and content losses from the claims file provided by FEMA Region 2.

Note (3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Note (4) FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

Note (5) A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case

Critical Facilities

The table below presents the number of critical facilities, by type, in the community located in the FEMA flood zones (1% and 0.2% annual chance boundaries).

Table 9.23-5. Number of Critical Facilities in the 1% and 0.2% Annual Chance Flood Boundary

Municipality	1% Annual Chance				0.2% Annual Chance				
	Dam	EMS	Potable Water Plant	School	Dam	EMS	Potable Water Plan	School	WWTP
Township of West Orange	1	1	1	2	1	1	1	2	1

Source: ECOEM

Other Vulnerabilities Identified by Municipality

According to the preliminary 2014 FEMA Flood Insurance Study (FIS), the Township has been affected by flooding in most of the low-lying areas located along the numerous open stream courses within its boundaries. Several other areas are also affected by flooding due to poor drainage. In 2010, the Township of West Orange passed 2274-10 An Ordinance Amending and Supplementing Chapter 25 Section 28 of the General Ordinances of the Town of West Orange, Entitled "Steep Slope and Natural Features Ordinance" which amended the steep slope ordinance by placing additional restrictions of State open waters, wetlands, wetland transition areas, flood hazard areas, floodways, and riparian zones. This amendment was warranted to prevent flooding, protect water quality, and preserve wildlife and aquatic habitat (FEMA FIS 2014).

A major flood area exists along the East Fork of the East Branch Rahway River in West Orange, east of Valley Road between Freeman Street and Kingsley Street. The flooding problem there, which is due to inadequate channel capacity, has been studied by the USACE (USACE, 1973). The upper portions of this stream are steeply sloped but as of the publication of the [date] countywide FIS report, requests have been made to the USACE and NJDEP to assess whether there is flood storage potential at golf courses and other open spaces as a part of the larger study underway to study flood mitigation alternatives in the Rahway River Basin (FEMA FIS 2014).

North Branch Wigwam Brook has had serious flooding problems in the vicinity of Harrison and Mississippi Avenues, and along most downstream parts of the improved channel. This is due to excessive velocity and lack of channel capacity, notably at Ashwood Terrace, Whittelsey Avenue, Watson Avenue, and Washington Avenue. South Branch Wigwam Brook has had serious flooding reported in the vicinity of Watchung Avenue, Lakeside Avenue, Standish Avenue, and Ashland Avenue (FEMA FIS 2014).

West Branch Rahway River has had flooding problems along its entire length from Northfield Avenue to Lake Vincent, although parts of this river flow through undeveloped or country club areas (FEMA FIS 2014).

An area on the western boundary of the Township of West Orange known as the Merklin District is subject to frequent flooding due to inadequate pipe sewers and insufficient capacity of the existing storm water pumping station. The area flooded is centered between Hunterdon and Morris Roads and Westover and Tappan Terraces. The Mayfair District centered on Mayfair Drive in the north central part of the township is one such location plagued by flooding related to drainage issues. In this location flooding is caused by an inadequate storm water ejector system (Elson T. Killman Associates, Inc., 1972). The Township of West Orange has been moving forward with plans to undertake storm sewer improvements and in 2011 awarded construction

contracts to begin the improvements to help alleviated flooding projects on several streets including Nestro Road, Midro Way, Mayfair Drive and Rosemont Terrace and Rosemont Drive. This project has been financed by a grant from the NJDEP and a loan from the New Jersey Environmental Infrastructure Trust (FEMA FIS 2014).

Peckman River Basin

The Peckman River Basin is located in Essex and Passaic Counties. The Peckman River is a tributary to the Passaic River and originates in the Township of West Orange and flows northeasterly through Verona, Cedar Grove, and Little Falls to its confluence with the Passaic River in West Paterson (USACE 2014). In the Township of West Orange, flooding has occurred between Nicholas Avenue Kenz Terrace along the Peckman River (FEMA FIS 2014).

Extensive development in this Basin has resulted in damages from flooding and ecosystem degradation. The Peckman River Basin experiences frequent flooding from intense thunderstorms and heavy rain events. These storms can deposit large amounts of precipitation in the watershed, producing significant runoff, which quickly surpasses the capacity of the river channel, and bridge and culvert openings. Significant degradation of the ecology of the Basin has occurred as a result of extensive erosion at specific locations along the Peckman River. The development of the watershed has reduced the water-holding capacity of the landscape and altered the natural flow dynamics within the river system. As a result, the habitat suitability and ecological complexity of the River have been moderately impaired (USACE 2014).

A favorable reconnaissance report was completed in July 2001. The report recommended a feasibility study to develop alternatives for flood damage reduction and ecosystem restoration in the Peckman River Basin. On March 14, 2002, a Feasibility Cost Sharing Agreement was executed between the USACE and the NJDEP. A draft feasibility report is expected to be completed by July 2015 (USACE 2014).

9.23.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- National Flood Insurance Program
- Integration of Mitigation Planning into Existing and Future Planning Mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the Township of West Orange.

Table 9.23-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept./ Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Building Code	Y	State	Construction Official	West Orange Revised General Ordinance (WORGO) 13-1; State adopted codes-10/2010
Zoning Ordinance	Y	Local	Zoning Official	WORGO 25
Subdivision Ordinance	Y	Local	Planning and Zoning Boards	WORGO 25
NFIP Flood Damage Prevention Ordinance	Y	Local	Construction Official	WORGO 24
Cumulative Substantial Damages	N			
Freeboard	Y	Local	Construction Official	WORGO 24
Growth Management	N			
Floodplain Management / Basin Plan	Y	State		Regulated by State
Stormwater Management Plan/Ordinance	Y	Local	Municipal Engineer	WORGO 25-29.1
Comprehensive Plan / Master Plan/ General Plan	Y	Local	Planning Department	WORGO 25
Capital Improvements Plan	Y	Local	Planning Board	WORGO 25
Site Plan Review Requirements	Y	Local	Planning and Building Departments	WORGO 25
Open Space Plan	Y	Local	Municipal Engineer and Planning Director	WORGO 2-57
Stream Corridor Management Plan	Y	State		Regulated by State
Watershed Management or Protection Plan	N			
Economic Development Plan	N			
Comprehensive Emergency Management Plan	Y	Local	Fire Chief OEM	Emergency Management Plan and Operations Plan
Emergency Response Plan	Y	Local	Fire Chief OEM	Emergency Operations Plan

Table 9.23-6. Planning and Regulatory Tools

Tool / Program (code, ordinance, plan)	Do you have this? (Y/N)	Authority (local, county, state, federal)	Dept./ Agency Responsible	Code Citation and Comments (code chapter, date of adoption, name of plan, explanation of authority, etc.)
Post Disaster Recovery Plan	N			
Post Disaster Recovery Ordinance	N			
Real Estate Disclosure Requirement	N			
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]	N/A			

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the Township of West Orange.

Table 9.23-7. Administrative and Technical Capabilities

Staff/ Personnel Resources	Available (Y or N)	Department/ Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Public Works & Planning
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Public Works & Building Dept.
Planners or engineers with an understanding of natural hazards	Y	Public Works & Building Dept.
NFIP Floodplain Administrator	Y	Leonard Lepore, P.E., Municipal Engineer
Surveyor(s)	N	Hire outside contractors
Personnel skilled or trained in “GIS” applications	Y	Public Works
Scientist familiar with natural hazards in the municipality.	N	
Emergency Manager	Y	Fire Department – Fire Chief
Grant Writer(s)	Y	Outside contractors
Staff with expertise or training in benefit/cost analysis	Y	Public Works & Finance
Professionals trained in conducting damage assessments	N	

Fiscal Capability

The table below summarizes financial resources available to the Township of West Orange.

Table 9.23-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don’t Know)
Community Development Block Grants (CDBG)	Yes – Public Works
Capital Improvements Project Funding	Yes – Public Works
Authority to Levy Taxes for specific purposes	Yes – Finance
User fees for water, sewer, gas or electric service	Yes – Finance
Impact Fees for homebuyers or developers of new development/homes	Yes – Planning
Incur debt through general obligation bonds	Yes – Finance

Table 9.23-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Incur debt through special tax bonds	Yes – Finance
Incur debt through private activity bonds	Yes – Finance
Withhold public expenditures in hazard-prone areas	No
Mitigation grant programs	Yes – Fire Department and Public Works
Other	N/A

Community Classifications

The table below summarizes classifications for community program available to the Township of West Orange.

Table 9.23-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	N/A
Building Code Effectiveness Grading Schedule (BCEGS)	NP	N/A
Public Protection	NP	N/A
Storm Ready	NP	N/A
Firewise	NP	N/A

N/A = Not applicable. NP = Not participating.

The classifications listed above relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The CRS class applies to flood insurance while the BCEGS and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1000 feet of a creditable fire hydrant and is within 5 road miles of a recognized Fire Station.

Criteria for classification credits are outlined in the following documents:

- The Community Rating System Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program

NFIP Floodplain Administrator

Leonard Lepore, P.E., Municipal Engineer

Flood Vulnerability Summary

The municipality does not maintain lists/inventories of properties that have been damaged by floods. The damage experienced by Superstorm Sandy was not related to flooding and substantial damage estimates were not conducted/declared for this event.

Resources

The Municipal Engineer is the sole person assuming responsibilities of floodplain administration. The services and functions of the NFIP administration include flood zone question, construction permit review, and field inspections. Education and outreach regarding flood hazards/risk and flood risk reduction are not provided to the municipality's residents.

The FPA indicated that staff and funding are some barriers to running an effective floodplain management program in the municipality. The FPA also stated that they do not feel adequately supported and trained to fulfill their responsibilities as the municipality's FPA. The Administrator also indicated that they would be interested in attending continuing education and/or certification training on floodplain management, if offered.

Compliance History

The municipality is in good standing with the NFIP. It is unknown when the most recent compliance audit was conducted.

Regulatory

The municipality's floodplain management regulations/ordinances meet the minimum FEMA and State requirements. The land use regulations support floodplain management. The municipality has considered joining the CRS program and the FPA would consider attending a CRS seminar if offered locally.

Community Rating System

The municipality does not participate in the Community Rating System (CRS) program. The Office of Emergency Management and the Floodplain Administer will be researching the CRS program and participating as a community.

Other Capabilities Identified

Previous actions that are now on-going programs and capabilities are described below. Refer to Table 9.X-11 presented later in this annex.

The municipality has identified the following mitigation projects/activities that have been completed:

The extended neighborhood which includes Nestro Road, Midro Way, Mayfair Drive, and Rosemont Terrace has been mitigated by the Mayfair district sanitary and storm sewer improvements projects. These projects included the elimination of a sanitary sewage pump station, construction of new gravity sewer mains and the enlargement of storm sewer pipes.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations. As part of this planning effort, each community was surveyed to obtain a better understanding of their community's progress in plan integration. A summary is provided below. In addition, the community identified specific integration activities that will be incorporated into municipal procedures.

- The Township utilizes mitigation funds to implement mitigation actions. The Township will continue to do so in the future, as appropriate. Past mitigation projects that were funded under Township budget to include: Nestro Road, Midro Way, Wayfair Drive, and Rosemont Terrace.
- The Township has proposed two new ordinances: Sprinkler and Stand pipe identification light and Installation of Knox boxes on new and existing commercial buildings. Same will protect first responder and structures.
- To continue implementing mitigation in day-to-day operations, the Township will develop a public outreach program to educate on hazards. Refer to action #13 in the Township's mitigation strategy.
- The Township has their ordinances and flood protection measures available on their website. Please visit the Township of West Orange's website at http://www.westorange.org for further information (FEMA FIS 2014).

9.23.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2007 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.23-10. Past Mitigation Initiative Status

Description	Status	Review Comments
Flood mitigation – other than Nestro Rd., Midro Way, Mayfair Dr., and Rosemont Terr. Areas	Discontinued	The Township wishes to remove this initiative. More specific actions and locations will be identified in this update.
Inflow and infiltration into sanitary sewer system (I&I) work needed	Discontinued	The Township wishes to remove this initiative. More specific locations of I&I work will be identified in this update.
Improvements along Nestro Rd., Midro Way, Mayfair Dr., and Rosemont Terr. to mitigate flooding	Completed	These improvements included new storm water collection and conveyance facilities and new sanitary sewer facilities including elimination of a pump station.
Rural fires	Discontinued	This initiative no longer wishes to be pursued by the Township due to increased development of rural lands.
Terrorism due to close proximity to New York City	Discontinued	The Township wishes to remove this initiative due to annual ongoing training and procurement of necessary equipment.
Dam failure in the City of Orange Reservoir	Discontinued	The Township wishes to remove this initiative due to minimal impact, current mandatory standards and annual inspections of the dam.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

The following initiatives have been completed in the municipality; however, they were not identified in the previous mitigation strategy: No initiatives have been completed since 2008 plan. The below initiatives were completed prior to 2008 mitigation plan.

- There have been numerous attempts to solve some of the flooding problems along various streams in the Township of West Orange. The East and West Forks of East Branch Rahway River have had channel improvements along substantial lengths (FEMA FIS 2014).
- The North Branch of the Wigwam Brook has had similar improvements as stated above.

Proposed Hazard Mitigation Initiatives for the Plan Update

The Township participated in a mitigation action workshop in March 2014 and was provided the following FEMA publications to use as a resource as part of their comprehensive review of all possible activities and mitigation measures to address their hazards: FEMA 551 'Selecting Appropriate Mitigation Measures for Floodprone Structures' (March 2007) and FEMA 'Mitigation Ideas – A Resource for Reducing Risk to Natural

Hazards' (January 2013). In June 2014, the Township participated in a second workshop and was provided the results to the risk assessment to further assist with the identification of mitigation actions.

Table 9.23-11 summarizes the comprehensive-range of specific mitigation initiatives the Township would like to pursue in the future to reduce the effects of hazards. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Both the four FEMA mitigation action categories and the six CRS mitigation action categories are listed in the table below to further demonstrate the wide-range of activities and mitigation measures selected.

As discussed in Section 6, 14 evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing your actions as 'High', 'Medium', or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.23-11 provides a summary of the prioritization of all proposed mitigation initiatives for the Plan update.

Table 9.23-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
West Orange-1 (NEW/LOI)	To ensure continuity of operations, obtain backup power for critical facilities. The following locations have been updated at this time: 1.West Orange Township Hall generator. 2.West Orange Fire Station #2 generator project. 3.West Orange Fire Station #3 generator project. 4. West Orange High School generator project. 5.West Orange wastewater sewage pump stations 6. West Orange public library 7.West Orange Police Department 8. West Orange Roosevelt Middle School 9. West Orange Fire Headquarters 10. West Orange Fire Station #4 11. West Orange Alex Caprio Animal Control Shelter											
	See above.	Existing	All	1.2 6.1	OEM Township Manager	High	Medium $75,000 each location	HMGP	Short Term DOF	High	SIP	ES
West Orange-2 (NEW)	Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable. Phase 1: Identify appropriate candidates and determine most cost-effective mitigation option (in progress). Phase 2: Work with the property owners to implement selected action based on available funding from FEMA and local match availability. Specifically identified are properties in the following areas: • East Branch of Rahway River • West Branch of Rahway River • North Branch Wigwam Brook • Peckman River area											
	See above.	Existing	Flood,	1.2 2.2	Engineering, Building Departments, OEM	Medium	Medium	FEMA Mitigation Grant Programs and local budget (or property owner) for cost share	Long term DOF	Medium	SIP	SP
West Orange-3 (NEW)	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what residents can do in the way of mitigation and preparedness, including flood insurance. This program will include: • Providing general natural hazard risk, preparedness and mitigation, and related NFIP information in regular newsletter and mailings. • Including natural hazard risk and risk reduction information through social media channels and email blast systems. • Posting of flyers and other readily available NFIP informational materials at Town/Village hall or distributing at regular civic meetings. • Preparation, distribution and analysis of public surveys.											

Table 9.23-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	• Developing/maintaining a natural hazard risk management webpage on the municipal website where information and mapping can be posted. • Enhance public outreach to residents in NFIP floodplain areas to inform of annual grant opportunities, etc. which may include periodic articles and handouts in the annual newsletter. • Provide public education on eliminating inflow from sump pump and roof leader discharges.											
	See above.	N/A	All Hazards	1.2 3.1 3.2	OEM, Town Manager	Medium	Low	Municipal Budget; HMA programs	Short	High	EAP	PE
West Orange-4 (NEW)	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative.	N/A	Flood	1.2 1.3 2.2	Municipal NFIP FPA, as fully supported by local government officials	Medium	Medium	Municipal Budget	Short (year 1)	Medium	LPR, EAP	PR
West Orange-5 (NEW)	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).	N/A	Flood	1.2 1.3 2.2	Municipal NFIP FPA, as fully supported by local government officials	Medium	Medium	Municipal Budget	Short (year 1)	Medium	LPR, EAP	PR
West Orange-6 (NEW)	Make structural improvements to sewer system Township wide to include identifying properties susceptible to sewage backups during flooding events.	Existing	Flood, Severe Weather	1.2 2.2	Public Works Department, Engineering	High	High	Federal HMA Grant Programs	Long term. DOF	High	SIP	SP
West Orange-7 (NEW)	Enhance/expand municipal tree maintenance and identification of	Existing	Severe Weather; Severe Winter Storm	1.2 2.1 6.1	Department of Public Works working with	Medium – High (reduced risk of	Medium	Municipal Budget	Short	Medium	NSP	NSP

Table 9.23-11. Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	preferred species planting program in conjunction with utility companies and PSE&G.				contractors and local utilities	utility outages; life safety)						

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	*Community Assistance Visit*
CRS	*Community Rating System*
DPW	*Department of Public Works*
FEMA	*Federal Emergency Management Agency*
FPA	*Floodplain Administrator*
HMA	*Hazard Mitigation Assistance*
N/A	*Not applicable*
NFIP	*National Flood Insurance Program*
NJDEP	*New Jersey Department of Environmental Protection*
NJOEM	*New Jersey Office of Emergency Management*
OEM	*Office of Emergency Management*

Potential FEMA HMA Funding Sources:

FMA	*Flood Mitigation Assistance Grant Program*
HMGP	*Hazard Mitigation Grant Program*
PDM	*Pre-Disaster Mitigation Grant Program*
RFC	*Repetitive Flood Claims Grant Program*
SRL	*Severe Repetitive Loss Grant Program*

Timeline:

Short	*1 to 5 years*
Long Term	*5 years or greater*
OG	*On-going program*
DOF	*Depending on funding*

Costs:
Where actual project costs have been reasonably estimated:

Low	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where actual project costs cannot reasonably be established at this time:

Low	*Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.*
Medium	*Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.*
High	*Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.*

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	*< $10,000*
Medium	*$10,000 to $100,000*
High	*> $100,000*

Where numerical project benefits cannot reasonably be established at this time:

Low	*Long-term benefits of the project are difficult to quantify in the short term.*
Medium	*Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.*
High	*Project will have an immediate impact on the reduction of risk exposure to life and property.*

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*

- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.23-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High / Medium / Low
West Orange-1 (NEW/LOI)	Obtain backup power to ensure continuity of operations.	1	0	1	1	1	1	0	1	1	1	1	1	1	1	12	High
West Orange-2 (NEW)	Mitigation of Vulnerable Structures	1	1	1	1	0	1	0	1	1	1	1	0	1	1	11	High
West Orange-3 (NEW)	Public Outreach	1	1	1	1	1	1	0	0	1	1	1	1	1	1	12	High
West Orange-4 (NEW)	Explore Participation in CRS	1	1	1	1	0	1	0	0	1	1	0	0	0	1	8	Medium
West Orange-5 (NEW)	CRS Community Assistance Visit	1	1	1	1	0	1	0	0	1	1	0	0	0	1	8	Medium
West Orange-6 (NEW)	Make structural improvements to sewer system Township wide	1	1	1	1	1	1	0	0	1	1	1	0	1	1	11	High
West Orange-7 (NEW)	Enhance/expand municipal tree maintenance program	1	1	1	1	1	1	0	1	1	1	1	1	1	0	12	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.23.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.23.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the Township of West Orange that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Township of West Orange has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.23.9 Additional Comments

None at this time.

Figure 9.23-1. Township of West Orange Hazard Area Extent and Location Map 1

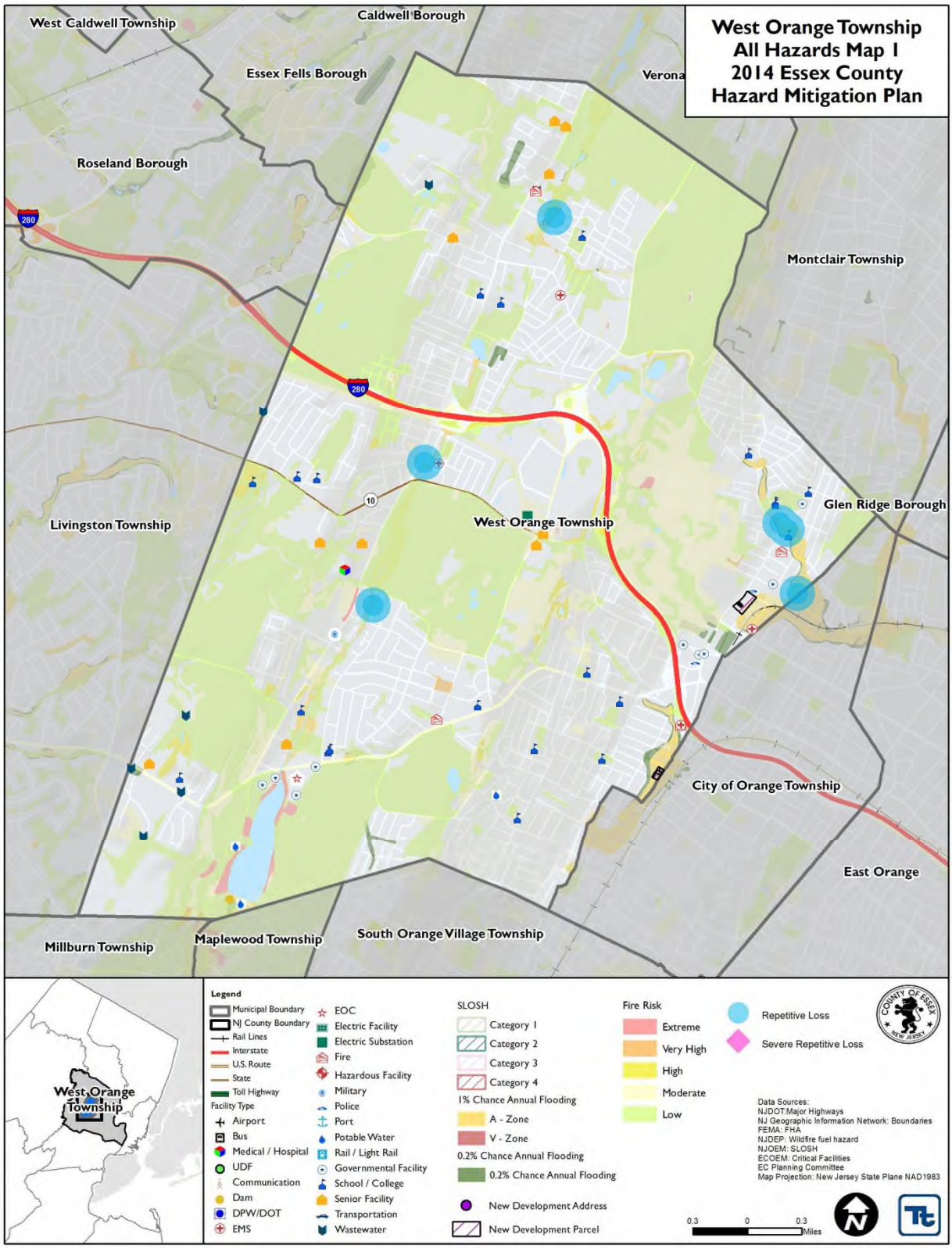
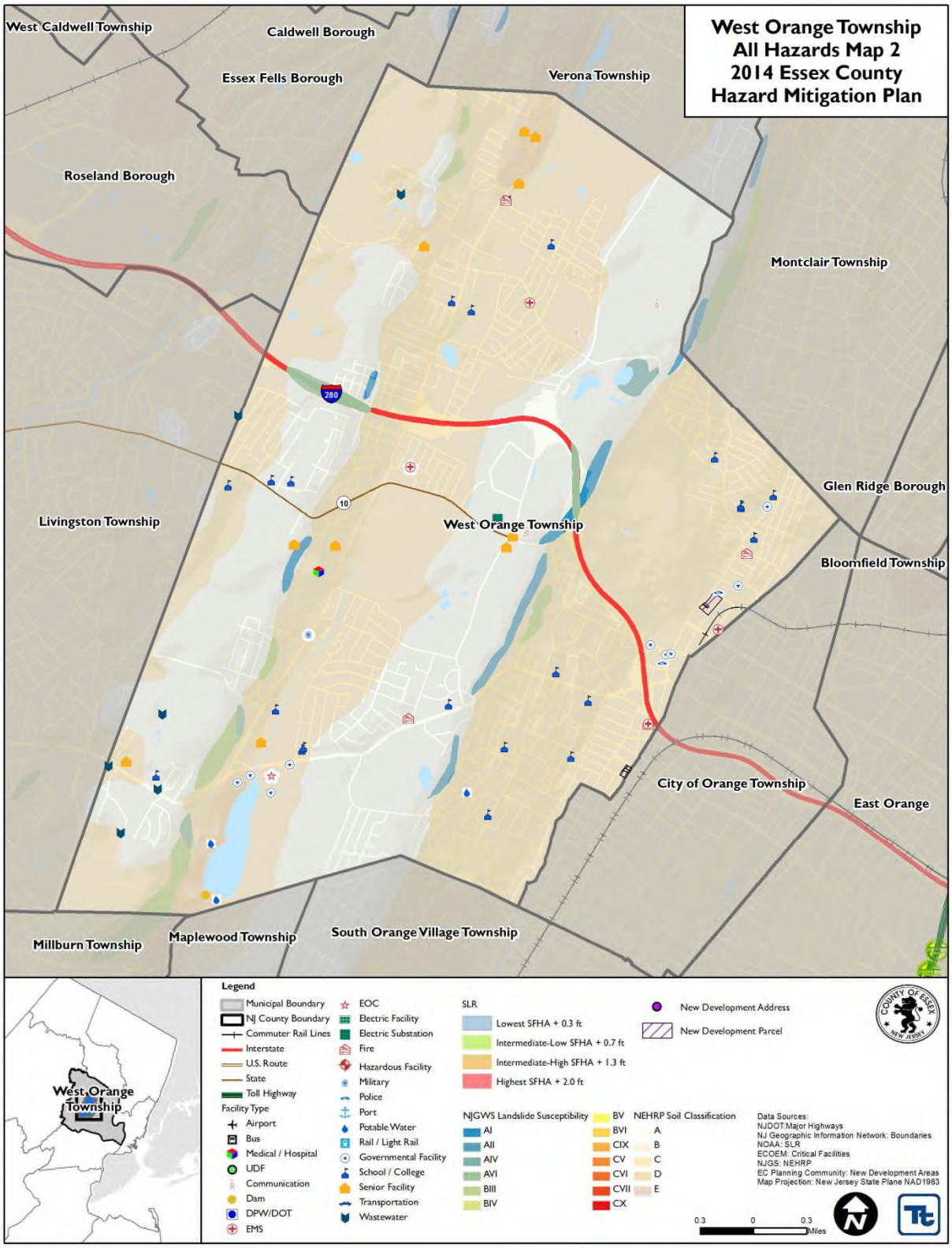


Figure 9.23-2. Township of West Orange Hazard Area Extent and Location Map 2



Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange Township Hall generator

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of Power, loss of operational capabilities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install a generator at Town Hall
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Continuity of operations
Estimated Cost	$75,000
Priority*	High
Plan for Implementation	
Responsible Organization	OEM, Township Manager
Local Planning Mechanism	EOP, Mitigation Plan
Potential Funding Sources	HMGP, Township Budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-1 (NEW/LOI)**
Mitigation Action/Initiative: West Orange Township Hall generator

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange-1 (NEW/LOI)**
Mitigation Action/Initiative: West Orange Fire Station #2 generator project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of Power, loss of operational capabilities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install a generator at Fire Station #2
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Emergency Response, continuity of operations
Estimated Cost	$75,000
Priority*	High
Plan for Implementation	
Responsible Organization	OEM, Fire Department
Local Planning Mechanism	EOP, Mitigation Plan
Potential Funding Sources	HMGP, Township Budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-1 (NEW/LOI)**
Mitigation Action/Initiative: West Orange Fire Station #2 generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange-1 (NEW/LOI)**
Mitigation Action/Initiative: West Orange Fire Station #3 generator project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of Power, loss of operational capabilities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install a generator at Fire Station #3
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Emergency Response, continuity of operations
Estimated Cost	$75,000
Priority*	High
Plan for Implementation	
Responsible Organization	OEM, Fire Department
Local Planning Mechanism	EOP, Mitigation Plan
Potential Funding Sources	HMGP, Township Budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-1 (NEW/LOI)**
Mitigation Action/Initiative: West Orange Fire Station #3 generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange-1 (NEW/LOI)**
Mitigation Action/Initiative: West Orange High School generator project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Maintain continuity of operations during power outage to support shelter operations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install a generator at High School
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Shelter Operations, Continuity of operations
Estimated Cost	$75,000
Priority*	High
Plan for Implementation	
Responsible Organization	OEM
Local Planning Mechanism	EOP, Mitigation Plan
Potential Funding Sources	HMGP, Township Budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-1 (NEW/LOI)**
Mitigation Action/Initiative: West Orange High School generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange wastewater sewage pump stations generators project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of Power, loss of operational capabilities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install a generator at Pump Stations
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Additional flooding and back up of wastewater and sewage, Continuity of operations
Estimated Cost	$75,000
Priority*	High
Plan for Implementation	
Responsible Organization	OEM, Township Manager
Local Planning Mechanism	EOP, Mitigation Plan
Potential Funding Sources	HMGP, Township Budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange wastewater sewage pump stations generators project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange-1 (NEW/LOI)**
Mitigation Action/Initiative: West Orange public library generator project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Maintain continuity of operations during power outage to support shelter operations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install a generator at Public Library
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Shelter Operations, Continuity of operations
Estimated Cost	$75,000
Priority*	High
Plan for Implementation	
Responsible Organization	OEM
Local Planning Mechanism	EOP, Mitigation Plan
Potential Funding Sources	HMGP, Township Budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-1 (NEW/LOI)**
Mitigation Action/Initiative: West Orange public library generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange Police Department generator project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Maintain continuity of operations during power outages.
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install a generator at Police Headquarters
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Continuity of operations for police, fire and EMS services
Estimated Cost	$75,000
Priority*	High
Plan for Implementation	
Responsible Organization	OEM, Police Department
Local Planning Mechanism	EOP, Mitigation Plan
Potential Funding Sources	HMGP, Township Budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-1 (NEW/LOI)**
Mitigation Action/Initiative: West Orange Police Department generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange Roosevelt Middle School generator project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Maintain continuity of operations during power outage to support shelter operations
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install a generator at Middle School
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Shelter Operations, Continuity of operations
Estimated Cost	$75,000
Priority*	High
Plan for Implementation	
Responsible Organization	OEM, Township Manager
Local Planning Mechanism	EOP, Mitigation Plan
Potential Funding Sources	HMGP, Township Budget
Timeline for Completion	Short Term, DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange Roosevelt Middle School generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective.
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project.
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange Fire Headquarters generator project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of Power, loss of operational capabilities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install a generator at Fire Headquarters
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Emergency Response, continuity of operations
Estimated Cost	$75,000
Priority*	High
Plan for Implementation	
Responsible Organization	Fire Department, OEM
Local Planning Mechanism	EOP, Mitigation Plan
Potential Funding Sources	HMGP, Township Budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange Fire Headquarters generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange Fire Station #4 generator project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of power, loss of operational capabilities
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install a generator at Fire Station #4
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Emergency Response, continuity of operations
Estimated Cost	$75,000
Priority*	High
Plan for Implementation	
Responsible Organization	Fire Department
Local Planning Mechanism	EOP, Hazard Mitigation Plan
Potential Funding Sources	HMGP, Township Budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange Fire Station #4 generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange Alex Caprio Animal Control Shelter generator project

Assessing the Risk	
Hazard(s) addressed:	All Hazards
Specific problem being mitigated:	Loss of Power, loss of operational capabilities, transfer of animals
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Tree Trimming-remove tree branches that may fall onto power lines causing power outages. This is currently being done as existing town maintenance, to protect feeder lines, but doesn't help with primary or secondary lines off Town property.
	2. Bury Power Lines. This option is not being pursued as it is cost prohibitive due to the long run and the Town does not have the legal authority to bury the lines.
	3. Urge Special Treatment from Power Company-Meet with the executive team and urge them to take steps necessary to prevent power failures to Town Hall • This is not the best alternative because it relies on others to address the problem. The solution remains outside the control of the Town. • Though we do get priority, the system is complex and does not provide a direct connection to a sub-station. (Another alternative could be to install a secondary electrical feed from an independent section of the local grid – this is typically technically infeasible and cost-prohibitive.)
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and install a generator at animal shelter
Action/Project Category	SIP
Goals/Objectives Met	1.2; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	Continuity of operations
Estimated Cost	$75,000
Priority*	High
Plan for Implementation	
Responsible Organization	OEM, Shelter Manager
Local Planning Mechanism	EOP, Mitigation Plan
Potential Funding Sources	HMGP, Township Budget
Timeline for Completion	Short Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-1 (NEW/LOI)**

Mitigation Action/Initiative: West Orange Alex Caprio Animal Control Shelter generator project

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will allow this critical facility to remain operational during power outages.
Property Protection	0	This project will have no significant effect on reducing damage to the Village Hall structure.
Cost-Effectiveness	1	This project is considered highly cost-effective
Technical	1	There are no technical issues associated with the project, and with routine maintenance will provide long term protection against power interruptions.
Political	1	This project is supported both publically and politically.
Legal	1	The municipality has full legal authority to implement this project.
Fiscal	0	The town can currently fund the local match if a grant were awarded.
Environmental	1	There are no environmental constraints associated with this project.
Social	1	This project benefits all sectors of the community equally.
Administrative	1	The Town has all administrative and technical resources necessary to implement this project
Multi-Hazard	1	This project provides protection against multiple hazards.
Timeline	1	The project can be implemented within one year once funding is secured.
Agency Champion	1	The Town Supervisor and Emergency Management Coordinator are the leads for this critical project.
Other Community Objectives	1	This project supports the Town's commitment to provide uninterrupted critical services to their residents, particularly in times of natural disasters and other emergencies.
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange-2**

Mitigation Action/Initiative: Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.

Assessing the Risk	
Hazard(s) addressed:	Flooding
Specific problem being mitigated:	Property damage, road closures, flooded basements
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Buy outs of flooded properties 2. Increase stream capacity 3. Provide storm water detention - Potential future projects, no action at this time.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Identify appropriate candidates, and work with property owners to implement selected action
Action/Project Category	SIP
Goals/Objectives Met	1.2, 2.2
Applies to existing and or new development, or not applicable	Existing
Benefits (losses avoided)	Flood damage
Estimated Cost	Medium
Priority*	Medium
Plan for Implementation	
Responsible Organization	Municipal OEM, homeowners
Local Planning Mechanism	Mitigation Plan
Potential Funding Sources	FEMA HMA Grants
Timeline for Completion	Long Term DOF
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange-2**

Mitigation Action/Initiative: Support the mitigation of vulnerable structures via retrofit (e.g. elevation, flood-proofing) or acquisition/relocation to protect structures from future damage, with repetitive loss and severe repetitive loss properties as a priority when applicable.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Will protect homeowners
Property Protection	1	Will protect structure
Cost-Effectiveness	1	Cost share with federal grants, a benefit cost analysis must be completed
Technical	1	This initiative is technically feasible
Political	0	Neutral
Legal	1	This is a legal initiative
Fiscal	0	Funding sources are needed
Environmental	1	Supports open space
Social	1	Community supports
Administrative	1	Administratively the Township can support
Multi-Hazard	1	Several hazards will be mitigated for structure
Timeline	0	Dependent upon funding
Agency Champion	1	OEM will spearhead this initiative
Other Community Objectives	1	Supports community objectives to protect life and property
Total	11	
Priority (High/Med/Low)	High	

Action Number: **West Orange -3**

Mitigation Action/Initiative: Develop and implement enhanced all hazards public outreach

Assessing the Risk	
Hazard(s) addressed:	All hazards
Specific problem being mitigated:	Preparedness
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Enhance Public outreach /education and mitigation information program
	2. Do nothing
	3. Hire outside public information officer
Action/Project Intended for Implementation	
Description of Selected Action/Project	Develop and implement an enhanced all-hazards, public outreach / education / mitigation information program on natural hazard risks and what residents can do in the way of mitigation and preparedness, including flood insurance
Action/Project Category	EAP
Goals/Objectives Met	1.2; 3.1; 3.3
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$10,000
Priority*	Medium
Plan for Implementation	
Responsible Organization	OEM, Township Administrator
Local Planning Mechanism	EOP, Mitigation Plan, codes and ordinances
Potential Funding Sources	Municipal Budget
Timeline for Completion	Short Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange - 3**
Mitigation Action/Initiative: Public Outreach

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Promotes LS
Property Protection	1	Promotes PP
Cost-Effectiveness	1	Cost is low to this initiative
Technical	1	Township has technical capability for this initiative
Political	1	Supported by government
Legal	1	
Fiscal	0	This initiative is an expense and budget must be found
Environmental	0	
Social	1	Supports community
Administrative	1	Township is capable of supporting this initiative
Multi-Hazard	1	Will address several hazards
Timeline	1	Can be completed in a limited amount of time
Agency Champion	1	OEM will spearhead
Other Community Objectives	1	Meets other objectives
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange - 4**

Mitigation Action/Initiative: Support participation in the NFIP Community Rating System (CRS) Program.

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Preparedness
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Support Participation in CRS Program
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Support participation in the NFIP Community Rating System (CRS) program by attending CRS workshop(s) if offered within the county. Join the CRS program if adequate resources to support long term participation can be dedicated. See following related Community Assistance Visit (CAV) initiative
Action/Project Category	EAP
Goals/Objectives Met	1.2; 3.1; 3.3
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$17,000
Priority*	Medium
Plan for Implementation	
Responsible Organization	OEM, Township Administrator
Local Planning Mechanism	Mitigation Plan, EOP
Potential Funding Sources	Municipal Budget
Timeline for Completion	Short Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange - 4**

Mitigation Action/Initiative: Support participation in the NFIP Community Rating System (CRS) Program.

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Supports life safety
Property Protection	1	Supports property protection
Cost-Effectiveness	1	Cost savings to residents
Technical	1	Township can support technically
Political	0	
Legal	1	Township has legal authority
Fiscal	0	Budget must be identified
Environmental	0	
Social	1	Community will support
Administrative	1	Capabilities
Multi-Hazard	0	
Timeline	0	
Agency Champion	0	
Other Community Objectives	1	Will be a cost savings to residents and useful information for Township
Total	8	
Priority (High/Med/Low)	Medium	

Action Number: **West Orange - 5**

Mitigation Action/Initiative: Determine if a Community Assistance visit is required to participate in CRS Program

Assessing the Risk	
Hazard(s) addressed:	Flood
Specific problem being mitigated:	Preparedness
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Determine if a Community Assistance visit is required to participate in CRS Program
	2. Do nothing
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Determine if a Community Assistance Visit (CAV) or Community Assistance Contact (CAC) is needed, and schedule if needed. This is a part of the process of joining CRS (above initiative).
Action/Project Category	EAP
Goals/Objectives Met	1.2; 3.1; 3.3
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$1,000
Priority*	Medium
Plan for Implementation	
Responsible Organization	OEM, Township Administrator
Local Planning Mechanism	Mitigation Plan
Potential Funding Sources	Municipal Budget
Timeline for Completion	Short Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange - 5**

Mitigation Action/Initiative: Determine if a Community Assistance visit is required to participate in CRS Program

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Supports life safety
Property Protection	1	Supports property protection
Cost-Effectiveness	1	Cost savings to residents
Technical	1	Township can support technically
Political	0	
Legal	1	Township has legal authority
Fiscal	0	Budget must be identified
Environmental	0	
Social	1	Community will support
Administrative	1	Township has the capability to implement
Multi-Hazard	0	
Timeline	0	
Agency Champion	0	
Other Community Objectives	1	Will be a cost savings to residents and useful information for Township
Total	8	
Priority (High/Med/Low)	Medium	

Action Number: **West Orange - 6**
Mitigation Action/Initiative: Structural Improvement to Sewer System

Assessing the Risk	
Hazard(s) addressed:	Flood, Severe Weather
Specific problem being mitigated:	Flooding of roadways and back up of storm water and sewer system
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Structural Improvements
	2. Do nothing
	3. Install new separate storm water and sewer system Township wide.
Action/Project Intended for Implementation	
Description of Selected Action/Project	Make structural improvements to sewer system Township wide to include identifying properties susceptible to sewage backups during flooding events.
Action/Project Category	SIP
Goals/Objectives Met	1.2; 2.1; 2.2;
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$1.6 million
Priority*	High
Plan for Implementation	
Responsible Organization	Township Engineer, FPA, Township Administrator
Local Planning Mechanism	Mitigation Plan
Potential Funding Sources	HMA Grants, State and County Grants, Municipal Budget
Timeline for Completion	Short Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange - 6**
Mitigation Action/Initiative: Structural Improvement to Sewer System

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Can support life safety due to damage to homes and hazards
Property Protection	1	Will protect property
Cost-Effectiveness	1	Benefit cost analysis must be completed with application
Technical	1	Project requires technical expertise
Political	1	Township government supports
Legal	1	Legal authority
Fiscal	0	Budget must be identified
Environmental	1	Supports environment
Social	1	Community support
Administrative	1	Township is capable of supporting
Multi-Hazard	1	Addresses several hazards
Timeline	1	Dependent upon funding and this project is a priority
Agency Champion	1	Township Administrator, FPA and engineer support this project
Other Community Objectives	0	
Total	12	
Priority (High/Med/Low)	High	

Action Number: **West Orange - 7**
Mitigation Action/Initiative: Enhance and Expand Tree Maintenance

Assessing the Risk	
Hazard(s) addressed:	Flood, Severe Weather, Winter Storm
Specific problem being mitigated:	Preparedness
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1. Enhance expand tree maintenance program
	2. Do nothing
	3. Hire a contractor to manage tree maintenance program
Action/Project Intended for Implementation	
Description of Selected Action/Project	Enhance/expand municipal tree maintenance and identification of preferred species planting program in conjunction with utility companies and PSE&G.
Action/Project Category	NSP
Goals/Objectives Met	1.2; 2.3; 6.1
Applies to existing, future, or not applicable	Existing
Benefits (losses avoided)	High
Estimated Cost	$50,000
Priority*	Medium
Plan for Implementation	
Responsible Organization	OEM, Township Administrator, Town Engineer
Local Planning Mechanism	Mitigation Plan, Department of Public Works
Potential Funding Sources	Municipal Budget
Timeline for Completion	Short Term
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Refer to prioritization table.

Action Number: **West Orange - 7**

Mitigation Action/Initiative: Enhance and Expand Tree Maintenance

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Falling branches during storms and other times, power line outages
Property Protection	1	Falling branches during storms
Cost-Effectiveness	1	Liability
Technical	1	Township possesses capabilities
Political	1	Government support
Legal	1	Legal authority
Fiscal	0	Budget must be identified
Environmental	1	Supports environment
Social	1	Community will benefit
Administrative	1	Township capabilities
Multi-Hazard	1	Addresses several hazards
Timeline	1	Can be implemented in short timeframe
Agency Champion	1	Several champions, OEM, DPW
Other Community Objectives	0	
Total	12	
Priority (High/Med/Low)	High	

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This resource defines terms that are used in or support the risk assessment document. These definitions were based on terms defined in documents included in the reference section, with modifications as appropriate to address the Essex County specific definitions and requirements.

100-year flood – A flood that has a 1-percent chance of being equaled or exceeded in any given year. This flood event is also referred to as the base flood. The term "100-year flood" can be misleading; it is not the flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1- percent chance of being equaled or exceeded each year. Therefore, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the standard used by most federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management to determine the need for flood insurance.

500-year flood – A flood that has a 0.2-percent chance of being equaled or exceeded in any one year.

Aggregate Data – Data gathered together across an area or region (for example, census tract or census block data).

Annualized Loss – The estimated long-term value of losses from potential future hazard occurrences of a particular type in any given single year in a specified geographic area. In other words, the average annual loss that is likely to be incurred each year based on frequency of occurrence and loss estimates. Note that the loss in any given year can be substantially higher or lower than the estimated annualized loss.

Asset – Any man-made or natural feature that has value, including but not limited to people, buildings, infrastructure (such as bridges, roads, and sewer and water systems), and lifelines (such as electricity and communication resources or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks).

At-Risk – Exposure values that include the entire building inventory value in census blocks that lie within or border the inundation areas or any area potentially exposed to a hazard based on location.

Base Flood – Flood that has a 1-percent probability of being equaled or exceeded in any given year. It is also known as the 100-year flood.

Base Flood Elevation (BFE) – Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The BFE is used as the standard for the National Flood Insurance Program.

Benefit – Net project outcomes, usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of conducting a benefit-cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including a reduction in expected property losses (building, content, and function) and protection of human life.

Benefit-cost analysis (BCA) – Benefit-cost analysis is a systematic, quantitative method of comparing the projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Blizzard - Characterized by low temperatures, wind gusts of 35 mph or more and falling and/or blowing snow that reduces visibility to 0.25 miles or less for an extended period of time (three or more hours).

Building – A structure that is walled and roofed, principally aboveground and permanently fixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.

Building Codes – Regulations that set forth standards and requirements for construction, maintenance, operation, occupancy, use, or appearance of buildings, premises, and dwelling units. Building codes can include standards for structures to withstand natural disasters.

Capability Assessment – An assessment that provides a description and analysis of a community or state's current capacity to address the threats associated with hazards. The capability assessment attempts to identify and evaluate existing policies, regulations, programs, and practices that positively or negatively affect the community or state's vulnerability to hazards or specific threats.

Climate – The meteorological elements, including temperature, precipitation, and wind, that characterizes the general conditions of the atmosphere over a period of time (typically 30-years) for a particular region.

Community Rating System (CRS) – CRS is a program that provides incentives for National Flood Insurance Program communities to complete activities that reduce flood hazard risk. When the community completes specific activities, the insurance premiums of these policyholders in communities are reduced.

Critical Facility – Facilities that are critical to the health and welfare of the population and that are especially important following a hazard. Critical facilities include essential facilities, transportation systems, lifeline utility systems, high-potential loss facilities, and hazardous material facilities. As defined for the Somerset County risk assessment, this category includes police stations, fire and/or EMS stations, major medical care facilities and emergency communications.

Dam Failure – A partial or complete breach in a dam, which impacts its integrity. Dam failures occur for a number of reasons such as flash flooding, inadequate size of spillways, mechanical failure of valves and other equipment, rodent activities in earthen dams, freezing and thawing cycles, earthquakes, and intentional destruction.

Debris – The scattered remains of assets broken or destroyed during the occurrence of a hazard. Debris caused by a wind or water hazard event can cause additional damage to other assets.

Digital Elevation Model (DEM) – U.S. Geological Survey (USGS) Digital Elevation Model (DEM) data files that are digital representations of cartographic information in a raster form. DEMs include a sampled array of elevations for a number of ground positions at regularly spaced intervals. These digital cartographic/geographic data files are produced by USGS as part of the National Mapping Program.

Digital Flood Insurance Rate Maps (DFIRMs) – These maps are used to calculate the cost insurance premiums, establish flood risk zones and base flood elevations to mitigate against potential future flood damages to properties.

Displacement Time – After a hazard occurs, the average time (in days) that a building's occupants must operate from a temporary location while repairs are made to the original building due to damages resulting from the hazard.

Disaster Mitigation Act of 2000 (DMA 2000) – Law that requires and rewards local and state pre-disaster planning, promotes sustainability as a strategy for disaster resistance, and is intended to integrate state and local planning with the aim of strengthening state-wide mitigation planning.

Drought – A period of time without substantial rainfall that persists from one year to the next. Droughts can affect large areas and can impact areas that range from a few counties to several states. Along with decreasing water supplies for human consumption and use, droughts can kill crops, livestock, grazing land, edible plants, and even in severe cases, trees.

Duration – The length of time a hazard occurs.

Earthquake – A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of earth's tectonic plates.

Erosion – Wearing away of the land surface by detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes.

Erosion Hazard Area – Area anticipated being lost to shoreline retreat over a given period of time. The projected inland extent of the area is measured by multiplying the average annual long-term recession rate by the number of years desired.

Essential Facility – A facility that is important to ensure a full recovery of a community or state following the occurrence of a hazard. These facilities can include: government facilities, major employers, banks, schools, and certain commercial establishments (such as grocery stores, hardware stores, and gas stations). For the Somerset County risk assessment, this category was defined to include schools, colleges, shelters, adult living and adult care facilities, medical facilities and health clinics, hospitals.

Exposure – The number and dollar value of assets that are considered to be at risk during the occurrence of a specific hazard.

Extent – The size of an area affected by a hazard or the occurrence of a hazard.

Extra-Tropical Cyclone - A group of cyclones defined as synoptic scale, low pressure, weather systems that occur in the middle latitudes of the Earth. These storms have neither tropical nor polar characteristics and are connected with fronts and horizontal gradients in temperature and dew point otherwise known as "baroclinic zones". These cyclones produce impacts ranging from cloudiness and mild showers to heavy gales and thunderstorms.

Federal Emergency Management Agency (FEMA) – Independent agency (now part of the Department of Homeland Security) created in 1978 to provide a single point of accountability for all federal activities related to disaster mitigation and emergency preparedness, response, and recovery.

Flash Flood – A flood occurring with little or no warning where water levels rise at an extremely fast rate.

Flood – A general and temporary condition of partial or complete inundation of normally dry land areas resulting from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.

Flood Depth – Height of the flood water surface above the ground surface.

Flood Elevation – Height of the water surface above an established datum (for example, the National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or mean sea level).

Flood Hazard Area – Area shown to be inundated by a flood of a given magnitude on a map.

Flood Insurance Rate Map (FIRM) – Official maps of a community, prepared by the FEMA that shows both the special flood hazard areas and the risk premium zones applicable to the community.

Flood Insurance Study (FIS) – A study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.

Flood Mitigation Assistance (FMA) Program – A program created as a part of the National Flood Insurance Report Act of 1994. FMA provides funding to assist communities and states in implementing actions that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other NFIP insurance structures, with a focus on repetitive loss properties.

Floodplain – Any land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that becomes inundated with water during a flood.

Frequency – A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1-percent chance of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.

Fuel Moisture (FM) Content - The quantity of water in a fuel particle expressed as a percent of the oven-dry weight of the fuel particle. FM content is an expression of the cumulative effects of past and present weather events and must be considered in evaluating the effects of current or future weather on fire potential.

Fujita Scale of Tornado Intensity – Rates tornadoes with numeric values from F0 to F5 based on tornado wind speed and damage sustained. An F0 (wind speed less than 73 mph) indicates minimal damage such as broken tree limbs or signs, while an F5 (wind speeds of 261 to 318 mpg) indicated severe damage sustained.

Geology – The scientific study of the earth, including its composition, structure, physical properties, and history.

Geographic Information Systems (GIS) – A computer software application that relates data regarding physical and other features on the earth to a database to be used for mapping and analysis.

GIS Shapefiles – A type of GIS vector file developed by ESRI for their ArcView software. This type of file contains a table and a graphic. The records in the table are linked to corresponding objects in the graphic.

Goals – General guidelines that explain what you want to achieve. They are usually broad policy-type statements, long term in nature, and represent global visions.

Hailstorm – Hail is defined as a showery precipitation in the form of irregular pellets or balls of ice more than 5 millimeters in diameter, falling from a cumulonimbus cloud. Hail is a product of thunderstorms or intense showers. It is generally white and translucent, consisting of liquid or snow particles encased with

layers of ice. Hail is formed within the higher reaches of a well-developed thunderstorm. When hailstones become too heavy to be caught in an updraft back into the clouds of the thunderstorm (hailstones can be caught in numerous updrafts adding a coating of ice to the original frozen droplet of rain each time), they fall as hail and a hailstorm ensues. A hailstorm is a storm associated with hail.

Haines Index - A fire weather index based on stability and moisture content of the lower atmosphere that measures the potential for existing fires to become large fires.

Hazard – A source of potential danger or an adverse condition that can cause harm to people or cause property damage. A natural hazard is a hazard that occurs naturally (such as flood, wind, and earthquake). A man-made hazard is one that is caused by humans (for example, a terrorist act or a hazardous material spill). Hazards are of concern if they have the potential to harm people or property.

Hazards of Concern – Those hazards that have been analytically determined to pose significant risk in an area, and thus the focus of the particular mitigation plan for that area (a subset of the Hazards of Interest).

Hazard Identification – The process of identifying hazards that threaten an area.

Hazardous Material Facilities – Facilities housing industrial and hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins.

Hazard Mitigation – Sustained actions taken to reduce or eliminate the long-term risk and effects that can result from the occurrence of a specific hazard. For example, building a flood wall can protect an area from flooding.

Hazard Mitigation Grant Program (HMGP) – Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster.

Hazard Mitigation Plan – A collaborative document in which hazards affecting the community are identified, vulnerability to hazards assessed, and consensus reached on how to minimize or eliminate the effects of these hazards.

Hazard Profile – A description of the physical characteristics of a hazard, including a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.

Hazards U.S. – Multi-Hazard (HAZUS-MH) – A GIS-based nationally standardized earthquake, flood, and wind loss estimation tool developed by FEMA.

HAZUS-MH Risk Assessment Methodology – This analysis uses the HAZUS-MH modules (earthquake, wind, and flood) to analyze potential damages and losses.

Heat Index (HI) - The temperature the body feels when heat and humidity are combined. Higher humidity plus higher temperatures often combine to make us feel a perceived temperature that is higher than the actual air temperature.

Heavy Snow - Snowfall accumulating to 4" or more in depth in 12 hours or less; or snowfall accumulating to 6" or more in depth in 24 hours or less.

High Potential Loss Facilities – Facilities that would have a high loss associated with them, such as nuclear power plants, dams, and military installations.

Hurricane – An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74 miles-per-hour or more and blow in a large spiral around a relatively calm center or "eye." Hurricanes develop over the North Atlantic Ocean, northeast Pacific Ocean, or the South Pacific Ocean (east of 160°E longitude). Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.

Hydraulics – That branch of science, or of engineering, which addresses fluids (especially, water) in motion, its action in rivers and canals, the works and machinery for conducting or raising it, its use as a prime mover, and other fluid-related areas.

Hydrography – Pertains to the measurement and description of bodies of water, including oceans, lakes, and rivers.

Hydrology – Hydrology is concerned with the circulation of water and its constituents through the hydrologic cycle.

Infrastructure – The public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, transportation system (such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, dry docks, piers and regional dams).

Ice Jam - An accumulation of ice in a river that acts as a natural dam and can flood low-lying areas upstream. They occur when warm temperatures and heavy rains cause rapid snow melt.

Ice Storm – Term used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication.

Intensity – A measure of the effects of a hazard occurring at a particular place.

Inventory – The assets identified in a study region. It includes assets that can be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

Keetch-Byram Drought Index (KBDI) - A drought index designed for fire potential assessment. It is a number representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers.

Level 1 Analysis – A HAZUS-MH analysis that yields a rough estimate or preliminary analysis based on the nationwide default database included in HAZUS-MH. A Level 1 analysis is a great way to begin the risk assessment process and prioritize high-risk communities without collecting or using local data.

Level 2 Analysis – A HAZUS-MH analysis that requires the input of additional or refined data and hazard maps that will produce more accurate risk and loss estimates. Assistance from local emergency

management personnel, city planners, GIS professionals, and others may be necessary for this level of analysis.

Lifelines – Critical facilities that include utility systems (potable water, wastewater, oil, natural gas, electric power facilities and communication systems) and transportation systems (airways, bridges, roads, tunnels and waterways).

Lightning – A visible electrical discharge produced by a thunderstorm. The discharge may occur within or between clouds or between a rain cloud and the ground.

Loss Estimation – The process of assigning hazard-related damage and loss estimates to inventory, infrastructure, lifelines, and population data. HAZUS-MH can estimate the economic and social loss for specific hazard occurrences. Loss estimation is essential to decision making at all levels of government and provides a basis for developing mitigation plans and policies. It also supports planning for emergency preparedness, response, and recovery.

Lowest Floor – Under the NFIP, the lowest floor of the lowest enclosed area (including basement) of a structure. For the HAZUS-MH flood model, this information can be used to assist in assessing the damage to buildings.

Magnitude – A measure of the strength of a hazard occurrence. The magnitude (also referred to as severity) of a given hazard occurrence is usually determined using technical measures specific to the hazard. For example, ranges of wind speeds are used to categorize tornados.

Major Disaster Declarations – Post-disaster status requested by a state's governor when local and state resources are not sufficient to meet disaster needs. It is based on the damage assessment, and an agreement to commit state funds and resources to the long-term recovery. The event must be clearly more than the state or local government can handle alone.

Master Plan – A document, also known as a "general plan", covering the entire geographic area of a community and expressing community goals and objectives. The plan lays out the vision, policies, and strategies for the future of the community, including all of the physical elements that will determine the community's future development. This plan can discuss the community's desired physical development, desired rate and quantity of growth, community character, transportation services, location of growth, and citing of public facilities and transportation. In most states, the comprehensive plan has no authority in and of itself, but serves as a guide for community decision-making.

Mean Return Period (MRP) – The average period of time, in years, between occurrences of a particular hazard (equal to the inverse of the annual frequency of exceedance).

Mitigation Actions – Specific actions that help achieve your goals and objectives.

Mitigation Goals – General guidelines that explain what you want to achieve. They are usually broad policy-type statements, long term, and represent global visions.

Mitigation Objectives – Strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable.

Mitigation Plan – A plan that documents the process used for a systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in a state or community. The

plan includes a description of actions to minimize future vulnerability to hazards. This plan should be developed with local experts and significant community involvement.

National Flood Insurance Program (NFIP) – Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 Code of Federal Regulations (CFR) §60.3.

Nor'Easter – Named for the strong northeasterly winds blowing in ahead of the storm, are also referred to as a type of extra-tropical cyclones (mid-latitude storms, or Great Lake storms. A Nor'Easter is a macro-scale extra-tropical storm whose winds come from the northeast, especially in the coastal areas of the Northeastern U.S. and Atlantic Canada.

Objectives – Objectives define strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable.

Occupancy Classes – Categories of buildings used by HAZUS-MH (for example, commercial, residential, industrial, government, and "other").

Ordinance – A term for a law or regulation adopted by local government.

Planning – The act or process of making or carrying out plans; the establishment of goals, policies and procedures for a social or economic unit.

Post-disaster mitigation – Mitigation actions taken after a disaster has occurred, usually during recovery and reconstruction.

Presidential Disaster Declaration – A post-disaster status that puts into motion long-term federal recovery programs, some of which are matched by state programs, and designed to help disaster victims, businesses, and public entities in the areas of human services, public assistance (infrastructure support), and hazard mitigation. If declared, funding comes from the President's Disaster Relief Fund and disaster aid programs of other participating federal agencies.

Preparedness – Actions that strengthen the capability of government, citizens, and communities to respond to disasters.

Probability – A statistical measure of the likelihood that a hazard event will occur.

Public education and outreach programs – Any campaign to make the public more aware of hazard mitigation and mitigation programs, including hazard information centers, mailings, public meetings, etc.

Recovery – The actions taken by an individual or community after a catastrophic event to restore order and lifelines in the community.

Regulation – Most states have granted local jurisdictions broad regulatory powers to enable the enactment and enforcement of ordinances that deal with public health, safety, and welfare. These include building codes, building inspections, zoning, floodplain and subdivision ordinances, and growth management initiatives.

Recurrence Interval – The average time between the occurrences of hazardous events of similar size in a given location. This interval is based on the probability that the given event will be equaled or exceeded in any given year.

Repetitive Loss Property – A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1,000 each have been paid within any 10-year period since 1978.

Replacement Value – The cost of rebuilding a structure. This cost is usually expressed in terms of cost per square foot and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.

Resolutions – Expressions of a governing body's opinion, will, or intention that can be executive or administrative in nature. Most planning documents must undergo a council resolution, which must be supported in an official vote by a majority of representatives to be adopted. Other methods of making a statement or announcement about a particular issue or topic include proclamations or declarations.

Resources – Resources include the people, materials, technologies, money, etc., required to implement strategies or processes. The costs of these resources are often included in a budget.

Risk – The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Risk Assessment – A methodology used to assess potential exposure and estimated losses associated with priority hazards. The risk assessment process includes four steps: (1) identifying hazards, (2) profiling hazards, (3) conducting an inventory of assets, and (4) estimating losses.

Risk Factors – Characteristics of a hazard that contribute to the severity of potential losses in the study area.

Riverine – Of or produced by a river (for example, a riverine flood is one that is caused by a river overflowing its banks).

Saffir-Simpson Scale – This scale categorizes or rates hurricanes from 1 (Minimal) to 5 (Catastrophic) based on their intensity. It is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall. Wind speed is the determining factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf and the shape of the coastline, in the landfall region.

Scale – A proportion used in determining a dimensional relationship; the ratio of the distance between two points on a map and the actual distance between the two points on the earth's surface.

Scour – Removal of soil or fill material by the flow of floodwaters. This term is frequently used to describe storm-induced, localized, conical erosion around pilings and other foundation supports where the obstruction of flow increases turbulence.

Special Flood Hazard Area (SFHA) – An area within a floodplain having a 1-percent or greater chance of flood occurrence in any given year (that is, the 100-year or base flood zone); represented on FIRMS as darkly shaded areas with zone designations that include the letter "A" or "V."

Stafford Act – The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law (PL) 100-107 was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.

Stakeholder – Stakeholders are individuals or groups, including businesses, private organizations, and citizens, that will be affected in any way by an action or policy.

State Hazard Mitigation Officer (SHMO) – The representative of state government who is the primary point of contact with FEMA, other state and Federal agencies, and local units of government in the planning and implementation of pre- and post-disaster mitigation activities.

Study Area – The geographic unit for which data are collected and analyzed. A study area can be any combination of states, counties, cities, census tracts, or census blocks. The study area definition depends on the purpose of the loss study and in many cases will follow political boundaries or jurisdictions such as city limits.

Substantial Damage – Damage of any origin sustained by a structure in a SFHA, for which the cost of restoring the structure to its pre-hazard event condition would equal or exceed 50 percent of its pre-hazard event market value.

Thunderstorm - A local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder. It forms from a combination of moisture, rapidly rising warm air and a force capable of lifting air such as a warm and cold front, a sea breeze, or a mountain.

Topographic – Map that shows natural features and indicate the physical shape of the land using contour lines based on land elevation. These maps also can include man-made features (such as buildings and roads).

Topography – The physical features of a surface area including relative elevations and the position of natural and man-made features.

Tornado – A violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm (or sometimes as a result of a hurricane) and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly.

Transportation Systems – One of the lifeline system categories. This category includes: airways (airports, heliports, highways), bridges, tunnels, roadbeds, overpasses, transfer centers; railways (tracks, tunnels, bridges, rail yards, depots), and waterways (canals, locks, seaports, ferries, harbors, dry docks, piers).

Tropical Cyclone - A generic term for a cyclonic, low-pressure system over tropical or sub-tropical waters containing a warm core of low barometric pressure which typically produces heavy rainfall, powerful winds and storm surge.

Tropical Depression - An organized system of clouds and thunderstorms with a defined surface circulation and maximum sustained winds of less than 38 mph. It has no “eye” (the calm area in the center of the storm) and does not typically have the organization or the spiral shape of more powerful storms.

Tropical Storm - An organized system of strong thunderstorms with a defined surface circulation and maximum sustained winds between 39 to 73 mph

Utility Systems – One of the lifeline systems categories. This category includes potable water, wastewater, oil, natural gas, electric power facilities and communication systems.

Vulnerability – Description of how exposed or susceptible an asset is to damage. This value depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. If an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect affects can be much more widespread and damaging than direct affects.

Vulnerability Assessment – Evaluation of the extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard occurrences on the existing and future built environment.

Watershed – Area of land that drains down gradient (from areas of higher land to areas of lower land) to the lowest point; a common drainage basin. The water moves through a network of drainage pathways, both underground and on the surface. Generally, these pathways converge into streams and rivers, which become progressively larger as the water moves downstream, eventually reaching an estuary, lake, or ocean.

Wildfire – Any instance of uncontrolled burning in grasslands, forests, and brush land. It is further defined as an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.

Wildland/Urban Interface (WUI) - The area where houses and wildland vegetation coincide. Interface neighborhoods are found all across the U.S., and include many of the sprawling areas that grew during the 1990s.

Wind Chill Index (WCI) - The temperature your body feels when the air temperature is combined with the wind speed. It is based on the rate of heat loss from exposed skin caused by the effects of wind and cold.

Windstorm – A storm characterized by high wind velocities; associated with cyclonic storms (e.g. hurricanes), thunderstorms and tornadoes.

Zone – A geographical area shown on a National FIRM that reflects the severity or type of flooding in the area.

Zoning Ordinance – Designation of allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

This appendix includes an example resolution to be submitted by Essex County and participating jurisdictions authorizing adoption of the Essex County All Hazard Mitigation Plan Update. The resolutions issued to support adoption of the plan by each jurisdiction will be included in this appendix as they are formally completed.

RESOLUTION NO. XXXX-XX

A RESOLUTION OF THE Governing Body OF THE Jurisdiction Name
AUTHORIZING THE ADOPTION OF THE
2014 ESSEX COUNTY
ALL HAZARD MITIGATION PLAN UPDATE

WHEREAS, all of Essex County has exposure to natural hazards that increase the risk to life, property, environment and the County's economy; and

WHEREAS; pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre and post disaster hazard mitigation programs; and

WHEREAS; a coalition of Essex County jurisdictions with like planning objectives has been formed to pool resources and create consistent mitigation strategies within Essex County; and

WHEREAS, the coalition has completed a planning process that engages the public, assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising this strategy;

NOW, THEREFORE, BE IT RESOLVED that the [**jurisdiction name]**:

1) Adopts in its entirety, the 2014 Essex County All Hazard Mitigation Plan Update (the "Plan") as the jurisdiction's Natural Hazard Mitigation Plan, and resolves to execute the actions identified in the Plan that pertain to this jurisdiction.
2) Will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified.
3) Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.
4) Will continue its support of the Mitigation Planning Committee as described within the Plan.
5) Will help to promote and support the mitigation successes of all participants in this Plan.
6) Will incorporate mitigation planning as an integral component of government and partner operations.
7) Will provide an update of the Plan in conjunction with the County no less than every five years.

PASSED AND ADOPTED on this Xst, Xnd, X$_{rd}$, Xth day of month, 2014, by the following vote:

AYES:
NOES:
ABSENT:
ABSTAIN:

ATTEST:

Clerk, Town of	Mayor, Town of

COUNTY OF ESSEX, NEW JERSEY
BOARD OF CHOSEN FREEHOLDERS

State of New Jersey,}
County of Essex } ss

I Deborah Davis Ford *Clerk of the Board of Chosen Freeholders of the County of Essex in the State of New Jersey Do Hereby Certify, the foregoing to be a true copy of a resolution adopted at a meeting of said Board on* Wednesday *the* 25th *day of* February, *2015 together with the certification, signatures and endorsements thereon.*

RESOLUTION NO.

	R-2015-00154	R-2015-00164	R-2015-00174
R-2015-00145	R-2015-00155	R-2015-00165	R-2015-00175
R-2015-00146	R-2015-00156	R-2015-00166	R-2015-00176
R-2015-00147	R-2015-00157	R-2015-00167	
R-2015-00148	R-2015-00158	R-2015-00168	
R-2015-00149	R-2015-00159	R-2015-00169	
R-2015-00150	R-2015-00160	R-2015-00170	
R-2015-00151	R-2015-00161	R-2015-00171	
R-2015-00152	R-2015-00162	R-2015-00172	
R-2015-00153	R-2015-00163	R-2015-00173	

IN Testimony WHEREOF, I have hereunto set my hand and affixed the official seal of said County at Newark this 3rd *day of* March *A.D.* 2014

Deborah Davis Ford
Clerk

RESOLUTION OF THE BOARD OF FREEHOLDERS
COUNTY OF ESSEX

#15

RESOLUTION NO. A-2015 00156 **AUTHORITY FOR RESOLUTION:** **N.J.S.A. 40:41A-38(n)**

PROPOSED BY: **COUNTY EXECUTIVE** **AUTHORITY FOR ACTION:** **N.J.S.A. 40:41A-36(i)**

SUBJECT:

OFFICE OF THE SHERIFF - RESOLUTION AUTHORIZING THE ADOPTION OF THE 2015 ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE

WHEREAS, all of Essex County has exposure to natural hazards that increase the risk to life, property, environment and the County's economy; and

WHEREAS, pro-active mitigation of known hazards before a disaster even can reduce or eliminate long term risk to life and property; and

WHEREAS, the Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre and post disaster hazard mitigation programs; and

WHEREAS, a coalition of Essex County jurisdictions with like planning objectives has been formed to pool resources and create consistent mitigation strategies within Essex County; and

WHEREAS, the coalition has completed a planning process that engages the public assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising their strategy, now, therefore; be it.

RESOLVED, by the Essex County Board of Chosen Freeholders:

1. That the Essex County Office of the Sheriff adopts in its entirety, the 2015 Essex County All Hazard Mitigation Plan Update as the jurisdiction's Natural Hazard Mitigation Plan, and resolves to execute the actions identified in the Plan that pertain to this jurisdictions.
2. That the Essex County Office of the Sheriff will use the adopted and approved portions of the Plan to guide pre- and post – disaster mitigation of the hazards identified;
3. That the Essex County Office of the Sheriff will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdiction authority;
4. That the Essex County Office of the Sheriff will continue its support of the Mitigation Planning Committee as described within the Plan;
5. That the Essex County Office of the Sheriff will help to promote and support the mitigation success of all participants in this Plan
6. That the Essex County Office of the Sheriff will incorporate mitigation planning as an integral component of government and partner operations;
7. That the Essex County Office of the Sheriff will provide an update of the Plan in conjunction with the County no less than every five years.

RECEIVED
CLERK OF THE BOARD
2015 FEB 11 PM 2:44
ESSEX COUNTY
BOARD OF
CHOSEN FREEHOLDERS

Approved as to form and legality _____ Date 2/9/15

ESSEX COUNTY COUNSEL

RECORD OF VOTE (X=Vote N.V.=Abstention ABS=Absent)

Moved By Freeholder Richardson
Second by Freeholder Bobadilla

Freeholder	Yes	No	N.V.	ABS	Freeholder	Yes	No	N.V.	ABS
Bobadilla	✓				Richardson	✓			
Gill, V.P.	✓				Sebold	✓			
Johnson	✓				Timberlake, Pres.	✓			
Jones	✓				Toro	✓			
Luciano	✓								

It is hereby certified that the foregoing Resolution was (✓) adopted ( ) defeated ( ) tabled by roll call vote at a regular meeting of the Board of Chosen Freeholders of the County of Essex, New Jersey held on Feb 25, 2015.

Is Publication Required ( ) Yes ( ) No

Date Published _____

Britnee N. Timberlake, President

EC Sheriff - 2015 EC All hazard Mitigation Plan Update

jf 2/5/15

TOWNSHIP OF FAIRFIELD
RESOLUTION #2015-78

A RESOLUTION OF THE MAYOR AND COUNCIL OF THE TOWNSHIP OF FAIRFIELD AUTHORIZING THE ADOPTION OF THE 2015 ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE

WHEREAS, all of Essex County has exposure to natural hazards that increase the risk to life, property, environment and the County's economy; and

WHEREAS; pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre and post disaster hazard mitigation programs; and

WHEREAS; a coalition of Essex County jurisdictions with like planning objectives has been formed to pool resources and create consistent mitigation strategies within Essex County; and

WHEREAS, the coalition has completed a planning process that engages the public, assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising this strategy;

NOW, THEREFORE, BE IT RESOLVED that the Township of Fairfield:

1) Adopts in its entirety, the 2015 Essex County All Hazard Mitigation Plan Update (the "Plan") as the jurisdiction's Natural Hazard Mitigation Plan, and resolves to execute the actions identified in the Plan that pertain to this jurisdiction.
2) Will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified.
3) Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.
4) Will continue its support of the Mitigation Planning Committee as described within the Plan.
5) Will help to promote and support the mitigation successes of all participants in this Plan.
6) Will incorporate mitigation planning as an integral component of government and partner operations.
7) Will provide an update of the Plan in conjunction with the County no less than every five years.

***

I hereby certify that the above resolution was adopted by the Mayor and Council of the Township of Fairfield at a meeting of said Governing Body held on February 9, 2015

MAYOR OF THE TOWNSHIP OF FAIRFIELD

MUNICIPAL CLERK OF THE TOWNSHIP OF FAIRFIELD

Resolution By: Councilman McGlynn
Seconded By: Councilman Cifelli

ROLL CALL VOTE

GOVERNING BODY	AYES	NAYS	ABSTAIN	ABSENT	NOT VOTING
COUNCIL PRESIDENT THOMAS J. MORGAN	X				
COUNCILMAN JOSEPH CIFELLI	X				
COUNCILMAN MICHAEL B. MCGLYNN	X				
COUNCILMAN JOHN LAFORGIA	X				
MAYOR JAMES GASPARINI	X				

S:\reso 2015 Fire Prev Auth to Adopt 2015 Essex Cty All Hazard Mitigation Plan Feb. 9, 2015
Admin Fire Prev

R-15-82

A RESOLUTION OF THE TOWNSHIP COUNCIL OF THE TOWNSHIP OF LIVINGSTON AUTHORIZING THE ADOPTION OF THE 2015 ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE

WHEREAS, all of Essex County has exposure to natural hazards that increase the risk to life, property, environment and the County's economy; and

WHEREAS; pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre and post disaster hazard mitigation programs; and

WHEREAS; a coalition of Essex County jurisdictions with like planning objectives has been formed to pool resources and create consistent mitigation strategies within Essex County; and

WHEREAS, the coalition has completed a planning process that engages the public, assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising this strategy;

NOW, THEREFORE, BE IT RESOLVED that the Township of Livingston:

1) Adopts in its entirety, the 2015 Essex County All Hazard Mitigation Plan Update (the "Plan") as the jurisdiction's Natural Hazard Mitigation Plan, and resolves to execute the actions identified in the Plan that pertain to this jurisdiction.
2) Will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified.
3) Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.
4) Will continue its support of the Mitigation Planning Committee as described within the Plan.
5) Will help to promote and support the mitigation successes of all participants in this Plan.
6) Will incorporate mitigation planning as an integral component of government and partner operations.
7) Will provide an update of the Plan in conjunction with the County no less than every five years.
8)

PASSED AND ADOPTED on this 9th day of FebruaryX[s], 2015, by the following vote:

AYES: FERNANDEZ, MEINHARDT, KLEIN, ANTHONY, SILVERMAN
NOES: —
ABSENT: —
ABSTAIN: —
ATTEST:

Glenn R. Turtletaub, Clerk

Michael M. Silverman, Mayor

Sharon L. Weiner, Township Attorney

I HEREBY CERTIFY the foregoing to be a true copy of a resolution adopted by the Livingston Township Council.

Glenn R. Turtletaub, Township Clerk

BOARD OF COMMISSIONERS
TOWNSHIP OF NUTLEY, NEW JERSEY

Resolution

Introduced by: Commissioner Joseph P. Scarpelli *Date:* February 3, 2015
Seconded by: Commissioner Steven Rogers *No.* *44-15*

WHEREAS, all of Essex County has exposure to natural hazards that increase the risk to life, property, environment and the County's economy; and

WHEREAS, pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre- and post- disaster hazard mitigation programs; and

WHEREAS, a coalition of Essex County jurisdictions with like planning objectives has been formed to pool resources and create consistent mitigation strategies within Essex County; and

WHEREAS, the coalition has completed a planning process that engages the public, assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising this strategy;

NOW, THEREFORE, BE IT RESOLVED that the Township of Nutley:

1) Adopts in its entirety, the 2015 Essex County All Hazard Mitigation Plan Update (the "Plan") as the jurisdiction's Natural Hazard Mitigation Plan, and resolves to execute the actions identified in the Plan that pertain to this jurisdiction.
2) Will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified.
3) Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.
4) Will continue its support of the Mitigation Planning Committee as described within the Plan.
5) Will help to promote and support the mitigation successes of all participants in this Plan.
6) Will incorporate mitigation planning as an integral component of government and partner operations.
7) Will provide an update of the Plan in conjunction with the County no less than every five years.

* * *

I, Eleni Pettas, Township Clerk of the Township of Nutley, Essex County, NJ, do hereby certify that the foregoing is a true copy of a resolution adopted by the Board of Commissioners at a regular meeting held February 3, 2015

Eleni Pettas

Record of Vote	*Commissioner Rogers*	*Commissioner Tucci*	*Commissioner Evans*	*Commissioner Scarpelli*	*Mayor Petracco*
Yes	X		X	X	X
No					
Not Voting					
Absent/Excused		X			

RESOLUTION 52-2015

BOROUGH OF ROSELAND
COUNTY OF ESSEX, STATE OF NEW JERSEY

A RESOLUTION AUTHORIZING THE ADOPTION OF THE 2015 ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE

WHEREAS, all of Essex County has exposure to natural hazards that increase the risk to life, property, environment and the County's economy; and

WHEREAS; pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre and post disaster hazard mitigation programs; and

WHEREAS; a coalition of Essex County jurisdictions with like planning objectives has been formed to pool resources and create consistent mitigation strategies within Essex County; and

WHEREAS, the coalition has completed a planning process that engages the public, assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising this strategy;

NOW, THEREFORE, BE IT RESOLVED that the Mayor and Council of the Borough of Roseland hereby adopts in its entirety, the 2015 Essex County All Hazard Mitigation Plan Update (the "Plan") as Roseland's Natural Hazard Mitigation Plan, and resolves to execute the actions identified in the Plan that pertain to this jurisdiction; and

BE IT FURTHER RESOLVED, that the Borough of Roseland will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified; and

BE IT FURTHER RESOLVED, that the Borough of Roseland will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority; and

BE IT FURTHER RESOLVED, that the Borough of Roseland will continue its support of the Mitigation Planning Committee as described within the Plan; and

BE IT FURTHER RESOLVED, that the Borough of Roseland will help to promote and support the mitigation successes of all participants in this Plan; and

BE IT FURTHER RESOLVED, that the Borough of Roseland will incorporate mitigation planning as an integral component of government and partner operations; and

BE IT FURTHER RESOLVED, that the Borough of Roseland will provide an update of the Plan in conjunction with the County no less than every five years.

John Duthie, Mayor

Jock H. Watkins, Borough Clerk

MOTION BY: Councilman Jacobs

SECOND BY: Councilman Vidovich

Record of Council Vote	Aye	Nay	Abstain	Absent
JACOBS, D.	X			
LEONARD, R	X			
SMITH, P.	X			
TOLLI, M.	X			
TSILIONIS, T.				X
VIDOVICH, M.	X			
DUTHIE, J. (In case of Tie)				

ADOPTED ON: January 3, 2015

Steve Wood
Karl Olsen
Ken Braft

R-15-041

TOWNSHIP OF MONTCLARI

RESOLUTION AUTHORIZING THE ADOTPION OF
THE 2015 ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE

February 10, 2015

WHEREAS all of Essex County has exposure to natural hazards that increase the risk to life, property, environment and the County's economy; and

WHEREAS pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS the Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre and post disaster hazard mitigation programs; and

WHEREAS a coalition of Essex County jurisdictions with like planning objectives has been formed to pool resources and create consistent mitigation strategies within Essex County; and

WHEREAS the coalition has completed a planning process that engages the public, assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising this strategy; now therefore

BE IT RESOLVED that the Township of Montclair:

1) Adopts in its entirety, the 2015 Essex County All Hazard Mitigation Plan Update (the "Plan") as the jurisdiction's Natural Hazard Mitigation Plan, and resolves to execute the actions identified in the Plan that pertain to this jurisdiction.

2) Will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified.

3) Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.

4) Will continue its support of the Mitigation Planning Committee as described within the Plan.

5) Will help to promote and support the mitigation successes of all participants in this Plan.

6) Will incorporate mitigation planning as an integral component of government and partner operations.

7) Will provide an update of the Plan in conjunction with the County no less than every five years.

RECORD OF COUNCIL VOTE

	YES	NO	ABS	N.V.	AB		YES	NO	ABS	N.V.	AB
Councilor Baskerville	✓					**Councilor Schlager**	✓				
Councilor Hurlock	✓					**Councilor Spiller**	✓				
Councilor McMahon	✓					**Mayor Jackson**	✓				
Deputy Mayor Russo	✓										

X - Indicate Vote ABS - Abstain N.V. - Not Voting AB - Absent

I HEREBY CERTIFY the foregoing to be a true copy of a Resolution adopted by the Council of the Township of Montclair, in the County of Essex, at its meeting held on February 10, 2015.

Linda S. Wanat
Clerk of the Township of Montclair, N.J.

R#22
2-10-15

..... Resolution of the Township of Belleville, N. J.

No. 15-40 Date of Adoption February 10, 2015

TITLE:

RESOLUTION OF THE MUNICIPAL COUNCIL OF THE TOWNSHIP OF BELLEVILLE AUTHORIZING THE ADOPTION OF THE 2015 ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE

Approved as to Form and Legality ..... Township Attorney

Factual contents certified to by ..... Title

Mayor
Council Member Robert Caruso, Fire Cheif ..... Presents the following Resolution

Council Member Kennedy ..... Moved for the adoption of the Resolution

Seconded by Council Member Rovell .....

RESOLVED BY THE MUNICIPAL COUNCIL OF BELLEVILLE, N. J.:

WHEREAS, all of Essex County has exposure to natural hazards that increase the risk to life, property, environment and the County's economy; and

WHEREAS; pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre and post disaster hazard mitigation programs; and

WHEREAS; a coalition of Essex County jurisdictions with like planning objectives has been formed to pool resources and create consistent mitigation strategies within Essex County; and

WHEREAS, the coalition has completed a planning process that engages the public, assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising this strategy;

NOW, THEREFORE, BE IT RESOLVED that the Municipal Council of the Township of Belleville:

1) Adopts in its entirety, the 2015 Essex County All Hazard Mitigation Plan Update (the "Plan") as the jurisdiction's Natural Hazard Mitigation Plan, and resolves to execute the actions identified in the Plan that pertain to this jurisdiction.
2) Will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified.
3) Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.
4) Will continue its support of the Mitigation Planning Committee as described within the Plan.
5) Will help to promote and support the mitigation successes of all participants in this Plan.
6) Will incorporate mitigation planning as an integral component of government and partner operations.
7) Will provide an update of the Plan in conjunction with the County no less than every five years.

Adopted by the Municipal Council of the Township of Belleville, N. J. — Date Feb. 10, 2015

RECORD OF VOTE

COUNCIL MEMBER	YES	NO	N.V.	AB.	COUNCIL MEMBER	YES	NO	N.V.	AB.
COZZARELLI	X				NOTARI				X
KENNEDY	X				ROVELL	X			
LONGO	X				STRUMOLO BURKE	X			
KIMBLE	X								
Sign:									

X—Indicates Vote N.V.—Not Voting AB—Absent

Certified to by me this 10th day of Feb. 2015

Caruso, Pedalino

Kelly A. Cavanagh
Municipal Clerk

This Resolution when adopted must remain in the custody of the Municipal Clerk. Certified copies are available.

26

Township Council
1 Municipal Plaza
Bloomfield, NJ 07003

Louise M. Palagano
Municipal Clerk

http://www.bloomfieldtwpnj.com

Meeting: 02/18/15 07:00 PM

2015 RESOLUTION APPROVAL

A RESOLUTION OF THE TOWNSHIP OF BLOOMFIELD AUTHORIZING THE ADOPTION OF THE 2015 ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATED

WHEREAS, all of the Essex County has exposure to natural hazards that increase the risk to life, property, environment and the County's economy; and

WHEREAS, pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre and post disaster hazard mitigation programs; and

WHEREAS, a coalition of Essex County jurisdictions with like planning objectives has been formed to pool resources and create consistent mitigation strategies within Essex County; and

WHEREAS, the coalition has completed a planning process that engages the public, assess the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising this strategy.

NOW, THEREFORE, BE IT RESOLVED, that the Township of Bloomfield:

1. Adopts in its entirety, the 2015 Essex County All Hazard Mitigation Plan Update (the "Plan") as the jurisdiction's Natural Hazard Mitigation Plan, and resolves to execute the actions identified in the Plan that pertain to this jurisdiction.
2. Will use the adopted and approved portions of the plan to guide pre- and post-disaster mitigation of the hazards identified.
3. Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.

APPROVED AS TO FORM AND PROCEDURE
ON BASIS OF FACTS SET FORTH

DIRECTOR OF LAW-TOWNSHIP ATTORNEY

4. Will continue its support of the Mitigation Planning Committee as described within the Plan.
5. Will help to promote and support the mitigation successes of all participants in this Plan.
6. Will incorporate mitigation planning as an integral component of government and partner operations.
7. Will provide an updated of the Plan in connection with the County no less than every five years.

......*...*

I hereby certify that the above resolution was duly adopted by the Mayor and Council of the Township of Bloomfield at a meeting of said Township Council held on February 18, 2015.

Municipal Clerk of the Township of Bloomfield

Mayor of the Township of Bloomfield

✓ Vote Record – Resolution			Yes/Aye	No/Nay	Abstain	Absent
☐ Adopt ☐ Deny ☐ Withdrawn ☐ Table ☐ Not Discussed ☐ First Reading ☐ Table with no Vote ☐ Approve ☐ Veto by Mayor ☐ Discussion ☐ Defeated ☐ Discussion No Vote	Elias N. Chalet		☑	☐	☐	☐
	Nicholas Joanow		☑	☐	☐	☐
	Carlos Bernard		☐	☐	☐	☑
	Wartyna Davis		☑	☐	☐	☐
	Joseph Lopez		☑	☐	☐	☐
	Carlos Pomares		☐	☐	☐	☑
	Michael J. Venezia		☑	☐	☐	☐

TOWNSHIP OF MILLBURN
RESOLUTION 15-044
AUTHORIZE ADOPTION OF THE
2015 ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE

WHEREAS, all of Essex County has exposure to natural hazards that increase the risk to life, property, environment and the County's economy; and

WHEREAS; pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre and post disaster hazard mitigation programs; and

WHEREAS; a coalition of Essex County jurisdictions with like planning objectives has been formed to pool resources and create consistent mitigation strategies within Essex County; and

WHEREAS, the coalition has completed a planning process that engages the public, assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising this strategy;

NOW, THEREFORE, BE IT RESOLVED that the Township of Millburn:

1) Adopts in its entirety, the 2015 Essex County All Hazard Mitigation Plan Update (the "Plan") as the jurisdiction's Natural Hazard Mitigation Plan, and resolves to execute the actions identified in the Plan that pertain to this jurisdiction.
2) Will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified.
3) Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.
4) Will continue its support of the Mitigation Planning Committee as described within the Plan.
5) Will help to promote and support the mitigation successes of all participants in this Plan.
6) Will incorporate mitigation planning as an integral component of government and partner operations.
7) Will provide an update of the Plan in conjunction with the County no less than every five years

Adopted by Township Committee on February 3, 2015

I, Christine A. Gatti, Township Clerk of the Township of Millburn, do hereby certify this document to be a true copy of the original which is on file in my office.

Date: 2/4/2015

Christine Gatti

Christine A. Gatti, Township Clerk
Township of Millburn

BOROUGH OF NORTH CALDWELL
Borough Hall – 141 Gould Avenue
North Caldwell, New Jersey 07006-4213

'hone 973-228-6410 **Fax 973-228-2914**

February 3, 2015

.ieutenant Edward Esposito
:ssex County Sheriff's Office
'ield Operations Division
)ffice of Emergency Management
;60 Northfield Avenue
Vest Orange, NJ 07052

Re: Hazard Mitigation
Plan Update

)ear Lieutenant Esposito:

As requested, enclosed is Borough of North Caldwell Resolution R-31-15, dated anuary 28, 2015 and titled *A Resolution of the Mayor and Council of the Borough of Vorth Caldwell Authorizing the Adoption of the 2015 Essex County All Hazard Mitigation Plan.*

Please let me know if you have any questions or require additional action by the 3orough.

Very truly yours,

Frank A. Zichelli, Jr.
Borough Engineer

'AZ:ei
:ncl.
:c: J. D'Ascensio

RESOLUTION
BOROUGH OF NORTH CALDWELL, ESSEX COUNTY, NEW JERSEY
R-31-15

A RESOLUTION OF THE MAYOR AND COUNCIL OF THE BOROUGH OF NORTH CALDWELL AUTHORIZING THE ADOPTION OF THE 2015 ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE

WHEREAS, all of Essex County has exposure to natural hazards that increase the risk to life, property, environment and the County's economy; and

WHEREAS; pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre and post disaster hazard mitigation programs; and

WHEREAS; a coalition of Essex County jurisdictions with like planning objectives has been formed to pool resources and create consistent mitigation strategies within Essex County; and

WHEREAS, the coalition has completed a planning process that engages the public, assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating and revising this strategy;

NOW, THEREFORE, BE IT RESOLVED that the Mayor and Council of theBorough of North Caldwell:

1) Adopts in its entirety, the 2015 Essex County All Hazard Mitigation Plan Update (the "Plan") as the jurisdiction's Natural Hazard Mitigation Plan, and resolves to execute the actions identified in the Plan that pertain to this jurisdiction.
2) Will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified.
3) Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.
4) Will continue its support of the Mitigation Planning Committee as described within the Plan.
5) Will help to promote and support the mitigation successes of all participants in this Plan.
6) Will incorporate mitigation planning as an integral component of government and partner operations.
7) Will provide an update of the Plan in conjunction with the County no less than every five years.

Motioned by Councilman Kessler, Seconded by Councilman Chiaia

COUNCIL MEMBER	YES	NO	ABSTAIN	ABSENT	COUNCIL MEMBER	YES	NO	ABSTAIN	ABSENT
ASTORINO	X				RAYMOND	X			
CHIAIA	X				REES	X			
KESSLER	X				SANTOMAURO	X			

IT IS HEREBY CERTIFIED THAT THE FOREGOING IS A TRUE AND CORRECT COPY OF A RESOLUTION ADOPTED BY THE BOROUGH COUNCIL OF THE BOROUGH OF NORTH CALDWELL AT A MEETING OF SAID COUNCIL HELD ON JANUARY 28, 2015.

Nancy A. Pravata

Nancy A. Pravata, Borough Clerk

Joseph H. Alessi, Mayor

This appendix includes meeting agendas, sign-in sheets and minutes (where applicable and as available) for meetings convened during the development of the 2015 Essex County Hazard Mitigation Plan Update.

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT

SIGN - IN

MEETING DATE: 9/9/13

SUBJ: Municipal Coordinator Meeting

NAME	AGENCY
[illegible]	[illegible]
Alex Torpey	South Orange
Micky Wagner	WO OEM
Kevin J Ryan	ECSO
John Tully	ECSO
Maura Lynch	ECSO
Edward Esposito	ECSO
Sheriff Fontana	ECSO
Maria Adamo	ECSO

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT

SIGN - IN

MEETING DATE: 9/9/13

SUBJ: Municipal Coordinator Meeting

NAME	AGENCY
[illegible]	Livingston Twp
[illegible]	Livingston [illegible]
[illegible]	[illegible]
Michael Dingelstedt	[illegible] OEM
Adam Loehner	South Orange
[illegible]	Caldwell
John Medina	W. Caldwell
Bill Wallace	W. Caldwell
GEORGE PEDALINO	BELLEVILLE
Tom Diveny	Montclair
Antoine Lambert	East Orange OEM
Donald Allen	Essex Fells OEM

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT

SIGN - IN

MEETING DATE: 9/9/13

SUBJ: Municipal Coordinator Meeting

NAME	AGENCY
Thomas Nicolitti	Nutley
Paul Cutone	Nutley
Tom Pelaia	Bloomfield
Fred Denzel	Bloomfield
Michael Rohal	Glen Ridge
Sal MACALUSO	EC DPW
Tpl. M. [illegible] #6532	NJOEM
K. MISCIA	MONTCLAIR
THOMAS GIORDANO	SETON HALL UNIVERSITY
TIM GORDON	MILLBURN TOWNSHIP
Michael Roberts	Millburn Twp.
JEFF HAYES	VERONA

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT

SIGN - IN

MEETING DATE: 9/9/13

SUBJ: Municipal Coordinator's Meeting

NAME	AGENCY
Thomas Nicolitti	Nutley
Paul Cutone	Nutley
Tom Pelaia	Bloomfield
Fred Renzel	Bloomfield
Michael Rohal	Glen Ridge
Sal Macaluso	EC DPW
Tpl. M. [illegible] #6532	NJOEM
K. Miscia	Montclair
Thomas Giordano	Seton Hall University
Tim Gordon	Millburn Township
Michael Roberts	Millburn Twp.
Jeff Hayes	Verona

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT

SIGN - IN

MEETING DATE: 9/9/13

SUBJ: Municipal Coordinator's Meeting

NAME	AGENCY
[illegible]	[illegible]
Alex Torpey	South Orange
Micky Wagner	WO OEM
Kevin J Ryan	ECSO
John Tully	ECSO
Maura Lynch	ECSO
Edward Esposito	ECSO
Sheriff Fontana	ECSO
Maria Adamo	ECSO

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT

SIGN - IN

MEETING DATE: 9/9/13

SUBJ: Municipal Coordinator - Meeting

NAME	AGENCY
[illegible]	[illegible] Twp
[illegible]	[illegible]
[illegible]	[illegible]
Michael Dingelstadt	Montclair OEM
Adam Loehner	South Orange
[illegible]	Caldwell
John Medina	W. Caldwell
[illegible]	W. Caldwell
GEORGE PEDALINO	BELLEVILLE
Tom Diveny	Montclair
Antoine Lambert	East Orange
Donald Allen	Essex Fells OEM

Essex County Hazard Mitigation Plan Update
Meeting Minutes

Purpose of Meeting:	Planning Committee/Partners Meeting
Location of Meeting:	Essex County College Police Academy
Date of Meeting:	September 9, 2013 and September 25, 2013

Attendees:

See attached sign-in sheets

Agenda Summary: Two municipal partner kick off meetings were held to allow all municipalities and their representatives options for attending. Each municipality was represented allowing the planning partners to begin the update of the Essex County Hazard Mitigation Plan. The agenda included a slide show presentation addressing mitigation planning, reasons for updating the plan to include FEMA regulations, organization of the planning groups, roles of the municipalities and "homework" or action items.

Item No.	Description	Action By:
1	**Letters of intent to participate –** All municipalities who wish to participate were requested to complete a LOIP and submit to County OEM and Tetra Tech by September 23, 2013.	All municipalities wishing to participate
2	**Municipal Contact and Information Sheet**– All municipalities who wish to participate were requested to complete this document by October 7, 2013.	All municipalities wishing to participate
3	**Municipal Events and Losses Sheet** – All municipalities who wish to participate were requested to complete this document by October 7, 2013.	All municipalities wishing to participate
4	**Current Municipal Plans** – All municipalities were requested to provide copies or links of their plans to Tetra Tech by October 7, 2013.	All municipalities wishing to participate. Tetra Tech to send out reminder e-mail
5	**Stakeholder Outreach –** Current stakeholder outreach was discussed to include academia and County Offices of Emergency Management.	All municipalities
6	**Municipal Participation –** It was stressed that all municipalities should be participating and to submit all forms by requested due dates.	All municipalities

9Am

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Municipal Kick-Off Meeting
MEETING DATE: 09/25/2013

	Title	Agency/Municipality	Phone Number	E-mail
William Smith	OEM Coordinator	Fairfield	973-882-2740	wsmith@fairfieldnj.org
Jeffrey McElroy	OEM	CEDAR GROVE	973-235-4100	jmcelroy@cedargrovepd.org
John Wade	Asp. OEM Coord	Orange	973-266-4229	wadej@ci.orange.nj.us
LANCE D. WEBB	SUPERVISOR ORANGE DPW	ORANGE	973-789-1373	LWEBB@CI.ORANGE.NJ.US
ED ESPOSITO	EC OEM	EC OEM	973-324-9750	[illegible]
Mehdi Mohammadish	Engineering Director	City of Newark	973-733-8520	mohammadism@ci.newark.nj.us
FRANK ZICHELI	ENGINEER	NO. CALDWELL/ ESSEX FELLS	973-228-6410 x107	ncdpw@northcaldwell.org
Roger Kerr	DPW Super	Essex Fells	973 226-3040	DPW@EssexFellsboro.com
VINCENT KULIK	CHIEF OF POLICE	ESSEX FELLS	973-226-0476	vKulik@EssexFellsPD.org
PAUL CARELLI	BOROUGH ADMINISTRATOR	CALDWELL	973-403-4634	pcarelli@caldwell-nj.com
BOB GALANTE	PROJECT MANAGER	UNITED WATER/ORANGE	973-678-7585	ROBERT.GALANTE@UNITEDWATER.COM
KEVIN BILIN	CREW CHIEF	UNITED WATER/ORANGE	973-678-7585	KEVIN.BILIN@UNITEDWATER.COM

9 Am

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Municipal Kick-Off Meeting
MEETING DATE: 09/25/2013

	Title	Agency/Municipality	Phone Number	E-mail
EDWARD P. ABBOT	MAYOR/OEM	Borough of Essex Fells	917 224 5312	Mayor@essexfellsboro.com
Ann DASSING	MAYOR	Borough of Caldwell	973-568-1798	anndassing@gmail.com
John D'Ascenzio	Fire Chief/OEM	Borough of N.C.	973-477-0057	JDERIF@AOL.com
Maura Lynch	EC OEM	EC Sheriff	973-324-9750	MLynch@essexsheriff.com
Keith Isaac	Director OEM	City of Newark	973-877-9262	Isaackc@ci.newark.nj.us
Peter Pinckney	NWK OEM	City of Newark	973-8779261	PinckneyP@ci.newark.nj.us
Robert Thomas	Newark OEM	City of Newark	973-733-3439	Thomasr2@ci.newark.nj.us

9Am

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Municipal Kick-Off Meeting
MEETING DATE: 09/25/2013

	Title	Agency/Municipality	Phone Number	E-mail
Anthony Greene	Director	Twp of So Orange	973 493 5552	AGreeneAT Southorange.org

10 Am

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Municipal Kick-Off Meeting
MEETING DATE: 09/25/2013

	Title	Agency/Municipality	Phone Number	E-mail
Anthony Gomez	OEM	Caldwell	973 493 5552	Amg22nt aol.com
Randy Wheest	Deputy Chief	Irvington	862 849 3536	IrvingtonFD@verizon.net
Gary Shumlick	Chief	Irvington	862-849-7130	IFDHQ1@yahoo.com
Glen Beczmeyer	Engineer	Caldwell	201-954-2078	GBeckmeyer@Caldwell
Andrea Adebowale	Director	City of Newark/W+S	973-733-5361	adebowalea@ci.newark.nj.us
Kim Craft	Engineer	Montclair	973-509-5707	Kcraft@montclairnjusa.org
Luis Rodriguez	Supervising Engineer	Essex County	973 226-8500 x2650	LRodriguez@essexcountynj.org
Jacqueline Bourdony	Engineering Aid	Essex County	973 226-8500 x2530	jbourdony@essexcountynj.org

ESSEX COUNTY HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Steering Committee Meeting
MEETING DATE: 11/25/2013

Name	Title	Agency/Department	Phone Number	E-mail
Jacqueline Bourdony	Engineering Aid	Essex County DPW	973-226-8500	jbourdony@essexcountynj.org
Sal Macaluso	Dir. of R&B	E.C. DPW	973-239-3364	Smacaluso@essexcountynj.org
James Tsoisi	Lt.	Essex County DOC	973-274-7524	jtsoisi@eccocorrections.org
Michael Venezia	Administrator Aid	Essex Administrator	973-621-6306	Mvenezia@adm.essexcountynj.org
DJ Salvante	Dir. of Ops, Stm Mtn Rec	Parks	973 341 6242	DJSalvante@Parks.essexcountynj.org
FRANK ZICHELLI	ENGINEER	NO. CALDWELL ESSEX FALLS	973-228-6410 x107	ncldpw@northcaldwell.org
Darren Marshall	Sheriff's IT	Essex Sheriff's	201-207-2542	dmarshall@essexsheriff.com
Paul Wannemacher	W.O. OEM	W.O. FD	973-325-4175	Paulw@woFIRE.ORG
PETE SMERALDO	WO OEM	WOFD	973 325 4185	firechief@westorange.org
Maura Lynch	Essex OEM	Essex Cty OEM	973-324-9750	MLynch@essexsheriff.com
Ed Esposito	Essex OEM	Essex OEM	973-324-9750	EEsposito@essexsemac.com
Kevin J. Ryan	Undersheriff	Essex/Sheriff	973-324-9750	KRyan@EssexSheriff.com
William Smith	OEM Coordinator	Fairfield	973-445-1550	wsmith@fairfieldnj.org
GAREY CHIN	DIRECTOR	ESSEX SHERIFF	973-621-7792	GCHIN@ESSEXSHERIFF.COM

ESSEX COUNTY HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Steering Committee Meeting
MEETING DATE: 11/25/2013

Name	Title	Agency/Department	Phone Number	E-mail
Jean C. Walker	Chief Enforcement Officer	Essex Regional Health Commission	9732512059	jwalker@essexregional.org
John Tully	Sergeant	ECSO / OEM	973-324-9758	jtully@essexsheriff.com

Essex County Hazard Mitigation Plan Update
Meeting Minutes

Purpose of Meeting:	Steering Committee
Location of Meeting:	Essex County Office of Emergency Management
Date of Meeting:	November 25, 2013

Attendees:

See attached sign-in sheets

Agenda Summary: This meeting was held to provide the Steering Committee information about the below topics and to make collaborative decisions.

Item No.	Description	Action By:
1	**Introduction** All members introducted themselves.	All SC members
2	**Slide Show: Updating the Mitigation Plan – Why?** This slideshow was presented to educate the Steering Committee members about the planning project.	Tetra Tech
3	**Role of the Steering Committee and Steering Committee Guidelines** Discussion and review was had about what is expected of Steering Committee members	Tetra Tech and all SC members
4	**Project Status** The current status of the project was reviewed. It was stressed that this project is on an accellerated timeframs.	Tetra Tech and all SC members
5	**Mission Statement, Goals and Objectives** The mission statement, goals and objectives were drafted by the Steering Committee.	All SC members
6	**Public Website and Citizen Survey** The public website and citizen survey was discussed by the Steering Committee.	All SC members
7	**Schedule Action Items** The proposed schedule and committee action items were discussed to include critical facilities, NFIP data request, update of past mitigation actions	All SC members
8	**Public and Stakeholder Outreach** A press release, public website information and draft brochure were discussed and finalized at the meeting	All SC members

Essex County Hazard Mitigation Plan Update
Meeting Minutes

Purpose of Meeting:	Steering Committee Meeting
Location of Meeting:	Essex County Office of Emergency Management
Date of Meeting:	December 16, 2013

Attendees:
Armando Fontoura, Sheriff/County OEM Coordinator
Kevin Ryan, Undersheriff/Deputy OEM Coordinator
Garey Chin, Director of Homeland Security
Dave Antonio, County DPW
Edward Esposito, County Communications
Maura Lynch, Training Coordinator
Darren Marshall, IT/GIS Coordinator
Frank Del Gaudio, County Risk Manager
Sanjeev Varghese, PE County Floodplain Administrator
Anthony Puglisi, Public Information Officer
Jean Walker, Essex Regional Health
Daniel Salvante, Director of Parks Department
Paul Miller, Tetra Tech

Agenda Summary: This conference call was held to approve and discuss the below topics.

Item No.	Description	Action By:
1	**Steering Committee Guidelines** Discussed and Approved	SC members
2	**Hazards of Concern** Discussed and Approved	SC members
3	**Mission Statement, Goals and Objectives** Discussed, Update/Changed and Approved	SC members
4	**Mitigation Website** Review and approve	SC members
5	**Discuss Public Meetings** Meeting venues were discussed and Millburn was decided to host a public meeting.	SC members
6	**Mitigation Brochure** Approved	SC members

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT

EMERGENCY PLANNING COUNCIL MEETING

DATE: January 10, 2014

NAME	AGENCY	E-MAIL	TELEPHONE #
Ed Esposito	EC OEM	EESPOSITO@ESSEXSHERIFF.com	973-909-2595
John Tully	EC OEM/BOMB SQUAD	jtully@essexsheriff.com	201-953-6315
Maura Lynch	EC OEM	MLynch@essexsheriff.com	973-334-9750
Steve Tibori	NJSP	LPP5799@GW.NJSP.ORG	(201) 919-5575
Jean Cswalk	Essex Regional Health Comm	jwalker@essexregional.org	973 251 2059
Anthony Ventimiglia	Colonial Pipeline	aventimiglia@colpipe.com	732 540 6152
PETER Mongeau	COLONIAL PIPELINE	pmongeau@colpipe.com	732 770 1807
Fred Morillo	Colonial Pipeline	fmorillo@colpipe.com	732-734-2055
PAUL MILLER	TETRA TECH	PAUL.MILLER@TETRATECH.com	973-630-8744
Alison Miskuman	TetraTech	alison.miskuman@tetratech.com	973-630-8045
CHRIS O'SHEA	PVSC	COSHEA@PVSC.NJ.GOV	973-867-5861
Eric Boston	PSE+G	eric.boston@pseg.com	973-868-0261
MICHAEL CLAYTON	SALVATION ARMY	MICHAEL.CLAYTON@USE.SALVATIONARMY.ORG	1-908-403 5416
Paulyn Holander	Superior Court	paulyn.holandez@judiciary.state.nj.us	973-693-5761
Jessica Reid, CVT	Turtle Back Zoo	tbzjess@gmail.com	9173731800x247
Sheila Devereaux	NJ Judiciary	Sheila.Devereaux@judiciary.state.nj.us	973-693-5707
MARIO Santos	Kessler Institute	msantos@Kessler-rehab.com	973-252-6391

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT

EMERGENCY PLANNING COUNCIL MEETING

DATE: January 10, 2014

NAME	AGENCY	E-MAIL	TELEPHONE #
DAVID HAMILTON	NUTLEY FIRE/HAZMAT	DHAMILTON@NUTLEYNJ.ORG	908-966-0065
Michael Ricker	Port Authority OEM	MRicker@PANYNJ.GOV	2014696745
Tim Phelan	UH-EMS	Phelandi@UHNJ.org	973-972-3480
John Grembowiec	UH-EMS	grembojj@UHNJ.ORG	973-972-6442
JOE BURLEW	UH-EMS	burlewjo@uhnj.org	973972 5908
JASMINE PIERCE	VERIZON NJ INC.	JASMINE.L.PIERCE@Verizon.com	201 788-9472
Addie Colon	JCP&L / First Energy	acolon@firstenergycorp.com	201-274-3841
BERT MOITA	Essex County OEM	NMOITA@ESSEXSHERIFF.com	973-985 3709
John D'ASCENSIO	Essex County OEM	JDERIF@GMAIL.com	973.477-0051
Stacey Spooner	Ames Red Cross	Stacey.Spooner@redcross.org	973.797.5300
JAMES DUNHAM	NJSP-NORCOM	LPP5825@GW.NJSP.ORG	973-227-3072
Sheriff A. Fontoura	ECSO / ECOEM	ESSEXOEM@EssexSheriff	973-324-9750
Maria Adams	Essex City OEM	essexoem@aol.com	973-324-9750

Joseph N. DiVincenzo, Jr.
Essex County Executive
MICHAEL FESTA, Ph.D.
Health Officer
Executive Director - Hazardous Response
Essex County Health Department
115 Clifton Avenue, Newark, New Jersey 07104
ecdohceha@admin.essexcountynj.org
973-497-9401 office 973-497-9407 telefax
973-216-2545 mobile phone

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: PUBLIC MEETING
MEETING DATE: FEBRUARY 18, 2014

Name	Title	Agency/Municipality	Phone Number	E-mail
Michael Roberts	Fire Chief	Millburn Fire		
John Tully	SERGEANT	Essex Co. Sheriff	973-324-2750	jtully@essexsheriff.com
Tim Gordon	Bu Ad	Millburn	973-564-7075	TGORDON@millburntwp.o
Robert Tillotson	mayor	millburn		RTillotson@millburnTwp.org
Ian Mount	Committeeman	Millburn	973-449-4110	imount@millburnTwp.org
Sandra Haimoff	Committeewoman	Millburn	973 379 3976	~~SHHA~~ SHaimoff@millburnTwp.org
Christine Gatti	Township Clerk	Millburn	973-564-7073	cgatti@millburntwp.org
TED BOURKE	COMMITTEEMAN	MILLBURN	973 632 5305	WTBOURKE@AOL.COM
Christopher H. Falcon	Township Attorney	Millburn	973-912-9008	cfalcon@mfhenvlaw.com
George Serio	Essex County Director	Essex County	973-655-0200	gserio@essexhd.com
EDWARD MAZER	—	—	973-376-4287	~~EHMAZER@YAHOO.COM~~
Andrew Lamb	—	Millburn	973 508 8601	acl99@comcast.net
Nicholas Zimmermann	—	Millburn	973-~~[illegible]~~38-3158	

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Steering Committee #3 Meeting
MEETING DATE: 2-24-14

Name	Title	Agency/Municipality	Phone Number	E-mail
Lt. James Troisi	Bureau Commander	Essex County DOC	973 274 7524	jtroisi@eccocrections.org
Jean C Walker	Chief Enforcement	Essex Regional Health	973 251-2059	jwalker@essexregional.org
Sal Macaluso	Dir of Rds-Fleet	E.C. D.P.W.	973-332-7262	smacaluso@essexcountynj.org
Michael Venezia	Conf. Asst to Administrator	Admin. Office	973-621-6306	mvenezia@admin.essexcountynj.org
JACK McGARRY	R.M.P	EEPO	973-621-4232	JOHN.McGARRY@NJEEPO.ORG
FRANK ZICHELLI	ENGINEER	NO. CALDWELL	973-228-6410 X107	ncdpw@northcaldwell.org
DJ Salvante	Parks	Essex County	973 3916292	DJSalvante@parks.essexcountynj.org
Jacqueline Bourdony	ECDPW-Engineering	EC DPW	973 226 8500	jbourdony@essexcountynj.org
Luis Rodriguez	Assistant County Engineer	EC-DPW	973-226-8500 x2650	LRodriguez@essexcountynj.org
Ed Esposito	Sergeant	EC OEM	973-324-9750	EESPOSITO@[illegible]
PETER F SMERALDO, JR	FIRE CHIEF/OEM COORD	TWP OF WEST ORANGE	(973)325-4185	firechief@westorange.org
Paul Wannemacher	Deputy Chief	Twp of West Orange	(973) 325-4175	fireadminoff@westorange.org
Michael Capodanno	S/O	ECSO	(201)207-4316	MCapodanno@essexsheriff.com

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Steering Committee #3 Meeting
MEETING DATE: 2-24-14

Name	Title	Agency/Municipality	Phone Number	E-mail
Maura Lynch	Detective	ECSO	973-324-9750	MLynch@essexsheriff.com
Kevin J. Ryan	Undersheriff	Essex County Sheriff	973-324-9750	KRyan@essexsheriff.com
Armando Fontoura	Sheriff	Essex County Sheriff	973-621-4105	AFontoura@essexsheriff.com

Essex County Hazard Mitigation Plan Update
Meeting Minutes

Purpose of Meeting:	Steering Committee Meeting
Location of Meeting:	Essex County Office of Emergency Management
Date of Meeting:	February 24, 2014

Attendees:
See attached sign in sheet

Agenda Summary: This meeting was held to update the Steering Committee members with the project status and future needs. The below topics were discussed.

Item No.	Description	Action By:
1	**Planning Partner Working meetings** Approved for March 12, 13, 14	SC members
2	**New Development within County** County Engineer to provide this information	SC members
3	**Stakeholders** Municipal Unility Authorities and Academia will be included	SC members
4	**Vulnerability Assessments** Will be completed after critical facilities are identified	SC members
5	**Public Outreach** Website up, Brochure has been distributed throughout county. Public survey response is minimal.	SC members
6	**Public Review of Draft and Meeting** FEMA requirements were discussed	

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Municipal Workshop
MEETING DATE: 3-12-14
AM

Name	Title	Agency/Municipality	Phone Number	E-mail
Craig M. Handschuch	Chief of Police OEM Coordinator	Livingston PD	973-992-3000	chandschuch@livingstonnj.org
Michael Anello	Sup DPW	Livingston DPW	973 992-5000	manello@livingstonnj.org
Richard Calbi	Livingston Eng	Livingston	973-487-6450	rcalbi@livingstonnj.or
Christopher Mullin	Fire Chief	Livingston F.D.	973-992-2373	Cmullin@livingstonnj.org
Frank Zichelli	Engineer	North Caldwell Engineer, DPW	973-228-6410 x107	ncdpw@northcaldwell.org
Michael Robal	Adm./Engr.	Glen Ridge	973-748-0303	mjrobal@glenridgenj.org
Michael Zichelli	Deputy Admin	Glen Ridge	973-743-3444	mpzichelli@glenridgenj.org
Gary Schall	Supt-DPW	Roseland Boro	973 226-6565	gSchall@roselandnj.org

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Municipal Workshop
MEETING DATE: 3-12-14
PM.

Name	Title	Agency/Municipality	Phone Number	E-mail
Joseph MANNING	OEM COOR.	TOWNSHIP OF MAPLEWOOD	973-762-5264	TWPADMIN@TWP.MAPLEWOOD.NJ.US
BOB McLoughlin	CONST. OFFICIAL	Township of West Caldwell	973-226-2302	BMcLoughlin@WESTCALDWELL.COM
Larry Peter	OEM	Twsp of West Caldwell	973-747-4946	LPeter@westcaldwell.com
Tony Greney	OEM	Caldwell	973-975-5068	AMGZZ@AOL.COM
GERARD GRENCI	OEM	CALDWELL	973-632-6415	GAGRENCI@VERIZON.NET
MARIO BIFALCO	DIRECTOR DPW	CALDWELL	973-725-0646	
Lawrence Gonnella	Engr -	Twp. of Fairfield	973-882-2724	
PHILIP CHEFF	CONST OFFICIAL FLOOD PLAIN MGR	TWP OF FAIRFIELD	973 882-2731	
William Smith	OEM Coordinator	Fairfield	973-882-2740	wsmith@fairfieldnjoem
Robert Payne	Director DPW	Fairfield	973-882-2700	RPayne@FairfieldNJ.org
JOHN MEDINA	DEPUTY EM.C.	W. CALDWELL	973 226-2302	jmedina@westcaldwell.com
Donald Allen	Dep. OEM coord	Essex Fells	973-226-3000	DAllen@EssexFellsPD.org

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Municipal Workshop
MEETING DATE: 3-13-14 AM

Name	Title	Agency/Municipality	Phone Number	E-mail
Jeffrey McElroy	OEM	TWSP OF CEDAR GROVE	973-239-4100 X262	JMCELROY@CEDARGROVEPD.ORG
ALEX PRUMBO	Twp. ENGINEER	Twp. of Cedar Grove	973-239-1410, Ext: 280	engineer@cedargrovenj.org
ROBERT MITTERMAIER	CONST OFFICIAL	TWP OF MAPLEWOOD	973-762-8120 3600	MITT@TWP.MAPLEWOOD.NJ.US
John Wade	OEM	Orange	973-266-4229	wadej@ci.orange.nj.us
Robert Cimino	Police Chief	Twp of Maplewood	973-762-3400	Policechief@Twp.maplewood.nj.us
Michael Dingelstadt	Fire Chief	Twp of Maplewood	973-762-6500 ext. 11	Firechief@twp.maplewood.nj.us
THOMAS MALAVASI	ENGINEER	"	973-762-8120	ENGINEER@TWP.MAPLEWOOD.NJ.US
JOHN SINGLETON	CODE ENF. SUPV.	TWP OF MAPLEWOOD	973-762-8120 x5603	J.Singleton@TWP OF MAPLEWOOD NJ.US

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Municipal Workshop
MEETING DATE: 3-13-14
P.M.

Name	Title	Agency/Municipality	Phone Number	E-mail
Antonio Gary	Captain	Irvington FD	973-399-6554	IrvingtonFD@verizon.net
Salvatore Ferrarro	Eng. Coord.	Nutley - DPW	973-284-4958	sferrarro@nutleynj.org
Samrah Jones	Dispatcher	E.O.FD	973-266-5510	Samrah.Jones@Eastorange-nj.gov
Jeff Hayes	OEM	Verona	973 857 4756	jhayes@veronanj.org
John Wiggins	Township Eng	Irvington	973-399-6696	wiggins@NJIT.edu

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Municipal Workshop
MEETING DATE: 3/14/14 AM

Name	Title	Agency/Municipality	Phone Number	E-mail
MARTHA ANNONI	ASST. TOWN ENG.	MILLBURN	973-564-7052	engineer@millburntwp.org
Thomas Tracey	C.O.	W.O.	973-325-4111	ttracey@westorange.org
Robert Echavarria	OEM-Batt. Chief	Millburn	973-564-7035	rechavarria@millburntwp.org
LEONARD LEPORE	MUNICIPAL ENG'R	WEST ORANGE	973 325 4160	LLepore@westorange.org
Paul Wannemacher	D/C	West Orange	973-325-4175	PaulW@WOFire.org
Fred Menzel	OEM	BLFD.	973-418-2108	bvestmen@aol.com
Tom Pelaia	OEM Dep Coord	BLFD	973-332-7855	TBone1019@Comcast.net
Adam Lochner	Deputy OEM Coord.	S.O.	973-378-7715	alochner@southorange.org
SAL RENDA	Village Engineer	S.O.	973-378-7715	srenda@southorange.org

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Municipal Workshop
MEETING DATE: 3/14/14 PM

Name	Title	Agency/Municipality	Phone Number	E-mail
THARIEN K. ARNOLD	Deputy Coordinator	NWK OEM	973 877.9260	ARNOLDT@ci.NEWARK.NJ.US
Mehdi Mohammadzeh	Director Eng.	Newark	973-733-8520	mohammadzehm@ci.newark.nj.us
Robert Thomas	Energy PM / Dept. Coordinator	Newark BA / OEM	(973) 733-3439	thomasr2@ci.newark.nj.us
Keith Isaac	Director OEM	Newark	973-877-9262	Isaackc@CI.Newark.NJ.US

ESSEX COUNTY HAZARD MITIGATION PLAN UPDATE

PUBLIC MEETING

MARCH 20, 2014

NAME	SIGNATURE	MUNICIPALITY
Carlos Bartheleemy (1)	Carlos Bartheleemy	IRVINGTON
Jordan DeSCafano (6)		~~Hoboken~~ Verona
Timothy Kealy (11)	Timothy Kealy	Bloomfield
Paul LaMagna (13)		Fair Field
Michael Medina (16)		Cedar Grove
Christopher Schepes (24)		Verona
Keenan Rogers (28)		Orange

ESSEX COUNTY HAZARD MITIGATION PLAN UPDATE

PUBLIC MEETING

MARCH 20, 2014

NAME	SIGNATURE	MUNICIPALITY
STU Slotman	[illegible]	LIVINGSTON
MARK PARRA	[illegible]	VERONA
David Actieri	[illegible]	Cedar Grove
JOSEPH LADOUCEUR	[illegible]	EAST ORANGE
JOHN S. MICHURA	[illegible]	MONTCLAIR
Michael Safro	[illegible]	WEST ORANGE
Dnis Oliveira	D Oliveira	NEWARK
Derrick Piercy	Deri Piercy	NEWARK
Alphonzo Ford	[illegible]	Newark
OSCAR CARRERA	[illegible]	WEST ORANGE
Pablo E. Solano	[illegible]	Newark

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Municipal Workshop
MEETING DATE: 3-20-14

Name	Title	Agency/Municipality	Phone Number	E-mail
GEORGE PEDALINO	OEM COOR	BELLEVILLE	973 450 3374	GPEDALINO @BELLEVILLEFIREDEPT.ORG
DAVID ANTONIO	PLANNER-COUNCIL	COUNTY OF ESSEX	973 926-8500	DANTONIO@essexcountynj.org

ESSEX COUNTY ALL HAZARD MITIGATION PLAN UPDATE
SIGN-IN SHEET
TOPIC: Final Municipal Workshop
MEETING DATE: May 14, 2104

Name	Title	Agency/Municipality	Phone Number	E-mail
LT Don Allen	LT	Essex Fells	973-226-3000	DAllen@EssexFallsAmg
Sgt. John R. Schmunk	Sgt.	Essexfells PD	973-226-3000	jschmunk@essexfellspd.org
Robert Thomas	Dept. Coordinator	Newark OEM	(973) 733-3439	thomasr2@ci.newark.nj.us
Keith Isaac	Director	OEM/HLS	973-877-9262	NWKOEM@ci.newark.NJ.US
Peter Pinkney	Analyst	Newark/OEM	973-877-9259	NWKOEM@ci.newark.NJ.US
Anthony Grewer	OEM Coordinator	Caldwell	973-493-5552	AMG22@aol.com
Fred Menzel	OEM Coordinator	Bloomfield	973-418-2108	bvestmen@aol.com
Adam Loemner	Dep. OEM coordinator	South Orange	973-378-7715	
Pat. Jeffrey McElroy	OEM Coordinator	Cedar Grove	973-239-4100 x262	JMCELROY@CEDARGROVEPD.ORG
~~Jeff Hayes~~	" "	Verona	973 857 4756	jhayes@veronanj.org

Essex County Hazard Mitigation Plan Update
Meeting Minutes

Purpose of Meeting:	Jurisdictional Annex Workshop
Location of Meeting:	Essex County Office of Emergency Management
Date of Meeting:	June 19, 2014

Attendees:

See attached sign-in sheets

Agenda Summary: This meeting was held with all municipal participants, county and NJOEM representatives

Item No.	Description	Action By:
1	**Project Status:** Status of project was discussed with attendees	Tetra Tech
2	**Jurisdiction Annex:** The annex format was reviewed detailing each portion and identifying what further information is needed. Two additional worksheets were provided which must be returned by June 30, 2014 along with the updated annex. A CD was provided to each municipality with resources to allow them to update their annex and to review/revise the Municipal Sign Off sheet.	County and Municipalities
3	**Stakeholder Surveys:** These surveys were mentioned and links were provided to each municipality. All municipalities were asked to promote stakeholder surveys within their municipality.	Municipalities
4	**Plan Maintenance:** Plan maintenance was discussed and a draft plan maintenance portion was presented to planning partners.	Tetra Tech
5	**Schedule:** All annex information was requested to be returned to Tetra Tech by June 30, 2014. This will allow a draft plan to be posted for public review first week in August.	Planning Partners and Tetra Tech
6	**In Kind Services Tracking:** All planning partners were reminded to maintain a record of time they spend on this project. The public website and citizen survey was discussed by the Steering Committee.	Planning Partners

Meeting Notes

Public Meeting 7-15-14

1. Thinking about POWER/ENERGY, COMMUNICATIONS, TRANSPORT, ROAD TRAVEL, TOWN PLANS (flooding, etc.) what worked well during Irene, Sandy and other major events that we want to KEEP? Respond like this: POWER: KEEP the.....because

- TRANSPORTATION: KEEP the bicycle and pedestrian conductivity which was extremely valuable during post sandy lack of fuel and improve these facilities in the future in case auto and public transit systems are disrupted.
- COMMUNICATIONS: Irene was flood, less wind; Sandy wind, less flood, but communication was effective among government entities. COORD: Government entities worked well and shared facilities.
- COMMUNICATIONS: Keep the old form of communication. Transition into new technology proved ineffective as the community is made up of Brazilian, Portuguese, Spanish and older families which rely on word of mouth rather than from new technology
- Communication and Coordination between Local and County OEM, current mutual aid agreements served us well.
- Assistance from State, National Guard and other federal agencies.
- COMMUNICATIONS: Air broadcast (radio and TV) provided most reliable emergency information. Back-up power was OK. Number of roof leaks, storm systems held ok. Radio communication was good. No major damage to the structures.

Themes: coordination and communication, inter-governmental relations,

2. Thinking about POWER/ENERGY, COMMUNICATIONS, TRANSPORT, ROAD TRAVEL, TOWN PLANS (flooding, etc.) what worked well during Irene, Sandy and other major events that we want to ABANDON? Respond like this: POWER: ABANDON the.....because

- Town Plans: Move away from grey infrastructure and more towards green/open space to mitigate flooding
- Abandon new building in known flood areas.
- Abandon use of above ground electrical power where practical.
- POWER/ENERGY: Aerial/Overhead communications and power lines were knocked out of service. Encourage U/G installation of data and electrical lines.
- Lack of fuel. Phone land lines were down, no way to get basic construction supplies.

- Notification systems broke down. R911. Street flooding caused the area to be locked down. Needed additional generator. Lack of fuel for emergency vehicles.
- VULNERABILITY: Too many facilities and infrastructure in vulnerable areas. Power facilities vulnerable, which led to power outages and fuel shortages - NO REDUNDANCY
- Lack of clearly marked countywide evacuation routes
- TOWN PLANS: Abandon future development in flood plain areas. Discontinue investment in flood plain areas. TRANSPORTATION: Resiliency planning for public transportation infrastructure such as the PATH from Essex County to NYC. Also, NJTRANSIT train stations and tracks

Themes: Lack of fuel, landlines/phone, cellular, moving supplies around was difficult, road closures, development on flood plain areas

3. Thinking about POWER/ENERGY, COMMUNICATIONS, TRANSPORT, ROAD TRAVEL, TOWN PLANS (flooding, etc.) what could work better than it did during Irene, Sandy and other major events that we want to INVENT/REINVENT? Respond like this: POWER: REINVENT the.....to achieve...

- Traffic signals should be interconnected to a shared emergency power source to maintain public safety and efficiency.
- Wind damage mitigation such as overhead utilities. Prepare better for last resort communications such as preplanned public information distribution points, increase shelter supplies and staffing. Ensure all public buildings have back up power and ensure a few community fuel stations have back up power.
- Design and build underground power and phone lines. Use of electric cars/trucks.
- Create fuel storage.
- Flood proof firehouse and other infrastructure facilities.
- Purchase additional portable generators for traffic control.
- Large coverage WIFI network available to general public for free during emergency
- As roads are being reconstructed, install solar panel based roads that can not only serve a sower sources but also change traffic patterns very quickly
- Quick connect generator available for gas stations along evacuation routes
- POWER; elevate, relocate or build backup generation capacity; WIND: develop mitigation strategies for minimizing property damage and overhead utility damage; ECONOMIC: Design for wave & surge - levee, bulkhead, etc.

Themes: Power grid and underground utilities, transportation solutions

4. Thinking about the planning report presented here tonight, what other factors, if any, do you feel should be considered or further developed? What is the most important thing to do moving forward?

- Timely distribution of funds, so that basic projects can be implemented expeditiously.
- Provide funding for raising properties.
- Flood control for the Passaic river

- Purchase homes in the flood prone areas
- Raise structure above the base flood elevation.
- Targeted assistance towards vulnerable populations, especially those in public housing
- Flood/Wind mitigation planning for the power grid.
- Increased involvement from local government officials in the planning and preparations so that the better understand their local capabilities.

6. Project: Thinking about the topic categories, describe a project that will help mitigate or enable Essex County to recover from events such as Irene/Sandy and sea level rise. Respond like this: Category + (3-5 word Snazzy Name for the project) and 25 word description.

1. **Power Beneath-** u/g power, data line conversion
2. **Complete streets and green roads** - concentrated effort to utilize solar panel based road infrastructure that serves as both a power source, traffic control tool, and pedestrian + bike transportation lanes that facilitate people gaining access to necessary resources
3. **Cycling connections** - safe access to employment, housing, and food by bicycle
4. **Design and construct large size facilities** capable to house large number of people. Facilities should have sored food and clothing.
5. **Community Rating System - CRS** - Assistance should be given to towns to apply for CRS (FEMA) to help their community with the cost of flood insurance.
6. **Regional city/county Wi-fi** - to be made available during emergencies that can serve as initial emergency information dissemination tool while laptops/cell phones are still largely functional
7. **I have Gas-** Natural gas generators/ hybrid as alternative to traditional gasoline
8. Local Community Response System: **Emergency alerts through block captain or word of mouth** applications
9. **Let's Talk!** Streamline the sharing of facilities between towns and with County - Do it like the Fire Departments!

Thinking about the report and /or the long terms effects of climate change/future weather events, how could you contribute to the MITIGATION, PREVENTION or RESPONSE. Respond like this: RESPONSE: (name of your organization) + (what you could do) + (type of event)

Emergency Management, Fire Department - Operate the EOC, response to emergencies. Responsible for Damage Assessments and long term recovery and FEMA reimbursements.

Essex County DPW- Traffic Signal electrical redundancy/ flood ponding pumping/ evacuation route signage/ ITS deployment/ planning standards for new development and arboratorial services.

Ironbound Community Corporation: Currently working on - Mitigation: Promoting green infrastructure, assisting Blue Acres Program, new sustainability plans for East Ferry; Prevention - Disaster Preparedness training across local community; Response - Work with local OEM; Community Response System; Post-disaster recovery studies/research on resiliency planning and climate change that may be of use to county

MASER - Technical Assistance - Work with NJAPA and NJASLA to mobilize volunteer professional services

North Jersey Transportation Planning Authority: MITIGATION, PREVENTION: Resiliency planning funding available based on county and/or Newark interest, assistance with state transportation agencies on transportation infrastructure operations and future construction projects that may be vulnerable to a storm

North Jersey Transportation Planning Authority: MITIGATION; PREVENTION: Currently doing studies/research on resiliency planning and climate change that may be of use to county

TESC is considering effort to provide a seminar for newly elected mayors to acclimate them to current/future issues and local government administration. Could offer climate change and extreme weather education as part of this

TETRA TECH: Provide information and support to county and municipalities in ongoing CRS to reduce flood vulnerability and impacts as well as flood insurance premiums.

West Orange OEM Improve communication ability and training level of local assets to respond to natural events such as storms and weather.

Suggestion: City of Phoenix has own natural gas infrastructure and is a vendor - maybe municipalities with capacity for this could assist other municipalities in fueling their vehicles/generators/etc. during emergency rather than relying on incoming fuel and commercial providers

Other ideas: Food waste recycling. Improving the public transportation system to reduce use of cars.

ESSEX COUNTY SHERIFF'S OFFICE
ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT

SIGN - IN

MEETING DATE: 9/24/14 **SUBJ:** **MUNICIPAL OEM COORDINATOR'S MEETING**

NAME	AGENCY
Sgt. John R. Schmunk	Essex Fells Police
JOHN MATHEIS	ROSELAND OEM
MATTHEW GALLUP	MONTCLAIR STATE UNIVERSITY OEM
Anthony Crewed	Caldwell OEM
FRANK IURATO	NJ TRANSIT PD OEM
Adam Lochner	South Orange OEM
Tim Phelan	UH EMS/EC OEM
Joe Grassi	UH EMS/EMSTF
Fred Menzel	Bloomfield OEM.
Sean Quinn	Glen Ridge OEM
ANTONIO GARY	IRVINGTON FIRE/OEM

ESSEX COUNTY SHERIFF'S OFFICE
ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT

SIGN - IN

MEETING DATE: 9/24/14 **SUBJ:** MUNICIPAL OEM COORDINATOR'S MEETING

NAME	AGENCY
Paul Cafone	Nutley Fire
Jeff Hayes	Verona OEM
George Pedalino	[illegible]
Michael Roberts	Millburn Fire/OEM
Kenneth Miscia	Montclair PD/OEM
Robert Echavarria	Millburn Fire/OEM
John Wade	Orange OEM
Maura Lynn	ECOEM
R David Williams	East Orange
[illegible]	Fairfield OEM
Paul Miller	Tetra Tech.

ESSEX COUNTY SHERIFF'S OFFICE
ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT

SIGN - IN

MEETING DATE: 9/24/14 **SUBJ:** MUNICIPAL OEM COORDINATOR'S MEETING

NAME	AGENCY
Michael Ticker	Port Authority OEM
Chris Mullin	Livingston Twp.
Larry Peter	West Caldwell
Gerrell Elliott	Chief of Staff Newark OEM
Ed Esposito	EC OEM
Kevin Ryan	EC Sheriff / EC OEM
Maria Adam	EC OEM
Director Herrell	Newark OEM

A matrix is presented to give a broad overview of who attended meetings and when input was provided to the HMP update. All participants were encouraged to attend the Kick-off Meeting and Jurisdictional Annex Workshop. During the planning process the consultant contacted each participant to offer support, explain the process, and to facilitate the submittal and review of critical documents.

The participating jurisdictions agreed to abide by the Planning Partner Expectations and Planning Committee Guidelines which included the establishment of a Steering Committee or core working group. The Authorization and Letter of Intent to Participate from each municipality is also included in this appendix.

Participation is defined as having input to the hazard analysis (providing critical facility, hazard event, vulnerability data), and as having participated in the annex workshop or alternate annex meetings as described above for the purpose of creating a mitigation strategy to be included in each jurisdictional annex found in Section 9 of the HMP.

Table C-1. Participation Matrix/Official Planning Meetings

Name	Title / Position	Attended Meeting(s)	Completed Information Gathering Worksheets/Surveys	Provided Data and Information	Reviewed/Updated Inventories (e.g. Critical Facilities)	Identified vulnerabilities	Identified progress on original Mitigation Strategy	Supported update of Mitigation Strategy	Facilitated/Supported public and stakeholder outreach	Supported Integration/Coordination with other Planning Mechanisms	Reviewed/Approved Draft and Final Plan Sections	Designated Project Point of Contact
Belleville												
George Pedalino	OEM Coordinator	X	X		X	X	X	X	X	X	X	X
Tom Herits	Township Engineer		X	X	X	X	X	X	X	X	X	
Kelly Cavanagh	Township Clerk			X								
Bloomfield												
Fred Menzel	OEM Coordinator	X	X	X	X	X	X	X	X	X	X	X
Tom Pelaia	Deputy OEM Coordinator	X	X	X	X	X	X	X	X	X	X	X
Paul Lasek	Engineer	X	X	X	X	X	X	X	X	X	X	X
Caldwell												
Paul M. Carelli	Borough Administrator	X	X									X
Lisa O'Neill	Deputy Clerk	X	X									X
Anthony Grenci	OEM Coordinator	X	X	X		X	X	X		X		X
Cedar Grove												
Jeffery McElroy	OEM Coordinator	X	X	X	X	X	N/A	X	X	X	X	X
Alex Palumbo	Township Engineer	X	X	X	X	X	N/A	X		X	X	
John D'Ascensio	Deputy OEM Coordinator, Fire	X	X	X			N/A				X	
East Orange												
R.David Williams	OEM Coordinator	X	X	X	X	X	X	X	X	X	X	X
Lloyd Abdul Raheem	Building Official/East Orange Building Division											X
Essex Fells												
John Schmunk	Dep. Coordinator / Sergeant	X	X	X	X	X		X	X	X		X

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Roger Kerr	DPW Supervisor										X	
Vincent Kulik	Chief of Police										X	
Edward Abbot	Mayor / OEM										X	
Frank Zichelli	Engineer	X	X	X	X	X	X	X	X	X	X	X
Donald Allen	Dep. Coordinator/Lieutenant (Retired)	X	X	X	X	X	X	X	X	X	X	X
Fairfield												
William Smith	OEM Coordinator	X	X	X	X	X	X	X	X	X	X	X
Lawrence Gonnello	OEM Coordinator	X	X	X	X	X	X	X	X	X	X	X
Philip Cheff	Flood Plain Administrator	X	X	X	X	X		X	X	X	X	X
Robert Payne	Director, DPW	X	X	X			X	X	X			
Glen Ridge												
Michael Rohal	OEM Coordinator/Borough Administrator/Engineer/Clerk	X	X	X	X	X	X	X	X	X	X	X
Michael Zichelli	Deputy Administrator/Director of Planning	X	X	X	X	X	X	X		X	X	X
William Bartlett	Public Works Supervisor			X		X						
Sheila Byron-Lagattuta	Police Chief/Deputy OEM Coordinator			X		X						
Irvington												
Randy Weust	Deputy Chief Fire Department	X	X	X	X	X	X	X		X	X	X
Gary Shumlich	Chief	X	X								X	
Antonio Gary	Captain, Fire Department	X	X									
John Wiggins	Township Engineer	X	X	X	X	X	X	X		X	X	X
Livingston												

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Craig Handschuch	Police Chief , OEM Coordinator	X	X	X	X	X	X	X	X	X	X	X
Michael Anello	Superintendent, DPW	X	X	X	X	X	X	X	X	X		
Richard Calbi	Livingston Engineer	X	X	X	X	X	X	X	X	X		
Christopher Mullin	Fire Chief/ Dep. Coordinator	X	X	X	X	X	X	X	X	X	X	X
Maplewood												
Joseph Manning	Business Administrator-Administration	X	X	X		X	X	X	X	X	X	X
Michael Dingelstedt	Fire Chief/Fire Department	X	X	X		X	X	X	X	X	X	X
Millburn												
Tim Gordon	Business Administrator / OEM Coordinator	X	X	X	X	X	X	X	X	X	X	
Michael Roberts	Fire Chief/ OEM Deputy Coordinator	X	X	X	X	X	X	X	X	X	X	
Martha Annoni	Assistant Town Engineer/ Certified Flood Plain Manager	X	X	X	X	X	X	X	X	X	X	X
Robert Echavarria	Fire Battalion Chief/ OEM	X	X	X	X	X	X	X	X	X	X	X
Tom Watkinson	Engineer/ Certified Flood Plain Manager	X	X	X	X	X		X		X		
John Bace	Director DPW	X			X	X		X			X	
Stephen Jones	Building Official	X	X	X		X		X				
Bernie Neuhaus	Police Captain	X										
Montclair												
Kim Craft	Township Engineer	X	X	X	X	X	X	X	X	X	X	X
Tom Diveny	Deputy Fire Chief	X	X	X	X	X					X	
Ken Miscia	Acting OEM Coordinator			X	X						X	

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Katya Wowk	Director of Communications								X			
Janice Talley	Director of Planning & Community Development		X	X						X		
Frank Mason	Director of Finance/CFO		X	X								
Gray Russell	Environmental Outreach Coordinator		X									
Newark												
Mehdi Mohammadish	Department of Engineering, Director	X	X	X	X	X	X	X		X	X	X
Robert Thomas	Chief of Energy and Environment / Deputy Energy Coordinator	X	X	X	X	X	X	X		X	X	X
Peter Pinckney	Office of Emergency Management/Homeland Security and Preparedness	X	X	X	X	X	X	X		X	X	X
Andrea Adebowale	Department of Water & Sewer Utilities, Director	X	X	X	X	X	X	X		X	X	X
Tharien Arnold	Office of Emergency Management/Homeland Security and Preparedness, Deputy Director	X	X	X	X	X	X	X		X	X	X
Keith Isaac	Office of Emergency Management/Homeland Security and Preparedness, Director	X	X	X	X	X	X	X		X	X	X
Michael Reed	Newark Fire Department, Battalion Chief		X	X	X	X	X	X		X	X	X
John Centanni	Newark Fire Department, Fire Chief		X	X	X	X	X	X		X	X	X
Amos Crudup	Neighborhood and Recreational Services, Acting Director			X	X							
Michele Alonso	Department of Economic & Housing Development, Assistant Director of Planning/Supervising Planner			X			X					
Damon Rich	Planning Director & Chief Urban Designer			X			X					
North Caldwell												
Frank Zichelli	Engineer	X	X	X		X	X	X	X	X	X	X

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John D'Asceniso	Fire Chief / OEM	X	X	X		X	X	X	X	X	X	X
Mark Deuer	Police Chief	X	X	X		X	X	X	X	X	X	X
Len Mendolla	Construction Code Official	X	X	X		X	X	X	X	X	X	X
Bill Stickles	Public Works Foreman	X	X	X		X	X	X	X	X	X	X
Nutley												
Thomas Nicoletti	OEM Coordinator	X		X	X	X	X	X	X	X	X	X
Paul Cafone	Deputy Fire Chief					X						
David Hamilton	Fire/HAZMAT					X						
Salvatore Ferraro	Engineering Coordinator	X	X	X	X	X	X	X			X	
Orange												
John Wade	Deputy OEM Coordinator	X	X	X		X	X			X	X	X
Marty Mayes	DPW Director	X	X	X	X							
Not provided	City Engineer (Contracted)		X	X		X		X		X	X	
Not provided	City Engineer (Contracted)		X	X		X		X		X	X	
Don Mozell	City Planner			X						X		
Roseland												
John Matheis	OEM Coordinator	X										X
Gary Schall	Supt. Public Works	X	X	X			X	X			X	X
South Orange Village												
Alex Torpey	Village President										X	
Adam Loehner	Deputy Village Administrator	X	X	X	X	X	X	X	X	X	X	X

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Sal Renda	Engineer	X	X	X	X	X	X	X	X	X	X	X
Tommy Michetti	DPW Director			X	X	X	X		X		X	
Barry Lewis				X	X	X	X	X		X	X	X
Verona												
Jeff Hayes	OEM Coordinator	X	X	X	X	X	X	X	X	X	X	X
Joseph Martin	Township Manager	X	X	X	X	X	X	X	X	X	X	
Jim Helb	Township Engineer	X	X	X	X	X	X	X	X	X	X	
Charles Molinaro	DPW Supervisor	X	X	X	X	X	X	X	X	X	X	
Thomas Jacobsen	Construction Code Official	X	X	X	X	X	X	X	X	X	X	
West Caldwell												
John Medina	Deputy Emergency Management Coordinator	X	X	X	X	X	X	X	X	X	X	X
Bill Wallace	Health Officer		X	X								
Bob McLoughlin	Construction Official		X	X		X						
Larry Peter	Emergency Management Coordinator	X	X	X	X	X	X	X	X	X	X	X
Frank Russo	Township Engineer		X	X		X	X	X				
West Orange												
Peter Smeraldo Jr.	Fire Chief / OEM Coordinator	X	X	X	X	X	X	X	X	X	X	X
Paul Wannamacher	Deputy OEM Coordinator											
Leonard Lepore	Fire Chief / OEM Coordinator	X	X	X	X	X	X	X	X	X	X	X
Thomas Tracey	Code Officer	X	X	X	X	X	X	X	X	X	X	
Karen Carnevale	Township Clerk	X	X	X	X	X	X	X	X	X	X	

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Maddy Longo	Township Clerk Assistant		X	X								
John K. Sayers	Business Administrator	X	X	X								
Geniece Gary-Adams	Zoning Official	X	X	X	X	X	X	X	X	X	X	
Paul Grygiel	Township Planner		X	X				X			X	
Micky Wagner	Fire Administration / OEM Administration		X	X								
Essex County												
Joseph DiVincenzo	County Executive	X							X			
Armando Fontoura	Sheriff/County OEM Coordinator	X							X			
Carolyn Murray	County Prosecutor	X										
Anthony Ambrose	Chief of Detectives	X										
Kevin Ryan	Undersheriff/Deputy OEM Coordinator	X										
Garey Chin	Director of Homeland Security	X										
Ralph Ciallella	County Administrator	X										
Michael Venezia	Administrator's Assistant	X										
John Tully	Haz Mat/Bomb Technician	X										
Lt. Ed Esposito	Essex County Sheriff's Office, OEM (County POC)	X	X	X	X	X	X	X	X	X	X	X
Maura Lynch	Essex County Sheriff's Office, OEM	X	X	X	X	X	X	X	X	X	X	X
Sal Macaluso	DPW - Director of County Roads and Bridges	X										
Luis Rodriguez	DPW - Supervising Engineer	X	X	X		X	X	X			X	
Jacqueline Bourdony	DPW - Engineering Aid											
Dave Antonio	DPW - County Planner	X	X	X		X	X	X		X	X	

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Anthony Puglisi	DPW - Public Information Officer								X			
Sanjeev Varghese	DPW - County Engineer and Floodplain Administrator	X										
Lt. James Troisi	Department of Corrections - Bureau Commander	X				X			X			
Darren Marshall	IT/GIS Coordinator	X		X	X							
Peter Smeraldo	Municipal OEM/Fire Chief	X										
Paul Wannemaker	Municipal OEM/Dep. Chief	X										
Wayne Smith	Municipal OEM/Mayor	X										
Frank Del Gaudio	County Risk Manager	X										
Anthony Puglisi	Public Information Officer	X										
Lauren Shears	Public Information Officer	X										
Jean Walker	Essex Regional Health	X										
Rich Budris	Essex Regional Health	X										
Daniel Salvante	Director of Parks Department	X										
Daniel Salvante Jr.	Parks Facility Manager	X										
Stephen Pringle	Warden ECCF	X										
Dr. Joyce Harley	Vice President, ECC	X										
Port Authority of New York New Jersey												
Michael Ricker	OEM	X										
Salvation Army												
Michael Clayton		X										
Kessler Institute												

Table C-1. Participation Matrix/Official Planning Meetings

Name	Title / Position	Attended Meeting(s)	Completed Information Gathering Worksheets/Surveys	Provided Data and Information	Reviewed/Updated Inventories (e.g. Critical Facilities)	Identified vulnerabilities	Identified progress on original Mitigation Strategy	Supported update of Mitigation Strategy	Facilitated/Supported public and stakeholder outreach	Supported Integration/Coordination with other Planning Mechanisms	Reviewed/Approved Draft and Final Plan Sections	Designated Project Point of Contact
Mario Santos		X										
Turtle Back Zoo												
Jessica Reid		X										
University Hospital Network												
John Grembowia	UH-EMS	X										
Joe Burton	UH-EMS	X										
Tim Phelan	UH-EMS	X										
Verizon NJ												
Jasmine Pierce		X										
Colonial Pipeline												
Fred Morillo		X										
Peter Mongeau		X										
Anthony Untimiglin		X										
PSE&G												
Eric Boston		X										
JCP&L / First Energy												
Addie Colon		X										
Passaic Valley Sewerage Commission												
Chris O'Shea		X										
Superior Court												
Paulyn Holandex		X										

Table C-1. Participation Matrix/Official Planning Meetings

Name	Title / Position	Attended Meeting(s)	Completed Information Gathering Worksheets/Surveys	Provided Data and Information	Reviewed/Updated Inventories (e.g. Critical Facilities)	Identified vulnerabilities	Identified progress on original Mitigation Strategy	Supported update of Mitigation Strategy	Facilitated/Supported public and stakeholder outreach	Supported Integration/Coordination with other Planning Mechanisms	Reviewed/Approved Draft and Final Plan Sections	Designated Project Point of Contact
NJ Judiciary												
Sheila Deveraux		X										
NJ State Police												
Marc Pelligrino	Regional Representative out of North Region Office	X										
James Dunham		X										
Steve Tiboni		X										
Shenetia Henderson	Planner	X										
Laura Connolly	Planner	X										
United Water												
Bob Galante	Project Manager	X										
Kevin Bilin	Crew Chief	X										
Seton Hall University												
Thomas Giordano		X										

TOWNSHIP of BELLEVILLE

ESSEX COUNTY

OFFICE OF: KEVIN M. ESPOSITO
INTERIM TOWNSHIP MANAGER

152 WASHINGTON AVENUE
BELLEVILLE, N. J. 07109
(973) 450-3322

October 10, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Township of Belleville

Dear Sheriff Fontoura:

Per your email dated August 14, 2013, the Township of Belleville is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the Township of Belleville:

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
  - Structure and facility inventory data
  - Identification of new development and anticipated development
  - Identification of natural hazard risk areas
  - Identification of natural hazard events and losses that have impacted your community in the last five years
  - Identification of plans, studies, reports and ordinances addressing natural hazard risk

TOWNSHIP of BELLEVILLE

ESSEX COUNTY

OFFICE OF: KEVIN M. ESPOSITO
INTERIM TOWNSHIP MANAGER

152 WASHINGTON AVENUE
BELLEVILLE, N. J. 07109
(973) 450-3322

- Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
  - Providing notices of the planning project on our municipal website if available with links to a County project website
  - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
  - Advertising and supporting public meetings in your area.
  - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: George Pedalino

Position/Department: OEM Coordinator

Phone Number: 973 450-3374

Email Address:gpedalino@bellevillefiredept.org

Alternate/Secondary POC: Thomas Herits

Position/Department: Town Engineer

Phone Number: 973 450-3414

Email Address: therits@maserconsulting.com

TOWNSHIP of BELLEVILLE

ESSEX COUNTY

OFFICE OF: KEVIN M. ESPOSITO
INTERIM TOWNSHIP MANAGER

152 WASHINGTON AVENUE
BELLEVILLE, N. J. 07109
(973) 450-3322

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Frank Delorenzo

Position/Department: Construction Code Official

Phone Number: 973 450-3410

Email Address: fdelorenzo@bellevillenj.net

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Kevin M Esposito

Kevin M. Esposito,
Interim Township Manager

Fred Menzel
Coordinator

Thomas Pelaia
Deputy Coordinator

Telephone
(973) 680-4177
Fax
(973) 680-4165

TOWNSHIP OF BLOOMFIELD
OFFICE OF EMERGENCY MANAGEMENT

Bloomfield, New Jersey 07003-3487

September 18, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Bloomfield Township

Dear Sheriff Fontoura:

Per your email dated August 14, 2013, the Township of Bloomfield is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the Township of Bloomfield:

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).

- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
    - Advertising and supporting public meetings in your area.
    - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Fred Menzel

Position/Department: OEM Coordinator

Phone Number: 973-418-2108

Email Address: fmenzel@bloomfieldtwpnj.com

Alternate/Secondary POC: Paul Lasek

Position/Department: Township Engineer

Phone Number: 973-680-4009

Email Address: plasek@bloomfieldtwpnj.com

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Paul Lasek

Position/Department: Township Engineer

Phone Number: 973-680-4009

Email Address: plasek@bloomfieldtwpnj.com

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Fred Menzel
OEM Coordinator

One Provost Square · Caldwell, NJ 07006 · 973-226-6100 · Fax 973-403-1355

October 1, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: **Essex County All Hazard Mitigation Plan Update**
Authorization and Letter of Intent to Participate
Borough of Caldwell

Dear Sheriff Fontoura:

Per your email dated August 14, 2013, the *Borough of Caldwell* is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the *Borough of Caldwell:*

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas

One Provost Square · Caldwell, NJ 07006 · 973-226-6100 · Fax 973-403-1355

- Identification of natural hazard events and losses that have impacted your community in the last five years
- Identification of plans, studies, reports and ordinances addressing natural hazard risk
- Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
  - Providing notices of the planning project on our municipal website if available with links to a County project website
  - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
  - Advertising and supporting public meetings in your area.
  - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community
- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

One Provost Square · Caldwell, NJ 07006 · 973-226-6100 · Fax 973-403-1355

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC:	Paul M. Carelli	Position/Department:	Borough Administrator
Phone Number:	(973) 403-4634	Email Address:	pcarelli@caldwell-nj.com
Alternate/Secondary POC:	Anthony Grenci	Position/Department:	OEM Coordinator
Phone Number:	(973) 493-5552	Email Address:	amg22@aol.com

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA:	Paul Milani	Position/Department:	Construction Official
Phone Number:	(973) 632-1991	Email Address:	pmilani@caldwell-nj.com

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Paul M. Carelli
Borough Administrator
Caldwell Borough
1 Provost Square
Caldwell, N.J. 07006
(973) 403-4634

Cc: Lisa O'Neil – Deputy Clerk
Anthony Grenci – OEM Coordinator
Paul Milani – Construction Official
Ann Dassing - Mayor

10-07-13

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Township of Cedar Grove

Dear Sheriff Fontoura:

Per your email dated August 14, 2013, the *Township of Cedar Grove* is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the *Township of Cedar Grove*

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)

- Advertising and supporting public meetings in your area.
- Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Position/Department:

Phone Number: Email Address:

Alternate/Secondary POC: Position/Department:

Phone Number: Email Address:

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Position/Department:

Phone Number: Email Address:

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Thomas Tucci, Township Manager - Township of Cedar Grove

City of East Orange
Office of Emergency Management

402 Springdale Avenue - East Orange, New Jersey 07017
973-677-8924

Robert L. Bowser, Mayor
R. David Williams, Coordinator
Antoine Lambert, Deputy Coordinator

Date October 10, 2013

Sheriff Armando Fontoura

County Emergency Management Coordinator

Essex County Office of Emergency Management

560 Northfield Avenue

West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update

Authorization and Letter of Intent to Participate

City of East Orange

Dear Sheriff Fontoura,

Per your email dated August 14, 2013, the City of East Orange is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the City of East Orange

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.

- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.

- Support the Steering Committee selected to oversee the development of this plan.

- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).

- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:

- Structure and facility inventory data

- Identification of new development and anticipated development

- Identification of natural hazard risk areas

- Identification of natural hazard events and losses that have impacted your community in the last five years

- Identification of plans, studies, reports and ordinances addressing natural hazard risk

- Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:

- Providing notices of the planning project on our municipal website if available with links to a County project website

- Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)

- Advertising and supporting public meetings in your area.

- Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.

- Review draft Plan sections when requested and provide comment and input as appropriate.

- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.

- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.

- Involve your local NFIP Floodplain Administrator in the planning process.

- Adopt the Plan by resolution of their governing body after FEMA conditional approval.

- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC:

R. David Williams / OEM Coordinator

David.Williams@eastorange-nj.gov

(973) 677-8924

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Lloyd Raheem, Zoning Officer / Property Maintenance

Lloyd.Raheem@eastorange-nj.gov

(973) 266-5302

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

R. David Williams

OEM Coordinator

October 1, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Borough of Essex Fells

Dear Sheriff Fontoura:

Per your email dated August 14, 2013, the **Borough of Essex Fells**, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the Borough Of Essex Fells

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
    - Advertising and supporting public meetings in your area.
    - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community
- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC:
Donald Allen
Phone Number:
973-226-3000
Alternate/Secondary POC: John Schmunk

Position/Department:
Dep.Coordinator/ Lt
Email Address:
dallen@essexfellspd.org
Position/ Department:Sergeant

Phone Number:973-226-3000

Email Address :jschmunk@essexfellspd.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Frank Zichelli Position/Department: Engineer

Phone Number:973-226-3400 Email Address:Engineer@essexfellsboro.com

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Lt. Donald R. Allen

Dep. O.E.M. coordinator

FAIRFIELD
James Gasparini, Mayor

OFFICE OF EMERGENCY MANAGEMENT
TOWNSHIP OF FAIRFIELD
230 FAIRFIELD ROAD, FAIRFIELD, NJ 07004
Phone: 973-882-2735 / Fax: 973-244-0178
William Smith, OEM Coordinator
wsmith@fairfieldnj.org

Date: September 25, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject : Essex County All Hazard Mitigation Plan Update

Authorization and Letter of Intent to Participate

Township of Fairfield

Dear Sheriff Fonturo:

Per your email dated August 14, 2013, the *Township of Fairfield*, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the *Township of Fairfield:*

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:

Primary POC: William Smith Position/Department: OEM Coordinator

Phone Number: 973-882-2735 Email Address: wsmith@fairfieldnj.org

Alternate/Secondary POC: Lawrence Gonnallo Position/Department: Engineer

Phone Number: 973-882-2727 Email Address: lgonnello@fairfieldnj.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Phil Cheff Position/Department: Construction Official

Phone Number: 973-882-2730 Email Address: pcheff@fairfieldnj.org

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

William F. Smith
OEM Coordinator
Township of Fairfield

Municipal Building
825 Bloomfield Avenue
P.O. Box 66
Glen Ridge, NJ 07028

Telephone
(973) 748-8400

Fax Number
(973) 748-3926

September 23, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Borough of Glen Ridge

Dear Sheriff Fonturo:

Per your email dated August 14, 2013, the Borough of Glen Ridge, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the Borough of Glen Ridge:

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:

    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
    - Advertising and supporting public meetings in your area.
    - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Michael J. Rohal, P.E., P.P. Position/Department: Borough Administrator/Engineer

Phone Number: 973-748-0303 Email Address: mjrohal@glenridgenj.org

Alternate/Secondary POC: Michael Zichelli, AICP, P.P. Position/Department: Deputy Administrator/ Director of Planning

Phone Number: 973-748-8400, ext.235 Email Address: mpzichelli@glenridgenj.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Michael J. Rohal, P.E., P.P. Position/Department: Borough Administrator/Engineer

Phone Number: 973-748-0303 Email Address: mjrohal@glenridgenj.org

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Michael J. Rohal

Michael J. Rohal, P.E., P.P.
Borough Administrator/Engineer

Date: September 16, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Township of Irvington

Dear Sheriff Fonturo:

Per your email dated August 14, 2013, the *Township of Irvington*, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the *Township of Irvington:*

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)

- Advertising and supporting public meetings in your area.
- Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: DC Randy Wuest

Position/Department: Deputy Fire Chief

Phone Number: 8628493536

Email Address: IrvingtonFD@verizon.net

Alternate/Secondary POC: Gary Shumlich

Position/Department: Fire Chief

Phone Number: 8628497130

Email Address: IFDHQ1@yahoo.com

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: John Wiggins

Position/Department: Engineer

Phone Number: 9733996696

Email Address: Wiggins@ADM.NJIT.EDU

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

DC Randy Wuest

October 1, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Township of Livingston, Livingston, N.J. 07039

Dear Sheriff Fontoura:

Per your email dated August 14, 2013, the *Township of Livingston*, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the Township of Livingston:

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
  - Structure and facility inventory data
  - Identification of new development and anticipated development
  - Identification of natural hazard risk areas
  - Identification of natural hazard events and losses that have impacted your community in the last five years
  - Identification of plans, studies, reports and ordinances addressing natural hazard risk
  - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions
- Support public outreach efforts in your community which may include:
  - Providing notices of the planning project on our municipal website if available with links to a County project website
  - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)

- Advertising and supporting public meetings in your area.
- Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Chief Craig Handschuch — Position/Department: Police Chief/O.E.M. Coordinator

Phone Number: (973) 436-4320 — Email Address: Chandschuch@livingstonnj.org

Alternate POC: Chief Christopher Mullin — Position/Department: Fire Chief/Dep. O.E.M. Coordinator

Phone Number: (973) 992-2373 — Email Address: Cmullin@livingstonnj.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Mr. Richard Calbi — Position/Department: Township of Livingston - Engineer

Phone Number: (973) 535-7948 — Email Address: Rcalbi@livingstonnj.org

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Christopher C. Mullin
Fire Chief/Deputy O.E.C. Coordinator

Township of Maplewood

Municipal Building, 574 Valley Street
Maplewood, New Jersey 07040-2691
Telephone (973) 762-8120, Ext. 2001
Fax: (973) 762-3645

Joseph F. Manning
Business Administrator

Email: twpadmin@twp.maplewood.nj.us
Web Site: www.maplewoodnj.org

October 1, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Township of Maplewood

Dear Sheriff Fonturo:

Per your email dated August 14, 2013, the Township of Maplewood is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the Township of Maplewood:

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
    - Advertising and supporting public meetings in your area.
    - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Joseph Manning

Business Administrator- Administration

Phone Number: 973.762.5264
twpadmin@twp.maplewood.nj.us

Email Address:

Alternate/Secondary POC: Michael Dingelstedt
Phone Number: 973.762.6500. ext. 11

Fire Chief/Fire Department
Email Address: firechief@twp.maplewood.nj.us

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA Thomas Malavasi

Township Engineer/Engineering Dept.:

Phone Number: 973.762.8120, ext 3300

Email Address: engineer@twp.maplewood.nj.us

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Joseph Manning
Business Administrator

C: Michael Dingelstedt, Fire Chief
Thomas Malavasi, Township Engineer

September 23, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Township of Millburn

Dear Sheriff Fonturo:

Per your email dated August 14, 2013, the Township of Millburn is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the Township of Millburn:

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)

- Advertising and supporting public meetings in your area.
- Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Tim Gordon

Position/Department: Business Administrator

Phone Number: (973)564-7071

Email Address: tgordon@millburntwp.org

Alternate/Secondary POC: Michael Roberts

Position/Department: Fire Chief

Phone Number: (973)564-7040

Email Address: mroberts@millburntwp.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Steve Jones

Position/Department: Construction Official

Phone Number: (973)564-7057

Email Address: sjones@millburntwp.org

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

J. Michael Roberts
Fire Chief/ Deputy OEM Coordinator

Montclair

Township of Montclair 205 Claremont Avenue Montclair, NJ 07042 tel: 973-509-4926 fax: 973-783-8826

Marc D. Davidoff
Township Manager
[illegible]

October 4, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Township of Montclair

Dear Sheriff Fontoura:

Per your email dated August 14, 2013, the *Township of Montclair* is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the *Township of Montclair:*

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk

    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
    - Advertising and supporting public meetings in your area.
    - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary of municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Kimberli Craft, P.E.	Position/Department: Township Engineer/ Community Services
Phone Number: (973) 509-5707	Email Address: kcraft@montclairnjusa.org
Alternate/Secondary POC: Tom Diveny	Position/Department: Deputy Chief/ Fire Dept.
Phone Number: (973) 509-4999	Email Address: tdiveny@montclairnjusa.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Kimberli Craft P.E.

Position/Department: Township Engineer/ Community Services

Phone Number: (973) 509-5707

Email Address: kcraft@montclairnjusa.org

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Marc D. Dashield

Marc D. Dashield
Township Manager

CITY OF NEWARK

Cory A. Booker
Mayor

Mehdi Mohammadish, P.E.
Director of Engineering

Department of Engineering

Date 10/7/13

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
City of Newark

Dear Sheriff Fonturo:

Per your email dated August 14, 2013, the City of Newark is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the City of Newark

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years

    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
    - Advertising and supporting public meetings in your area.
    - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Mehdi Mohammadish	Position/Department: Director of Engineering Dept.
Phone Number: (973) 733-8520	Email Address: mohammadishm@ci.newark.nj.us
Alternate/Secondary POC: Andrea Adebowale	Position/Department: Acting Director of Water & Sewer Dept.
Phone Number: (973) 733-5630	Email Address: adebowalea@ci.newark.nj.us
Alternate/Third POC: Keith Isaac	Position/Department: Director, Office of Emergency Management & Homeland Security Dept.
Phone Number: (862) 754-4227	Email Address: isaacke@ci.newark.nj.us

BOROUGH OF NORTH CALDWELL
Borough Hall – 141 Gould Avenue
North Caldwell, New Jersey 07006-4213

Phone 973-228-6410 **Fax 973-228-2914**

September 26, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Borough of North Caldwell

Dear Sheriff Fontoura:

Per your email dated August 14, 2013, the *Borough of North Caldwell*, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the *Borough of North Caldwell:*

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website

- Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
- Advertising and supporting public meetings in your area.
- Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community
- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.

- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: John D'Ascensio — Position/Department: O.E.M. Coordinator

Phone Number: 973-477-0051 — Email Address: jdeif@gmail.com

Alternate/Secondary POC: Frank Zichelli — Position/Department: Engineer/Engineering DPW

Phone Number: 973-228-6410 x 107 — Email Address: ncdpw@northcaldwell.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Len Mendola — Position/Department: Building Inspector

Phone Number: 973-228-6410 x 112 — Email Address: lmendola@northcaldwell.org

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Very truly yours,

Frank A. Zichelli, Jr.
Borough Engineer

FAZ:ei
cc: J. D'Ascensio
Mayor Alessi
L. Mendola

TOWNSHIP OF NUTLEY

DEPARTMENT OF PUBLIC WORKS
NUTLEY, NEW JERSEY 07110

JOSEPH P. SCARPELLI, D.C.
Director

Phone: (973) 284-4959
Fax: (973) 284-4995

MICHAEL LUZZI
Superintendent / CPWM

Phone: (973) 284-4984
Fax: (973) 284-4995

September 11, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Township of Nutley

Dear Sheriff Fonturo:

Per your email dated August 14, 2013, the *Township of Nutley*, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the *Township of Nutley:*

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years

- Identification of plans, studies, reports and ordinances addressing natural hazard risk
- Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
  - Providing notices of the planning project on our municipal website if available with links to a County project website
  - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
  - Advertising and supporting public meetings in your area.
  - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Salvatore Ferraro

Position/Department: Engineering/Department of Public Works

Phone Number : 973-284-4900 x2254

Email Address: sferraro@nutleynj.org

Alternate/Secondary POC: Thomas Nicolette

Position/Department: OEM Coordinator

Phone Number: 973-727-2925

Email Address: tnicolette@nutleynj.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Salvatore Ferraro

Position/Department: Engineering/Department of Public Works

Phone Number: 973-284-4900 x2254

Email Address: sferraro@nutleynj.org

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Salvatore Ferraro
Township of Nutley Engineering Coordinator

CITY OF ORANGE TOWNSHIP

MAYOR DWAYNE D. WARREN, ESQ.

29 North Day Street, Orange, New Jersey 07050
Phone: (973) 266-4005 Fax: (973) 676-7458

September 27, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: **Essex County All Hazard Mitigation Plan Update**
Authorization and Letter of Intent to Participate
City of Orange Township

Dear Sheriff Fontoura:

Per your email dated August 14, 2013, the City of Orange Township is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the City of Orange Township:

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas

- Identification of natural hazard events and losses that have impacted your community in the last five years
- Identification of plans, studies, reports and ordinances addressing natural hazard risk
- Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
  - Providing notices of the planning project on our municipal website if available with links to a County project website
  - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
  - Advertising and supporting public meetings in your area.
  - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: John Wade

Position/Department: Dep. OEM Coordinator

Phone Number: 862-216-4217

Email Address: wadej@ci.orange.nj.us

Alternate/Secondary POC: Raymond Wingfield

Position/Department: OEM Coordinator

Phone Number: 862-250-3140

Email Address: rwingfield@ci.orange.nj.us

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Brian Johnson

Position/Department: Municipal Engineering Contractor
Carroll Engineering

Phone Number: 1-908-874-7500 Ext. 218

Email Address: bjohnson@carrollengineering.com

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Yours in Service,

Dwayne D. Warren

Mayor Dwayne D. Warren, Esq.
City of Orange Township

BOROUGH of ROSELAND
ESSEX COUNTY - NEW JERSEY

DEPARTMENT OF PUBLIC WORKS SERVICES
AND CONSTRUCTION CODE ENFORCEMENT

300 EAGLE ROCK AVENUE 07068
(973) 226-6565
FAX: (973) 226-8520

September 23, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
as the Borough of Roseland

Dear Sheriff Fonturo:

Per your email dated August 14, 2013, the *Borough of Roseland*, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the *Borough of Roseland:*

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk

    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
    - Advertising and supporting public meetings in your area.
    - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC:	John Matheis	Position/Department: OEM Coordinator
Phone Number:	(973) 449-4751 Cell	Email Address: jmatheis@roselandnj.org
Alternate/Secondary POC: Gary Schall		Position/Department: Supt. Public Works
Phone Number:	(973) 226-6565 Office	Email Address: gschall@roselandnj.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA:	Ralph Tango, PE	Position/Department: Borough Engineer
Phone Number:	(973) 398-3110	Email Address: rtango@maserconsulting.com

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

John Matheis, OEM Coordinator

Township of South Orange Village

Alex Torpey
Village President

October 1, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Township of South Orange Village

Dear Sheriff Fonturo:

Per your email dated August 14, 2013, the Township of South Orange Village, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the Township of South Orange Village:

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:

- Providing notices of the planning project on our municipal website if available with links to a County project website
- Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
- Advertising and supporting public meetings in your area.
- Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Alex Torpey
Phone Number: (973) 378-7715 Ext. 2
Position/Department: Village President
Email Address: atorpey@southorange.org

Alternate/Secondary POC: Adam D. Loehner
Phone Number: (973) 378-7715 Ext. 7735
Position/Department: Deputy Village Administrator
Email Address: aloehner@southorange.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Sal Renda
Phone Number: (973) 378-7715 Ext. 7706
Position/Department: Engineer
Email Address: srenda@southorange.org

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Alex Torpey
Village President
Township of South Orange Village

Date: September 23, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Township of Verona

Dear Sheriff Fonturo:

Per your email dated August 14, 2013, the *Township of Verona*, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the *Township of Verona:*

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions

- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
    - Advertising and supporting public meetings in your area.

- Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Jeff Hayes

Position/Department: Director OEM, IT &Admin

Phone Number: 973 857 4756

Email Address: jhayes@veronanj.org

Alternate/Secondary POC: Doug Huber
cord

Position/Department: Police Chief, Dpty OEM

Phone Number: 973 239 5000

Email Address: doug.huber@veronapolice.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Jim Helb

Position/Department: Engineer

Phone Number: 973 857 4803

Email Address: jhelb@veronanj.org

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Jeff Hayes

09/27/13

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
West Caldwell

Dear Sheriff Fontoura,

Per your email dated August 14, 2013, West Caldwell, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, West Caldwell:

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner

- Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community

- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.
- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

Primary POC: Larry Peter — Position/Department: Emergency Management

Phone Number: 973-747-9946 — Email Address: Lpeter@westcaldwell.com

Alternate/Secondary POC: John Medina — Position/Department: Emergency Management

Phone Number: 862-881-6308 — Email Address: Jmedina@westcaldwell.com

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Robert McLoughlin — Position/Department: Construction Official

Phone Number: 973-226-2300 — Email Address: rmcloughlin@westcaldwell.com

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Sincerely,

Larry Peter
Township of West Caldwell
Emergency Management

2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

- Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.
- Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.
- Support the Steering Committee selected to oversee the development of this plan.
- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions
- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
    - Advertising and supporting public meetings in your area.

TOWNSHIP OF WEST ORANGE

415 VALLEY ROAD, WEST ORANGE, N.J. 07052

OFFICE OF EMERGENCY MANAGEMENT

ROBERT D. PARISI
Mayor

Fire Chief Peter F. Smeraldo, Jr.
OEM Coordinator

Tel: (973) 325-4175
Fax: (973) 669-1080
E-mail: wo-oem@westorange.org

September 9, 2013

Sheriff Armando Fontoura
County Emergency Management Coordinator
Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Subject: Essex County All Hazard Mitigation Plan Update
Authorization and Letter of Intent to Participate
Township of West Orange

Dear Sheriff Fontoura:

Per your email dated August 14, 2013, the Township of West Orange, is committed to participating in the Essex County Hazard Mitigation Plan (HMP) Update project. By way of this letter, the Township of West Orange:

1. Authorizes the Essex County HMP Update Steering Committee (aka "Steering Committee"), to guide and direct this planning process, perform certain parts of the planning process, and prepare certain parts of the plan documents on our behalf.
2. Agrees to meet the minimum requirements of jurisdictional participation (a.k.a. the Planning Partner Expectations), specifically:

   - Execute and return this "Authorization and Acknowledgement" letter to the Essex County Office of Emergency Management, attention: Sheriff Armando Fontoura.

   - Identify municipal representatives to serve as the planning point of contacts (POC), below. These people will be responsible for representing their community and assuring that these participation expectations are met by their community.

   - Support the Steering Committee selected to oversee the development of this plan.

- Provide representation at municipal Planning Committee meetings (~ 4 meetings over 8 months, including a Kick-Off Meeting and a Jurisdictional Annex Workshop meeting).
- Provide data and information about your community as requested by the Essex County Office of Emergency Management, or the contract consultant, including:
    - Structure and facility inventory data
    - Identification of new development and anticipated development
    - Identification of natural hazard risk areas
    - Identification of natural hazard events and losses that have impacted your community in the last five years
    - Identification of plans, studies, reports and ordinances addressing natural hazard risk
    - Identify mitigation activity in your community in the last five years, including progress on previously identified mitigation actions
- Support public outreach efforts in your community which may include:
    - Providing notices of the planning project on our municipal website if available with links to a County project website
    - Providing notice of the planning project, the availability of Plan documents, and notice of public meetings via available local media (e.g. newsletters, flyers, email blasts, social media, etc.)
    - Advertising and supporting public meetings in your area.
    - Supporting outreach to NFIP Repetitive Loss and Severe Repetitive Loss property owners in your community
- Assist with the identification of stakeholders within your community that should be informed and potentially involved with the planning process.
- Review draft Plan sections when requested and provide comment and input as appropriate.
- Prepare and submit a Jurisdictional Annex to the Steering Committee and/or the contract consultant. Templates and instructions to aid in the compilation of this information will be provided to all participating partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee. The Steering Committee will assure that technical and administrative resources are available to assist with the preparation and completion of the annexes.
- Identify specific mitigation actions to address each of the natural hazards posing high or medium risk to your community. These initiatives will be presented in your annex.

- Involve your local NFIP Floodplain Administrator in the planning process.
- Adopt the Plan by resolution of their governing body after FEMA conditional approval.
- Periodically provide the Steering Committee with summary or municipal staff and volunteer labor spent on the planning process.

3. Assigns the following persons to be the Points of Contact for our jurisdiction. We understand that these POCs are responsible for assuring municipal representation at Planning Committee meetings, and assuring that the other minimum requirements of jurisdictional participation, as detailed in the Planning Partner Expectations above, are met.

   Primary POC: Fire Chief Peter F. Smeraldo, Jr.
   Position/Department: OEM Coordinator

   Phone Number: (973) 325-4185 Email Address: WO-OEM@westorange.org

   Alternate/Secondary POC: Deputy Fire Chief Paul Wannemacher
   Position/Department: Deputy OEM Coordinator

   Phone Number: (973) 325-4175 Email Address: Fireadminoff@westorange.org

4. Our designated local Floodplain Administrator (FPA) under the National Flood Insurance Program (NFIP) is:

Name of NFIP FPA: Leonard Lepore, P.E. Position/Department: Municipal Engineer

Phone Number: (973) 325-4160 Email Address: llepore@westorange.org

5. Recognizes that failure to meet the minimum participation expectations and deadlines, as determined by the Steering Committee will result in our municipality being excluded from the planning process.

Yours truly

Fire Chief Peter F. Smeraldo, Jr.
OEM Coordinator

PS:mw

Cc: Mr. J.K. Sayers, Business Administrator
Deputy Chief P. Wannemacher
Director L. Lepore, Municipal Engineer

This appendix provides documentation of public and stakeholder outreach. Public and stakeholder involvement in this planning process has been broad and productive as discussed in Section 3 (Planning Process). Public and stakeholder input received was provided to the County and all municipalities for their consideration. As a result input was incorporated throughout this HMP as identified in the References section, as well as within specific mitigation initiatives identified in Volume II, Section 9.

Essex County's original Hazard Mitigation Plan (HMP) was approved by FEMA in September 2008.

By regulation, local HMPs must be formally updated every five years. The update process is an opportunity for Essex County and its municipalities to re-[illegible] their vulnerability to natural and human caused hazards, evaluate progress on the mitigation strategies identified in the original plan, and add new mitigation actions/projects/initiatives so that the County can continue to lower its overall hazard risk.

Essex County's Office of Emergency Management and the Planning Team are leading this plan update effort, which is expected to continue through September 2014. The County and all 22 municipalities have committed to participating in this update process, and so continue to be eligible for pre-disaster mitigation grant funding for eligible projects.

TETRA TECH

Sheriff Armando B. Fontoura
Essex County Emergency Management Coordinator

For more information contact:

Essex County Office of Emergency Management
560 Northfield Avenue
West Orange, NJ 07052

Telephone: 973-[illegible]-[illegible]-324-[illegible]

essexoem@essexsheriff.com

Visit our webpage and take the online Citizens Survey
http://hmp.essexsheriff.com

Essex County Hazard Mitigation Plan Update

[illegible]

Reducing Losses to Natural and Human Caused Hazards

Mission Statement

Through partnerships and strategic planning, identify and reduce the vulnerability to hazards in order to protect the health, safety, quality of life, environment, and economy of the communities within Essex County.

Purpose

Essex County's Office of Emergency Management and Planning Team are leading this plan update effort for Essex County and its municipalities. This effort is expected to continue through September 2014 and is an opportunity to detail a variety of potential hazards that could affect County residents, visitors, property and economy. It will also allow the County and participating municipalities to continue to be eligible for future FEMA mitigation funding opportunities.

The goal of the plan update is to identify projects that can reduce damages from future natural and human caused hazards. The plan will include a Risk Assessment and a Hazard Mitigation Strategy. The primary hazards of concern in Essex County include Flooding, Drought, and Severe Weather events such as Tornadoes, Hurricanes and Winter Storms.

The plan will focus on existing and future buildings, infrastructure, and critical facilities that might be impacted. Critical facilities include police, fire, EMS, hospitals and shelters as well as infrastructure such as power-generation facilities, water utilities, roadways, railroads, and communication systems.

How can I provide information to support the plan?

To obtain input and gauge citizen preparedness for natural hazard events, a public survey may be accessed directly at: http://hmp.essexsheriff.com or from the link on the Essex County Sheriff's website at: www.essexsheriff.com

Please visit the site and complete the Citizen Survey to provide valuable information for the planning process.

Where can I review the Draft Plan and provide input if I choose?

Sections of the plan will be available directly at: http://hmp.essexsheriff.com or from the link on the Essex County Sheriff's website at: www.essexsheriff.com

Comments on the draft plan may be forwarded to the contacts identified in this brochure.

Public meetings will also be scheduled throughout this update process. Information on public meetings will be available on our website, through public notices and press releases.

Can I get funding to mitigate my property?

Possibly, once this Plan is approved by FEMA and adopted by each municipality, owners of properties vulnerable to flooding are frequently eligible to receive funding to elevate a structure above flood levels, or have their property acquired by their municipality. Generally the property must have a history of NFIP (National Flood Insurance Program) damage claims. The property owner may be responsible for up to 25% of the project costs. Interested property owners should contact their local NFIP Floodplain Administrator or the contacts identified in this brochure.

A note about NFIP Flood Insurance:

Many properties in Essex County are vulnerable to flooding; for those it is not a question of if, but when and how severe. NFIP flood insurance is available to everyone. Standard homeowner policies do not cover flood damage. Federal grants to mitigate vulnerable properties are typically only awarded to those who participate in, and have made claims against, the NFIP.

If you live in or near a flood-prone area and don't have flood insurance, consider it! If you have it and suffer flood damage, use it!

Essex County Sheriff's Office

NEWS RELEASE

December 4, 2013

Sheriff Fontoura Urges Essex County Residents to Take Online Survey for Hazard Mitigation Plan Update

Newark - Sheriff Armando Fontoura, coordinator of the Essex County Office of Emergency Management, today advised local residents that they are invited to participate in updating a countywide Hazard Mitigation Plan (HMP) that will pave the way for pre-disaster preparedness and mitigation funding.

To learn more about this project and take the online survey, visit the Essex County Sheriff's website at www.essexsheriff.com

Sheriff Fontoura stated that Essex County is in the process of updating its 2008 All Hazards Mitigation Plan to ensure eligibility for future mitigation funding from the Federal Emergency Management Agency and identify new mitigation initiatives as a result of Hurricane Sandy. This detailed plan addresses a variety of potential hazards that could affect some or all county's residents.

"Our county staff, municipal representatives and community liaisons collaborated to create this plan and now are working on the required five-year update," said County OEM Coordinator, Sheriff Armando Fontoura. "We're offering our residents the convenience of an online survey and comments section."

The goal of the HMP update is to save lives and property through the reduction of hazard vulnerability for the community. This is accomplished by identification

of projects that can reduce damages from future hazards. The plan includes a risk assessment and a hazard-mitigation strategy. One of the primary hazards in Essex County is flooding, but other potential hazards that were analyzed included geological hazards, drought, severe storms (Hurricanes), severe winter storms (Nor'easters), earthquakes and extreme heat and extreme cold. The study focuses on existing and future buildings, infrastructure and critical facilities that might be impacted.

Communities with an approved HMP may apply for pre-disaster mitigation funding for projects to mitigate risk to both public and private property, such as home elevations and local flood-control measures. Ultimately these projects will reduce vulnerability and enable communities to recover more quickly from disasters.

Additional information will be presented to the public at three regional meetings in the near future. Further information to include dates and locations of these meetings will be forthcoming. If you would like more information about this project, please visit www.essexsheriff.com or contact the Essex County Office of Emergency Management at: 973-324-9750 or essexoem@essexsheriff.com

Stephanie Knox

From: Stephanie Knox
Sent: Tuesday, December 24, 2013 11:34 AM
To: 'joseph.gerace@patch.com'
Subject: NEWS- Hazard Mitigation survey

Stephanie Knox

From: Stephanie Knox

Sent: Tuesday, December 24, 2013 11:29 AM

To: 'porterm@montclairtimes.com'; 'vcgtimes@northjersey.com'; 'lgreenspan@recordernewspapers.com'; 'tribuneeditorial@verizon.net'; 'theitem@northjersey.com'; 'mail@italiantribune.com'; 'thecat@italiantribune.com'

Subject: NEW- Hazard Mitigation Survey

Stephanie Knox

From: Stephanie Knox

Sent: Tuesday, December 24, 2013 11:19 AM

To: 'ZAMBITO, TOM'; 'LEE, EUNICE'; 'paul.milo@patch.com'; 'adamb@patch.com'; 'cycurley@thealternativepress.com'; 'cumming@thealternativepress.com'; 'info@thealternativepress.com'; 'news@brazilianvoice.com'; 'canalbrasilnewsnj@yahoo.com'; 'dlillinj@gmail.com'; 'tips@baristanet.com'

Subject: NEWS- Hazard mitigation survey

February 13, 2014
Newsstand 75¢
Home-Delivered 53¢

Serving our Community Since 1888

The Item of Millburn and Short Hills

Hazard mitigation meeting is scheduled for Feb. 18

The Township of Millburn will host a public meeting regarding the Essex County Hazard Mitigation Plan Update.

The meeting will take place at Town Hall Tuesday, Feb. 18, at 7:30 p.m.

The Hazard Mitigation Plan is an ever-evolving document that communities use to reduce their vulnerability to hazards such as flooding and severe storms. This meeting is intended to inform and engage the public and other local and regional stakeholders in the planning process.

The Essex County Hazard Mitigation Plan website can be found at http://hmp.essexsheriff.com. Residents are invited to visit the website and take the online Citizen Survey.

OFFICE OF THE SHERIFF

ARMANDO B. FONTOURA, SHERIFF

OEM COORDINATOR

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT
560 NORTHFIELD AVENUE
WEST ORANGE, NEW JERSEY 07052
ESSEXOEM@ESSEXSHERIFF.COM
973-324-9750 OFFICE
973-324-9759 FAX

UNDERSHERIFFS
JESUS PADILLA
JAMES W. PITTS
KEVIN J. RYAN

CHIEF
JOHN D. DOUGH

August 14, 2014

Lt. Matthew Tiedemann, Bergen County OEM Coordinator
Bergen County OEM
285 Campgaw Road
Mahwah, NJ 07430-2598

Re: Essex County All Hazards Mitigation Plan

Lieutenant Tiedemann,

Essex County is currently updating our *All Hazards Mitigation Plan* to meet the requirements of the Disaster Mitigation Act of 2000 (DMA 2000). The purpose of this plan is to identify vulnerabilities to a variety of natural and man-made disasters, and to develop plans to help minimize losses if disasters should occur. The intent of the plan is to provide a comprehensive document that takes into account the wide diversity of communities, businesses, and services that are an integral part of Essex County and the region as a whole. In addition to its value as a hazard mitigation plan, the development of this document is also required under the DMA 2000 to ensure eligibility for Federal Mitigation funding.

Due to your proximity to Essex County, the effects of many of these disasters would be similar in your county and your involvement in this process could reap mutual benefits to both counties. By participating in the review of this plan, you will be engaging in the regional coordination of disaster mitigation planning, which is one of the intents of the Mitigation Planning Regulations (*44 CFR 201*).

Presently, our draft plan is now in a public review period prior to submission to FEMA for approval. By means of this letter, Essex County is seeking your participation in this important planning effort. Specifically, we encourage interested neighboring community representatives to become familiar with this process by reviewing and providing input on the draft and final plan documents by visiting http://hmp.essexsheriff.com.

Any questions or comments regarding the plan can be made directly to our Office of Emergency Management by phone at (973) 324-9750 or by email to essexoem@essexsheriff.com.

Sincerely,

Sheriff Armando B. Fontoura
Coordinator, Essex County OEM

ABF/ee

OFFICE OF THE SHERIFF

ARMANDO B. FONTOURA, SHERIFF

OEM COORDINATOR

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT
560 NORTHFIELD AVENUE
WEST ORANGE, NEW JERSEY 07052
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CHIEF
JOHN D. DOUGH

August 14, 2014

Jim Woods, Hudson County OEM Coordinator
Hudson County OEM
595 County Avenue
Building 11
Secaucus, NJ 07094

Re: Essex County All Hazards Mitigation Plan

Coordinator Woods,

Essex County is currently updating our *All Hazards Mitigation Plan* to meet the requirements of the Disaster Mitigation Act of 2000 (DMA 2000). The purpose of this plan is to identify vulnerabilities to a variety of natural and man-made disasters, and to develop plans to help minimize losses if disasters should occur. The intent of the plan is to provide a comprehensive document that takes into account the wide diversity of communities, businesses, and services that are an integral part of Essex County and the region as a whole. In addition to its value as a hazard mitigation plan, the development of this document is also required under the DMA 2000 to ensure eligibility for Federal Mitigation funding.

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Any questions or comments regarding the plan can be made directly to our Office of Emergency Management by phone at (973) 324-9750 or by email to essexoem@essexsheriff.com.

Sincerely,

Sheriff Armando B. Fontoura
Coordinator, Essex County OEM

ABF/ee

OFFICE OF THE SHERIFF

ARMANDO B. FONTOURA, SHERIFF

OEM COORDINATOR

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT
560 NORTHFIELD AVENUE
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CHIEF
JOHN D. DOUGH

August 14, 2014

Director Scott DiGiralomo, Morris County OEM Coordinator
Morris County OEM
500 West Hanover Ave
Parsippany, NJ 07054

Re: Essex County All Hazards Mitigation Plan

Director DiGiralomo,

Essex County is currently updating our *All Hazards Mitigation Plan* to meet the requirements of the Disaster Mitigation Act of 2000 (DMA 2000). The purpose of this plan is to identify vulnerabilities to a variety of natural and man-made disasters, and to develop plans to help minimize losses if disasters should occur. The intent of the plan is to provide a comprehensive document that takes into account the wide diversity of communities, businesses, and services that are an integral part of Essex County and the region as a whole. In addition to its value as a hazard mitigation plan, the development of this document is also required under the DMA 2000 to ensure eligibility for Federal Mitigation funding.

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Any questions or comments regarding the plan can be made directly to our Office of Emergency Management by phone at (973) 324-9750 or by email to essexoem@essexsheriff.com.

Sincerely,

Sheriff Armando B. Fontoura
Coordinator, Essex County OEM

ABF/ee

OFFICE OF THE SHERIFF

ARMANDO B. FONTOURA, SHERIFF

OEM COORDINATOR

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT
560 NORTHFIELD AVENUE
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UNDERSHERIFFS
JESUS PADILLA
JAMES W. PITTS
KEVIN J. RYAN

CHIEF
JOHN D. DOUGH

August 14, 2014

Robert Lyons, Passaic County OEM Coordinator
Passaic County OEM
300 Oldham Road
Wayne, NJ 07470-2209

Re: Essex County All Hazards Mitigation Plan

Coordinator Lyons,

Essex County is currently updating our *All Hazards Mitigation Plan* to meet the requirements of the Disaster Mitigation Act of 2000 (DMA 2000). The purpose of this plan is to identify vulnerabilities to a variety of natural and man-made disasters, and to develop plans to help minimize losses if disasters should occur. The intent of the plan is to provide a comprehensive document that takes into account the wide diversity of communities, businesses, and services that are an integral part of Essex County and the region as a whole. In addition to its value as a hazard mitigation plan, the development of this document is also required under the DMA 2000 to ensure eligibility for Federal Mitigation funding.

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Any questions or comments regarding the plan can be made directly to our Office of Emergency Management by phone at (973) 324-9750 or by email to essexoem@essexsheriff.com.

Sincerely,

Sheriff Armando B. Fontoura
Coordinator, Essex County OEM

ABF/ee

OFFICE OF THE SHERIFF

ARMANDO B. FONTOURA, SHERIFF

OEM COORDINATOR

ESSEX COUNTY OFFICE OF EMERGENCY MANAGEMENT
560 NORTHFIELD AVENUE
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CHIEF
JOHN D. DOUGH

August 14, 2014

Director Chris Scaturo, Union County OEM Coordinator
Union County OEM
300 North Avenue East
Westfield, NJ 07090

Re: Essex County All Hazards Mitigation Plan

Director Scaturo,

Essex County is currently updating our *All Hazards Mitigation Plan* to meet the requirements of the Disaster Mitigation Act of 2000 (DMA 2000). The purpose of this plan is to identify vulnerabilities to a variety of natural and man-made disasters, and to develop plans to help minimize losses if disasters should occur. The intent of the plan is to provide a comprehensive document that takes into account the wide diversity of communities, businesses, and services that are an integral part of Essex County and the region as a whole. In addition to its value as a hazard mitigation plan, the development of this document is also required under the DMA 2000 to ensure eligibility for Federal Mitigation funding.

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Any questions or comments regarding the plan can be made directly to our Office of Emergency Management by phone at (973) 324-9750 or by email to essexoem@essexsheriff.com.

Sincerely,

Sheriff Armando B. Fontoura
Coordinator, Essex County OEM

ABF/ee

Essex County Hazard Mitigation Plan - Citizens Survey

Exit this survey

1. Essex County Hazard Mitigation - Citizen Survey

25%

CITIZEN PREPAREDNESS QUESTIONNAIRE

Essex County has assembled a team to update our hazard mitigation plan which addresses hazards that may occur in each of our 22 municipalities. We request you to help us identify and plan for future disasters by completing this survey.

This questionnaire is designed to gather information from around the County to help us better coordinate activities and reduce the risk of injury or property damage. This information will be shared with municipal, state, federal and County entities for planning purposes only.

These questions are for information gathering only and do not necessarily reflect any intent or future priorities of any governing body.

You will be asked if your home is located in a floodplain. If you do not know, or are not sure, please check the following website: http:\\www.floodsmart.gov

The "One Step Flood Risk Profile" will help you compare your location to the mapped floodplains. You can also view paper copies of the NFIP Flood Insurance Rate Maps at your Municipal Hall.

This survey consists of 23 questions and will take approximately 12-15 minutes to complete.

We would like to thank you in advance for your cooperation and participation.

Essex County Hazard Mitigation Planning Team

Next

Essex County Hazard Mitigation Plan - Citizens Survey

Exit this survey

2. General Household Information

50%

The answers provided in this section will be treated as CONFIDENTIAL and will be used solely for the preparation of this plan.

1. Please indicate your age range:

- 18 to 30
- 31 to 40
- 41 to 50
- 51 to 60
- 60 or over

2. Please indicate in which municipality you live:

- Belleville
- Bloomfield
- Caldwell
- Cedar Grove
- East Orange
- Essex Fells
- Fairfield
- Glen Ridge
- Irvington
- Livingston
- Maplewood
- Millburn
- Montclair
- Newark
- North Caldwell
- Nutley
- Orange
- Roseland
- South Orange Village
- Verona
- West Caldwell
- West Orange

3. How long have you lived here?

- Less than 1 year
- 1 to 5 years
- 6 to 9 years
- 10 to 19 years
- 20 years or more

4. Do you own or rent your place of residence?

- Own
- Rent

5. What is your zip code?

6. What is your home address? (optional, will be kept confidential - only used to identify localized hazard areas such as flooding)

Prev Next

Essex County Hazard Mitigation Plan - Citizens Survey

Exit this survey

3. Natural Hazard Information

75%

7. Rank how prepared you feel you and your household are for natural disaster events likely to occur within your municipality. Rank on a scale of 1 to 5, with 5 representing the most prepared.

- 1 (least)
- 2
- 3
- 4
- 5 (Most)

8. In what ways do you believe you are prepared for a natural disaster that may occur within your municipality? (Please check all that apply)

- I have taken precautionary measures to protect my property through retrofits or when constructed
- I have a preparedness kit consisting of basic supplies and materials for my family and myself
- I have identified the location of the nearest severe weather shelter
- I have a personal family emergency preparedness plan, and have discussed it with my family and others for whom I have responsibility
- I have at least two methods for receiving emergency notifications and for information during severe weather or other potential emergency situations
- I have insurance policies to cover losses from specific risks (e.g. flood insurance)
- I have received emergency preparedness information from a government source (e.g., federal, state, or local emergency management)
- I have used local news or other media to obtain information
- I have received information from schools and other academic institutions
- I have attended meetings that have dealt with disaster preparedness
- Other (please specify)

9. In the past 10 years, which of the following types of natural disasters have you or someone in your household experienced, or sustained damage as a result of, and how concerned are you about the following natural hazards impacting the area, within Essex County? (In the first column indicate if you have experienced the hazard, then indicate your level of concern).

	Have Experienced	Not Concerned	Somewhat Concerned	Very Concerned	Extremely Concerned
Coastal Erosion					

Essex County Hazard Mitigation Plan - Citizens Survey

Exit this survey

4. Natural Hazard Mitigation

100%

The term mitigation in this respect means to prevent future property damage. Mitigation activities are those types of actions you can take to protect your home and property from natural hazard events such as floods, severe storms and wildfires. Essex County and its municipalities are in the process of updating the county-wide Hazard Mitigation Plan. This process is designed to aid our county and municipalities in protecting life and property from the impacts of future natural disasters.

16. Did you consider the impact a natural disaster could have on your home before you purchased/moved into your home?

- Yes
- No

17. Was the presence of a natural hazard risk zone (for example, flood zone) disclosed to you by a real estate agent, seller, or landlord before you purchased/moved into your home?

- Yes
- No
- Not Applicable

18. Would the disclosure of this type of information influence your decision to purchase/move into a home?

- Yes
- No
- Not sure

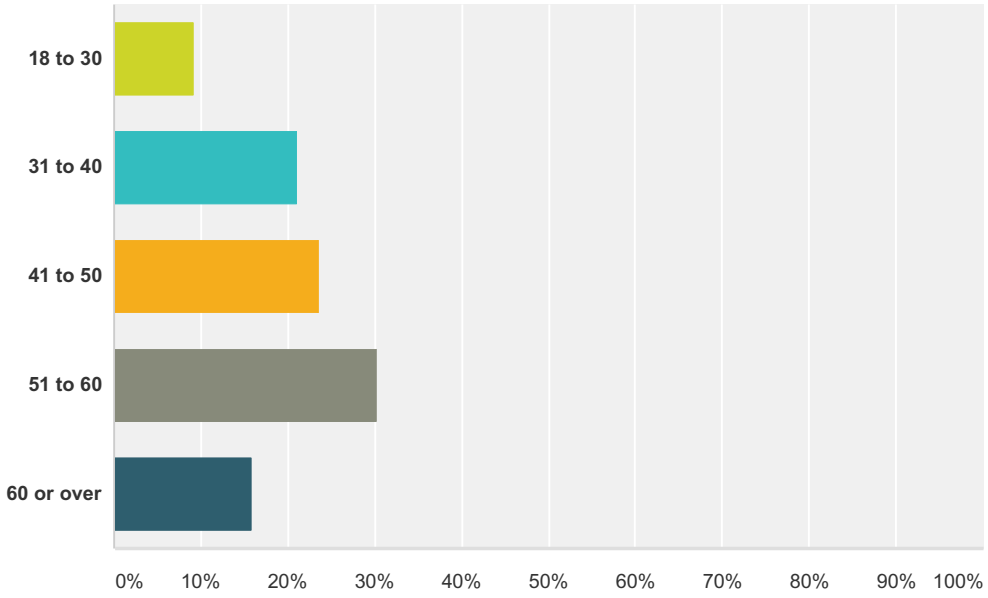
19. How much money would you be willing to spend on your current home to help protect it from the impacts of potential future natural disasters within our community? Examples are: Elevating a flood-prone home; elevating utilities in flood-prone basements; strengthening your roof, siding, doors or windows to withstand high winds; removing threatening trees or branches.

- Over $10,000
- Between $5,000 and $9,999
- Between $1,000 and $4,999
- Less than $1,000
- Nothing
- Don't know

20. Which, if any incentives would motivate you to spend money on protecting your home from the possible impacts of a natural disaster? (such as lower interest rates, grant funding, waivers, etc.)

Q1 Please indicate your age range:

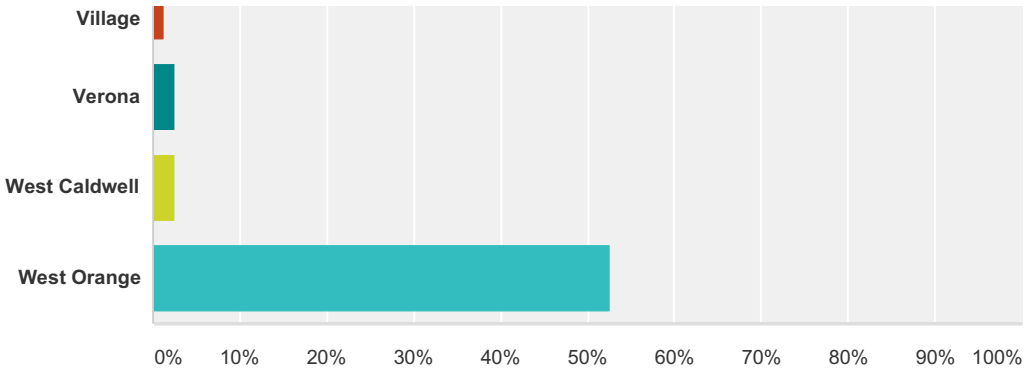
Answered: 76 Skipped: 3



Answer Choices	Responses	
18 to 30	**9.21%**	7
31 to 40	**21.05%**	16
41 to 50	**23.68%**	18
51 to 60	**30.26%**	23
60 or over	**15.79%**	12
Total		**76**

Q2 Please indicate in which municipality you live:

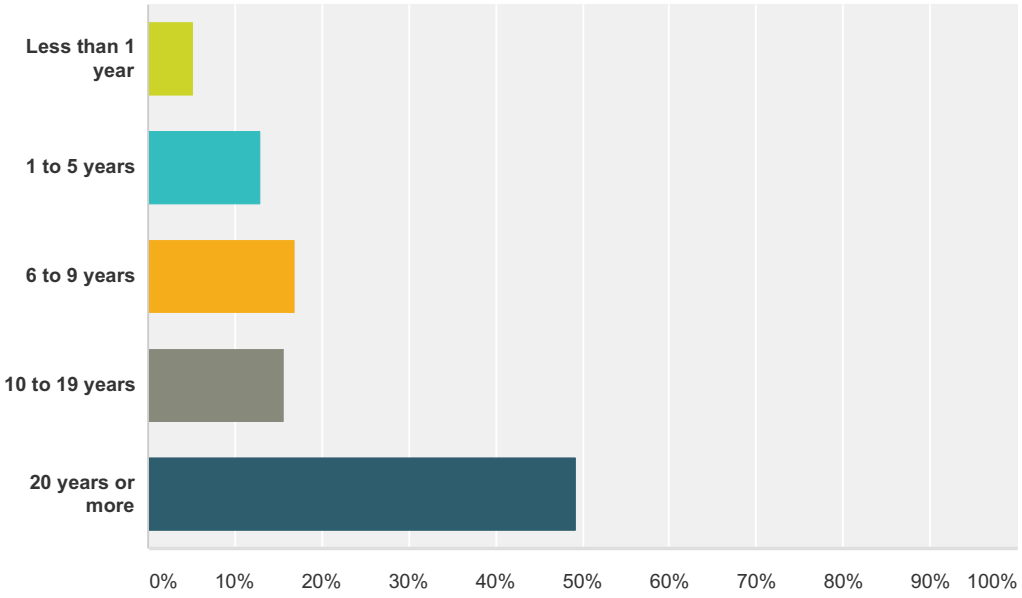
Answered: 78 Skipped: 1



Answer Choices	Responses	
Belleville	**0.00%**	0
Bloomfield	**14.10%**	11
Caldwell	**2.56%**	2
Cedar Grove	**2.56%**	2
East Orange	**0.00%**	0
Essex Fells	**0.00%**	0
Fairfield	**0.00%**	0
Glen Ridge	**0.00%**	0
Irvington	**0.00%**	0
Livingston	**1.28%**	1
Maplewood	**6.41%**	5
Millburn	**1.28%**	1
Montclair	**2.56%**	2
Newark	**5.13%**	4
North Caldwell	**1.28%**	1
Nutley	**3.85%**	3
Orange	**0.00%**	0
Roseland	**0.00%**	0
South Orange Village	**1.28%**	1
Verona	**2.56%**	2
West Caldwell	**2.56%**	2
West Orange	**52.56%**	41
Total		**78**

Q3 How long have you lived here?

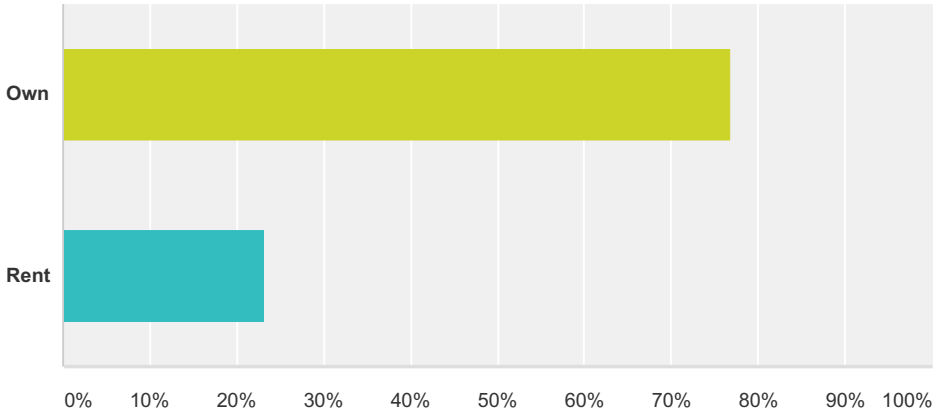
Answered: 77 Skipped: 2



Answer Choices	Responses	
Less than 1 year	**5.19%**	4
1 to 5 years	**12.99%**	10
6 to 9 years	**16.88%**	13
10 to 19 years	**15.58%**	12
20 years or more	**49.35%**	38
Total		**77**

Q4 Do you own or rent your place of residence?

Answered: 78 Skipped: 1



Answer Choices	Responses	
Own	**76.92%**	60
Rent	**23.08%**	18
Total		**78**

Q5 What is your zip code?

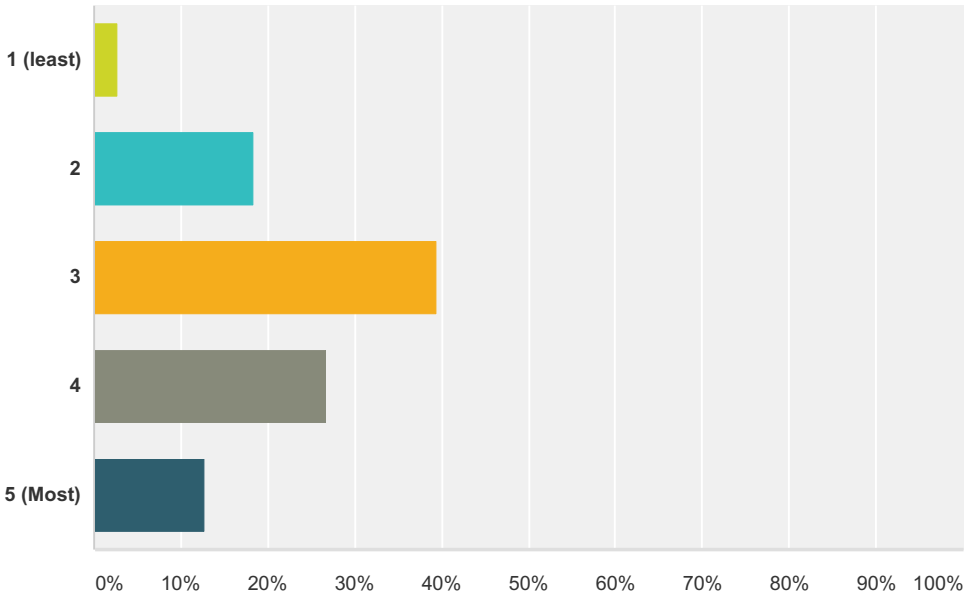
Answered: 78 Skipped: 1

Q6 What is your home address? (optional, will be kept confidential - only used to identify localized hazard areas such as flooding)

Answered: 38 Skipped: 41

Q7 Rank how prepared you feel you and your household are for natural disaster events likely to occur within your municipality. Rank on a scale of 1 to 5, with 5 representing the most prepared.

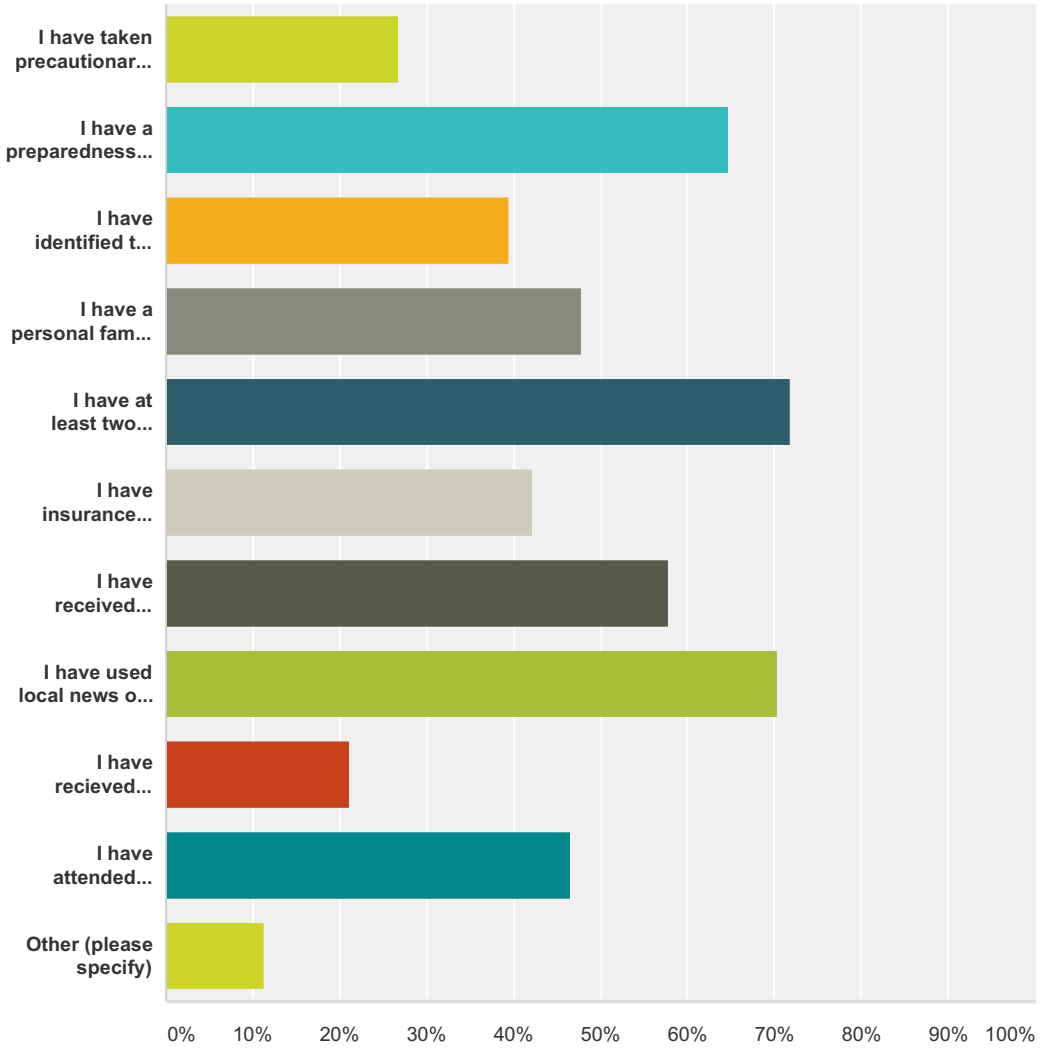
Answered: 71 Skipped: 8



Answer Choices	Responses	
1 (least)	**2.82%**	2
2	**18.31%**	13
3	**39.44%**	28
4	**26.76%**	19
5 (Most)	**12.68%**	9
Total		**71**

Q8 In what ways do you believe you are prepared for a natural disaster that may occur within your municipality? (Please check all that apply)

Answered: 71 Skipped: 8

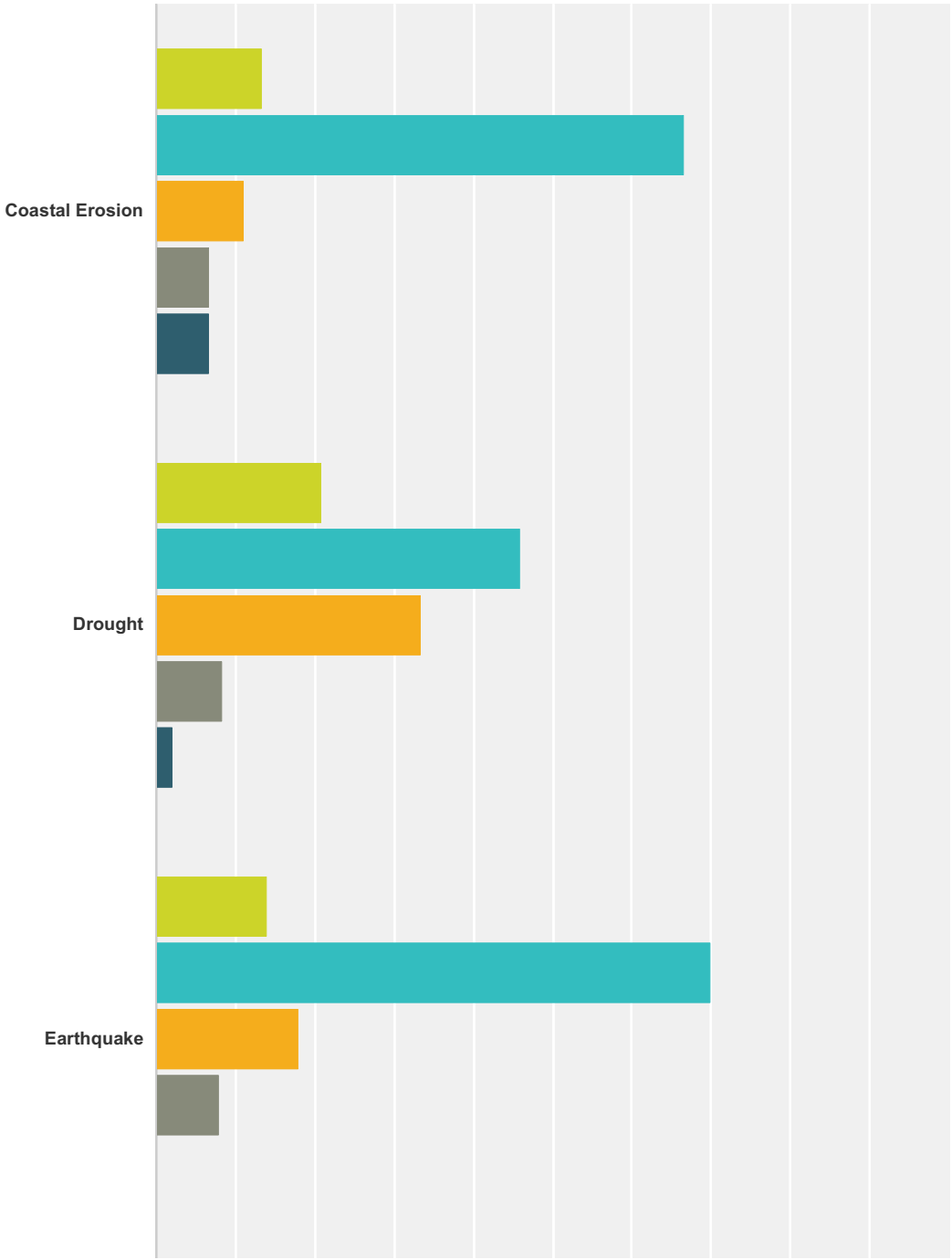


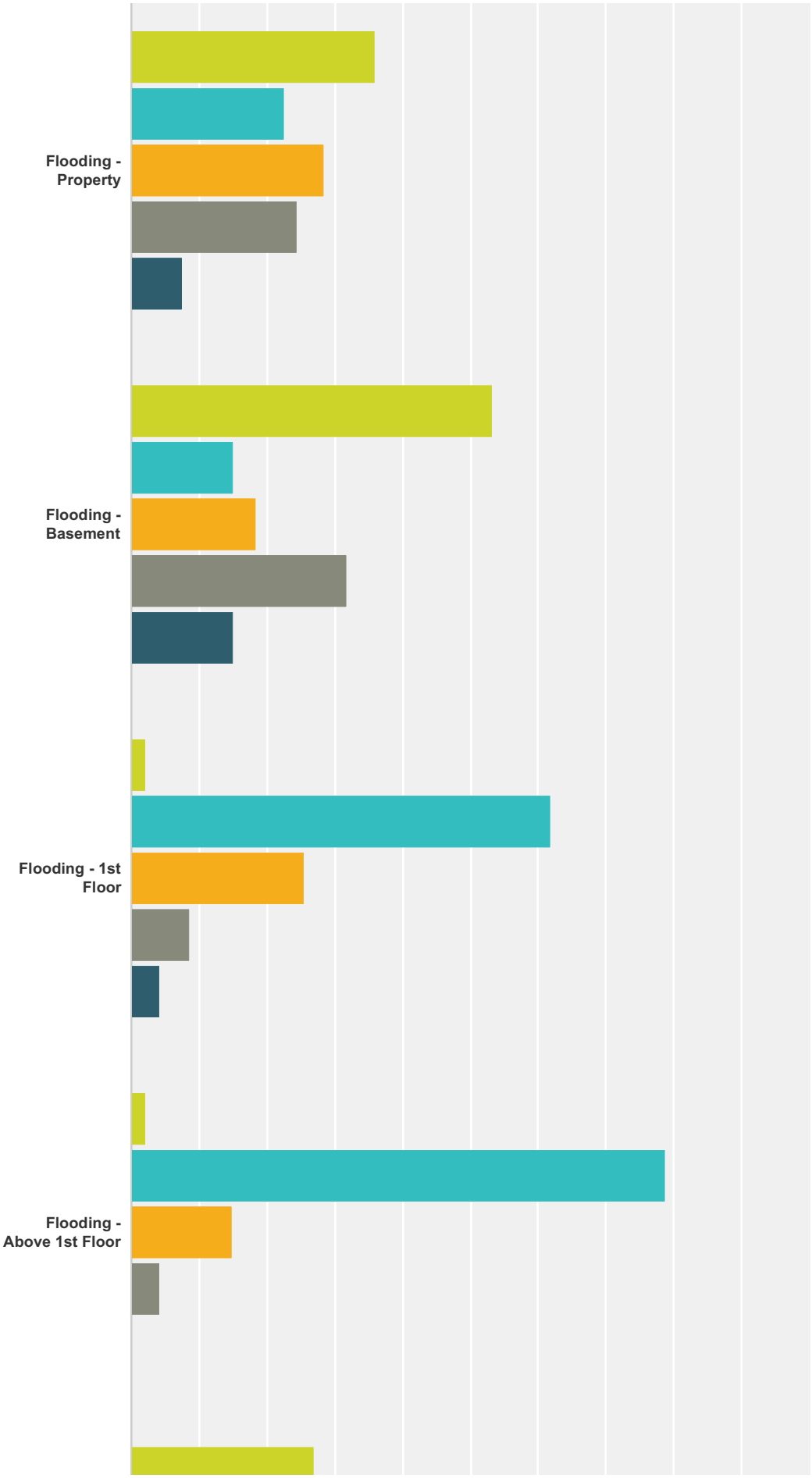
Answer Choices	Responses	
I have taken precautionary measures to protect my property though retrofits or when constructed	**26.76%**	19
I have a preparedness kit consisting of basic supplies and materials for my family and myself	**64.79%**	46
I have identified the location of the nearest severe weather shelter	**39.44%**	28
I have a personal family emergency preparedness plan, and have discussed it with my family and others for whom I have responsibility	**47.89%**	34
I have at least two methods for receiving emergency notifications and for information during severe weather or other potential emergency situations	**71.83%**	51
I have insurance policies to cover losses from specific risks (e.g. flood insurance)	**42.25%**	30

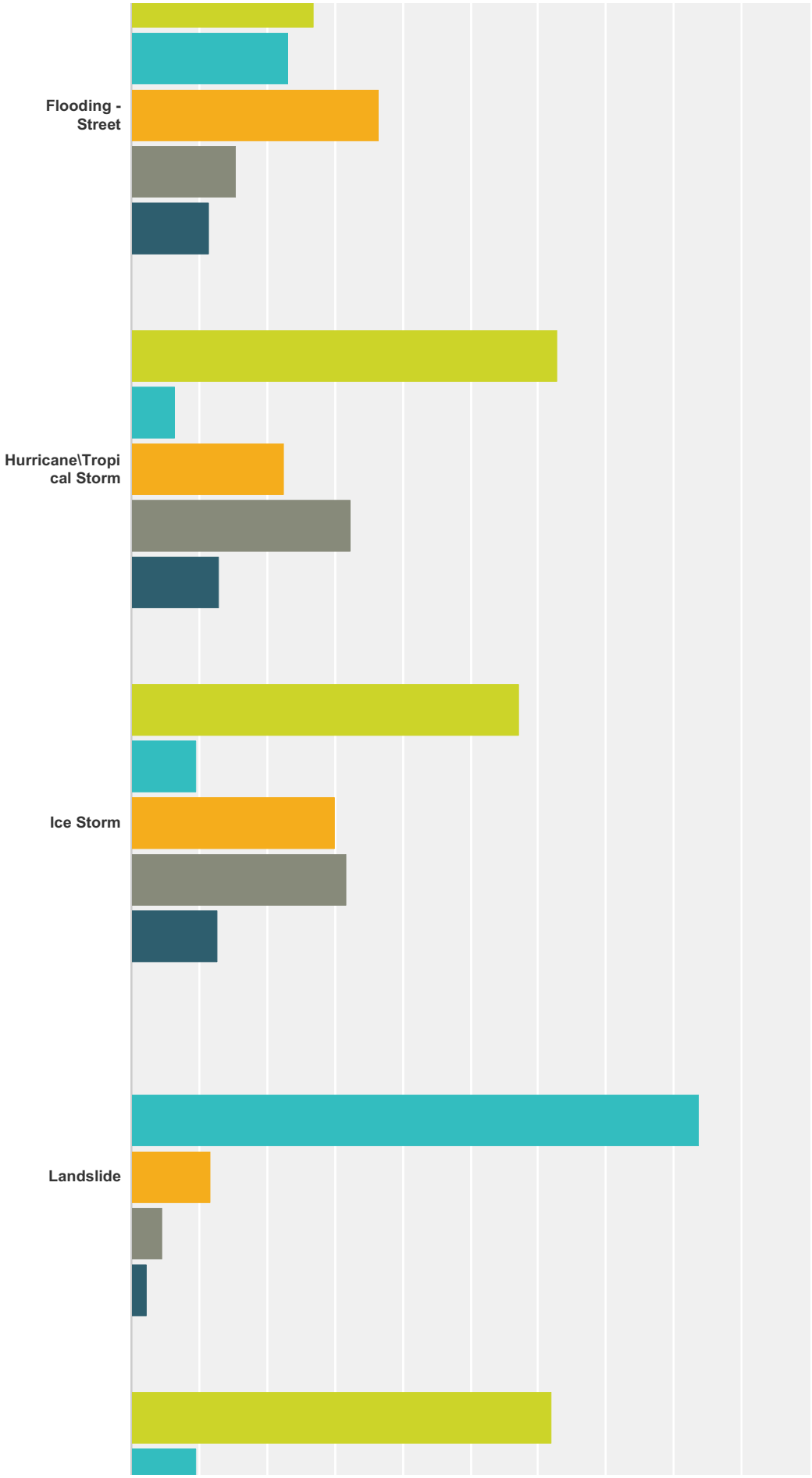
I have received emergency preparedness information from a government source (e.g., federal, state, or local emergency management)	**57.75%**	41
I have used local news or other media to obtain information	**70.42%**	50
I have recieved information from schools and other academic institutions	**21.13%**	15
I have attended meetings that have dealt with disaster preparedness	**46.48%**	33
Other (please specify)	**11.27%**	8
Total Respondents: 71		

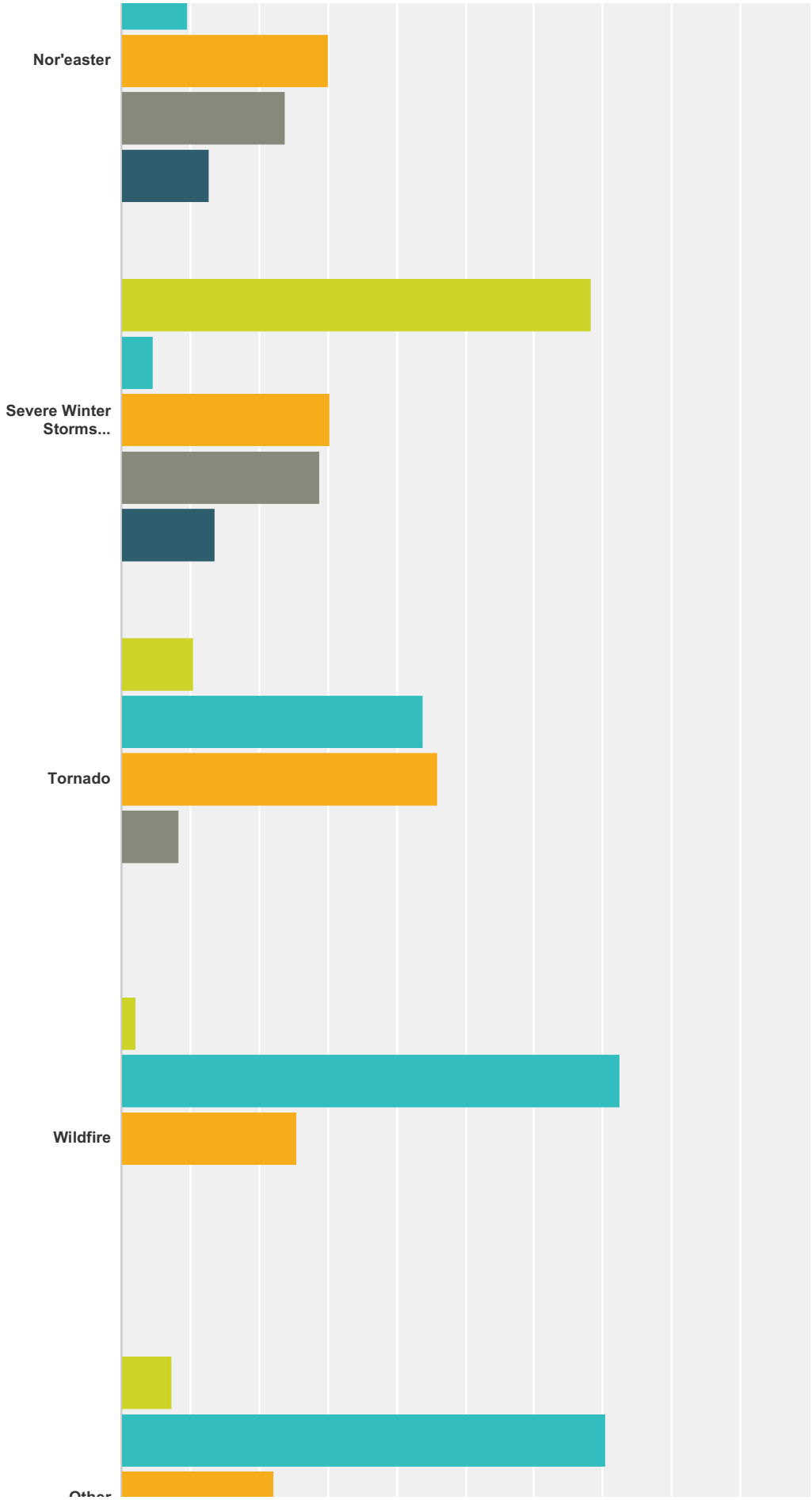
Q9 In the past 10 years, which of the following types of natural disasters have you or someone in your household experienced, or sustained damage as a result of, and how concerned are you about the following natural hazards impacting the area, within Essex County? (In the first column indicate if you have experienced the hazard, then indicate your level of concern).

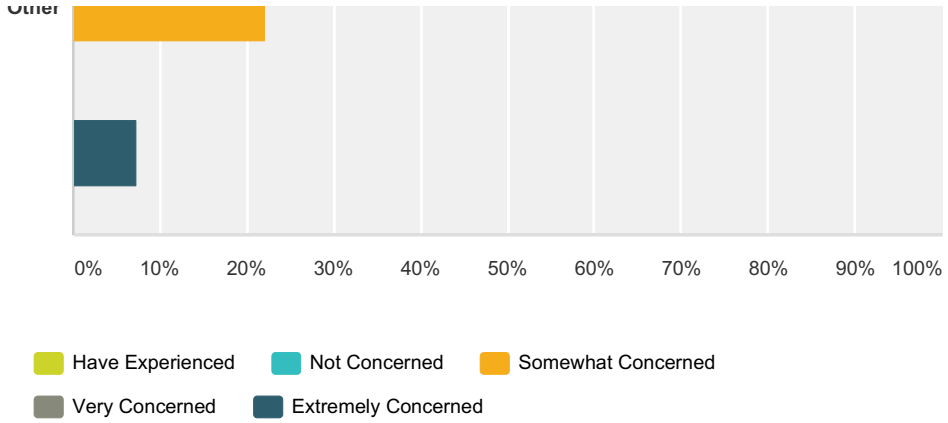
Answered: 71 Skipped: 8




Flooding - Property
Flooding - Basement
Flooding - 1st Floor
Flooding - Above 1st Floor


Flooding - Street
Hurricane\Tropical Storm
Ice Storm
Landslide

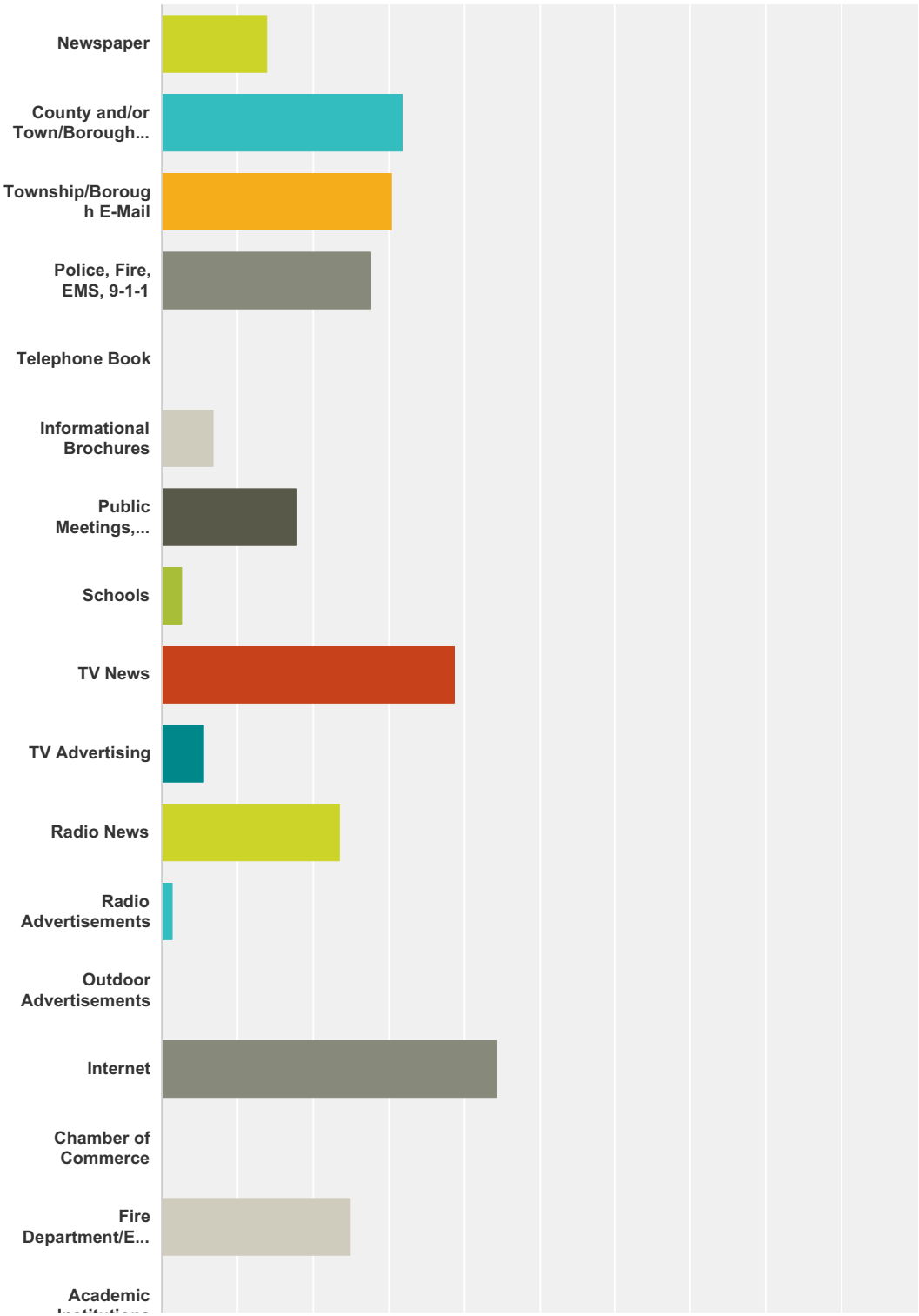

Nor'easter
Severe Winter Storms...
Tornado
Wildfire
Other

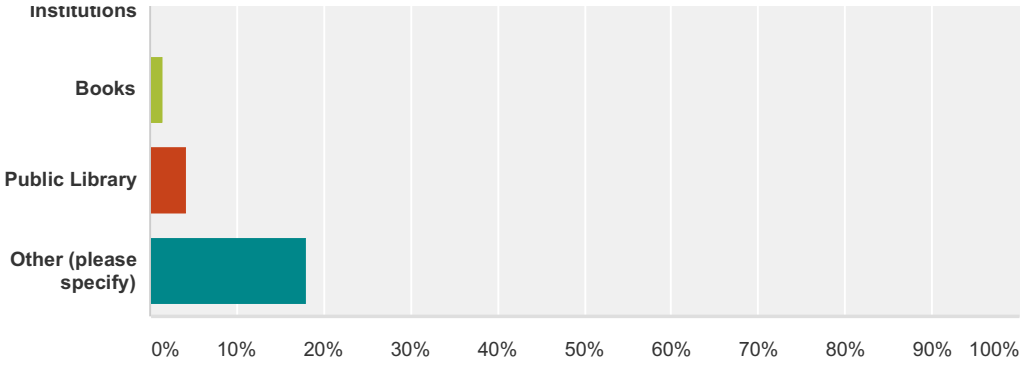


	Have Experienced	Not Concerned	Somewhat Concerned	Very Concerned	Extremely Concerned	Total Respondents
Coastal Erosion	**13.33%** 6	**66.67%** 30	**11.11%** 5	**6.67%** 3	**6.67%** 3	45
Drought	**20.83%** 10	**45.83%** 22	**33.33%** 16	**8.33%** 4	**2.08%** 1	48
Earthquake	**14.00%** 7	**70.00%** 35	**18.00%** 9	**8.00%** 4	**0.00%** 0	50
Flooding - Property	**35.85%** 19	**22.64%** 12	**28.30%** 15	**24.53%** 13	**7.55%** 4	53
Flooding - Basement	**53.33%** 32	**15.00%** 9	**18.33%** 11	**31.67%** 19	**15.00%** 9	60
Flooding - 1st Floor	**2.13%** 1	**61.70%** 29	**25.53%** 12	**8.51%** 4	**4.26%** 2	47
Flooding - Above 1st Floor	**2.13%** 1	**78.72%** 37	**14.89%** 7	**4.26%** 2	**0.00%** 0	47
Flooding - Street	**26.92%** 14	**23.08%** 12	**36.54%** 19	**15.38%** 8	**11.54%** 6	52
Hurricane\Tropical Storm	**62.90%** 39	**6.45%** 4	**22.58%** 14	**32.26%** 20	**12.90%** 8	62
Ice Storm	**57.14%** 36	**9.52%** 6	**30.16%** 19	**31.75%** 20	**12.70%** 8	63
Landslide	**0.00%** 0	**83.72%** 36	**11.63%** 5	**4.65%** 2	**2.33%** 1	43
Nor'easter	**61.90%** 39	**9.52%** 6	**30.16%** 19	**23.81%** 15	**12.70%** 8	63
Severe Winter Storms (Blizzard, Heavy Snow, Ice)	**68.18%** 45	**4.55%** 3	**30.30%** 20	**28.79%** 19	**13.64%** 9	66
Tornado	**10.42%** 5	**43.75%** 21	**45.83%** 22	**8.33%** 4	**0.00%** 0	48
Wildfire	**2.13%** 1	**72.34%** 34	**25.53%** 12	**0.00%** 0	**0.00%** 0	47
Other	**7.41%** 2	**70.37%** 19	**22.22%** 6	**0.00%** 0	**7.41%** 2	27

Q10 Of the information sources below, please identify the top three (3) that are MOST EFFECTIVE in providing you with information to make your home safer and better able to withstand the impact of natural disaster events.

Answered: 72 Skipped: 7

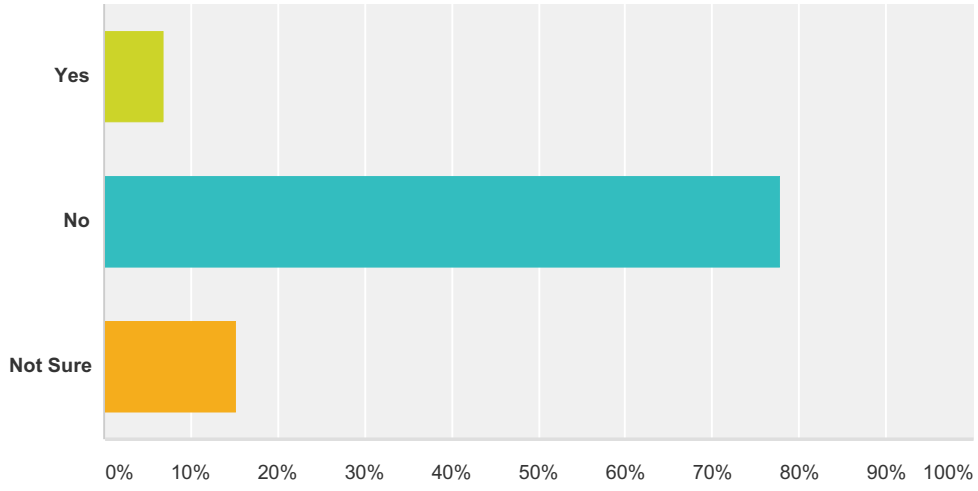




Answer Choices	Responses	
Newspaper	**13.89%**	10
County and/or Town/Borough Websites	**31.94%**	23
Township/Borough E-Mail	**30.56%**	22
Police, Fire, EMS, 9-1-1	**27.78%**	20
Telephone Book	**0.00%**	0
Informational Brochures	**6.94%**	5
Public Meetings, Workshops, or Public Awareness Events	**18.06%**	13
Schools	**2.78%**	2
TV News	**38.89%**	28
TV Advertising	**5.56%**	4
Radio News	**23.61%**	17
Radio Advertisements	**1.39%**	1
Outdoor Advertisements	**0.00%**	0
Internet	**44.44%**	32
Chamber of Commerce	**0.00%**	0
Fire Department/EMS Agency	**25.00%**	18
Academic Institutions	**0.00%**	0
Books	**1.39%**	1
Public Library	**4.17%**	3
Other (please specify)	**18.06%**	13
Total Respondents: 72		

Q11 To the best of your knowledge is your property located in a designated floodplain?

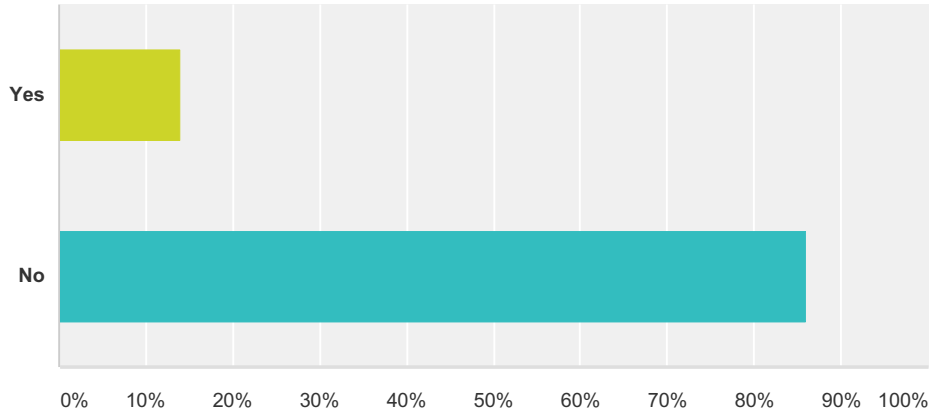
Answered: 72 Skipped: 7



Answer Choices	Responses	
Yes	**6.94%**	5
No	**77.78%**	56
Not Sure	**15.28%**	11
Total		**72**

Q12 Do you have flood insurance?

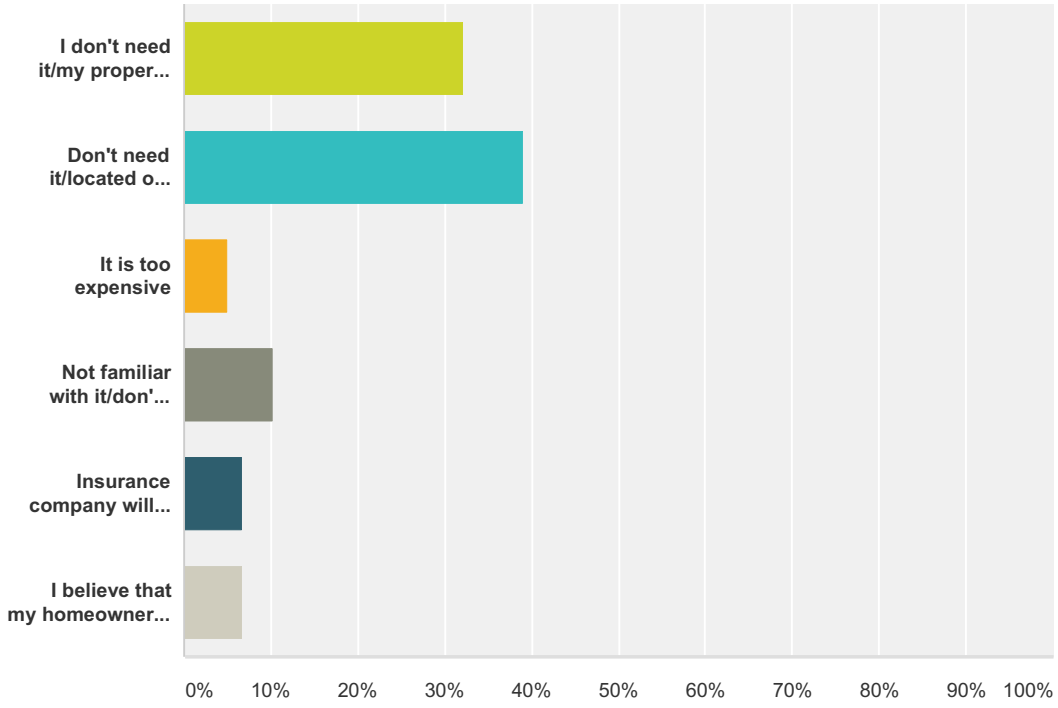
Answered: 71 Skipped: 8



Answer Choices	Responses	
Yes	**14.08%**	10
No	**85.92%**	61
Total		**71**

Q13 If you do NOT have flood insurance, what is the primary reason?

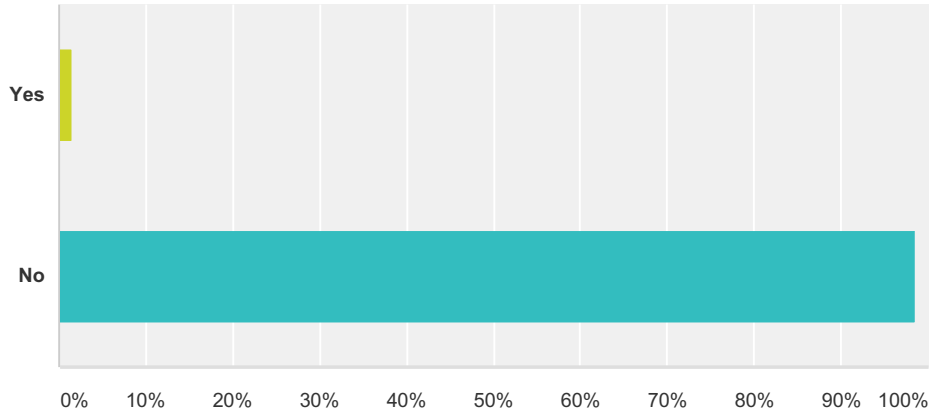
Answered: 59 Skipped: 20



Answer Choices	Responses	
I don't need it/my property has never flooded	**32.20%**	19
Don't need it/located on high ground	**38.98%**	23
It is too expensive	**5.08%**	3
Not familiar with it/don't know about it	**10.17%**	6
Insurance company will not provide	**6.78%**	4
I believe that my homeowners insurance will cover me	**6.78%**	4
Total		**59**

Q14 Do you or did you have problems getting homeowners/renters insurance due to risks from natural hazards?

Answered: 72 Skipped: 7



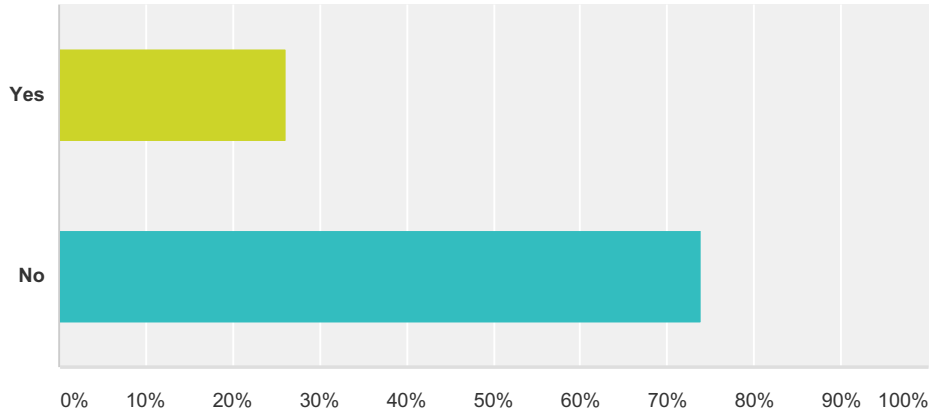
Answer Choices	Responses	
Yes	**1.39%**	1
No	**98.61%**	71
Total		**72**

Q15 If you answered "yes" to the previous question, please identify the natural hazard risk that caused you to have problems obtaining homeowners/renters insurance.

Answered: 0 Skipped: 79

Q16 Did you consider the impact a natural disaster could have on your home before you purchased/moved into your home?

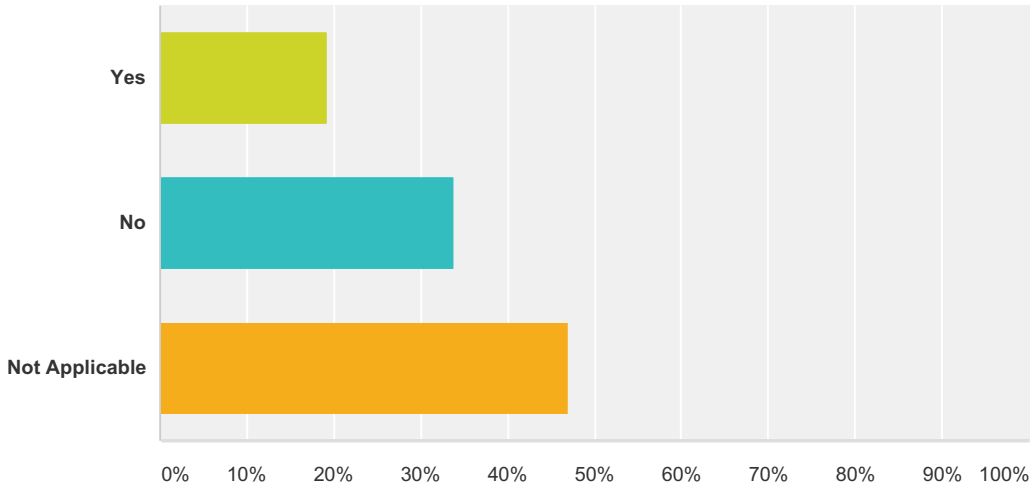
Answered: 69 Skipped: 10



Answer Choices	Responses	
Yes	**26.09%**	18
No	**73.91%**	51
Total		**69**

Q17 Was the presence of a natural hazard risk zone (for example, flood zone) disclosed to you by a real estate agent, seller, or landlord before you purchased/moved into your home?

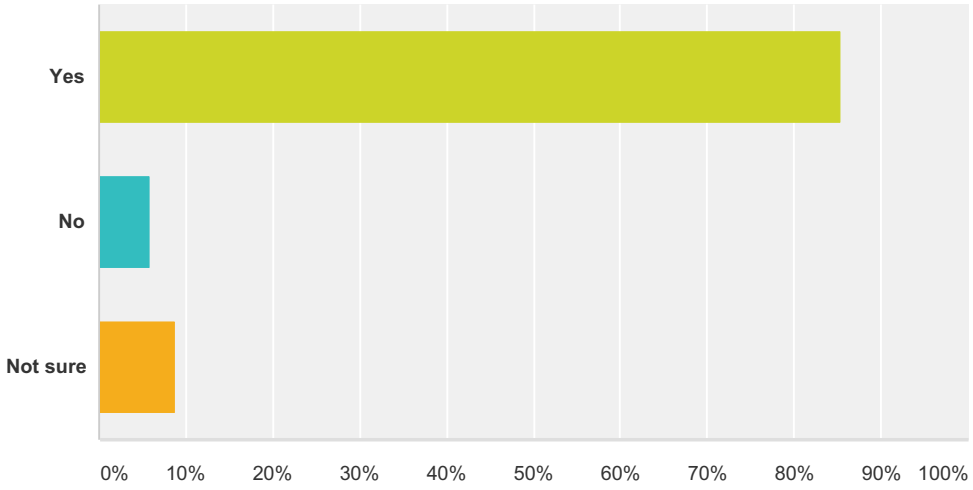
Answered: 68 Skipped: 11



Answer Choices	Responses	
Yes	**19.12%**	13
No	**33.82%**	23
Not Applicable	**47.06%**	32
Total		**68**

Q18 Would the disclosure of this type of information influence your decision to purchase/move into a home?

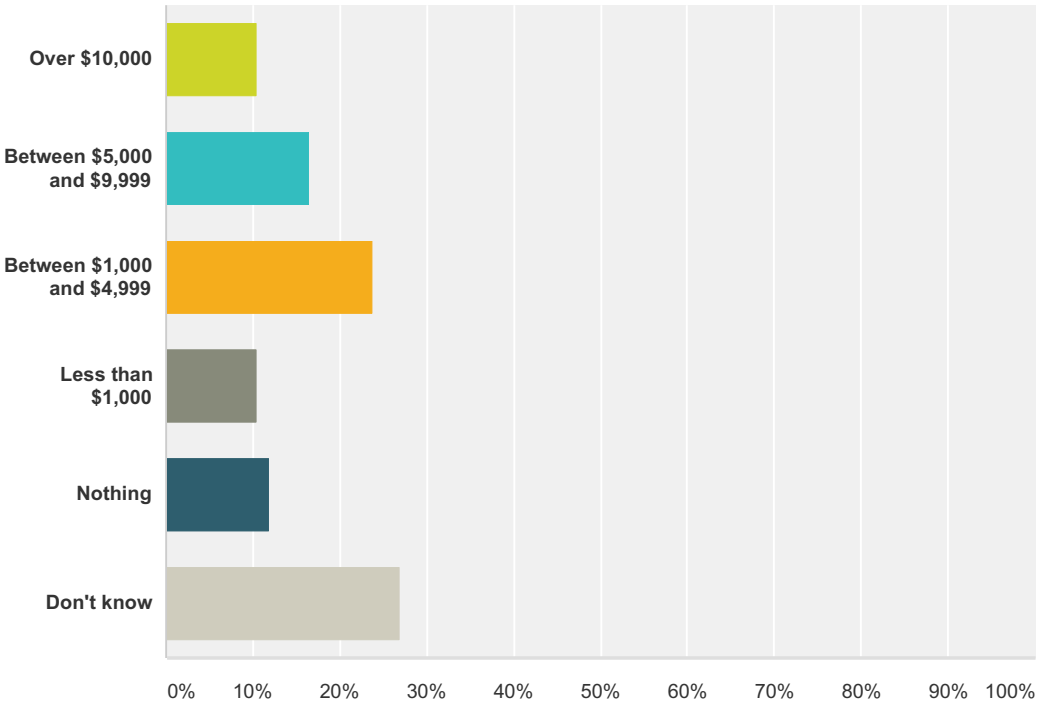
Answered: 68 Skipped: 11



Answer Choices	Responses	
Yes	**85.29%**	58
No	**5.88%**	4
Not sure	**8.82%**	6
Total		**68**

Q19 How much money would you be willing to spend on your current home to help protect it from the impacts of potential future natural disasters within our community? Examples are: Elevating a flood-prone home; elevating utilities in flood-prone basements; strengthening your roof, siding, doors or windows to withstand high winds; removing threatening trees or branches.

Answered: 67 Skipped: 12



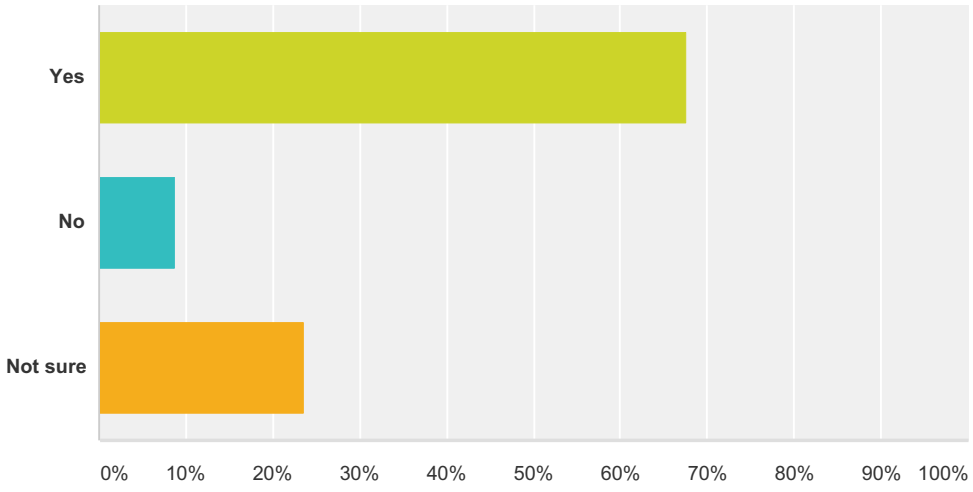
Answer Choices	Responses	
Over $10,000	**10.45%**	7
Between $5,000 and $9,999	**16.42%**	11
Between $1,000 and $4,999	**23.88%**	16
Less than $1,000	**10.45%**	7
Nothing	**11.94%**	8
Don't know	**26.87%**	18
Total		**67**

Q20 Which, if any incentives would motivate you to spend money on protecting your home from the possible impacts of a natural disaster? (such as lower interest rates, grant funding, waivers, etc.)

Answered: 36 Skipped: 43

Q21 If your property were located in a designated "high hazard" area, or had received repeated damages from a natural disaster event, would you consider a "buyout", "elevation" of the structure, or "relocation"?This is for research purposes only. This is not a guarantee of any formal offer or intent of any future offer by any entity of any municipal, county, state or federal government.

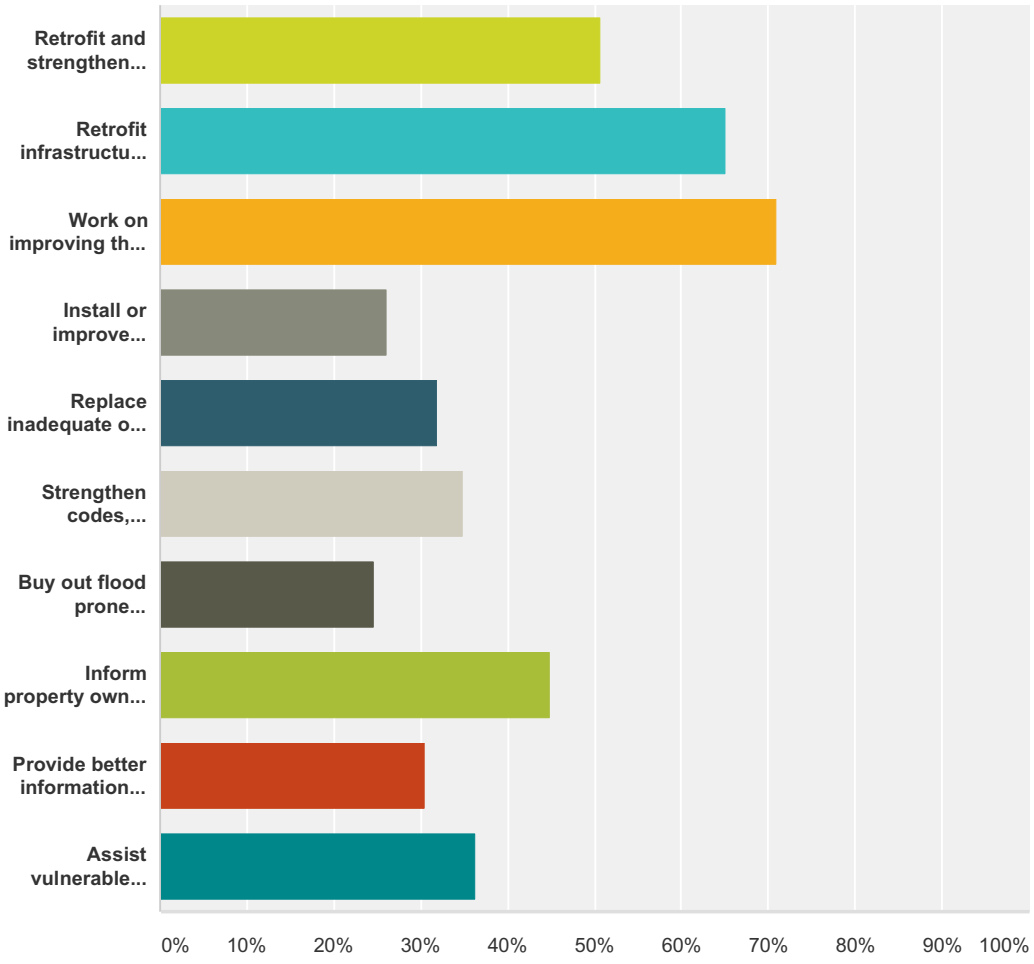
Answered: 68 Skipped: 11



Answer Choices	Responses	
Yes	**67.65%**	46
No	**8.82%**	6
Not sure	**23.53%**	16
Total		**68**

Q22 What types of projects do you believe local, county, state or federal government agencies could be doing in order to reduce the damage and disruption of natural disasters in Essex County? Select your top three choices

Answered: 69 Skipped: 10



Answer Choices	Responses
Retrofit and strengthen essential facilities such as police, schools, hospitals	**50.72%** 35
Retrofit infrastructure, such as elevating roadways and improving drainage systems	**65.22%** 45
Work on improving the damage resistance of utilities (electricity, communications, water/wstewater facilities etc.)	**71.01%** 49
Install or improve protective structures, such as floodwalls or levees	**26.09%** 18
Replace inadequate or vulnerable bridges and causeways	**31.88%** 22
Strengthen codes, ordinances and plans to require higher hazard risk management standards and/or provide greater control over development in high hazard areas	**34.78%** 24

Buy out flood prone properties and maintain as open-space	**24.64%**	17
Inform property owners of ways they can mitigate damage to their properties	**44.93%**	31
Provide better information about hazard risks and high-hazard areas	**30.43%**	21
Assist vulnerable property owners with securing funding to mitigate their properties	**36.23%**	25
Total Respondents: 69		

Q23 Please list any additional types of projects you believe local, county, state or federal government agencies could be doing in order to reduce the damage and disruption of natural disasters in Essex County?

Answered: 15 Skipped: 64

Q24 For additional information about the Essex County Hazard Mitigation Plan Update, please visit:http://www.essexsheriff.com/Other Comments:

Answered: 2 Skipped: 77

#1

COMPLETE

Collector: Web Link (Web Link)
Started: Thursday, August 21, 2014 8:35:30 AM
Last Modified: Thursday, August 21, 2014 8:46:51 AM
Time Spent: 00:11:21
IP Address: 70.39.231.164

PAGE 1

Q1: **I wish to comment on:**	Section 9.23 - West Orange
Q2: **Page Number(s):**	22

Q3: **My Comment:**

The all hazard map on page 22 identifies a 500 year/0.2% flooding hazard. My property is located at 62 Maple Avenue and the area defined represents a drainage culvert behind my property. The new house at 3 Ash avenue has filled in that culvert behind their home and replaced with a 18" black plastic pipe. I do not think that the culvert or the filling in of said culvert has enough capacity to handle even a heavy rain storm. We have basement flooding all along that section. I would like to see this area at least be inspected as I have lived there for over 10 years and it has never been inspected or cleared. I would say maintenance is required.

Q4: **My Name is:**	Jay Mahar
Q5: **My Organization Is (use "General Public" if not associated with a specific organization):**	General Public
Q6: **My Email Address is:**	jmmahar@gmail.com

#2

COMPLETE

Collector: Web Link (Web Link)
Started: Tuesday, September 23, 2014 1:32:33 PM
Last Modified: Tuesday, September 23, 2014 1:34:26 PM
Time Spent: 00:01:53
IP Address: 24.187.16.178

PAGE 1

Q1: **I wish to comment on:**	Entire Plan
Q2: **Page Number(s):**	*Respondent skipped this question*

Q3: **My Comment:**

Section 5.4.6, Coastal Increased Inundation Areas
• For the Hazard Mitigation Plan (HMP), each municipality should be required to include an assessment of their town's vulnerability based on each level of sea level rise and storm surge data projected for the next 50 years. This would allow for smart long-term planning and reduce the amount of spending on projects that may meet current standards but will quickly be put at risk again due to rising sea levels and higher protection standards. There is no point in spending money repairing something to current standards if we have good reason to know that that will not be enough to protect it ten years from now. The money would be spent more efficiently by protecting structures to the highest extent the first time around.

o In Section 9.1 under the Essex County Strategic Recovery Planning Report (SRPR) it states that "The spatial analysis conducted for the Hazard Mitigation Plan appears in the SRPR for the flood, storm surge, and sea level rise hazards." However, I did not see sea level rise or storm surge data on any of the maps for individual municipalities, nor did I see it specifically referred to except that it posed a general hazard. Additionally, there was no indication of which sea level rise reference tool is or should be used. By recommending a specific reference tool it will provide a standard for consistency.
Section 9.1, Essex County
• Page 7- Under Land Use Planning it states that the Planning Department supports integration of natural hazard risk into planning programs. We fully support this initiative as it promotes the follow through of mitigation actions listed in the plan. We think that this initiative should be strengthened by appointing someone to create and hold training sessions for local officials and planning board members. This will give them the knowledge needed to integrate hazard risk into daily planning and activities.
• In the HMP the following towns outright stated that their floodplain administrators did not feel that they were qualified or had enough training to fulfill their responsibilities:
o Belleville
o Livingston
o Maplewood
o Millburn
o Montclair
o Newark
o Roseland
o West Caldwell
o West Orange
o In addition, Glen Ridge, Nutley, and Verona indicated that they feel qualified but would also appreciate additional training.
The following statement was made "The major barrier to running a more effective floodplain management

program in X Township is a lack of training. More in-depth training and exposure to floodplain management implementation would help the program greatly and be welcomed." With such a large need voiced across multiple municipalities, it becomes the county's responsibility to provide such training.

Recommendation: In the section Public Education/Outreach Programs/Training, the county should include an initiative to provide training to have designated NFIP Floodplain Administrators (FPA), and other local officials who would benefit, become Certified Floodplain Managers (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training such as FEMA Benefit-Cost Analysis (BCA) and Substantial Damage Estimation (SDE). Additional outreach should be conducted to ensure that municipalities are aware of this training.

• Multiple communities expressed interest in learning more about the Community Rating System (CRS) if a seminar was presented within the county. The following municipalities indicated in the HMP that they would like more information about CRS:
o Glen Ridge
o Bloomfield
o Livingston
o Maplewood
o Millburn
o Montclair
o Newark
o Nutley
o South Orange
o Verona
o West Caldwell
o West Orange

Recommendation: Bergen and Passaic Counties jointly hosted an informational seminar on the CRS on September 15, 2014. Essex County would benefit by hosing a similar seminar for interested municipalities.
• Page 8- Number 4 of Future Planning Mechanisms states the need to update land development regulations. This is a highly important task as oftentimes new hazard information and flood maps are not used to update zoning and poor land use decisions are then made. Someone should be designated to complete this action.
• Page 8- Number 8 of Future Planning Mechanisms states that "The long term impacts of future sea level rise should be projected and studied for Newark Bay and the tidal portions of the Passaic River." This is extremely important and we are glad that the county has addressed this need. This should be given priority status and a person should be appointed to completing this project as this knowledge is necessary to begin protecting the city.
• Proposed Hazard Mitigation Initiatives- In some of the municipality past mitigation initiatives sections, they indicated that projects were discontinued because they fell under county jurisdiction and referenced section 9.1 of the plan. Some of these initiatives were carried over to the county plan, such as flood mitigation along Bloomfield Avenue, but others did not appear under the county initiatives. One example is the action to mitigate Forest Avenue streams against flooding in West Caldwell. When will these actions be addressed?
General Comments on Section 9 (all municipalities)
• Many municipalities indicated that they were not keeping track of the properties that had experienced flood damage or expressed interest in mitigation. In order to reduce future spending on repairs. Municipalities need to be aware of which properties are at high risk of damage. Municipalities should be encouraged or required to keep a list of all properties that experienced damage and had to receive grant money, and a list of all property owners who are interested in mitigation. This would make it easier for municipalities to address these issues.
• A large number of municipalities included a proposed action of starting a public outreach program to inform residents of natural hazard risks. We highly support this initiative and are pleased to see that so many municipalities are taking action on this. There were several municipalities which did not include this action: Irvington, Millburn, North Caldwell, Roseland, Orange, Verona and West Caldwell. What is the reason that these municipalities have not included this low cost outreach initiative? Do they already have such programs in place?
• We support the post event disaster assessment program initiative put forward by several municipalities. This will help communities to quickly rebound from a disaster and help residents in need.
• The municipalities indicating that they have repetitive loss and/or severe repetitive loss properties should

• The municipalities indicating that they have repetitive loss and/or severe repetitive loss properties should include a mitigation strategy to address these properties.
• We are glad that the section was included on how the HMP will be included in daily activities. This is vital to the action initiatives actually being put to use and implemented. In this section many municipalities simply provided a link to their website when they referenced ordinances. It would be helpful if the ordinances related to hazard risk were listed out.
Section 9.2- Belleville
• Belleville indicated that their floodplain administrator did not feel he had adequate training. The township should add an initiative to have their floodplain administrator become a Certified Floodplain Manager (CFM).
Section 9.6- East Orange City
• There are multiple highlighted sections that were not completed/ addressed by the city.
• Proposed action 7 states that they will develop mitigation actions to address flooding in areas (the areas are not identified in the plan). These mitigation actions and flood areas should already be identified and included in the HMP. At the very least, if the actions could not be identified in time for the plan, the city should appoint someone to be in charge of developing the actions and creating a schedule for implementation.
Section 9.7- Essex Fells Borough
• The borough identifies several actions that were not completed in the past due to lack of funding. These actions should include a list of possible sources that they can apply to for funding so that they can be completed. Someone from the borough should be put in charge of targeting funding.
• Proposed action 6- Coordinate this action with other municipalities. Caldwell is also doing a flood study on Pine Brook. There is the possibility of cost sharing the expense, and the municipalities will see better results if the mitigation measures taken are cohesive and coordinated.
• Proposed action 7- Be proactive in mitigating the identified properties. Set up a meeting with the property owners to discuss Blue Acres and other available options. Contact Blue Acres to have a specialist come out to provide additional information.
Section 9.8 and 9.12- Fairfield and Maplewood
• We commend the townships for having an ordinance which restricts development in the floodplain.
Section 9.13- Millburn
• We commend the township for prohibiting development within the floodplain and other environmentally sensitive or unsafe areas.
Section 9.16- North Caldwell
• Currently the borough has very few properties in the flood zone, but has just approved 5 new buildings to be built within the flood zone. As part of the HMP the county states that it will discourage municipalities from approving development within hazardous areas. We hope that the Borough of North Caldwell does not continue on this trend of putting properties in danger by allowing development within the floodplain.
Section 9.17- Nutley
• There were several projects listed in the Future Growth section that were approved within the floodplain despite frequent flooding and flood hazards within the community.
• We support the proposed action 12 which will update ordinances pertaining to stormwater and floodplain management.
Section 9.18- Orange City
• Under the section Integration of Hazard Mitigation into Existing and Future Planning Mechanisms, the city has essentially no plans to include the HMP in daily activities. The city needs to be more specific than just "will be used to guide the addition of hazard information for inclusion in the next Master Plan update". This line is highlighted in the draft which gives me the impression that someone at the municipality was supposed to address this and did not.
• The Proposed Hazard Mitigation Initiatives table needs to be completed; especially the priority levels of the old projects (page 9.18-16).
• The city states that after Hurricanes Irene and Sandy the pumping stations were offline due to a loss of power. The city should include a proposed action initiative to install a backup power source at the pumping stations to ensure continuing service.
Section 9.19- Roseland
• Table 9.19-6 should be completed to indicate the planning and regulatory tools available to the borough.
• Several highlighted sections in the draft were not addressed/ completed.
• The plan states that the Eagle Rock Avenue Bridge will be replaced but not elevated under this project. It is not cost effective to complete two projects on the same bridge when the mitigation actions could easily be completed at the same time. They should be searching for additional funding sources so that the bridge can be replaced at a higher elevation. The plan also states that this is a project between jurisdictions. Between

two jurisdictions they should be able to find funding to do this project once and not waste taxpayer money on inefficient spending.
• The proposed initiative actions 1 and 3 appear to be the same thing; both are for generators for traffic signal control.
Section 9.20 South Orange
• The past initiative 2- Sewer system problems, will not be carried over to the new plan for the municipality because it was a larger project than anticipated and should be handled by the county. It is not listed under Section 9.1 Essex County Proposed Initiatives. Will the county be addressing this initiative? If not, it needs to be addressed/ resolved since it is too high of a burden for the township alone to handle. An additional comment to this is that the municipality should have planned updates to infrastructure into their budget when approving additional development which required the infrastructure. By not doing this they had falsely low tax rates.

Q4: **My Name is:**	Jessica Evans
Q5: **My Organization Is (use "General Public" if not associated with a specific organization):**	NY/NJ Baykeeper
Q6: **My Email Address is:**	jessica@nynjbaykeeper.org

#3

COMPLETE

Collector: Web Link (Web Link)
Started: Monday, September 29, 2014 10:44:49 AM
Last Modified: Monday, September 29, 2014 10:46:22 AM
Time Spent: 00:01:32
IP Address: 24.187.16.178

PAGE 1

Q1: **I wish to comment on:**	Entire Plan
Q2: **Page Number(s):**	*Respondent skipped this question*

Q3: **My Comment:**

I am submitting the following as a supplement to the original comments by NY/NJ Baykeeper. These resources may be helpful to the municipalities in implementing the plan.

1. Funding is available for planning through the DCA Post-Sandy Planning Grant Assistance Program. They can fund the creation of Vulnerability Assessments and Strategic Recovery Planning Reports, and they can also fund CRS planning. More information is available on their website.
2. One of our comments was for the county to suggest a specific tool for sea level rise and flood prediction models. This would encourage continuity in planning throughout the county. NJ ADAPT is a tool created by Rutgers that would provide maps of various future and present flooding, storm surge, and sea level rise scenarios.
3. We suggested offering county wide training for the CRS. Monmouth County and Bergen County each have multiple CRS resources available for their municipalities. Their websites would be good resources to use when developing a program.
4. The HMP indicates the need for inclusion in daily activities. The City of Hoboken is working with a consultant, Princeton Hydro, to develop a system for including their HMP into daily planning and using it to make vital land use changes. Essex County may want to contact the City of Hoboken and/or Princeton Hydro to find out more information about this project and how it could be replicated.

Q4: **My Name is:**	Jessica Evans
Q5: **My Organization Is (use "General Public" if not associated with a specific organization):**	NY/NJ Baykeeper
Q6: **My Email Address is:**	Jessica@nynjbaykeeper.org

Q1 Name of your Academic Institution (school, district, higher education institution):

Answered: 12 Skipped: 0

Q2 Name of Respondent:

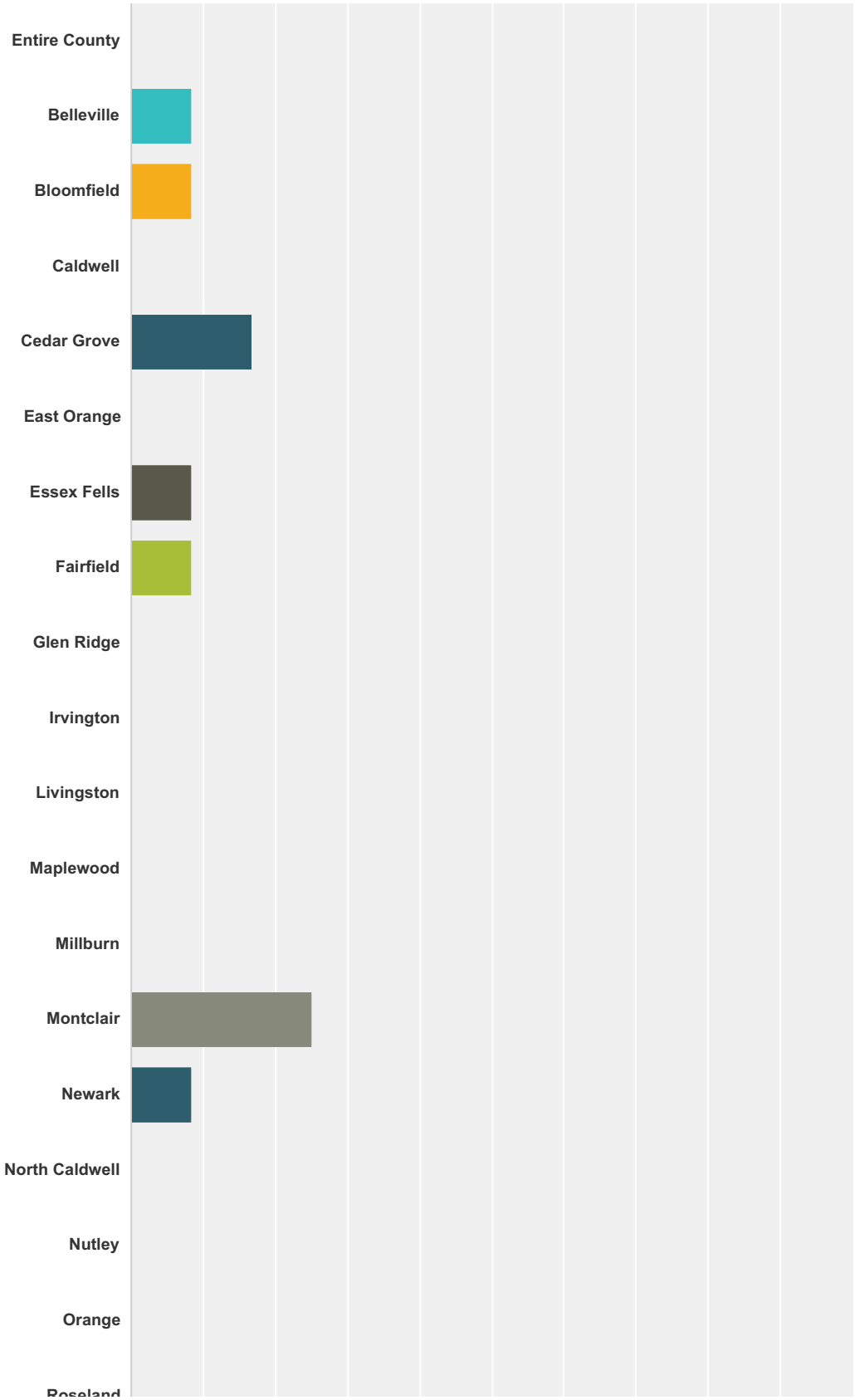
Answered: 12 Skipped: 0

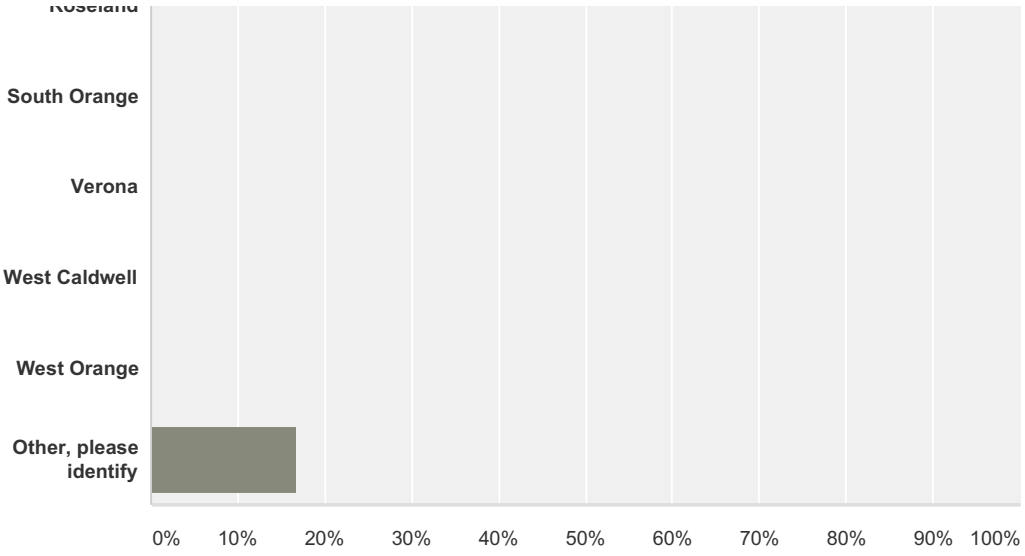
Q3 Contact information (email address or phone number) - optional:

Answered: 12 Skipped: 0

Q4 Please identify the location of your facility(ies) and or primary service area:

Answered: 12 Skipped: 0



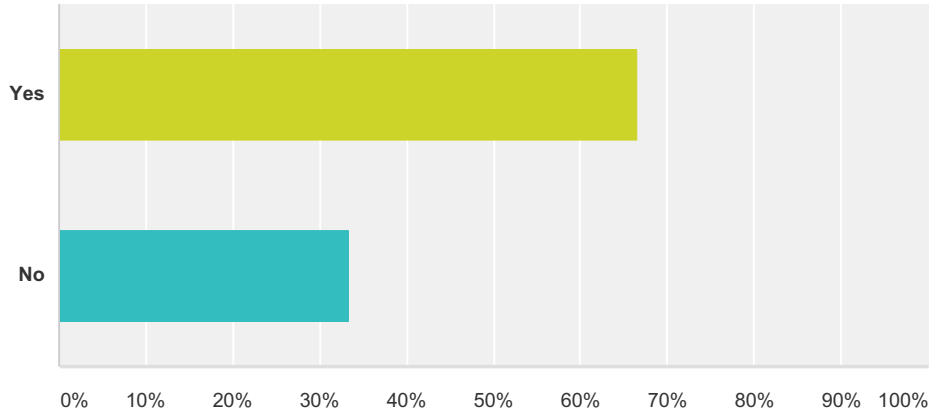


Answer Choices	Responses	
Entire County	**0.00%**	0
Belleville	**8.33%**	1
Bloomfield	**8.33%**	1
Caldwell	**0.00%**	0
Cedar Grove	**16.67%**	2
East Orange	**0.00%**	0
Essex Fells	**8.33%**	1
Fairfield	**8.33%**	1
Glen Ridge	**0.00%**	0
Irvington	**0.00%**	0
Livingston	**0.00%**	0
Maplewood	**0.00%**	0
Millburn	**0.00%**	0
Montclair	**25.00%**	3
Newark	**8.33%**	1
North Caldwell	**0.00%**	0
Nutley	**0.00%**	0
Orange	**0.00%**	0
Roseland	**0.00%**	0
South Orange	**0.00%**	0

Verona	**0.00%**	0
West Caldwell	**0.00%**	0
West Orange	**0.00%**	0
Other, please identify	**16.67%**	2
Total		**12**

Q5 Has your academic institution been impacted by natural hazard events (damaged, closed for extended periods, etc.)?

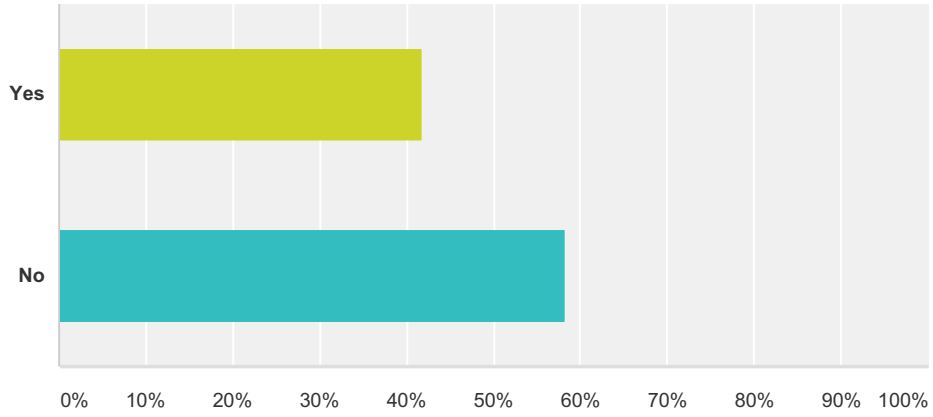
Answered: 12 Skipped: 0



Answer Choices	Responses	
Yes	**66.67%**	8
No	**33.33%**	4
Total		**12**

Q6 Do your facilities provide sheltering services during hazard events?

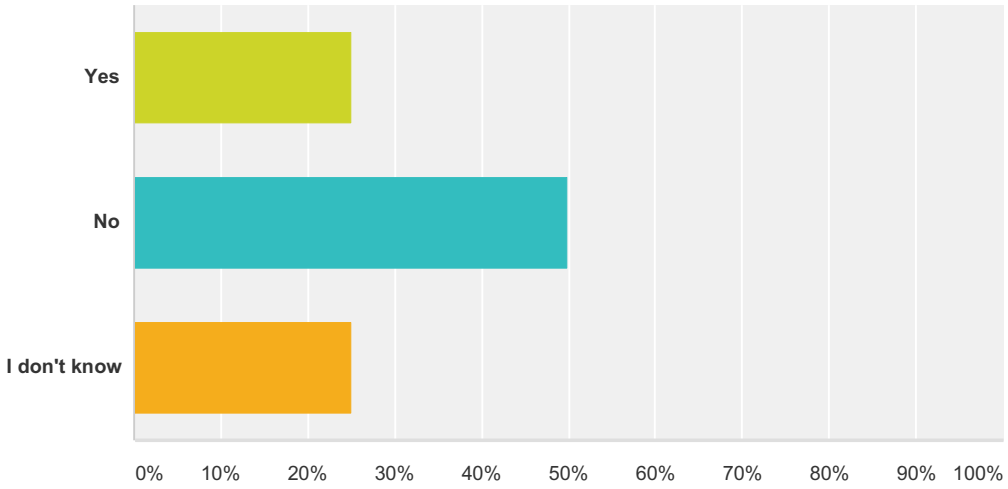
Answered: 12 Skipped: 0



Answer Choices	Responses	
Yes	**41.67%**	5
No	**58.33%**	7
Total		**12**

Q7 Do you believe that your facilities and associated infrastructure are disaster-resistant, or capable of withstanding a natural disaster (e.g. are properly located and constructed, and have back-up power as appropriate)?

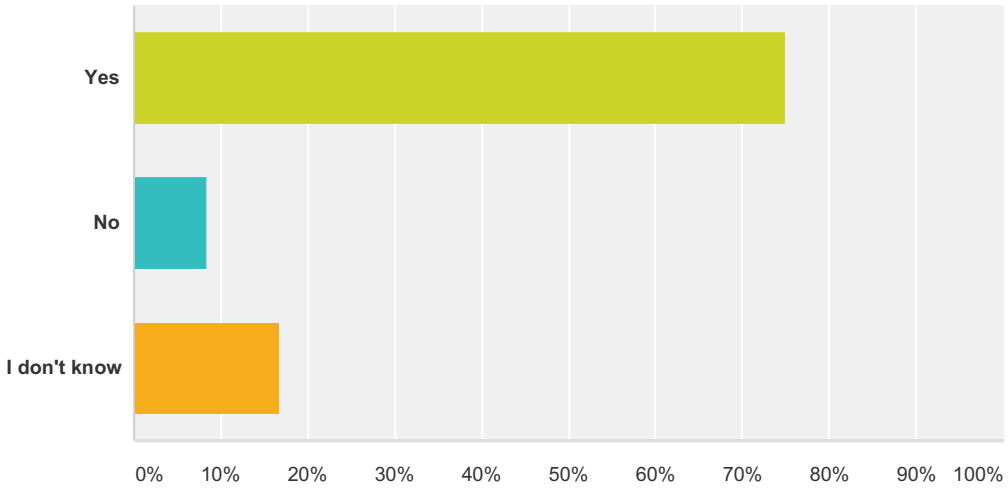
Answered: 12 Skipped: 0



Answer Choices	Responses	
Yes	**25.00%**	3
No	**50.00%**	6
I don't know	**25.00%**	3
Total		**12**

Q8 Do you think that the transportation infrastructure serving your facilities (e.g. roads and bridges) are properly designed to withstand closures and/or damage due to natural hazards?

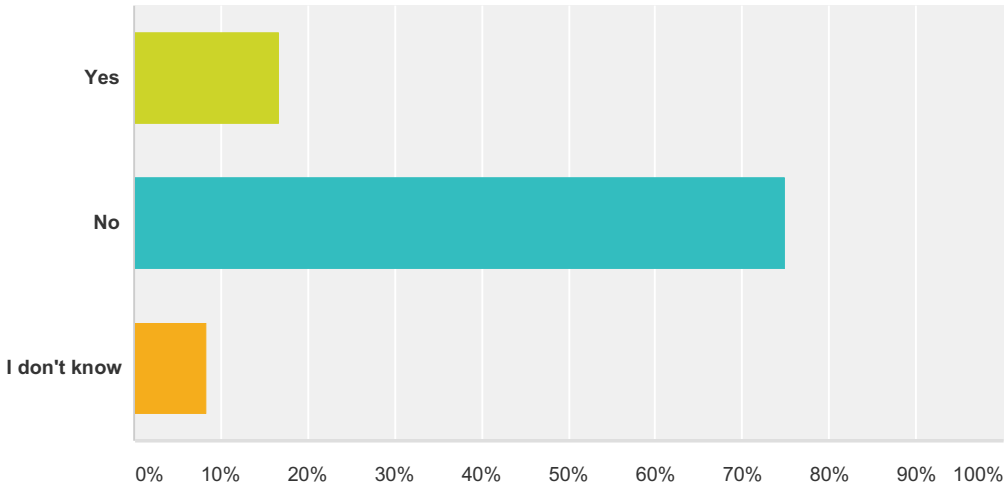
Answered: 12 Skipped: 0



Answer Choices	Responses	
Yes	**75.00%**	9
No	**8.33%**	1
I don't know	**16.67%**	2
Total		**12**

Q9 Do you think that the utility infrastructure (specifically electricity and communications) is sufficiently disaster-resistant to support your academic functions during and after hazard events?

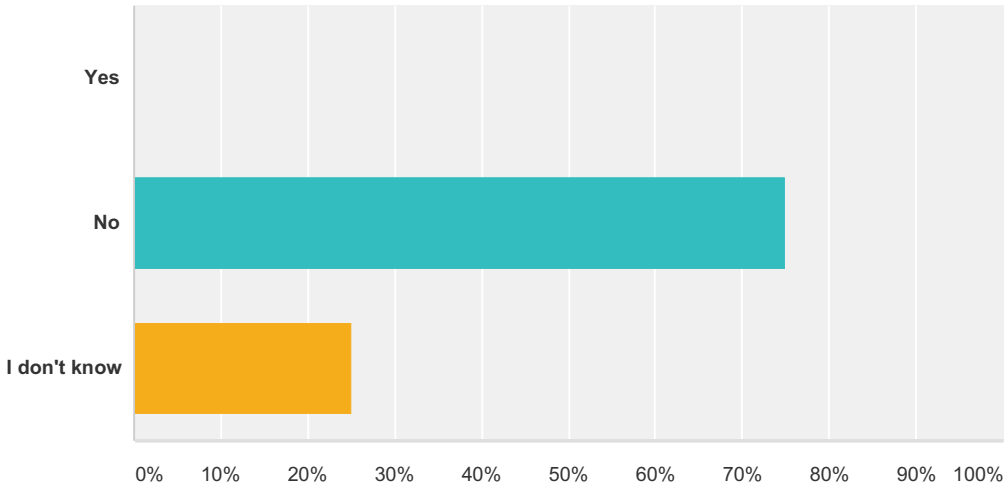
Answered: 12 Skipped: 0



Answer Choices	Responses	
Yes	**16.67%**	2
No	**75.00%**	9
I don't know	**8.33%**	1
Total		**12**

Q10 If your facilities are American Red Cross designated shelters, do you believe they are adequately designed and equipped to support sheltering during and after hazard events? Do your facilities have generator capabilities to support the American Red Cross shelter?

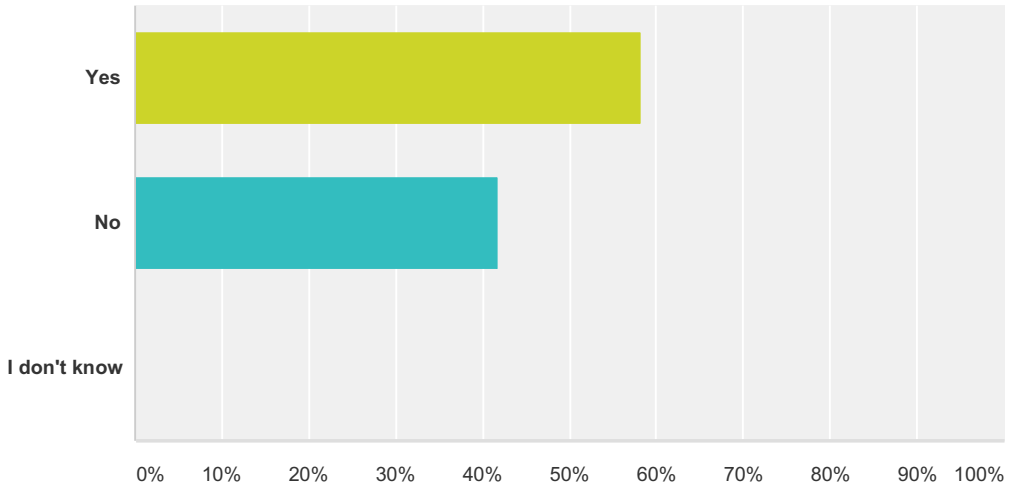
Answered: 12 Skipped: 0



Answer Choices	Responses	
Yes	**0.00%**	0
No	**75.00%**	9
I don't know	**25.00%**	3
Total		**12**

Q11 Do you think that weather forecasts and announcements of road closures and pending road closures are sufficiently accurate and available to support your institution's operation and student transportation decisions in the event of hazard events?

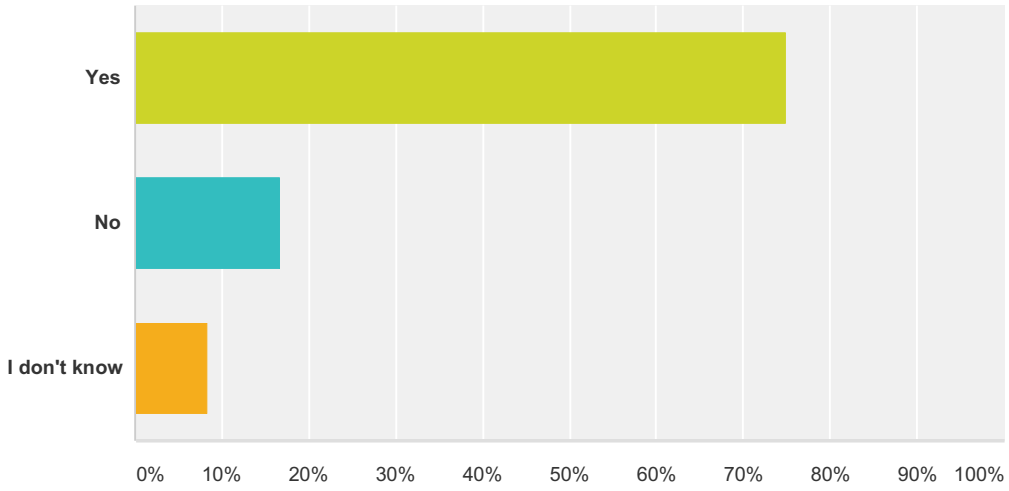
Answered: 12 Skipped: 0



Answer Choices	Responses	
Yes	**58.33%**	7
No	**41.67%**	5
I don't know	**0.00%**	0
Total		**12**

Q12 Do you believe that emergency response planning, services, and equipment are capable of managing and responding properly to disasters in your community?

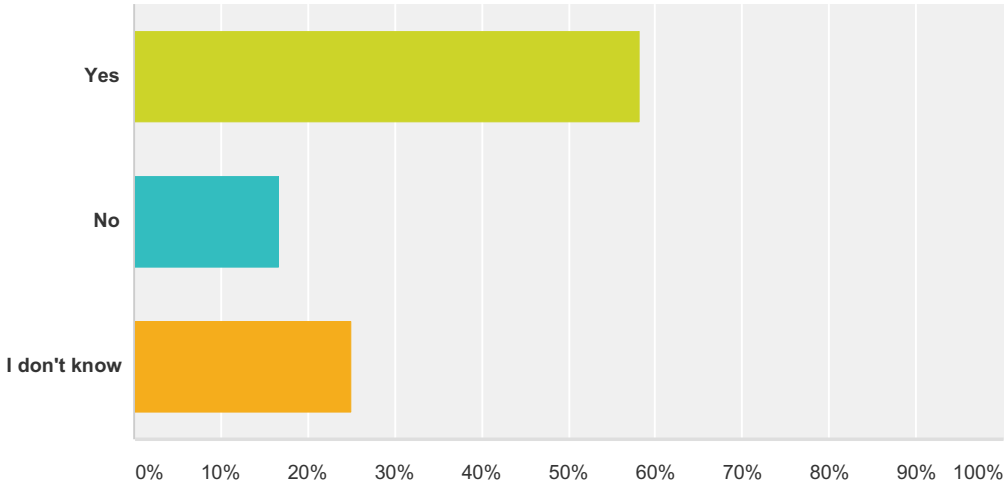
Answered: 12 Skipped: 0



Answer Choices	Responses	
Yes	**75.00%**	9
No	**16.67%**	2
I don't know	**8.33%**	1
Total		**12**

Q13 Do you believe that local government understands, supports, and possesses adequate resources for hazard risk reduction efforts in the community?

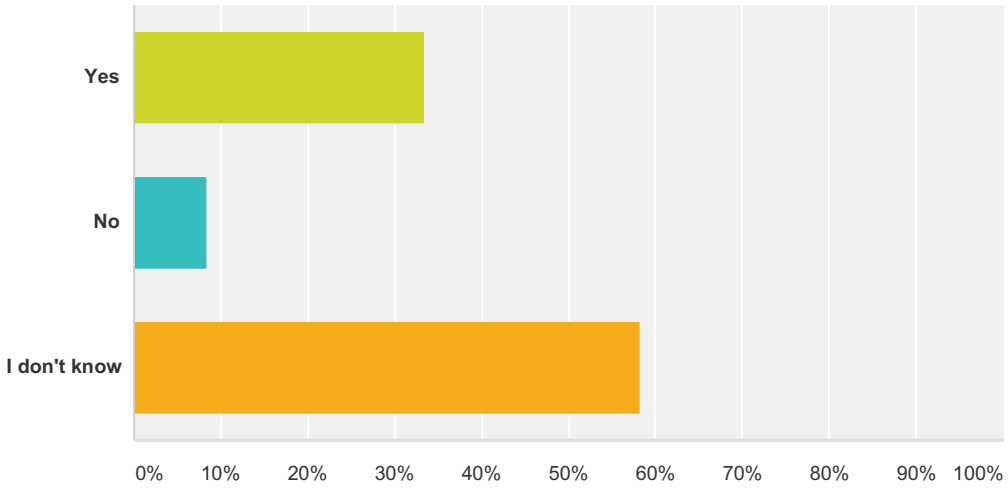
Answered: 12 Skipped: 0



Answer Choices	Responses	
Yes	**58.33%**	7
No	**16.67%**	2
I don't know	**25.00%**	3
Total		**12**

Q14 Is your institution covered by a Continuity of Operations (COOP) Plan? COOP plans examine an institution's ability to perform minimum essential functions during any situation, and support the continuance of institution functions.

Answered: 12 Skipped: 0



Answer Choices	Responses	
Yes	33.33%	4
No	8.33%	1
I don't know	58.33%	7
Total		**12**

Q15 Can you identify projects or programs that will reduce your facility's vulnerability to damages and losses, including loss of operation/service to hazard events?

Answered: 9 Skipped: 3

Q16 Do you have any other comments, questions, or concerns?

Answered: 2 Skipped: 10

Q1 Name of your Business:

Answered: 9 Skipped: 0

Q2 Name of Respondent:

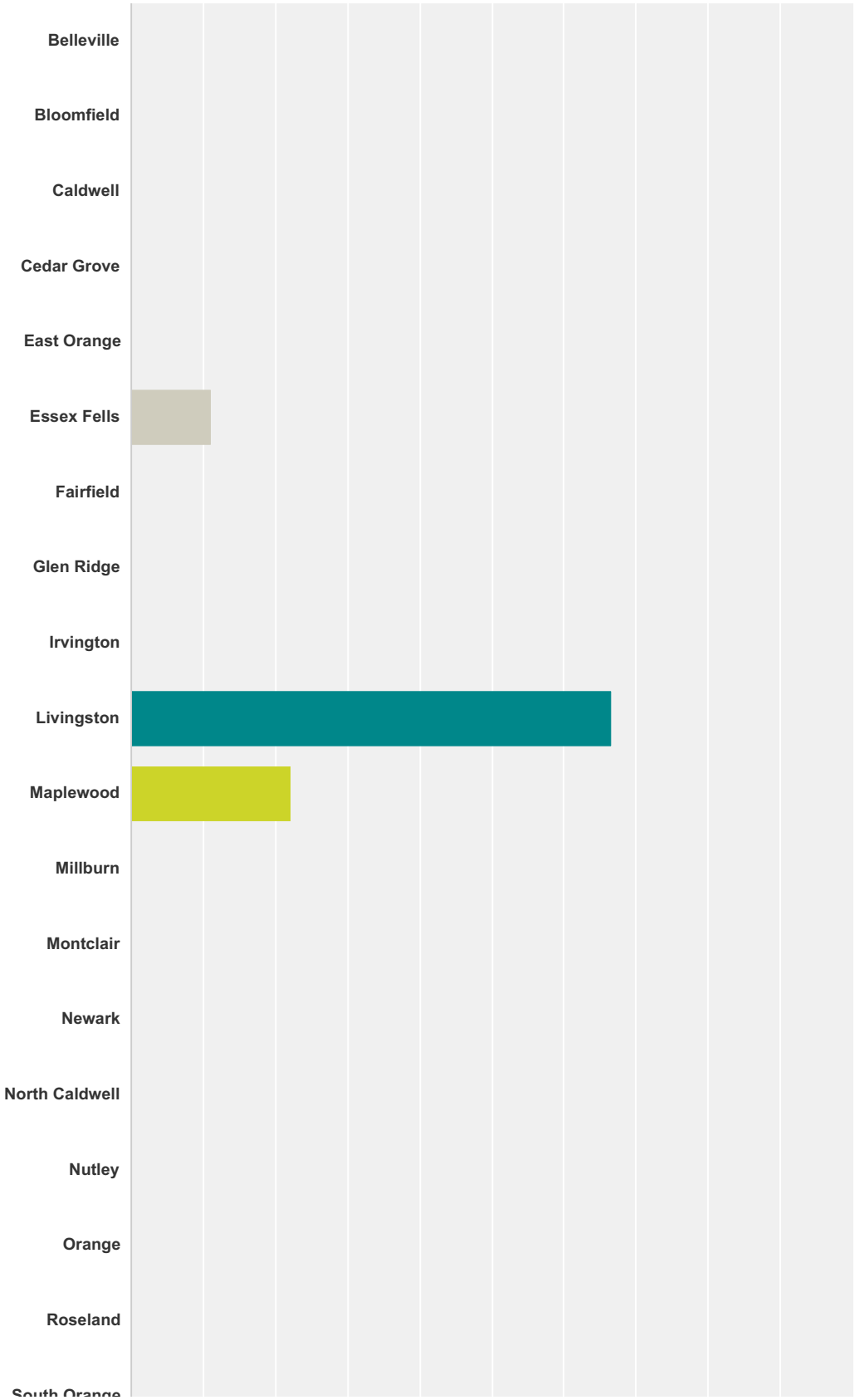
Answered: 8 Skipped: 1

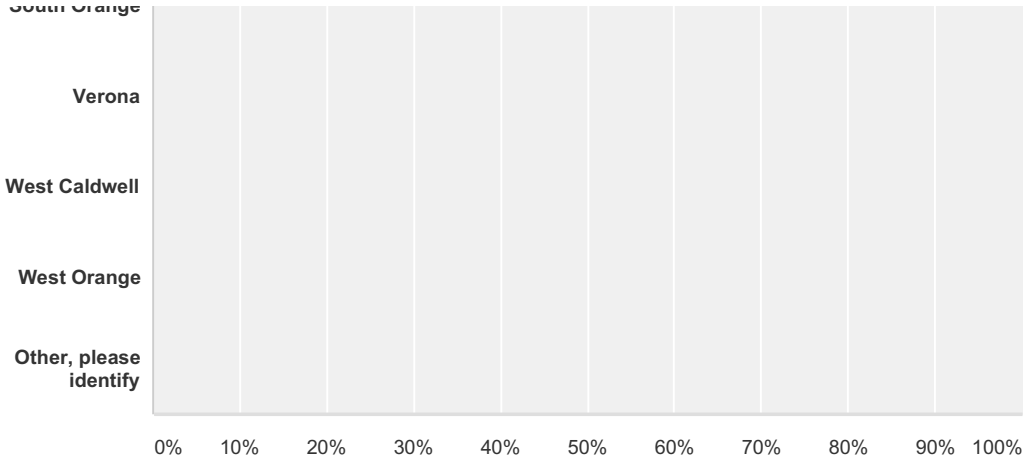
Q3 Contact information (email address or phone number) - optional:

Answered: 6 Skipped: 3

Q4 Please identify the location of your facility(ies) and or primary service area:

Answered: 9 Skipped: 0



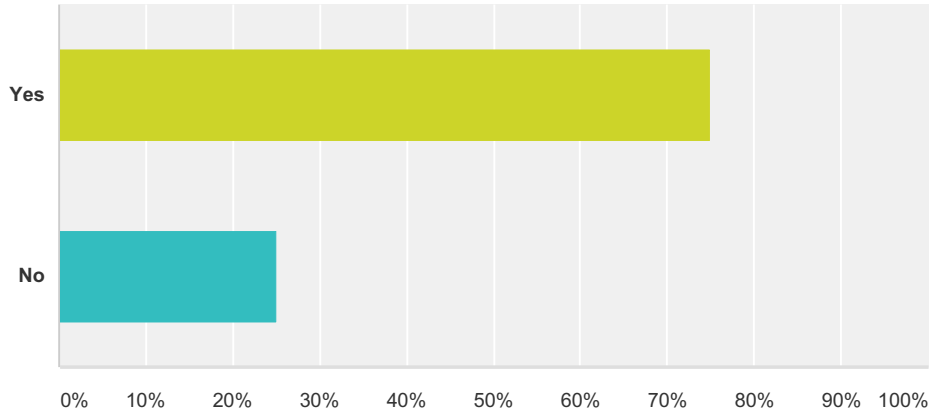


Answer Choices	Responses	
Belleville	**0.00%**	0
Bloomfield	**0.00%**	0
Caldwell	**0.00%**	0
Cedar Grove	**0.00%**	0
East Orange	**0.00%**	0
Essex Fells	**11.11%**	1
Fairfield	**0.00%**	0
Glen Ridge	**0.00%**	0
Irvington	**0.00%**	0
Livingston	**66.67%**	6
Maplewood	**22.22%**	2
Millburn	**0.00%**	0
Montclair	**0.00%**	0
Newark	**0.00%**	0
North Caldwell	**0.00%**	0
Nutley	**0.00%**	0
Orange	**0.00%**	0
Roseland	**0.00%**	0
South Orange	**0.00%**	0
Verona	**0.00%**	0
West Caldwell	**0.00%**	0
West Orange	**0.00%**	0

Other, please identify	**0.00%**	0
Total		**9**

Q5 Has your business been impacted by hazard events (damaged, closed for extended periods, etc.)?

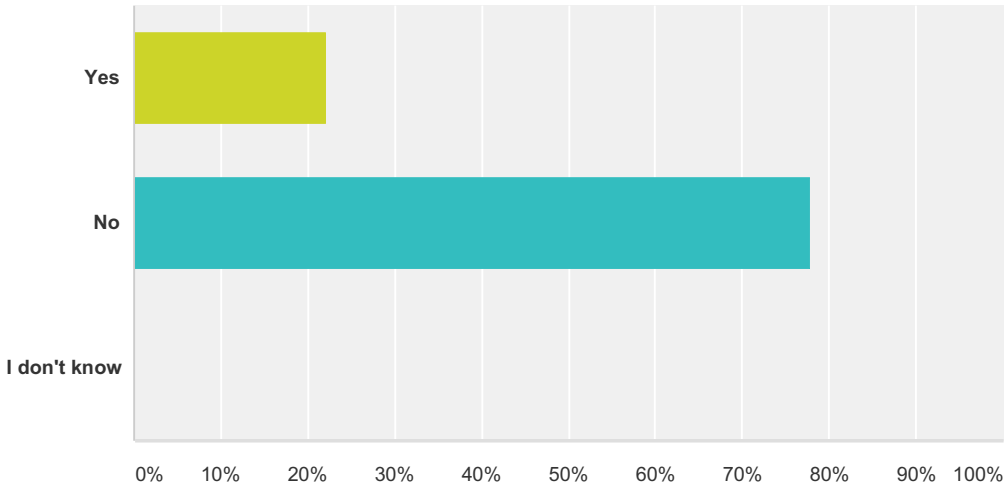
Answered: 8 Skipped: 1



Answer Choices	Responses	
Yes	**75.00%**	6
No	**25.00%**	2
Total		**8**

Q6 Do you believe that your facilities are disaster-resistant, or capable of withstanding a disaster (e.g. are properly located and constructed, and have back-up power as appropriate)?

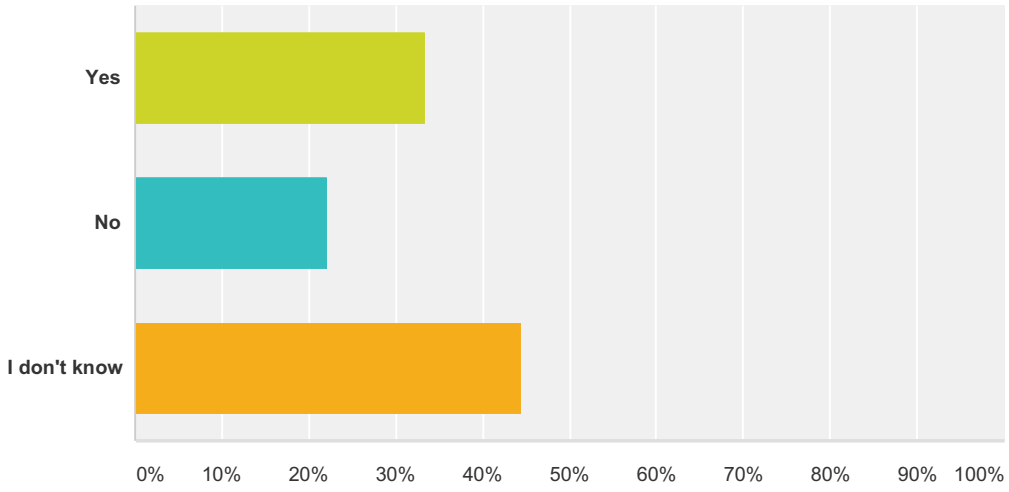
Answered: 9 Skipped: 0



Answer Choices	Responses	
Yes	**22.22%**	2
No	**77.78%**	7
I don't know	**0.00%**	0
Total		**9**

Q7 Do you think that the transportation infrastructure serving your facilities (e.g. roads and bridges) are properly designed to withstand closures and/or damage due to hazard events, and thus provides longterm support for your business and commerical needs?

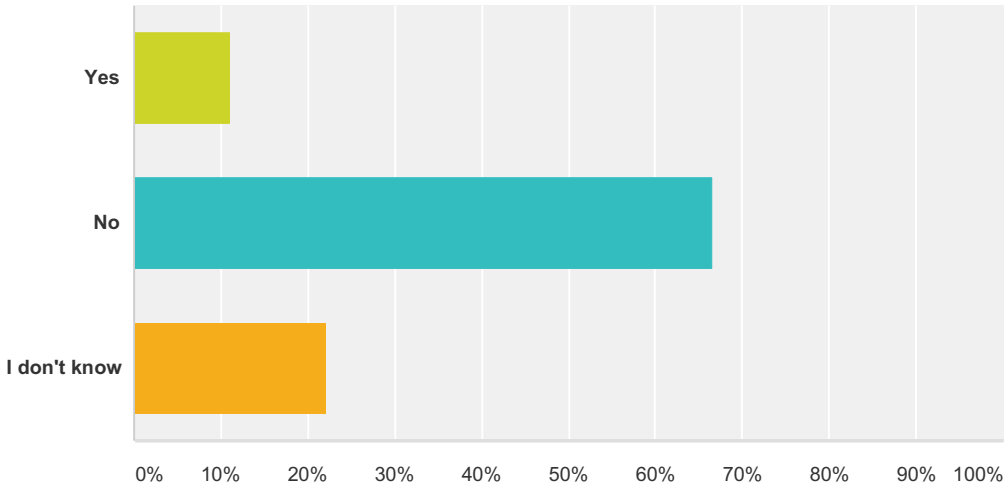
Answered: 9 Skipped: 0



Answer Choices	Responses	
Yes	**33.33%**	3
No	**22.22%**	2
I don't know	**44.44%**	4
Total		**9**

Q8 Do you think that the utility infrastructure (specifically electricity and communications) is sufficiently disaster-resistant to support your business and commercial needs?

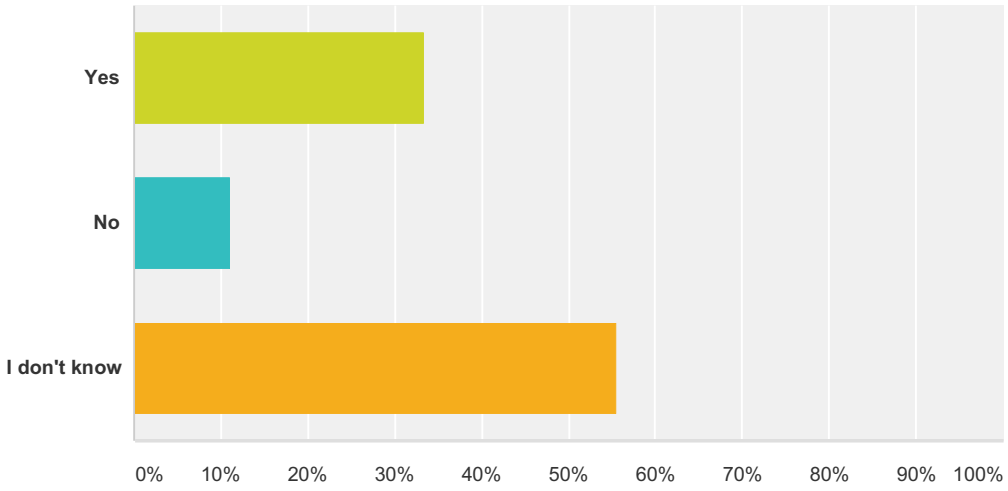
Answered: 9 Skipped: 0



Answer Choices	Responses	
Yes	**11.11%**	1
No	**66.67%**	6
I don't know	**22.22%**	2
Total		**9**

Q9 Do you believe that natural hazard risks (e.g. flood zones, coastal hazard zones, wildfire risk zones) are considered when developing or expanding commercial or industrial areas?

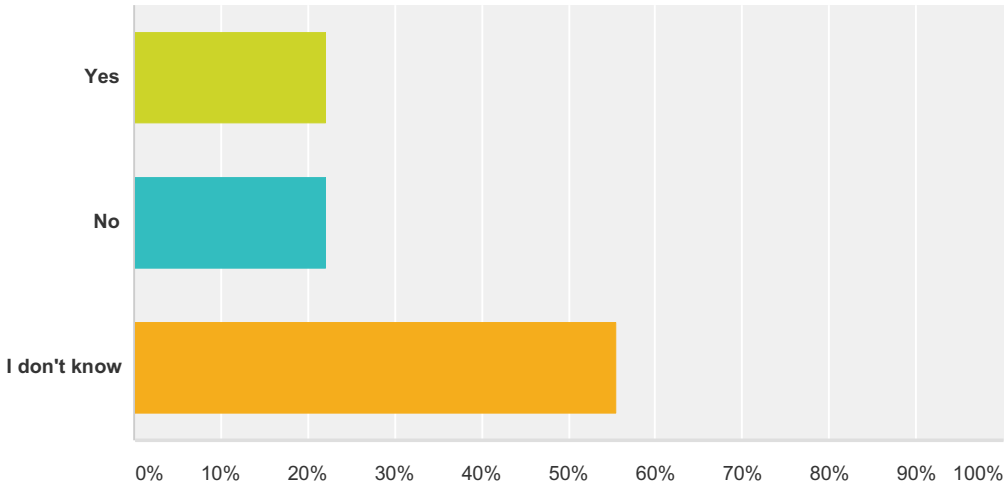
Answered: 9 Skipped: 0



Answer Choices	Responses	
Yes	**33.33%**	3
No	**11.11%**	1
I don't know	**55.56%**	5
Total		**9**

Q10 Do you believe that business organizations/associations, chambers of commerce, etc., are a valuable resource in helping business owners protect themselves pre-disaster, and/or recover post-disaster?

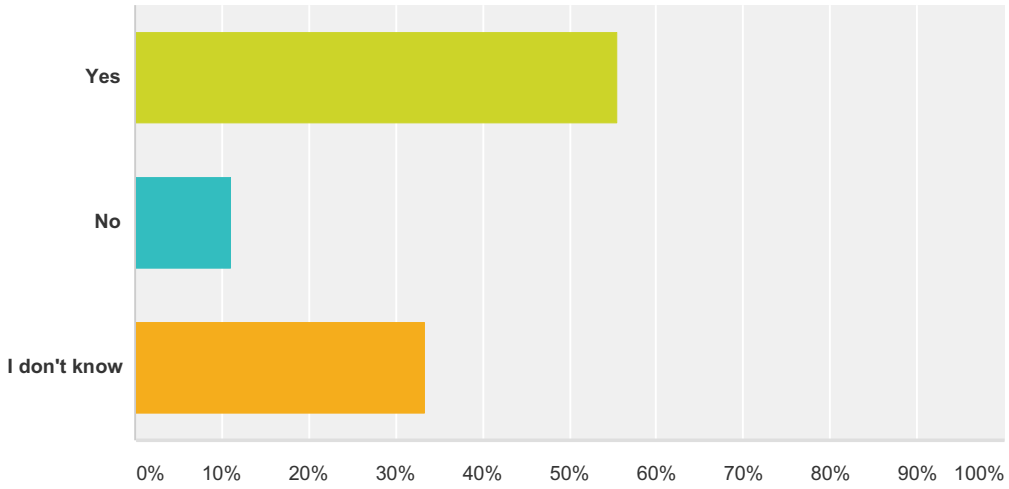
Answered: 9 Skipped: 0



Answer Choices	Responses	
Yes	**22.22%**	2
No	**22.22%**	2
I don't know	**55.56%**	5
Total		**9**

Q11 Do you believe that businesses are aware and take appropriate advantage of flood insurance and other risk management resources and programs to help protect them from losses, as well as to support recovery from disasters?

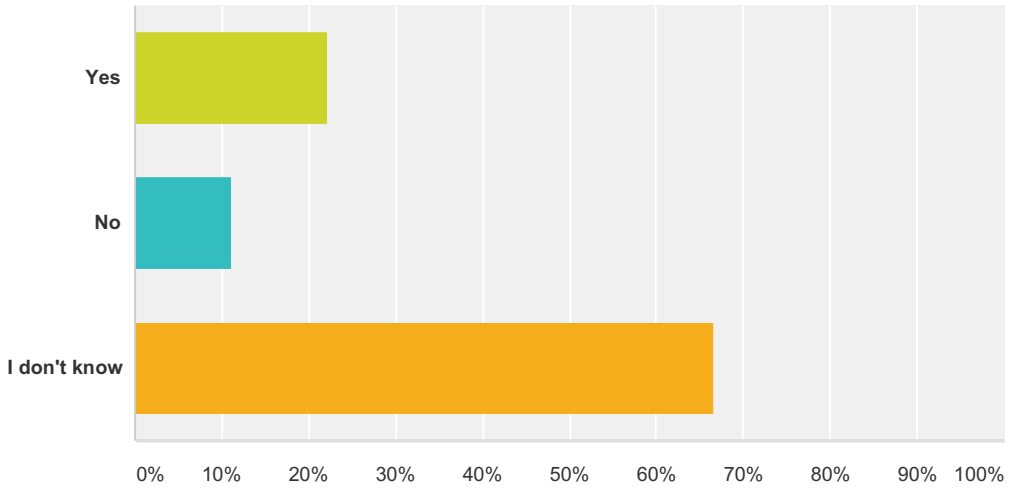
Answered: 9 Skipped: 0



Answer Choices	Responses	
Yes	**55.56%**	5
No	**11.11%**	1
I don't know	**33.33%**	3
Total		**9**

Q12 Do you believe that emergency planning, services, and equipment are adequate to manage and respond properly to disasters that may impact your business or commercial interests?

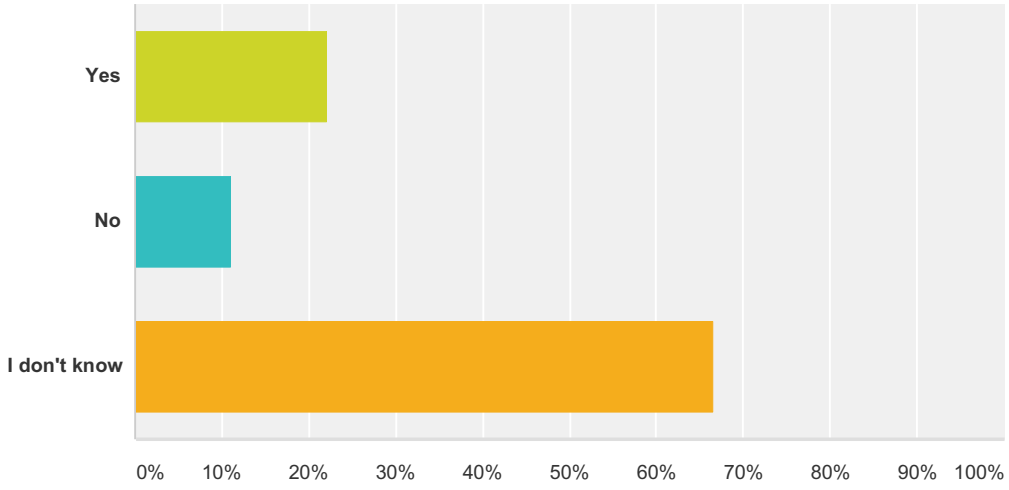
Answered: 9 Skipped: 0



Answer Choices	Responses	
Yes	**22.22%**	2
No	**11.11%**	1
I don't know	**66.67%**	6
Total		**9**

Q13 Do you believe that local government understands, supports, and possesses adequate resources for hazard risk reduction efforts in the community?

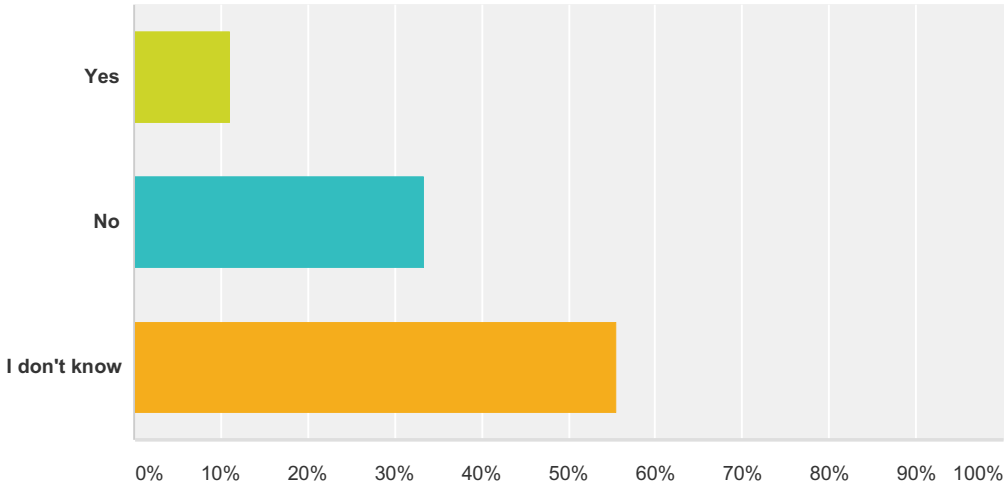
Answered: 9 Skipped: 0



Answer Choices	Responses	
Yes	**22.22%**	2
No	**11.11%**	1
I don't know	**66.67%**	6
Total		**9**

Q14 Is your business covered by a Continuity of Operations / Continuity of Government (COOP / COG) plan? COOP / COG plans examine an business's ability to perform minimum essential functions during any situation. COOP activities support the continuance of business functions, while COG activities support the continuance of business governance.

Answered: 9 Skipped: 0



Answer Choices	Responses	
Yes	**11.11%**	1
No	**33.33%**	3
I don't know	**55.56%**	5
Total		**9**

Q15 Can you identify projects or programs that will reduce your facility's vulnerability to damages and losses, including loss of operation/service, to hazard events?

Answered: 5 Skipped: 4

Q16 Do you have any other comments, questions, or concerns?

Answered: 2 Skipped: 7

Q1 Name of your EMS Agency / Facility:

Answered: 16 Skipped: 0

Q2 Name of Respondent:

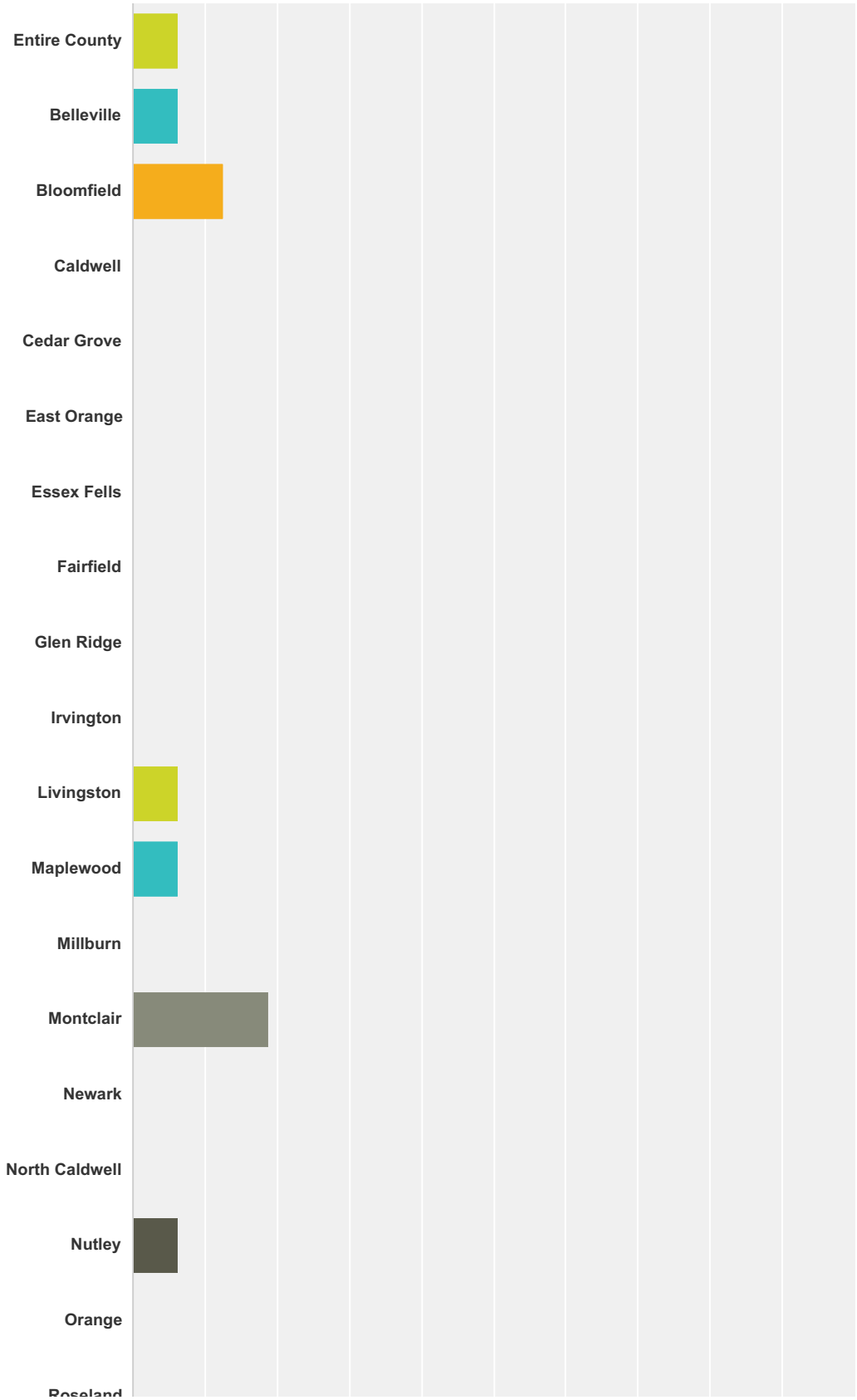
Answered: 16 Skipped: 0

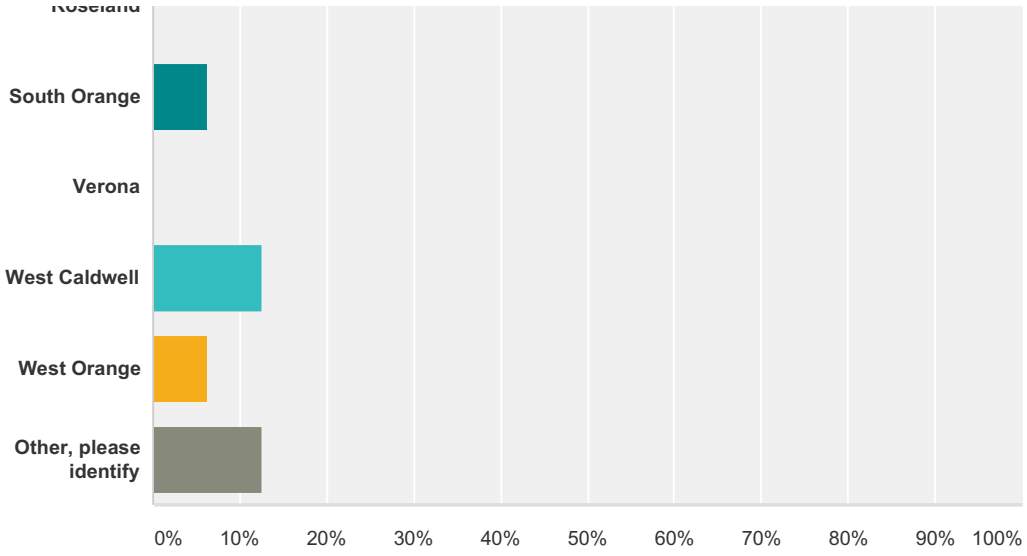
Q3 Contact information (email address or phone number) - optional:

Answered: 15 Skipped: 1

Q4 Please identify the location of your facility(ies) and or primary service area:

Answered: 16 Skipped: 0



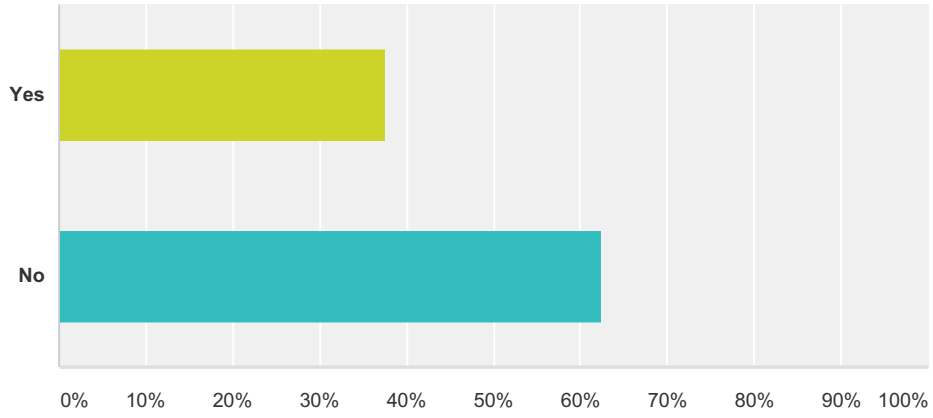


Answer Choices	Responses	
Entire County	**6.25%**	1
Belleville	**6.25%**	1
Bloomfield	**12.50%**	2
Caldwell	**0.00%**	0
Cedar Grove	**0.00%**	0
East Orange	**0.00%**	0
Essex Fells	**0.00%**	0
Fairfield	**0.00%**	0
Glen Ridge	**0.00%**	0
Irvington	**0.00%**	0
Livingston	**6.25%**	1
Maplewood	**6.25%**	1
Millburn	**0.00%**	0
Montclair	**18.75%**	3
Newark	**0.00%**	0
North Caldwell	**0.00%**	0
Nutley	**6.25%**	1
Orange	**0.00%**	0
Roseland	**0.00%**	0
South Orange	**6.25%**	1

Verona	**0.00%**	0
West Caldwell	**12.50%**	2
West Orange	**6.25%**	1
Other, please identify	**12.50%**	2
Total		**16**

Q5 Has your EMS facility been impacted by hazard events (damaged, closed for extended periods, etc.)?

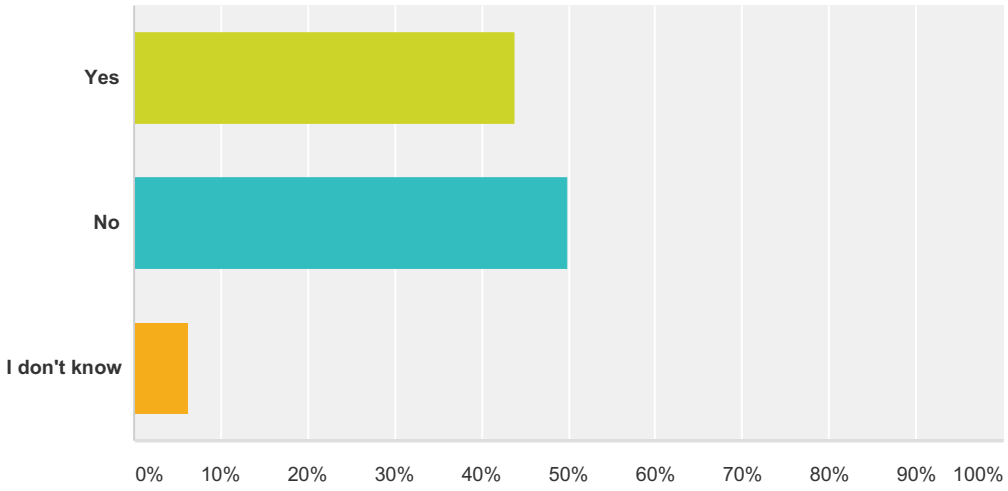
Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**37.50%**	6
No	**62.50%**	10
Total		**16**

Q6 Do you think that critical and essential facilities (incl. EMS facilities, hospitals and medical centers) are disaster-resistant (e.g. are properly located and constructed, and have back-up power as appropriate)?

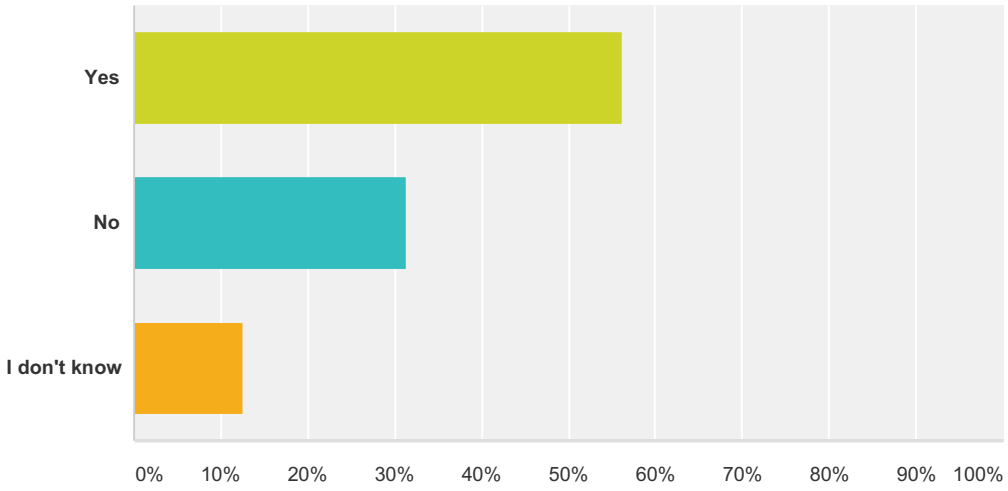
Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**43.75%**	7
No	**50.00%**	8
I don't know	**6.25%**	1
Total		**16**

Q7 Do you think that the transportation infrastructure serving your facilities (e.g. roads and bridges) are properly designed to withstand closures and/or damage due to hazards?

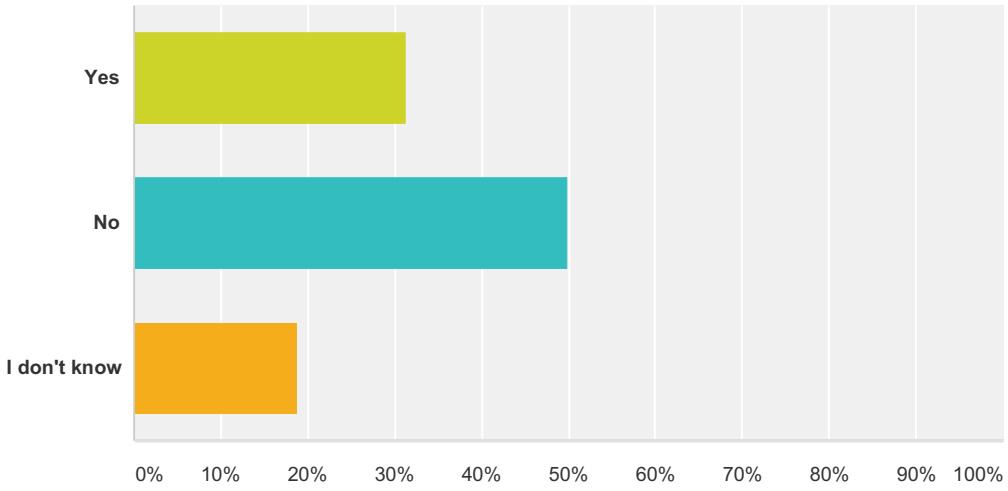
Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**56.25%**	9
No	**31.25%**	5
I don't know	**12.50%**	2
Total		**16**

Q8 Do you think that the utility infrastructure (specifically electricity and communications) is sufficiently disaster-resistant to support EMS functions during and after hazard events?

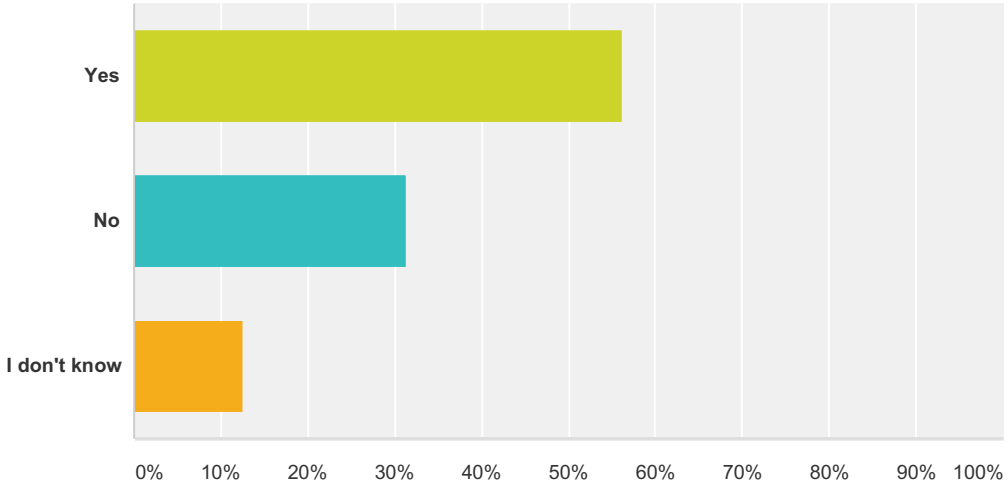
Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**31.25%**	5
No	**50.00%**	8
I don't know	**18.75%**	3
Total		**16**

Q9 Do you think that local public education and awareness programs are effective at informing the public on what they should do to be prepared for and reduce their personal risk to disasters, so as not to increase the need for EMS during hazard events?

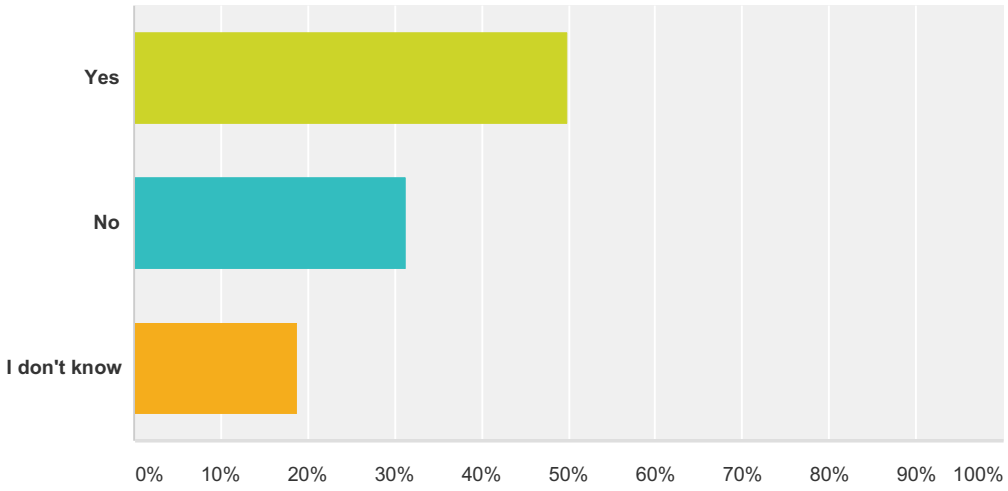
Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**56.25%**	9
No	**31.25%**	5
I don't know	**12.50%**	2
Total		**16**

Q10 Do you think that announcements of road closures and pending road closures are sufficiently accurate and available to support EMS functions during hazard events?

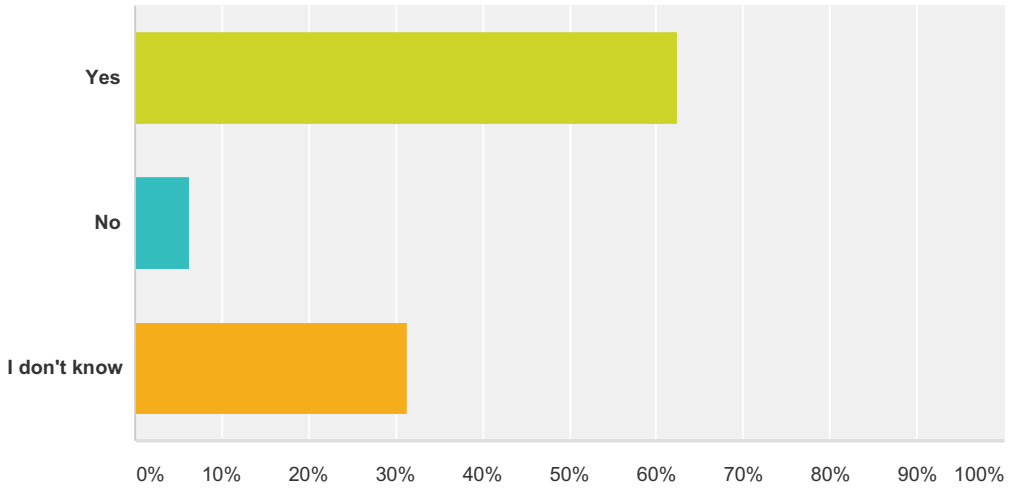
Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**50.00%**	8
No	**31.25%**	5
I don't know	**18.75%**	3
Total		**16**

Q11 Do you think that the public is aware of, understands, and takes advantage of emergency warning and notification systems and services (reverse 911, audible alerts, cell and text services, NJ-ALERT)?

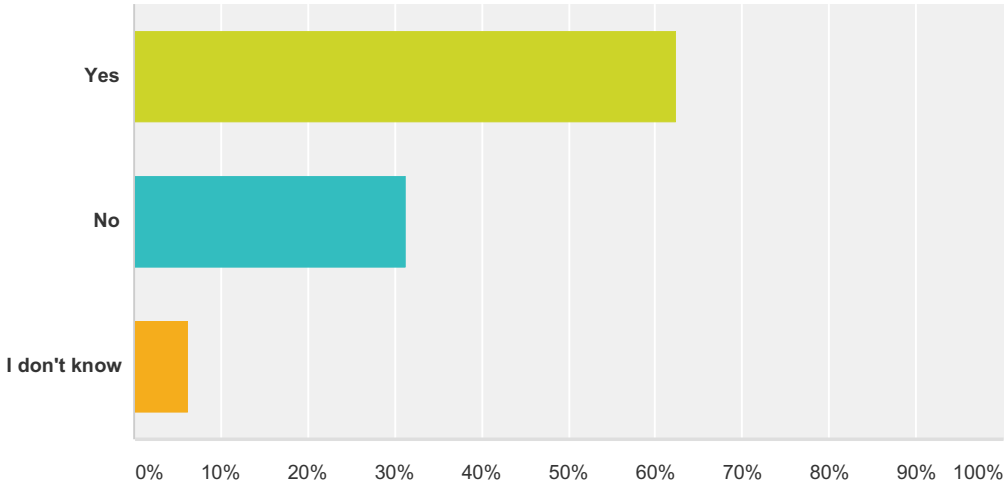
Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**62.50%**	10
No	**6.25%**	1
I don't know	**31.25%**	5
Total		**16**

Q12 Do you think that your EMS company works to inform your constituents of how they can better manage their risk to hazards?

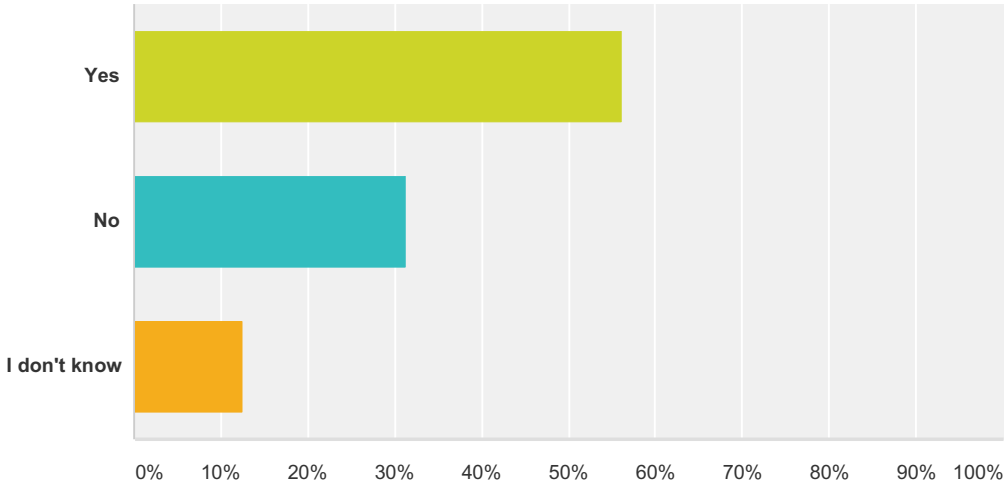
Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**62.50%**	10
No	**31.25%**	5
I don't know	**6.25%**	1
Total		**16**

Q13 Do you think that emergency response planning, services, and equipment are adequate to manage and respond properly to disasters in your community?

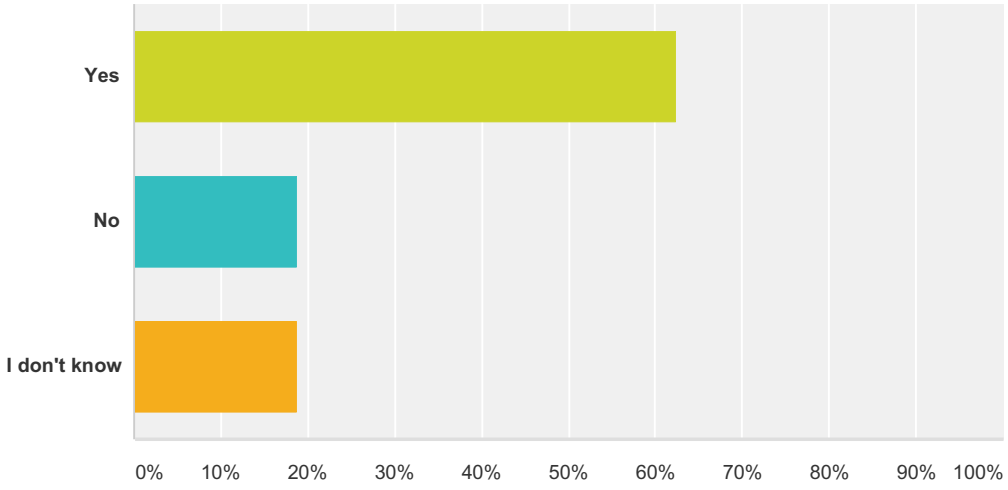
Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**56.25%**	9
No	**31.25%**	5
I don't know	**12.50%**	2
Total		**16**

Q14 Do you think that local government understands, supports, and possess the resources for hazard risk reduction efforts in the community?

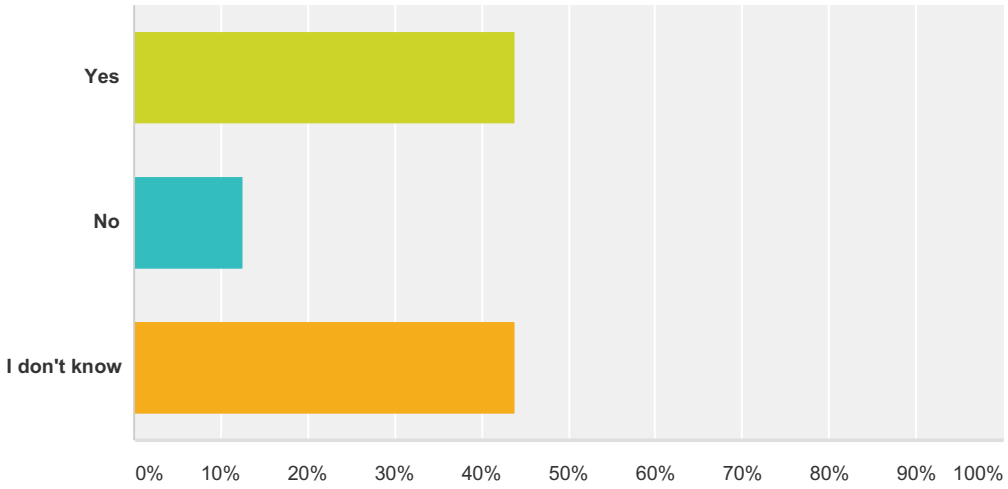
Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**62.50%**	10
No	**18.75%**	3
I don't know	**18.75%**	3
Total		**16**

Q15 Is your organization covered by a Continuity of Operations (COOP) plan? COOP plans examine an organization's ability to perform minimum essential functions during any situation, and support the continuance of organization functions.

Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**43.75%**	7
No	**12.50%**	2
I don't know	**43.75%**	7
Total		**16**

Q16 Can you identify projects or programs that will reduce your facility's vulnerability to damages and losses, including loss of operation/service, to hazard events?

Answered: 11 Skipped: 5

Q17 Do you have any other comments, questions, or concerns?

Answered: 5 Skipped: 11

Q1 Name of your fire department or district:

Answered: 22 Skipped: 0

Q2 Name of respondent:

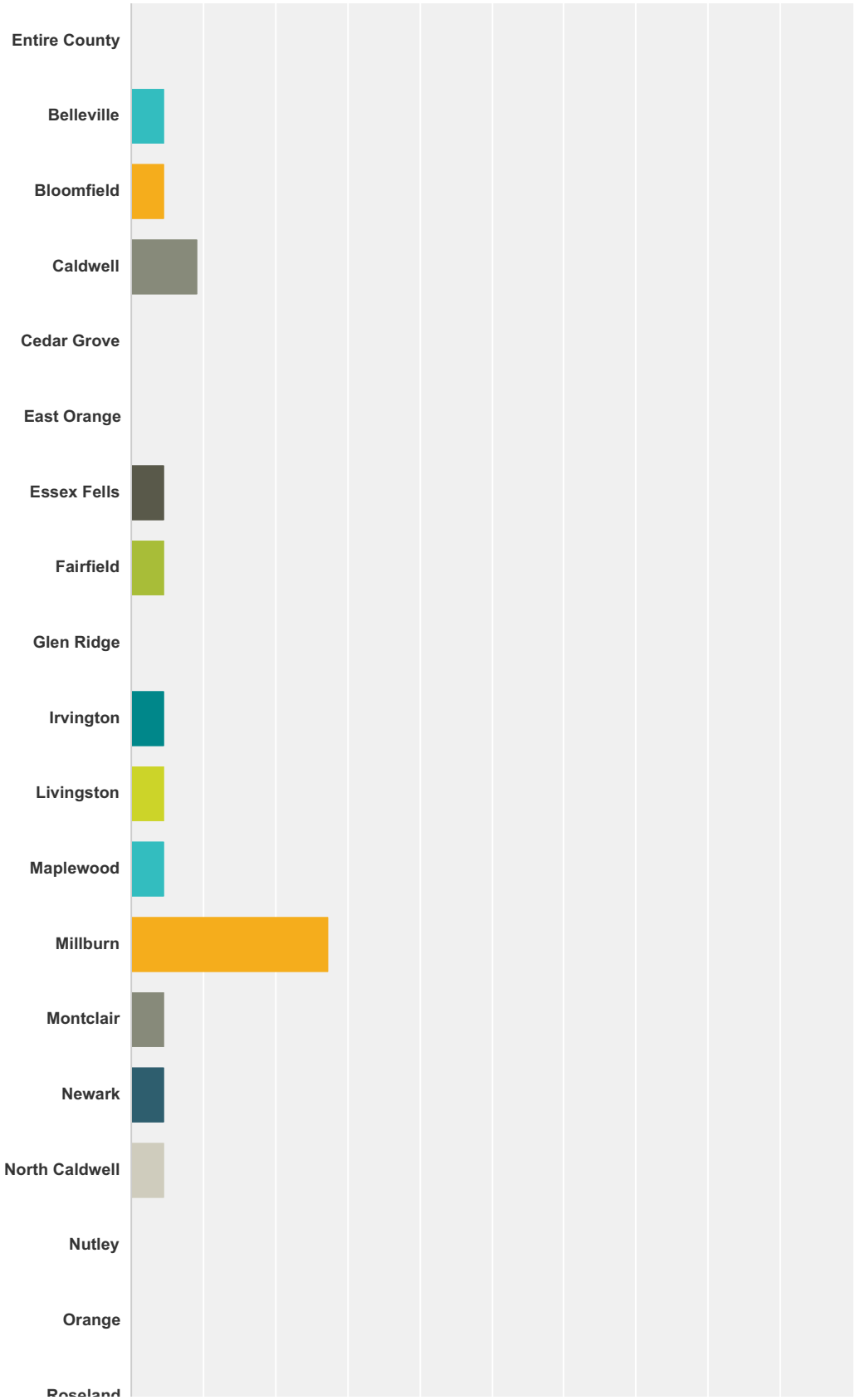
Answered: 20 Skipped: 2

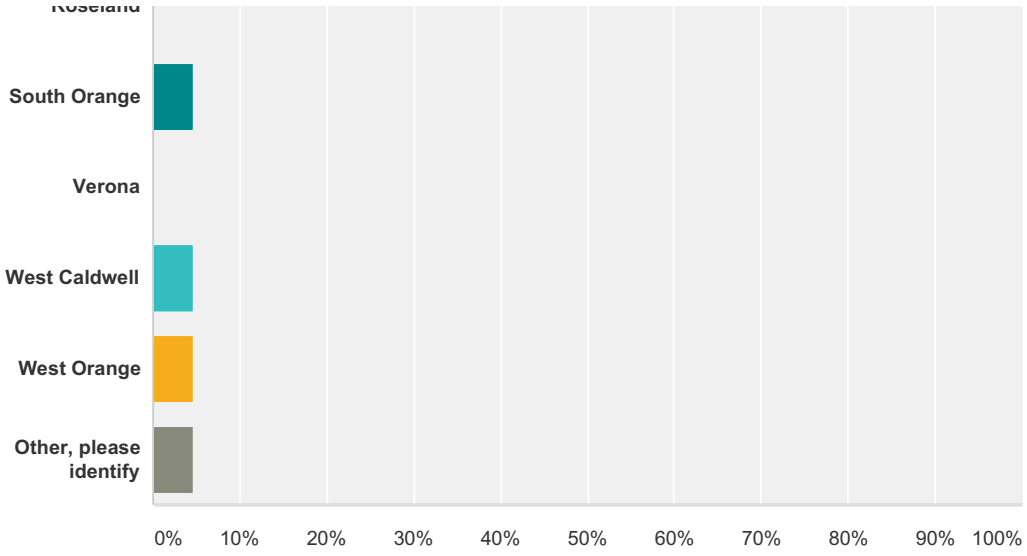
Q3 Contact information (email address or phone number) - optional:

Answered: 18 Skipped: 4

Q4 Please identify the location of your facility(ies) and or primary service area:

Answered: 22 Skipped: 0



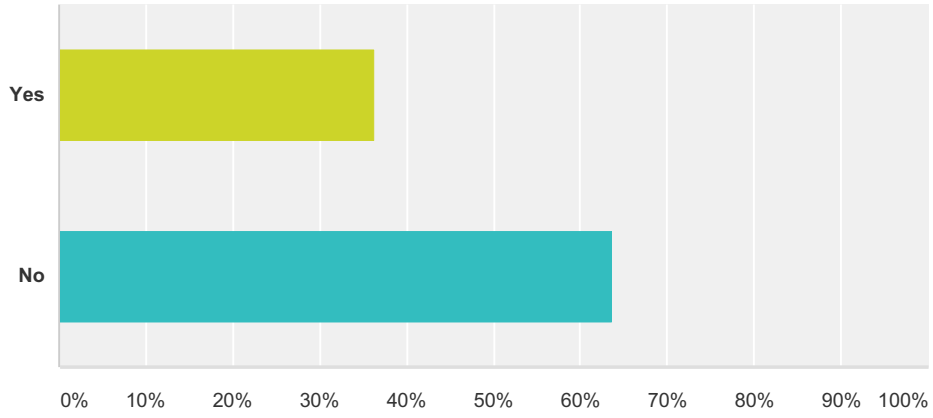


Answer Choices	Responses	
Entire County	**0.00%**	0
Belleville	**4.55%**	1
Bloomfield	**4.55%**	1
Caldwell	**9.09%**	2
Cedar Grove	**0.00%**	0
East Orange	**0.00%**	0
Essex Fells	**4.55%**	1
Fairfield	**4.55%**	1
Glen Ridge	**0.00%**	0
Irvington	**4.55%**	1
Livingston	**4.55%**	1
Maplewood	**4.55%**	1
Millburn	**27.27%**	6
Montclair	**4.55%**	1
Newark	**4.55%**	1
North Caldwell	**4.55%**	1
Nutley	**0.00%**	0
Orange	**0.00%**	0
Roseland	**0.00%**	0
South Orange	**4.55%**	1

Verona	**0.00%**	0
West Caldwell	**4.55%**	1
West Orange	**4.55%**	1
Other, please identify	**4.55%**	1
Total		**22**

Q5 Has your fire department been impacted by hazard events (damaged, closed for extended periods, etc.)?

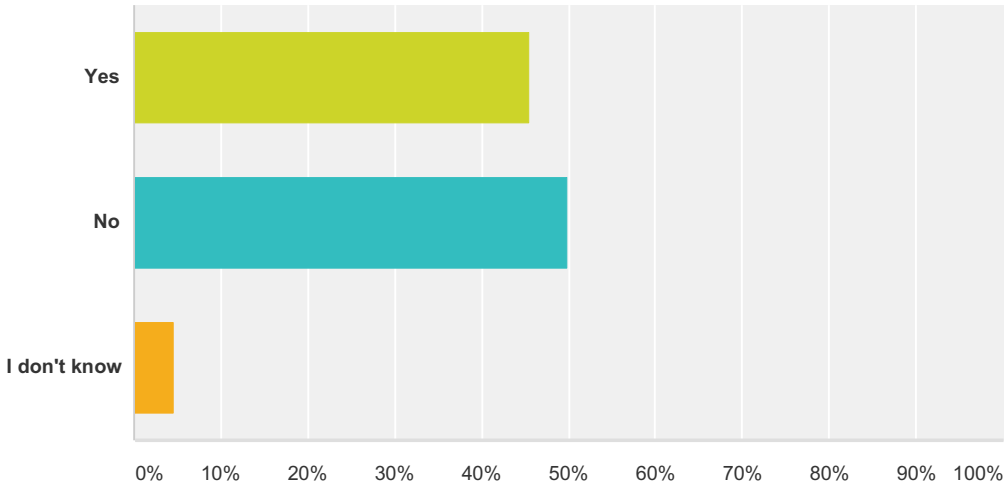
Answered: 22 Skipped: 0



Answer Choices	Responses	
Yes	**36.36%**	8
No	**63.64%**	14
Total		**22**

Q6 Do you think that critical and essential facilities (including fire departments, EMS, hospitals and medical centers) are disaster-resistant (e.g. are properly located and constructed, and have back-up power as appropriate)?

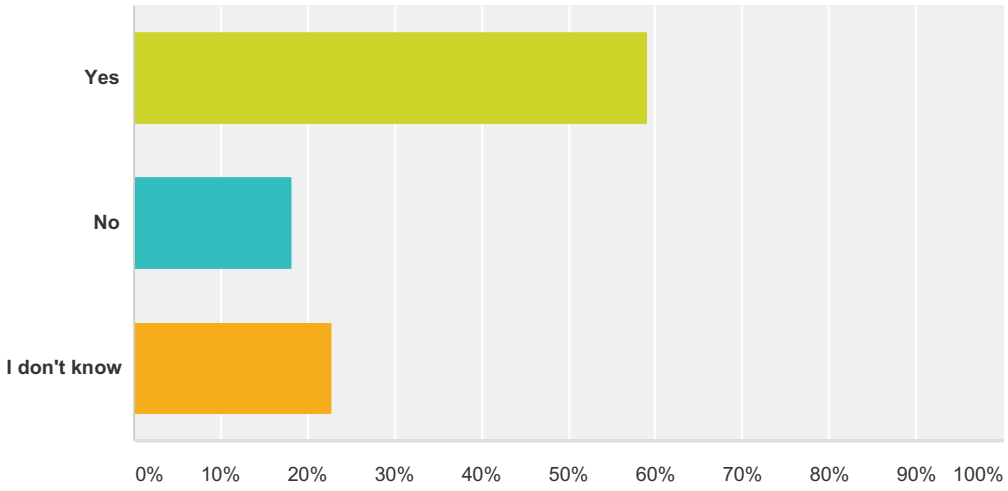
Answered: 22 Skipped: 0



Answer Choices	Responses	
Yes	**45.45%**	10
No	**50.00%**	11
I don't know	**4.55%**	1
Total		**22**

Q7 Do you think that the transportation infrastructure serving your facilities (e.g. roads and bridges) are properly designed to withstand closures and/or damage due to hazards?

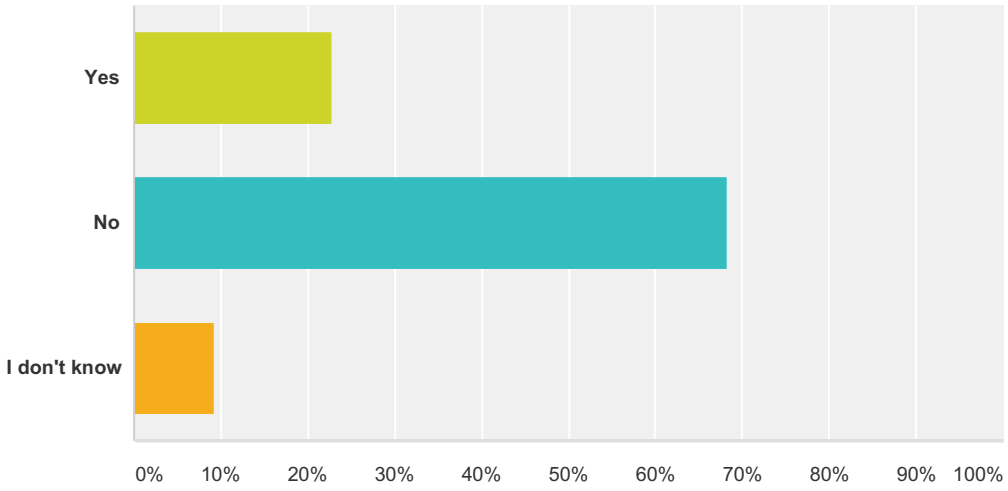
Answered: 22 Skipped: 0



Answer Choices	Responses	
Yes	**59.09%**	13
No	**18.18%**	4
I don't know	**22.73%**	5
Total		**22**

Q8 Do you think that the utility infrastructure (specifically electricity and communications) is sufficiently disaster-resistant to support fire fighting functions after hazard events?

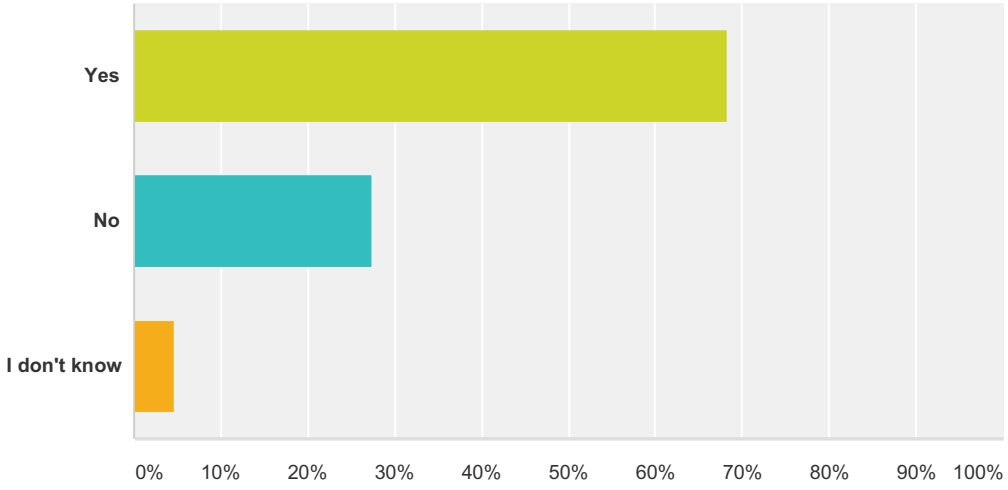
Answered: 22 Skipped: 0



Answer Choices	Responses	
Yes	**22.73%**	5
No	**68.18%**	15
I don't know	**9.09%**	2
Total		**22**

Q9 Do you think that local public education and awareness programs are effective at informing the public on what they should do to be prepared for and reduce their personal risk to disasters, so as not to increase the need for fire fighting services during hazard events?

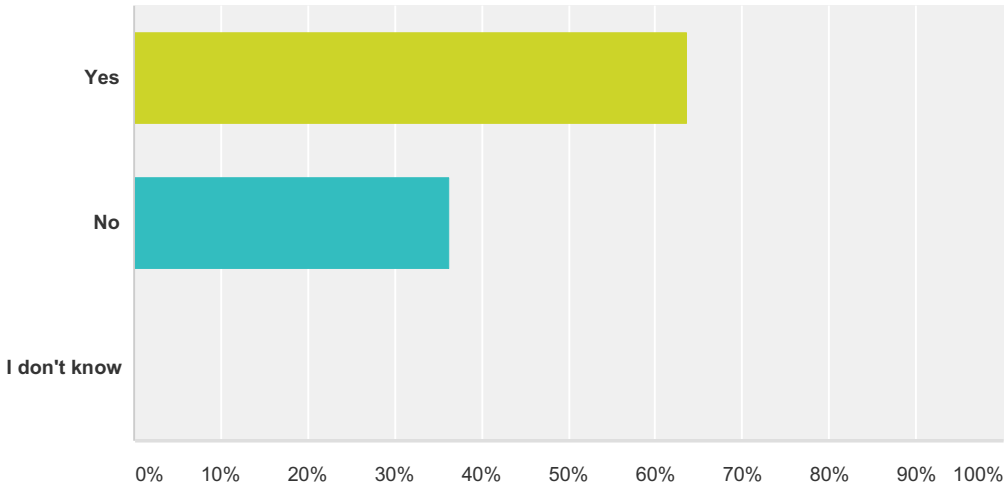
Answered: 22 Skipped: 0



Answer Choices	Responses	
Yes	**68.18%**	15
No	**27.27%**	6
I don't know	**4.55%**	1
Total		**22**

Q10 Do you think that announcements of road closures and pending road closures are sufficiently accurate and available to support fire department functions during hazard events?

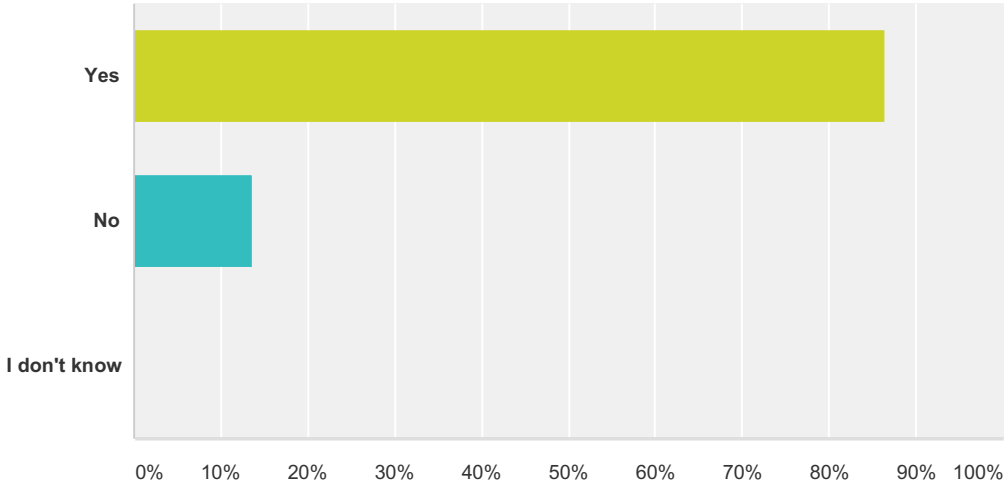
Answered: 22 Skipped: 0



Answer Choices	Responses	
Yes	**63.64%**	14
No	**36.36%**	8
I don't know	**0.00%**	0
Total		**22**

Q11 Do you think that the public is aware of, understands, and takes advantage of emergency warning and notification systems and services (reverse 911, audible alerts, cell and text services, NJ-ALERT)?

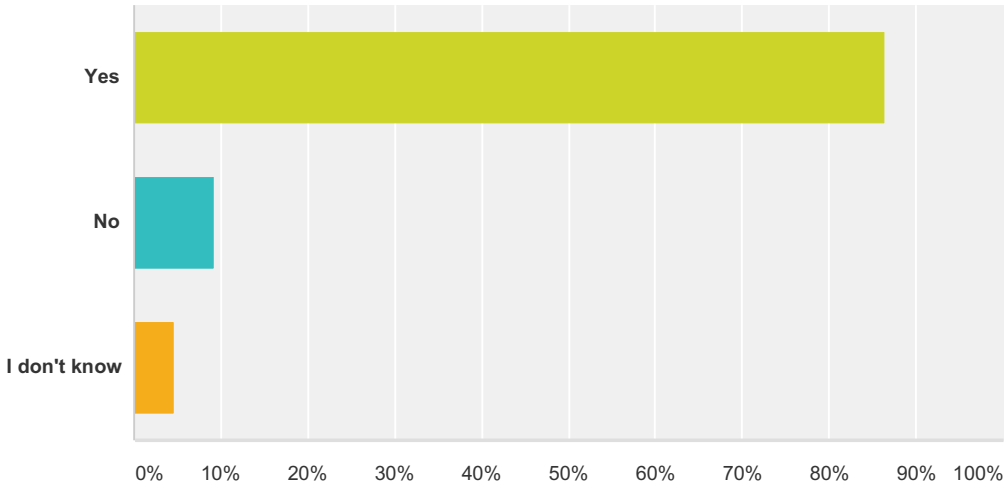
Answered: 22 Skipped: 0



Answer Choices	Responses	
Yes	**86.36%**	19
No	**13.64%**	3
I don't know	**0.00%**	0
Total		**22**

Q12 Do you think that your department/fire district works to inform your constituents of how they can better manage their risk to hazards (e.g. proper use of portable heaters and generators, defensible space for wildfires, etc.)?

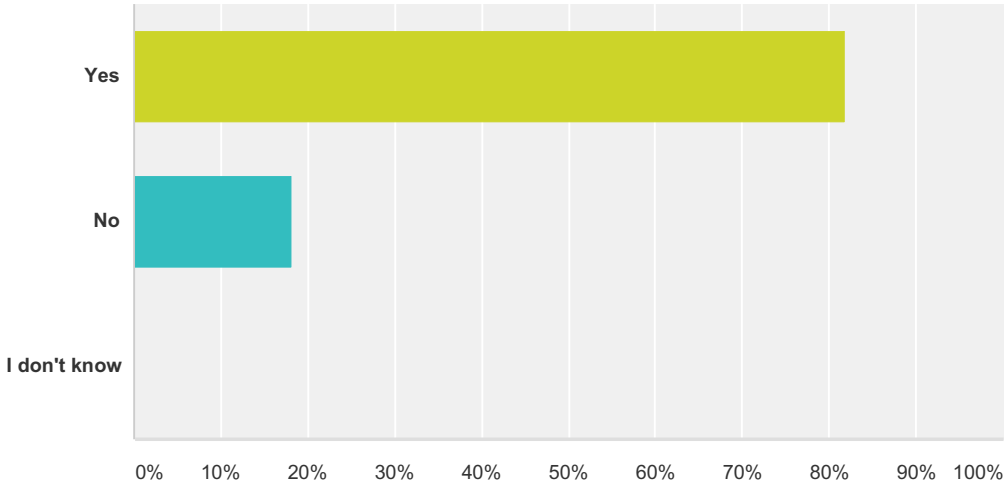
Answered: 22 Skipped: 0



Answer Choices	Responses	
Yes	**86.36%**	19
No	**9.09%**	2
I don't know	**4.55%**	1
Total		**22**

Q13 Do you think that emergency response planning, services, and equipment are adequate to manage and respond properly to disasters in your community?

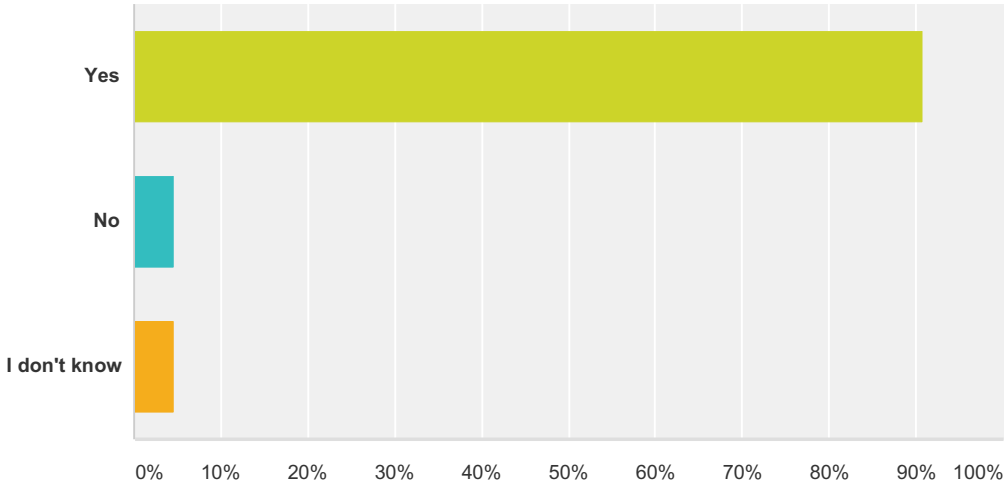
Answered: 22 Skipped: 0



Answer Choices	Responses	
Yes	**81.82%**	18
No	**18.18%**	4
I don't know	**0.00%**	0
Total		**22**

Q14 Do you think that local government understands, supports, and possess the resources for hazard risk reduction efforts in the community?

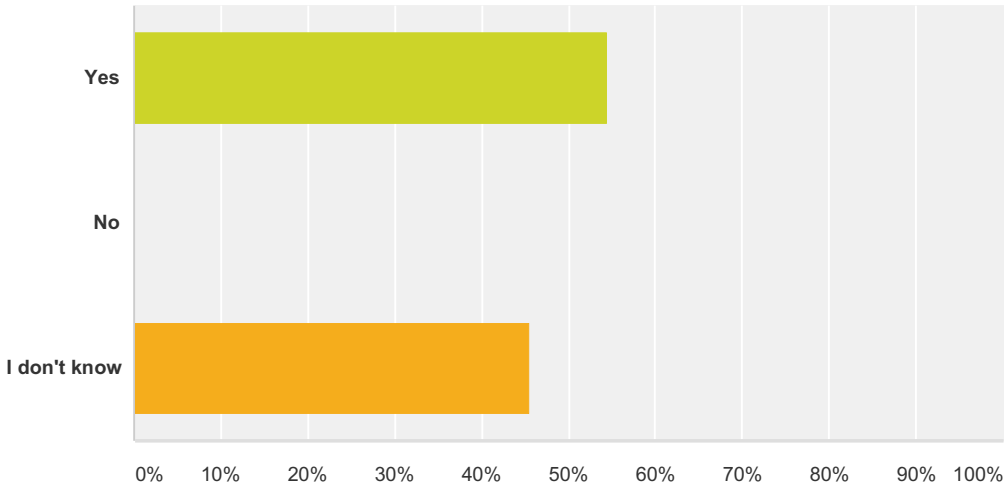
Answered: 22 Skipped: 0



Answer Choices	Responses	
Yes	**90.91%**	20
No	**4.55%**	1
I don't know	**4.55%**	1
Total		**22**

Q15 Is your organization covered by a Continuity of Operations (COOP) plan? COOP plans examine an organization's ability to perform minimum essential functions during any situation, and support the continuance of your organization's functions.

Answered: 22 Skipped: 0



Answer Choices	Responses	
Yes	**54.55%**	12
No	**0.00%**	0
I don't know	**45.45%**	10
Total		**22**

Q16 Can you identify projects or programs that will reduce your facility's vulnerability to damages and losses, including loss of operation/service, to hazard events?

Answered: 14 Skipped: 8

Q17 Do you have any other comments, questions, or concerns?

Answered: 5 Skipped: 17

Q1 Name of your health care facility:

Answered: 27 Skipped: 0

Q2 Name of respondent:

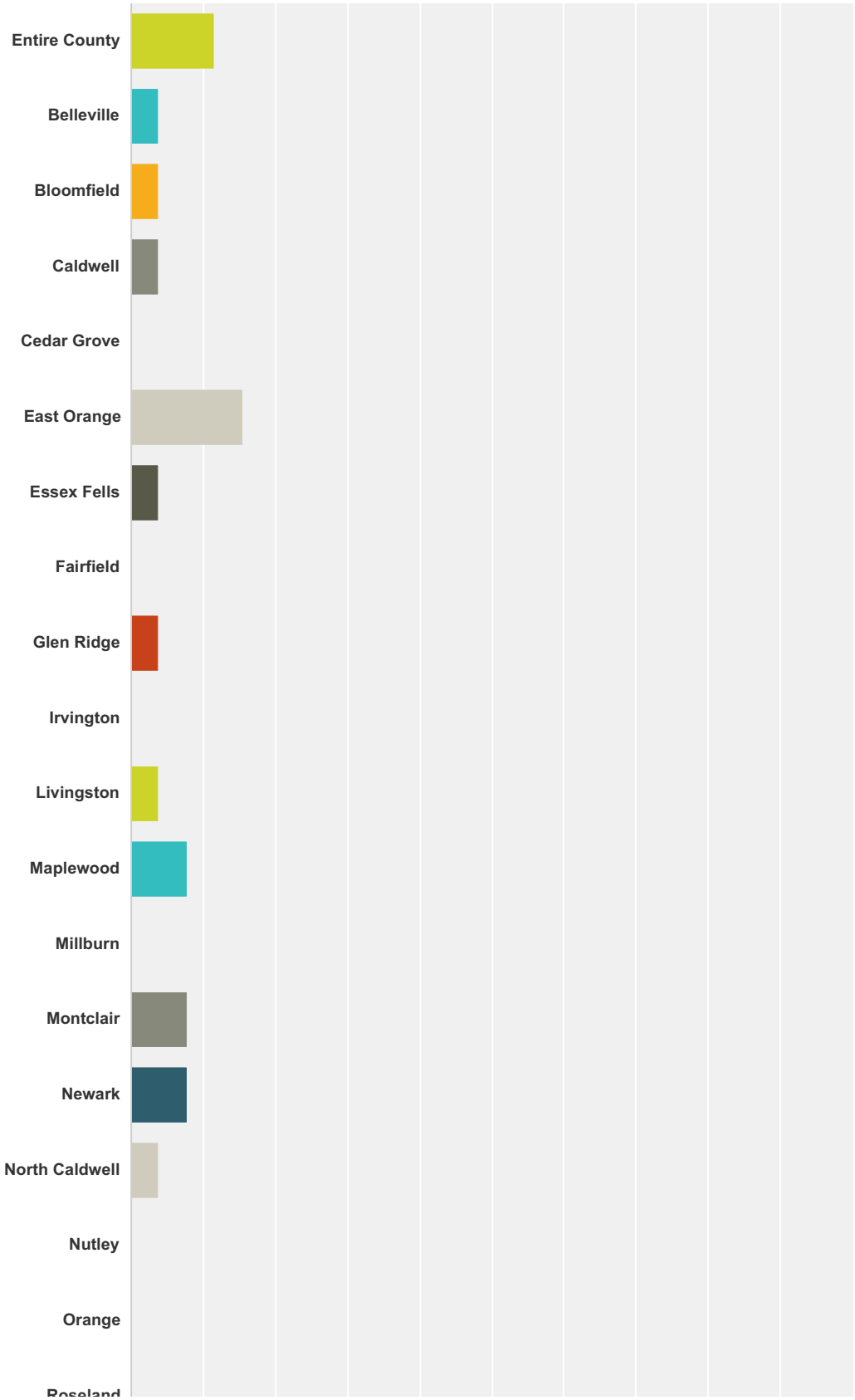
Answered: 25 Skipped: 2

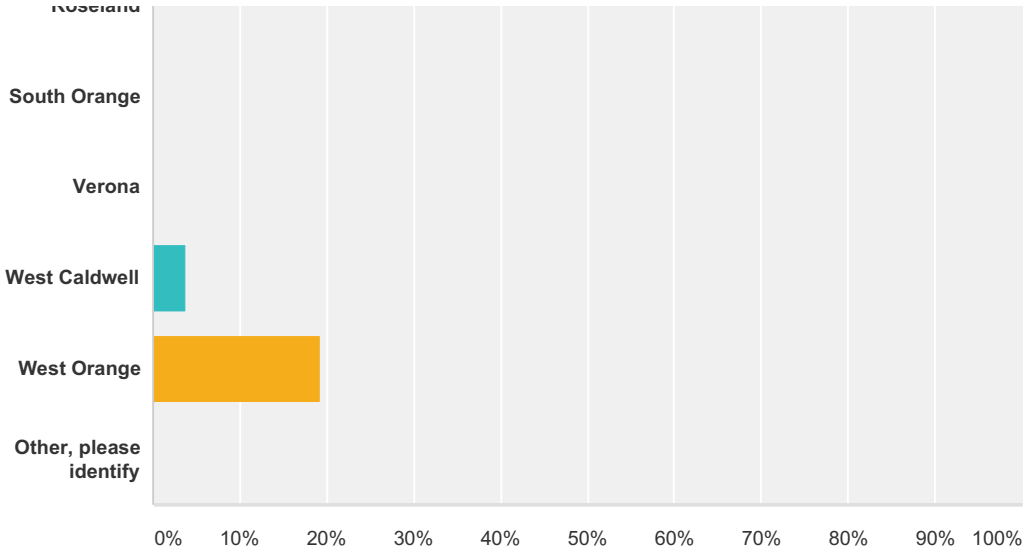
Q3 Contact information (email address or phone number) - optional:

Answered: 23 Skipped: 4

Q4 Please identify the location of your facility(ies) and or primary service area:

Answered: 26 Skipped: 1



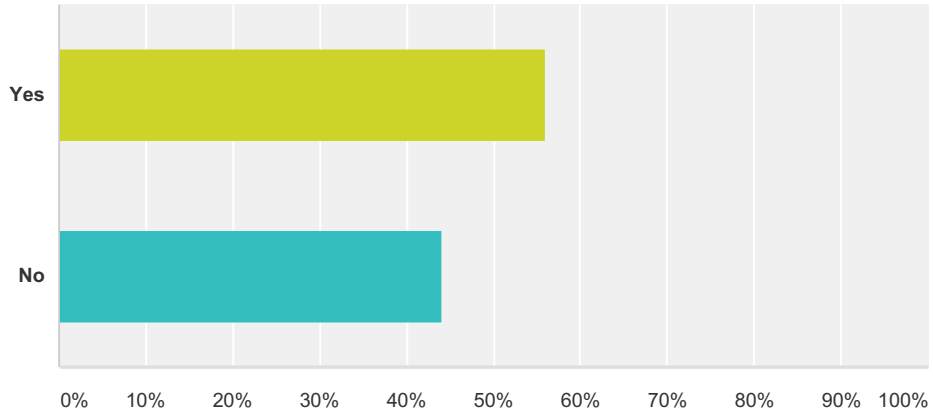


Answer Choices	Responses	
Entire County	**11.54%**	3
Belleville	**3.85%**	1
Bloomfield	**3.85%**	1
Caldwell	**3.85%**	1
Cedar Grove	**0.00%**	0
East Orange	**15.38%**	4
Essex Fells	**3.85%**	1
Fairfield	**0.00%**	0
Glen Ridge	**3.85%**	1
Irvington	**0.00%**	0
Livingston	**3.85%**	1
Maplewood	**7.69%**	2
Millburn	**0.00%**	0
Montclair	**7.69%**	2
Newark	**7.69%**	2
North Caldwell	**3.85%**	1
Nutley	**0.00%**	0
Orange	**0.00%**	0
Roseland	**0.00%**	0
South Orange	**0.00%**	0

Verona	**0.00%**	0
West Caldwell	**3.85%**	1
West Orange	**19.23%**	5
Other, please identify	**0.00%**	0
Total		**26**

Q5 Have your facilities been impacted by natural hazard events (damaged, closed for extended periods, etc.)?

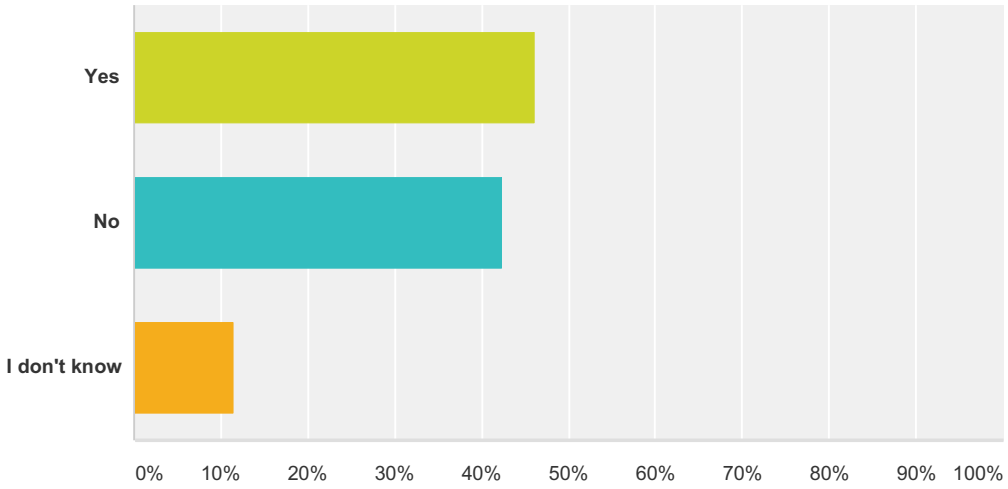
Answered: 25 Skipped: 2



Answer Choices	Responses	
Yes	**56.00%**	14
No	**44.00%**	11
Total		**25**

Q6 Do you think that critical and essential facilities (including hospitals and medical centers, EMS facilities, schools, etc.) are disaster-resistant (e.g. are properly located and constructed, and have back-up power as appropriate)?

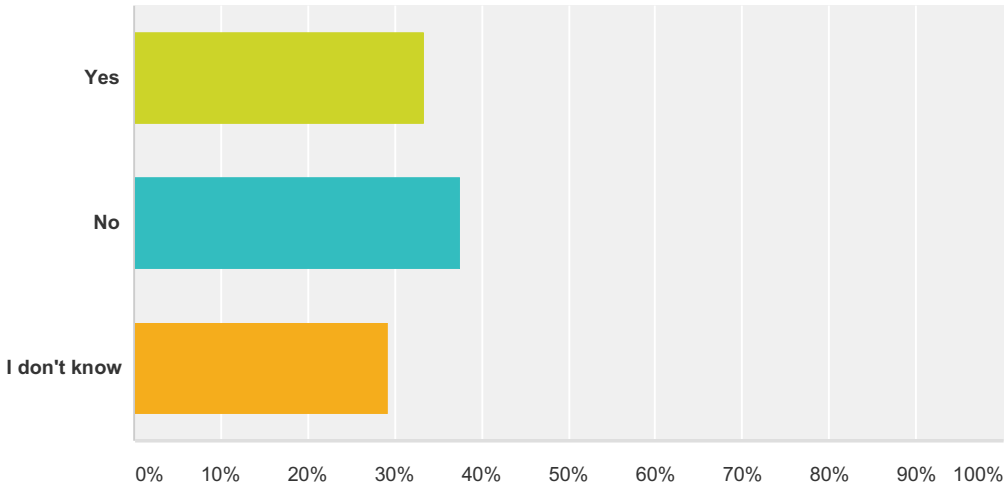
Answered: 26 Skipped: 1



Answer Choices	Responses	
Yes	**46.15%**	12
No	**42.31%**	11
I don't know	**11.54%**	3
Total		**26**

Q7 Do you think that the transportation infrastructure serving your facilities (e.g. roads and bridges) are properly designed to withstand closures and/or damage due to hazard events?

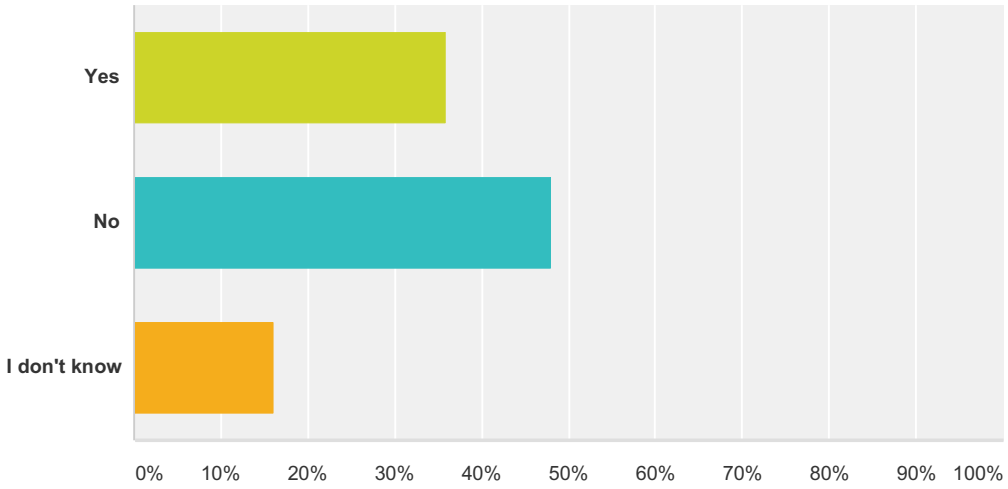
Answered: 24 Skipped: 3



Answer Choices	Responses	
Yes	**33.33%**	8
No	**37.50%**	9
I don't know	**29.17%**	7
Total		**24**

Q8 Do you think that the utility infrastructure (specifically electricity and communications) is sufficiently disaster-resistant to support your facility's health care functions during and after hazard events?

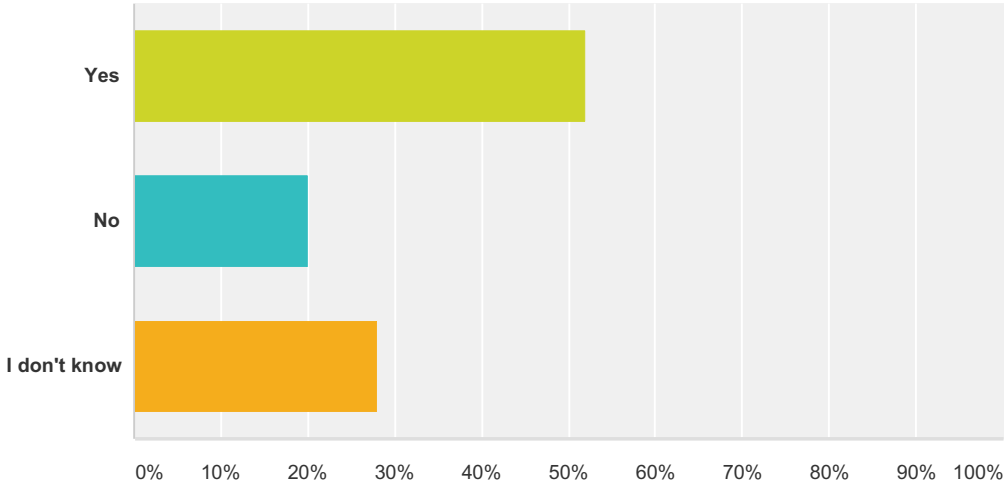
Answered: 25 Skipped: 2



Answer Choices	Responses	
Yes	**36.00%**	9
No	**48.00%**	12
I don't know	**16.00%**	4
Total		**25**

Q9 Do you think that local public education and awareness programs are effective at informing the public on what they should do to be prepared for and reduce their personal risk to disasters, so as not to increase the need for health care services during hazard events?

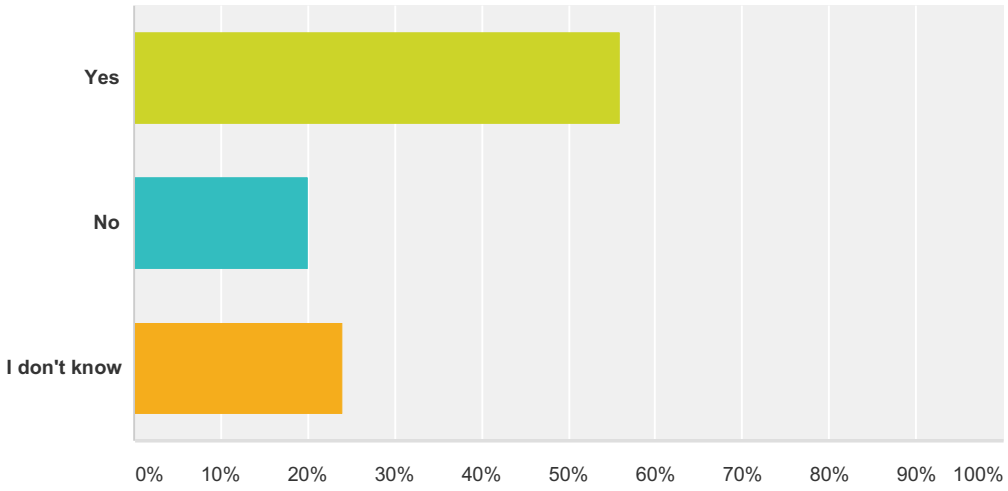
Answered: 25 Skipped: 2



Answer Choices	Responses	
Yes	**52.00%**	13
No	**20.00%**	5
I don't know	**28.00%**	7
Total		**25**

Q10 Do you think that announcements of road closures and pending road closures are sufficiently accurate and available to support hospital functions during hazard events?

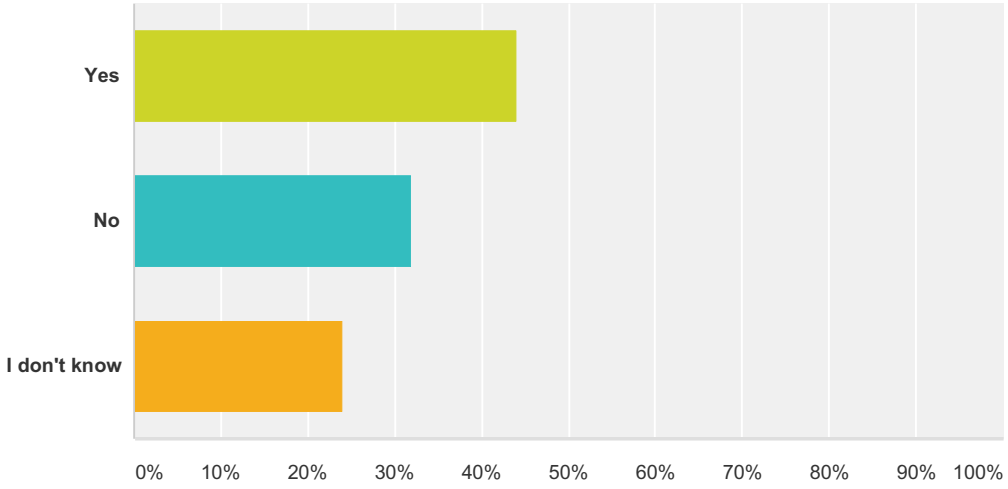
Answered: 25 Skipped: 2



Answer Choices	Responses	
Yes	**56.00%**	14
No	**20.00%**	5
I don't know	**24.00%**	6
Total		**25**

Q11 Do you think that the public is aware of, understands, and takes advantage of emergency warning and notification systems and services (reverse 911, audible alerts, cell and text services, NJ-ALERT)?

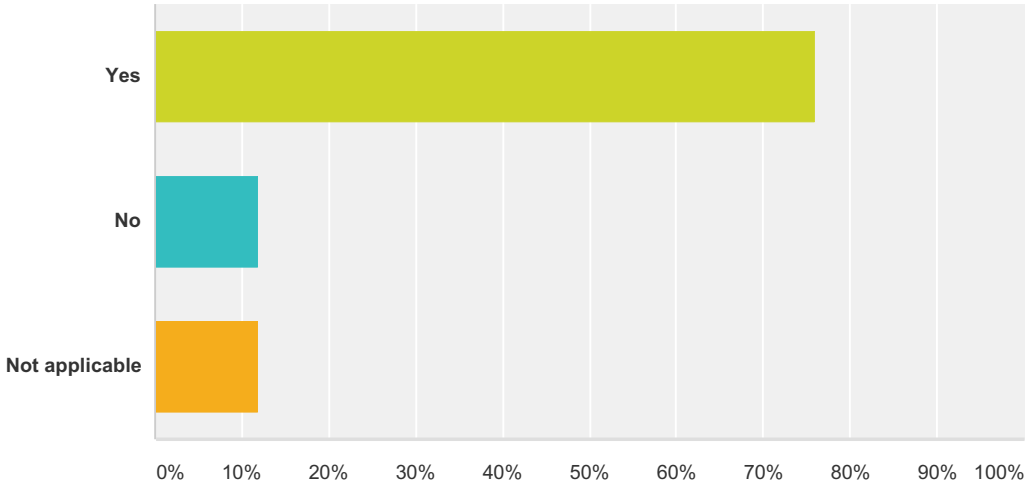
Answered: 25 Skipped: 2



Answer Choices	Responses	
Yes	**44.00%**	11
No	**32.00%**	8
I don't know	**24.00%**	6
Total		**25**

Q12 Do you think that your organization works to inform your constituents of how they can better manage their risk to hazard events?

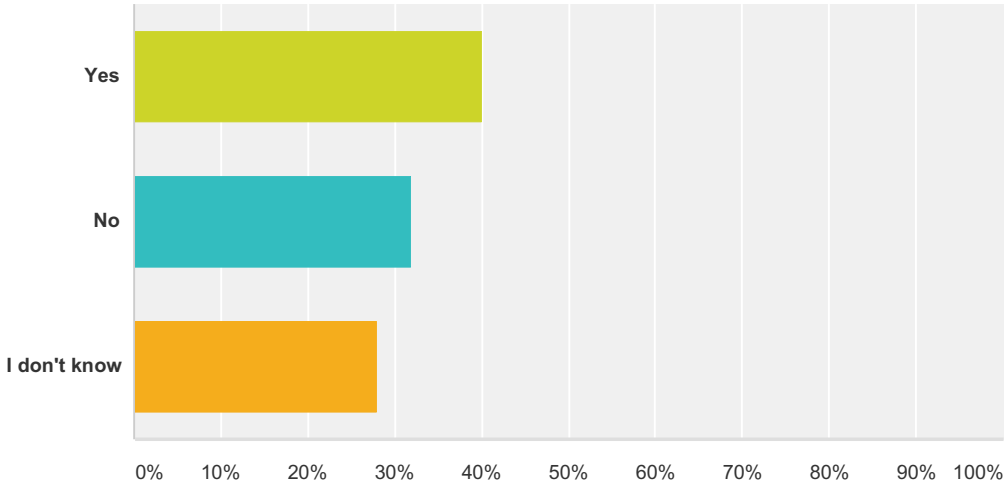
Answered: 25 Skipped: 2



Answer Choices	Responses	
Yes	**76.00%**	19
No	**12.00%**	3
Not applicable	**12.00%**	3
Total		**25**

Q13 Do you think that emergency response planning, services, and equipment are adequate to manage and respond properly to disasters in your community?

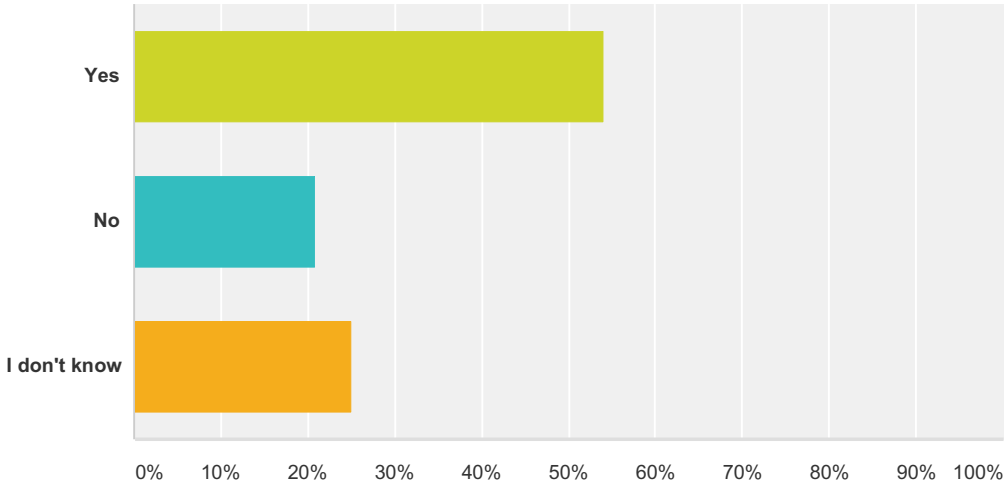
Answered: 25 Skipped: 2



Answer Choices	Responses	
Yes	**40.00%**	10
No	**32.00%**	8
I don't know	**28.00%**	7
Total		**25**

Q14 Do you think that local government understands, supports, and possess the resources for hazard risk reduction efforts in the community?

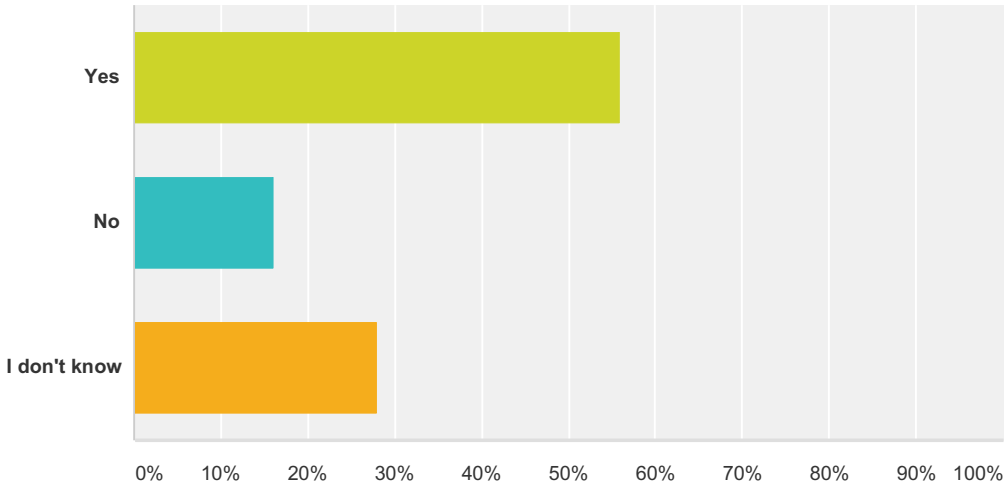
Answered: 24 Skipped: 3



Answer Choices	Responses	
Yes	**54.17%**	13
No	**20.83%**	5
I don't know	**25.00%**	6
Total		**24**

Q15 Is your organization covered by a Continuity of Operations (COOP) plan? COOP plans examine an organization's ability to perform minimum essential functions during any situation, and support the continuance of organization functions.

Answered: 25 Skipped: 2



Answer Choices	Responses	
Yes	**56.00%**	14
No	**16.00%**	4
I don't know	**28.00%**	7
Total		**25**

Q16 Can you identify projects or programs that will reduce your facility's vulnerability to damages and losses, including loss of operation/service, to hazard events?

Answered: 17 Skipped: 10

Q17 Do you have any other comments, questions, or concerns?

Answered: 13 Skipped: 14

Q1 Name of your police department or law enforcement agency:

Answered: 13 Skipped: 0

Q2 Name of Respondent:

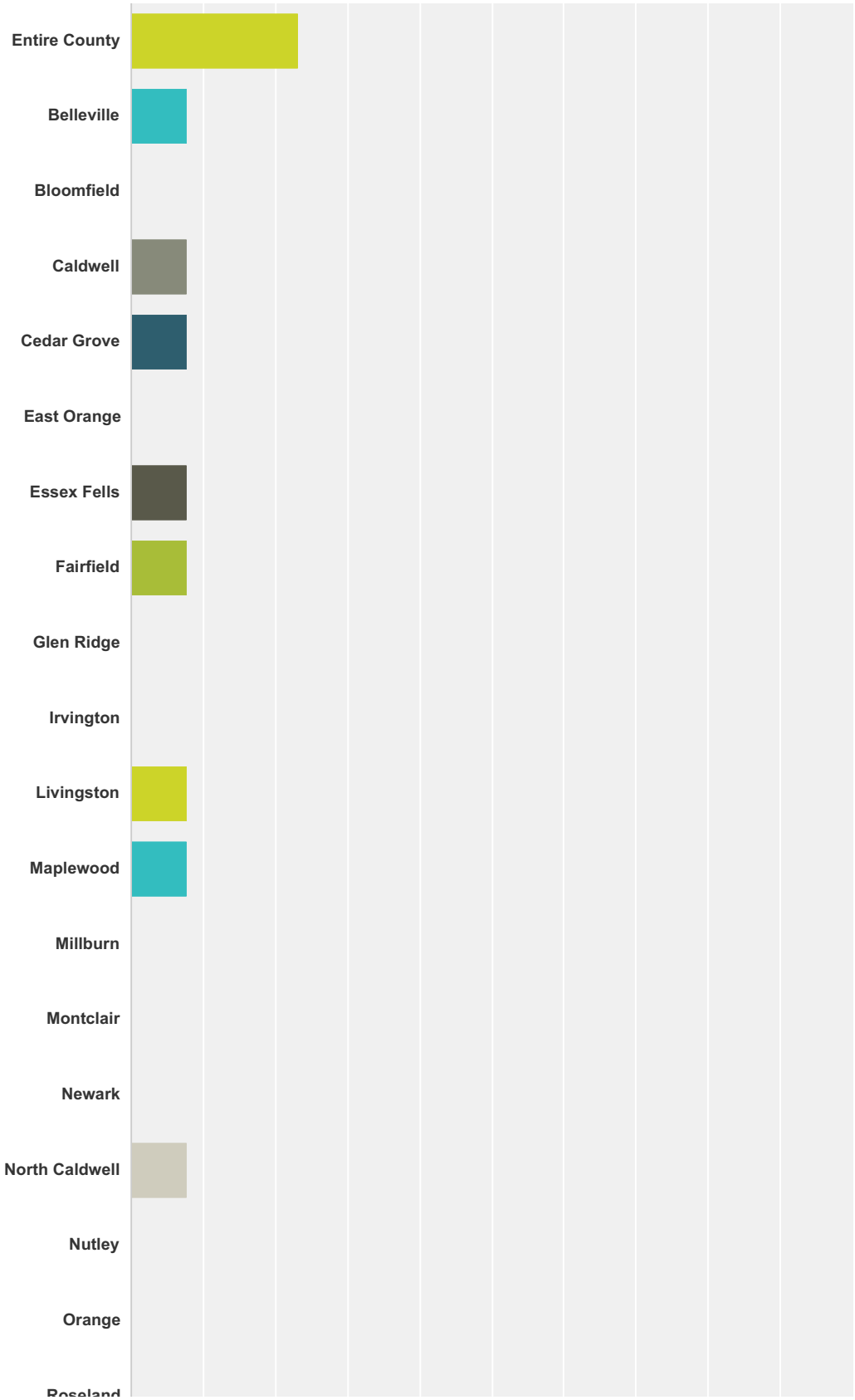
Answered: 13 Skipped: 0

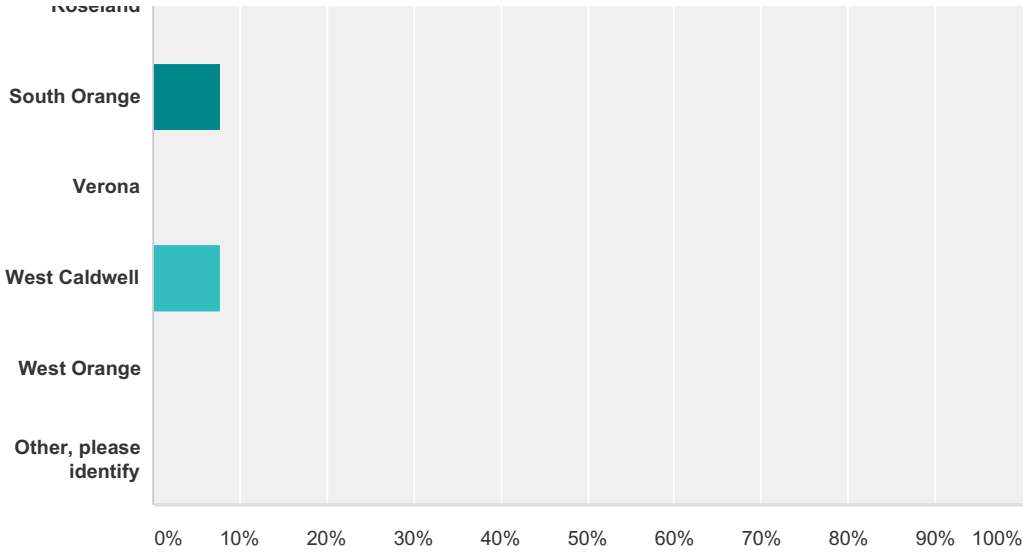
Q3 Contact information (email address or phone number) - optional:

Answered: 13 Skipped: 0

Q4 Please identify the location of your facility(ies) and or primary service area:

Answered: 13 Skipped: 0



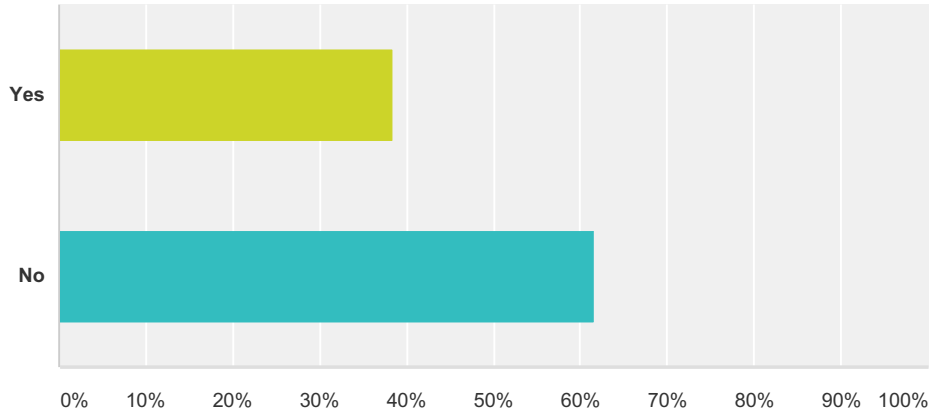


Answer Choices	Responses	
Entire County	**23.08%**	3
Belleville	**7.69%**	1
Bloomfield	**0.00%**	0
Caldwell	**7.69%**	1
Cedar Grove	**7.69%**	1
East Orange	**0.00%**	0
Essex Fells	**7.69%**	1
Fairfield	**7.69%**	1
Glen Ridge	**0.00%**	0
Irvington	**0.00%**	0
Livingston	**7.69%**	1
Maplewood	**7.69%**	1
Millburn	**0.00%**	0
Montclair	**0.00%**	0
Newark	**0.00%**	0
North Caldwell	**7.69%**	1
Nutley	**0.00%**	0
Orange	**0.00%**	0
Roseland	**0.00%**	0
South Orange	**7.69%**	1

Verona	**0.00%**	0
West Caldwell	**7.69%**	1
West Orange	**0.00%**	0
Other, please identify	**0.00%**	0
Total		**13**

Q5 Have your facilities been impacted by hazard events (damaged, closed for extended periods, etc.)?

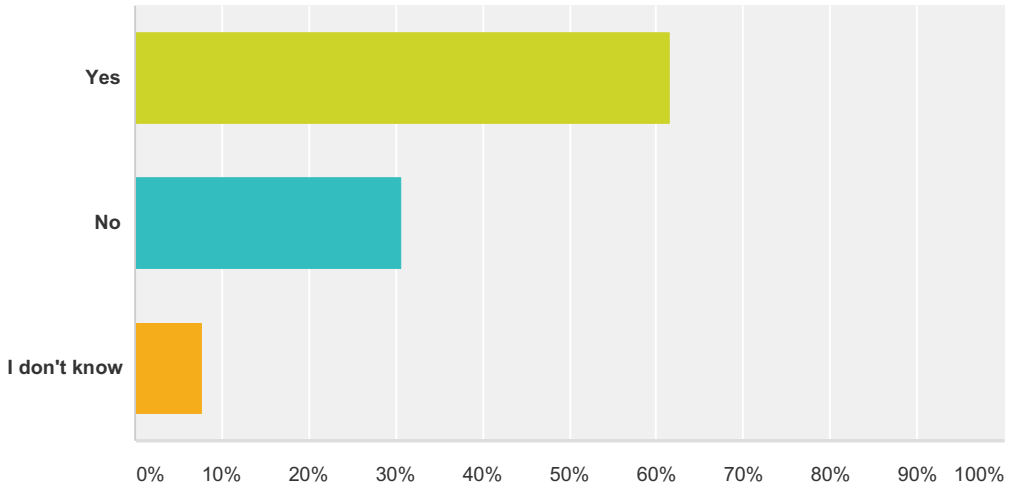
Answered: 13 Skipped: 0



Answer Choices	Responses	
Yes	**38.46%**	5
No	**61.54%**	8
Total		**13**

Q6 Do you think that critical and essential facilities (including police stations, jails and detention centers) are disaster-resistant (e.g. are properly located and constructed, and have back-up power as appropriate)?

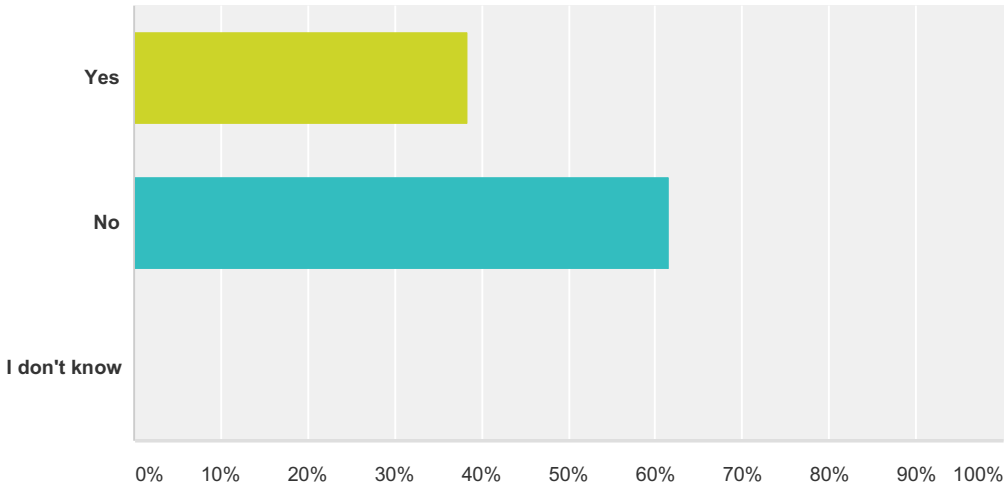
Answered: 13 Skipped: 0



Answer Choices	Responses	
Yes	**61.54%**	8
No	**30.77%**	4
I don't know	**7.69%**	1
Total		**13**

Q7 Do you think that the transportation infrastructure serving your facilities (e.g. roads and bridges) are properly designed to withstand closures and/or damage due to hazard events?

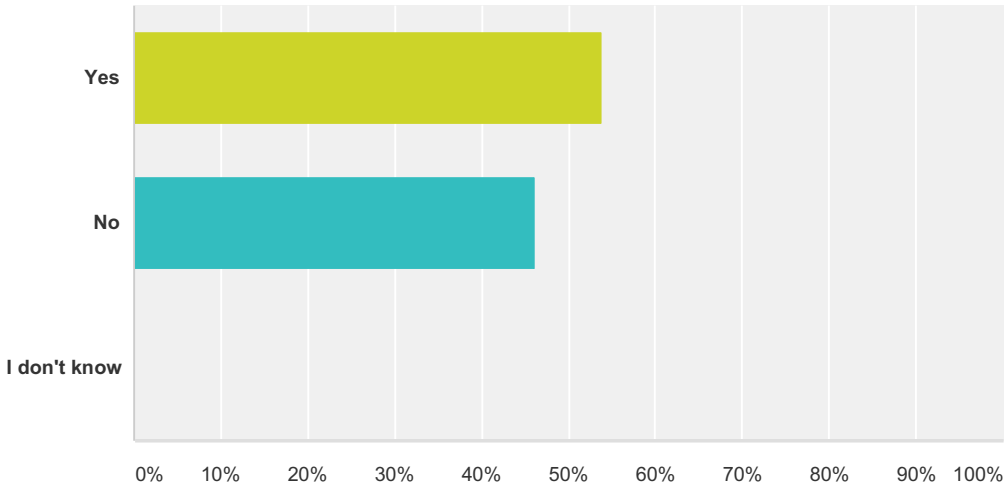
Answered: 13 Skipped: 0



Answer Choices	Responses	
Yes	**38.46%**	5
No	**61.54%**	8
I don't know	**0.00%**	0
Total		**13**

Q8 Do you think that the utility infrastructure (specifically electricity and communications) is sufficiently disaster-resistant to support law enforcement functions during and after hazard events?

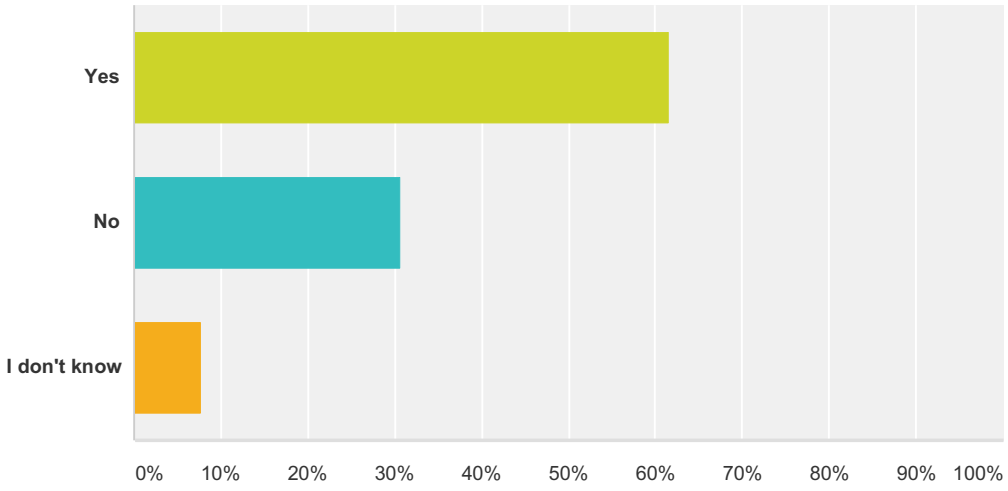
Answered: 13 Skipped: 0



Answer Choices	Responses	
Yes	**53.85%**	7
No	**46.15%**	6
I don't know	**0.00%**	0
Total		**13**

Q9 Do you think that local public education and awareness programs are effective at informing the public on what they should do to be prepared for and how to reduce their personal risk to disasters, so as not to increase the need for law enforcement and police protective services during hazard events?

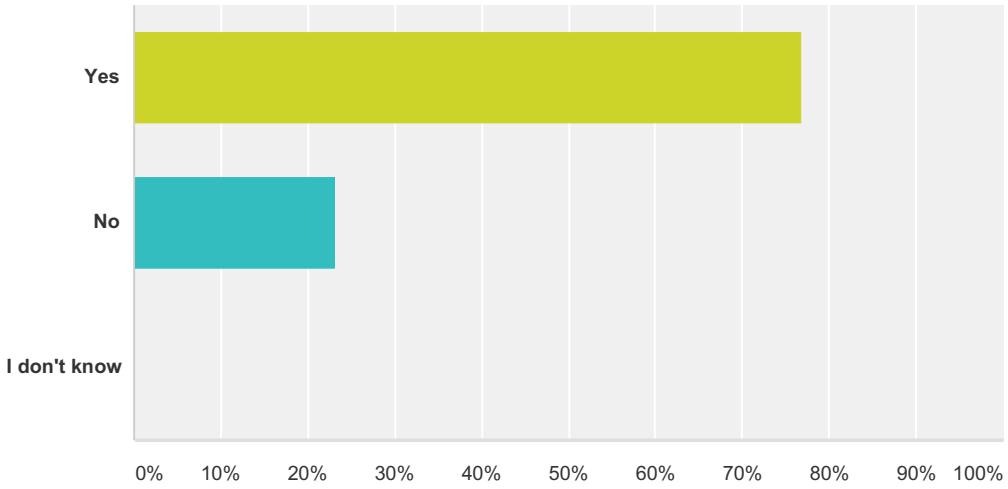
Answered: 13 Skipped: 0



Answer Choices	Responses	
Yes	**61.54%**	8
No	**30.77%**	4
I don't know	**7.69%**	1
Total		**13**

Q10 Do you think that announcements of road closures and pending road closures are sufficiently accurate and available to support law enforcement and police protective service functions during hazard events?

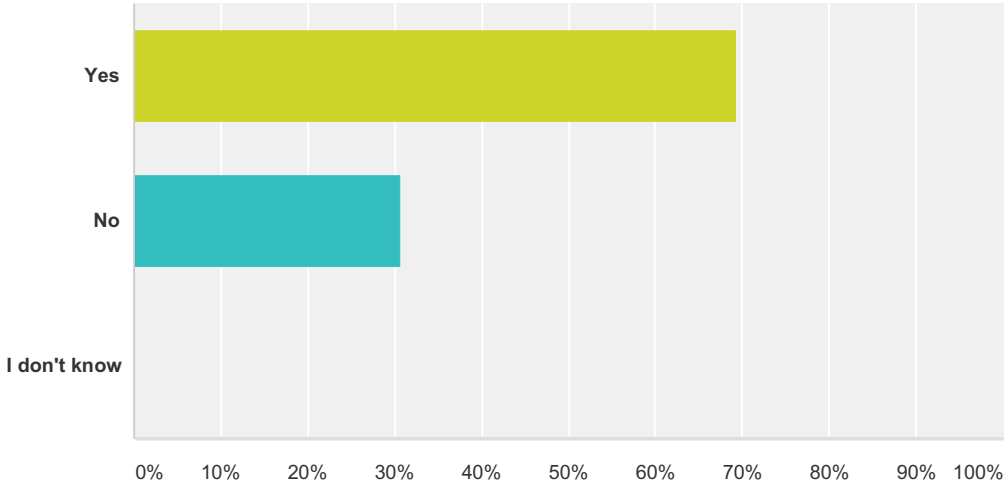
Answered: 13 Skipped: 0



Answer Choices	Responses	
Yes	**76.92%**	10
No	**23.08%**	3
I don't know	**0.00%**	0
Total		**13**

Q11 Do you think that the public is aware of, understands, and takes advantage of emergency warning and notification systems and services (reverse 911, audible alerts, cell and text services, social media)?

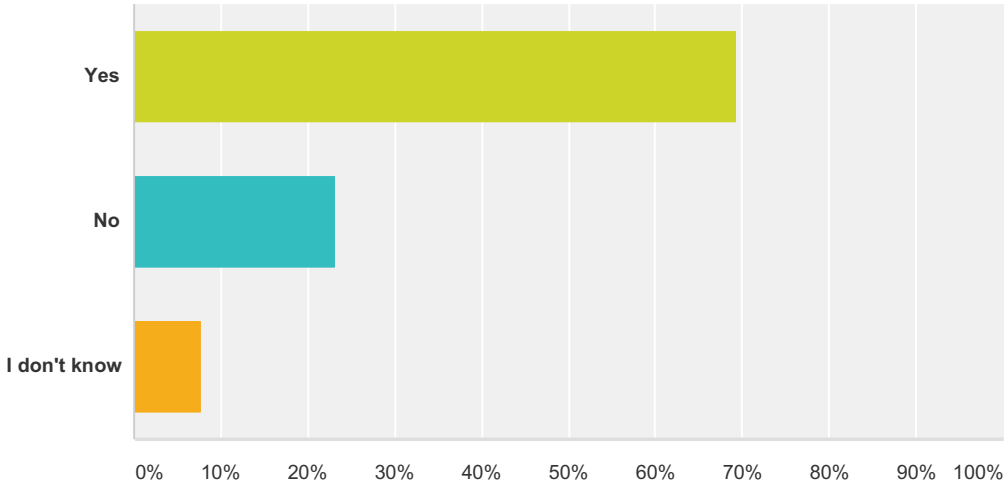
Answered: 13 Skipped: 0



Answer Choices	Responses	
Yes	**69.23%**	9
No	**30.77%**	4
I don't know	**0.00%**	0
Total		**13**

Q12 Do you think that emergency response planning, services, and equipment are adequate to manage and respond properly to disasters in your community?

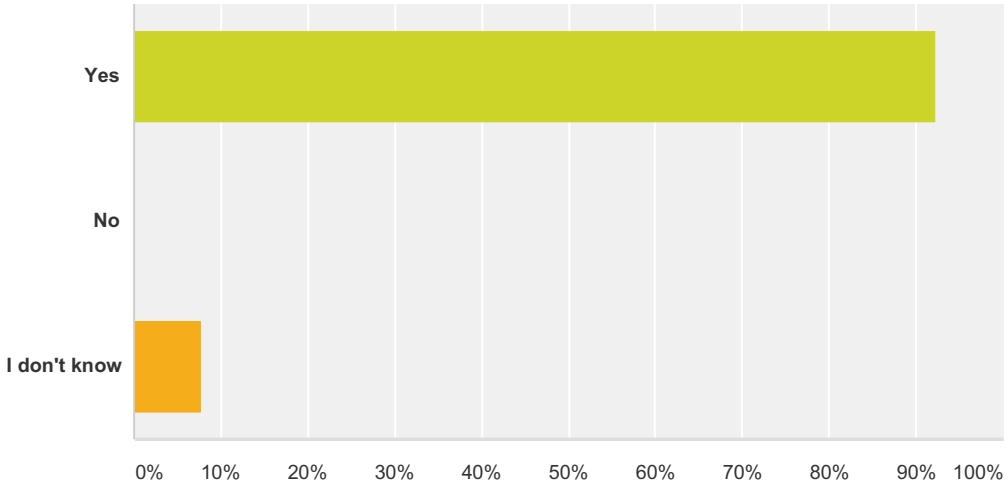
Answered: 13 Skipped: 0



Answer Choices	Responses	
Yes	**69.23%**	9
No	**23.08%**	3
I don't know	**7.69%**	1
Total		**13**

Q13 Do you think that local government understands, supports, and possess the resources for hazard risk reduction efforts in the community?

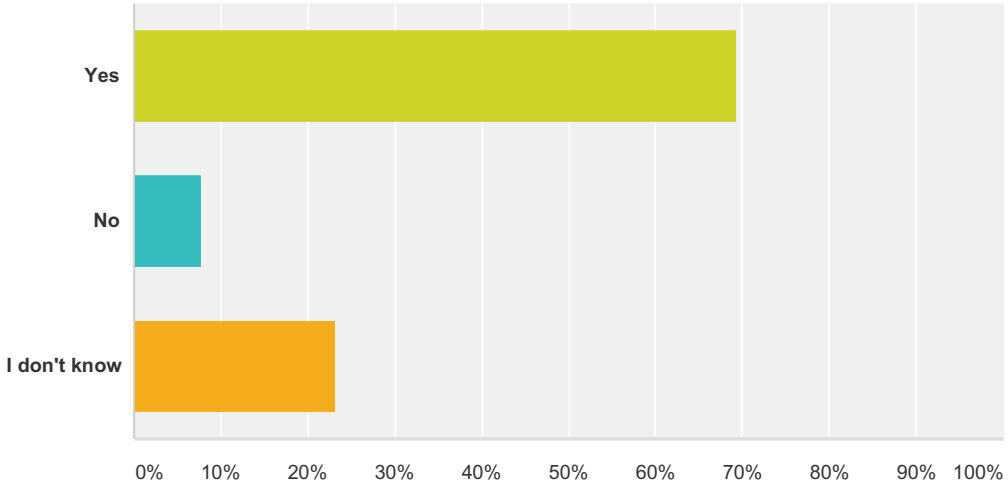
Answered: 13 Skipped: 0



Answer Choices	Responses	
Yes	**92.31%**	12
No	**0.00%**	0
I don't know	**7.69%**	1
Total		**13**

Q14 Is your organization covered by a Continuity of Operations (COOP) plan? COOP plans examine an organization's ability to perform minimum essential functions during any situation, and support the continuance of your organization's functions.

Answered: 13 Skipped: 0



Answer Choices	Responses	
Yes	**69.23%**	9
No	**7.69%**	1
I don't know	**23.08%**	3
Total		**13**

Q15 Can you identify projects or programs that will reduce your facility's vulnerability to damages and losses, including loss of operation/service, to hazard events?

Answered: 8 Skipped: 5

Q16 Please provide any additional comments here. Thank you!

Answered: 3 Skipped: 10

Q1 Name of your Transportation Agency, Public Works Department or District:

Answered: 14 Skipped: 0

Q2 Name of respondent:

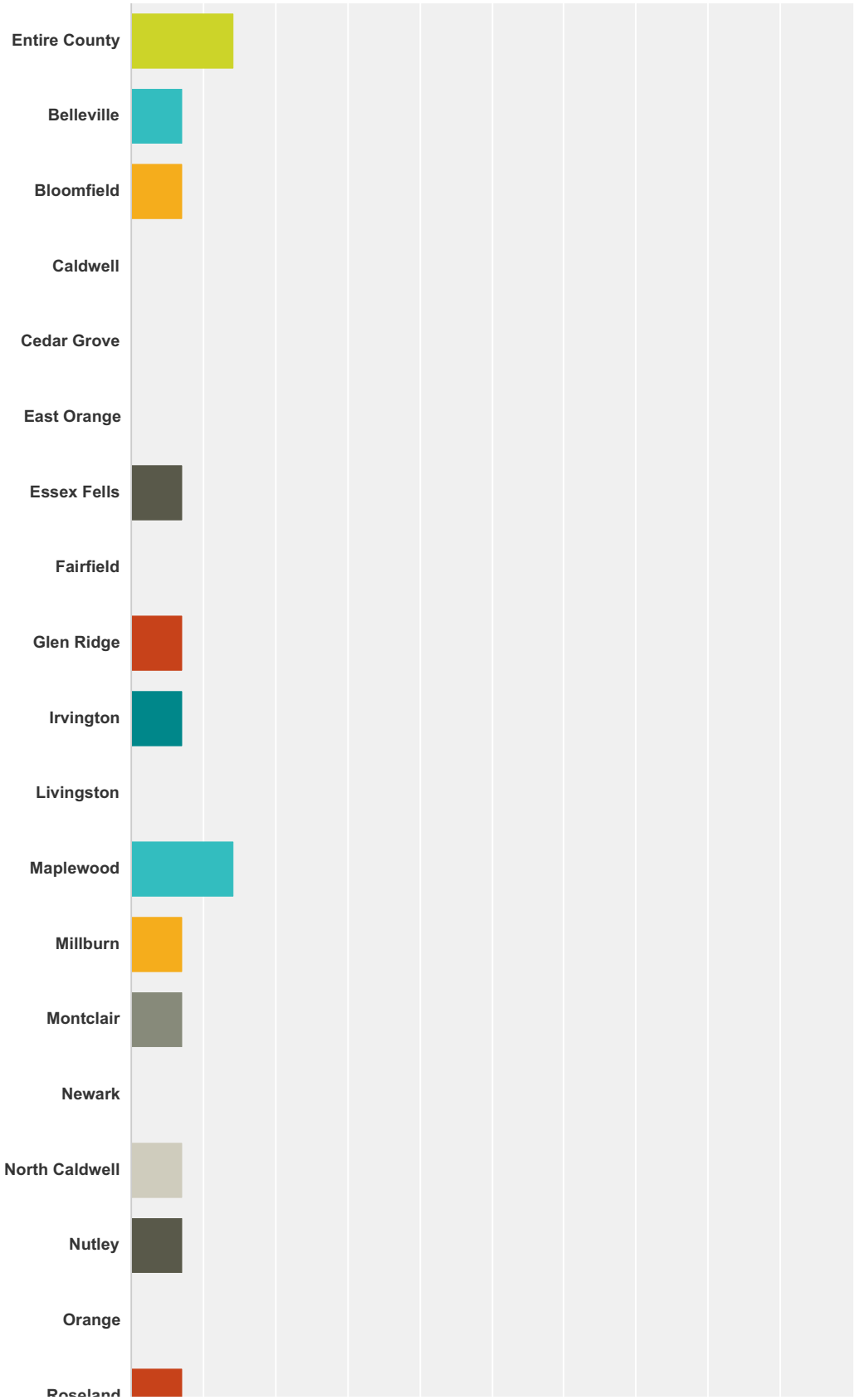
Answered: 14 Skipped: 0

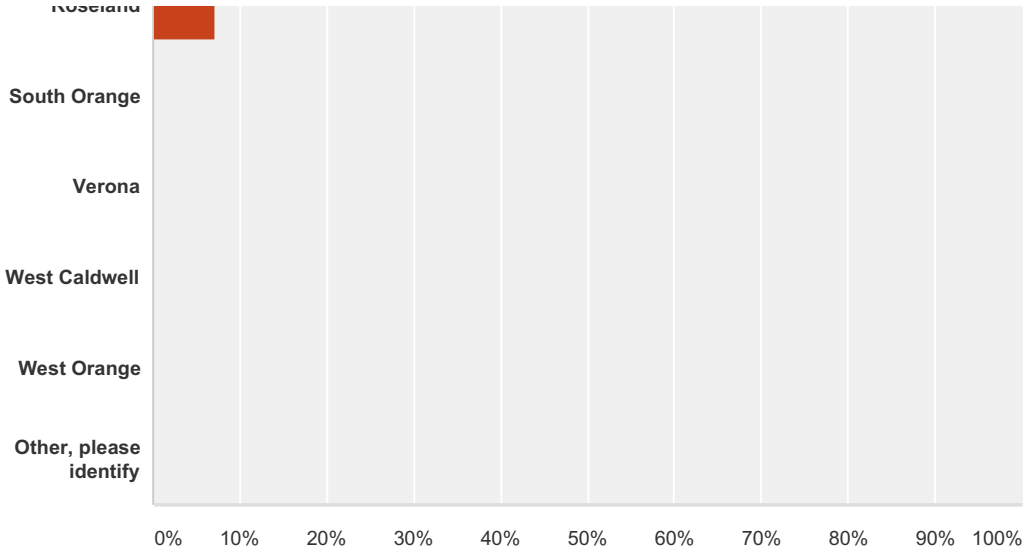
Q3 Contact information (email address or phone number) - optional:

Answered: 13 Skipped: 1

Q4 Please identify the location of your facility(ies) and or primary service area:

Answered: 14 Skipped: 0



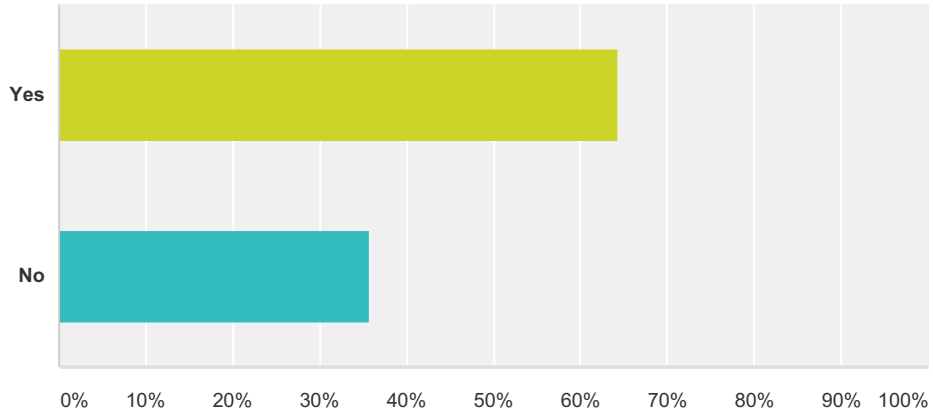


Answer Choices	Responses	
Entire County	**14.29%**	2
Belleville	**7.14%**	1
Bloomfield	**7.14%**	1
Caldwell	**0.00%**	0
Cedar Grove	**0.00%**	0
East Orange	**0.00%**	0
Essex Fells	**7.14%**	1
Fairfield	**0.00%**	0
Glen Ridge	**7.14%**	1
Irvington	**7.14%**	1
Livingston	**0.00%**	0
Maplewood	**14.29%**	2
Millburn	**7.14%**	1
Montclair	**7.14%**	1
Newark	**0.00%**	0
North Caldwell	**7.14%**	1
Nutley	**7.14%**	1
Orange	**0.00%**	0
Roseland	**7.14%**	1
South Orange	**0.00%**	0

Verona	**0.00%**	0
West Caldwell	**0.00%**	0
West Orange	**0.00%**	0
Other, please identify	**0.00%**	0
Total		**14**

Q5 Has your agency, department or district been impacted by hazard events (damaged, closed for extended periods, etc.)?

Answered: 14 Skipped: 0



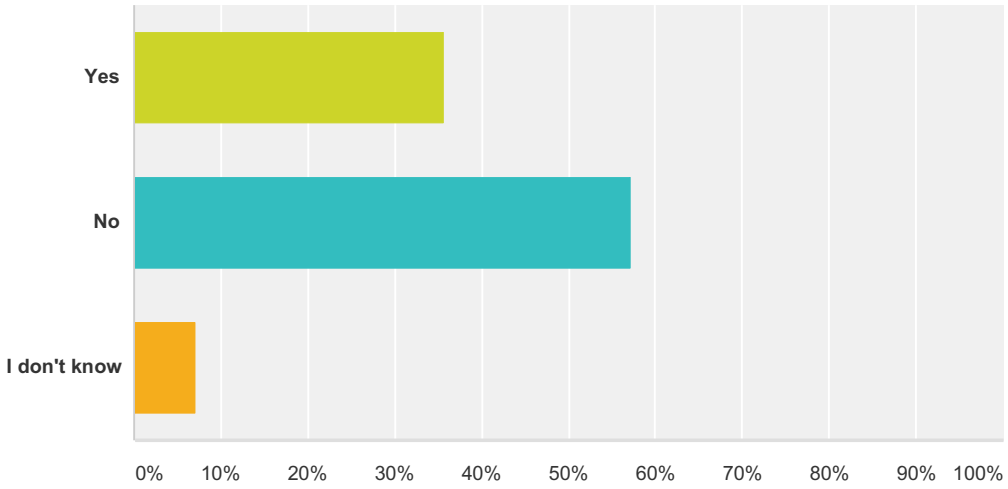
Answer Choices	Responses	
Yes	**64.29%**	9
No	**35.71%**	5
Total		**14**

Q6 Can you identify projects or programs that will reduce your facility's vulnerability to damages and losses, including loss of operation/service, to hazard events?

Answered: 9 Skipped: 5

Q7 Do you think that critical and essential facilities (including public works, transportation, police, fire and EMS) are disaster-resistant (e.g. are properly located and constructed, and have back-up power as appropriate)?

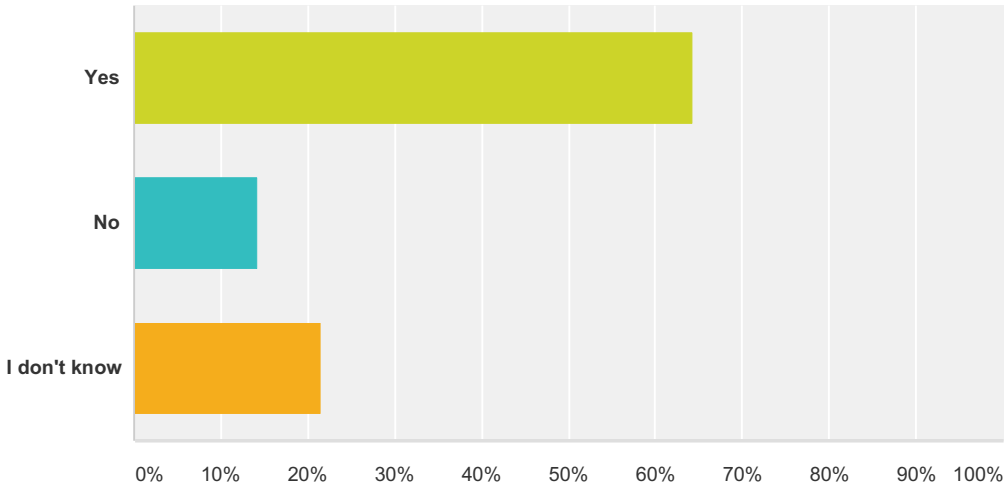
Answered: 14 Skipped: 0



Answer Choices	Responses	
Yes	**35.71%**	5
No	**57.14%**	8
I don't know	**7.14%**	1
Total		**14**

Q8 Do you think that the transportation infrastructure serving your facilities (e.g. roads and bridges) are properly designed to withstand closures and/or damage due to natural hazards?

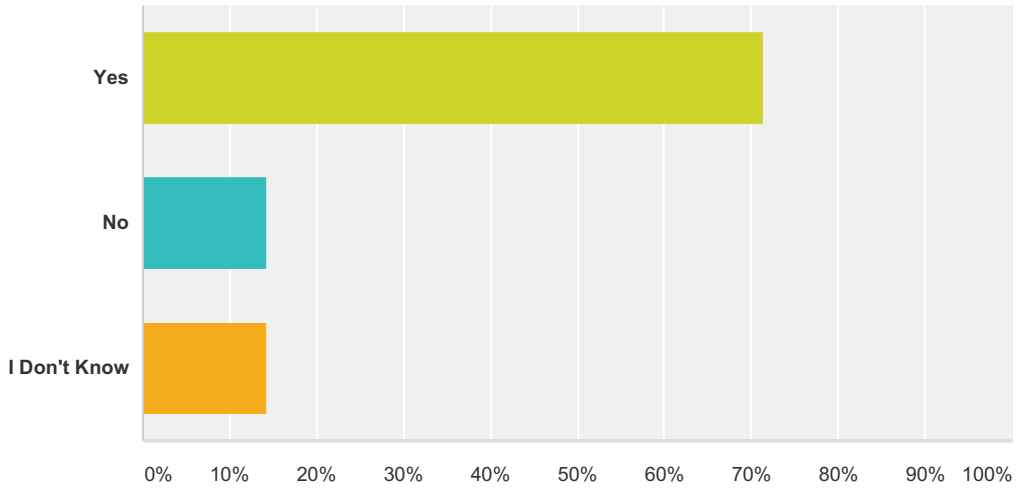
Answered: 14 Skipped: 0



Answer Choices	Responses	
Yes	**64.29%**	9
No	**14.29%**	2
I don't know	**21.43%**	3
Total		**14**

Q9 Do you think that the transportation infrastructure serving your facilities (e.g. roads and bridges) are properly maintained to withstand closures and/or damage due to unforseen hazards?

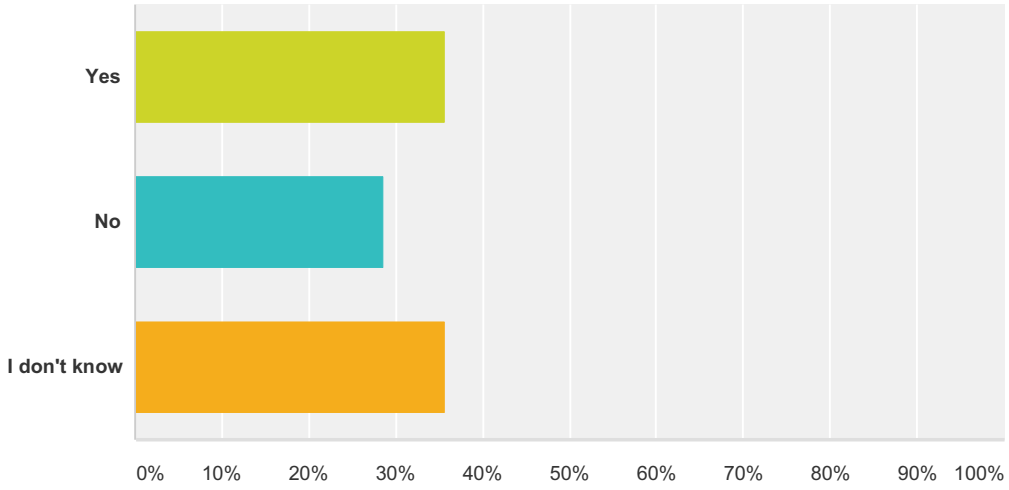
Answered: 14 Skipped: 0



Answer Choices	Responses	
Yes	**71.43%**	10
No	**14.29%**	2
I Don't Know	**14.29%**	2
Total		**14**

Q10 Are evacuation routes properly identified and known by department personnel as well as the public?

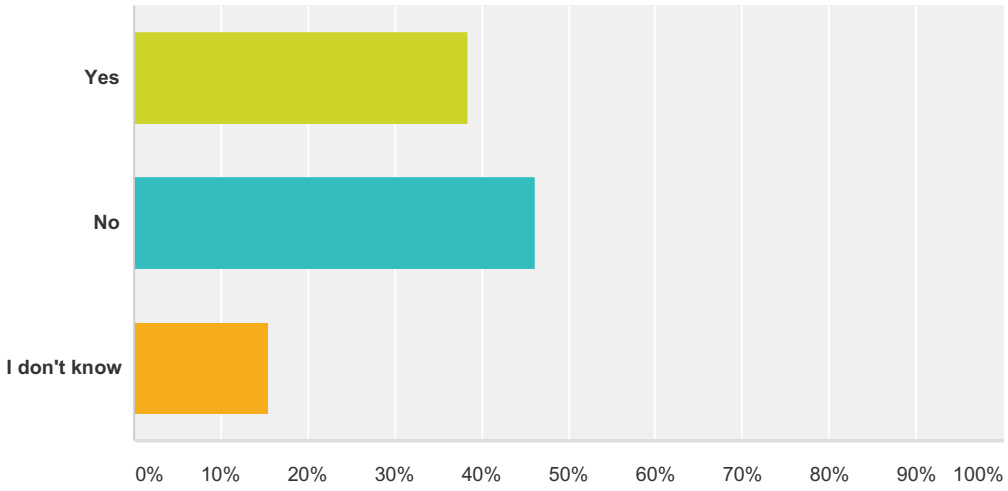
Answered: 14 Skipped: 0



Answer Choices	Responses	
Yes	**35.71%**	5
No	**28.57%**	4
I don't know	**35.71%**	5
Total		**14**

Q11 Do you think that the utility infrastructure (specifically electricity and communications) is sufficiently disaster-resistant to support response and recovery functions after hazard events?

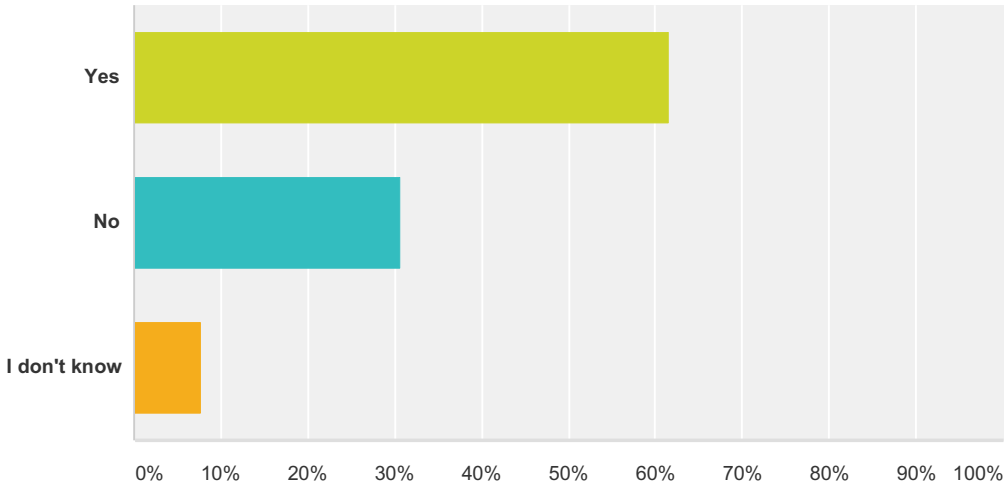
Answered: 13 Skipped: 1



Answer Choices	Responses	
Yes	**38.46%**	5
No	**46.15%**	6
I don't know	**15.38%**	2
Total		**13**

Q12 Do you think that local public education and awareness programs are effective at informing the public on preparedness and how to reduce their personal risk to disasters, so as not to increase the need for public works and transportation services during hazard events?

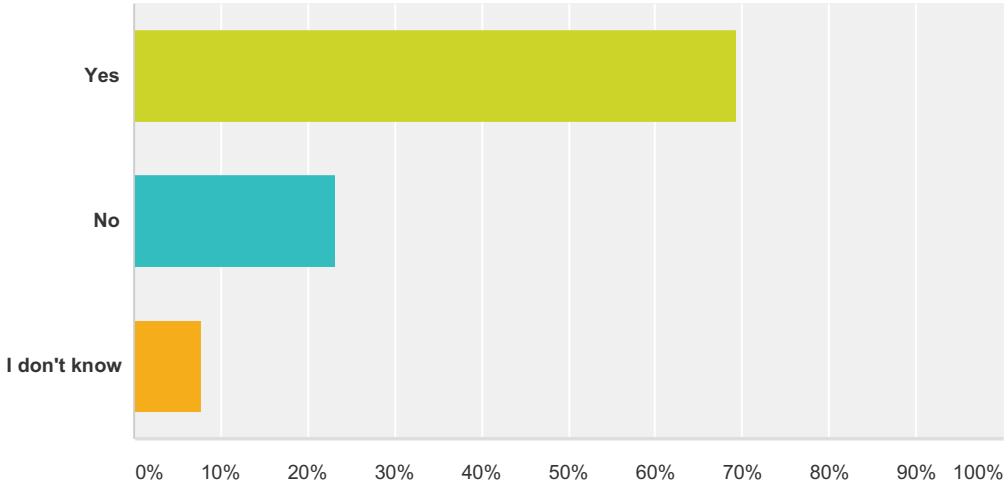
Answered: 13 Skipped: 1



Answer Choices	Responses	
Yes	**61.54%**	8
No	**30.77%**	4
I don't know	**7.69%**	1
Total		**13**

Q13 Do you think that announcements of road closures and pending road closures are sufficiently accurate and available to support public works and transportation functions during hazard events?

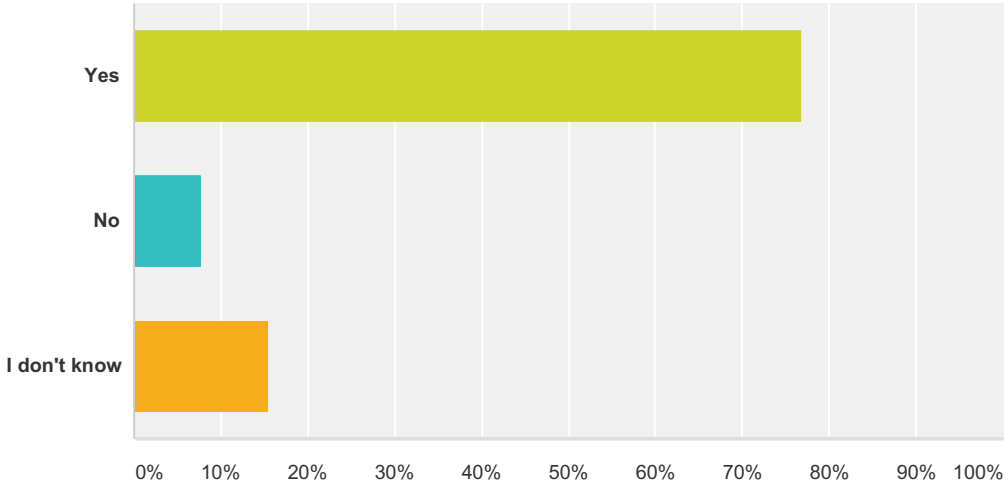
Answered: 13 Skipped: 1



Answer Choices	Responses	
Yes	**69.23%**	9
No	**23.08%**	3
I don't know	**7.69%**	1
Total		**13**

Q14 Do you think that the public is aware of, understands, and takes advantage of emergency warning and notification systems and services (reverse 911, audible alerts, cell and text services, NJ-ALERT)?

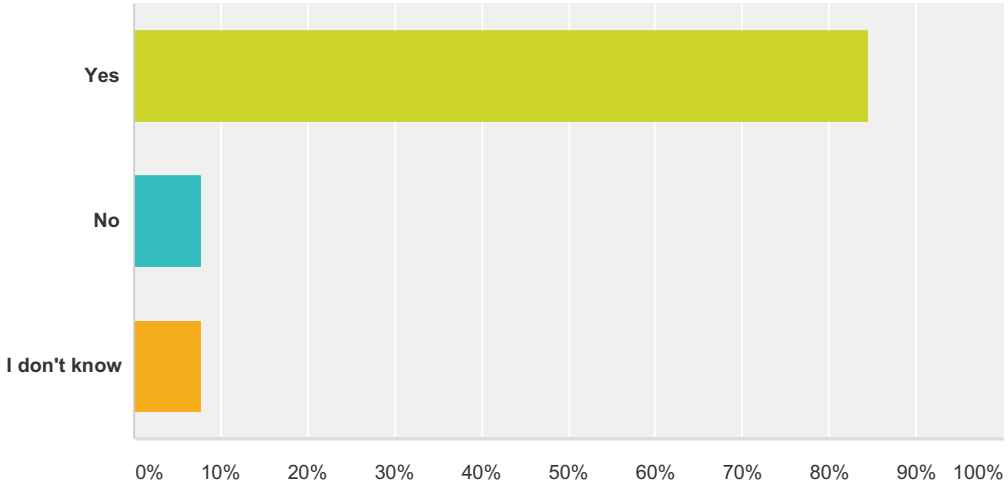
Answered: 13 Skipped: 1



Answer Choices	Responses	
Yes	**76.92%**	10
No	**7.69%**	1
I don't know	**15.38%**	2
Total		**13**

Q15 Do you think that your department works to inform your constituents of how they can better manage their risk to hazards (e.g. debris removal, recycling, proper use of portable heaters and generators, etc.)?

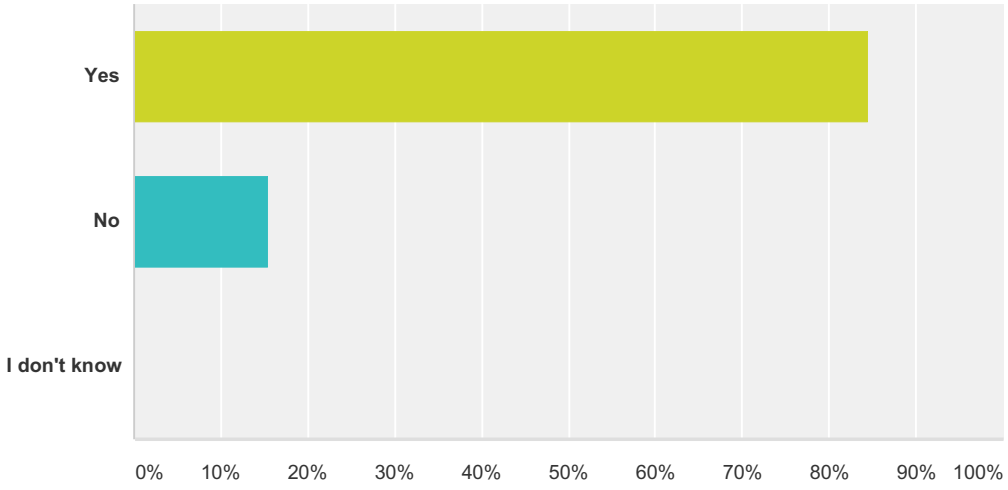
Answered: 13 Skipped: 1



Answer Choices	Responses	
Yes	**84.62%**	11
No	**7.69%**	1
I don't know	**7.69%**	1
Total		**13**

Q16 Do you think that emergency response planning, services, and equipment are adequate to manage and respond properly to disasters in your community?

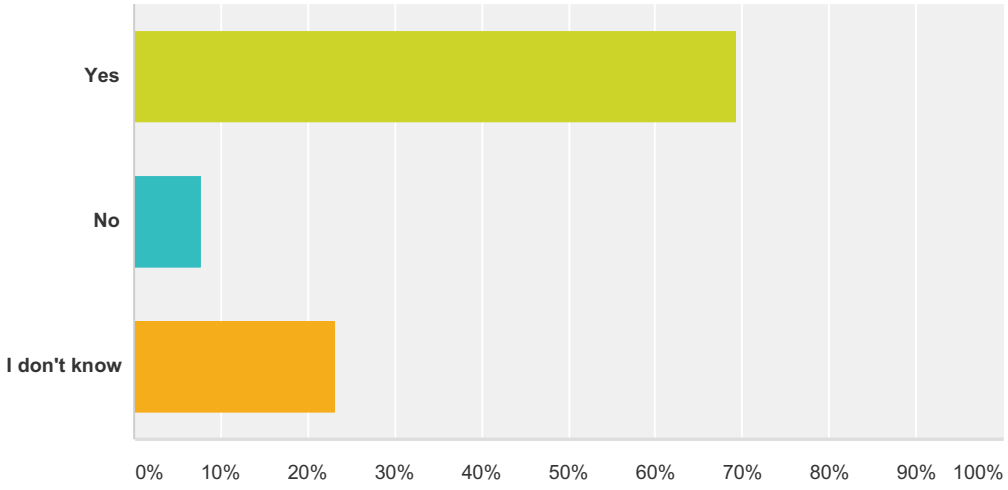
Answered: 13 Skipped: 1



Answer Choices	Responses	
Yes	**84.62%**	11
No	**15.38%**	2
I don't know	**0.00%**	0
Total		**13**

Q17 Do you think that local government understands, supports, and possess the resources for natural hazard risk reduction efforts in the community?

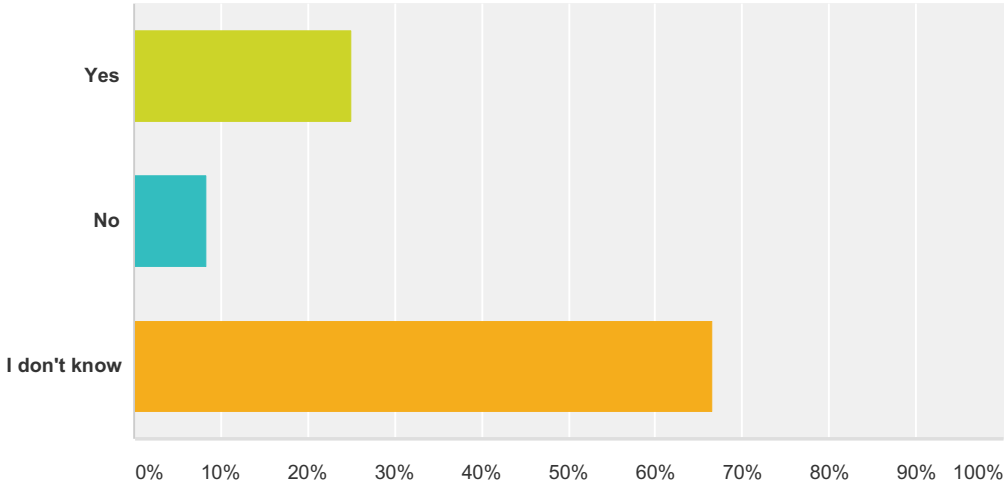
Answered: 13 Skipped: 1



Answer Choices	Responses	
Yes	**69.23%**	9
No	**7.69%**	1
I don't know	**23.08%**	3
Total		**13**

Q18 Is your department covered by a Continuity of Operations (COOP) plan? COOP plans examine an organization's ability to perform minimum essential functions during any situation, and support the continuance of your organization's functions.

Answered: 12 Skipped: 2



Answer Choices	Responses	
Yes	**25.00%**	3
No	**8.33%**	1
I don't know	**66.67%**	8
Total		**12**

Q19 Do you have any other comments, questions, or concerns?

Answered: 1 Skipped: 13

September 23, 2014

Paul Miller
Senior Disaster Recovery and Mitigation Planner - Northeast Operations
Tetra Tech, Inc.
1000 The American Road
Morris Plains, NJ 07950

Mr. Miller,
Please accept the following comments from NY/NJ Baykeeper ("Baykeeper") on the Essex County Hazard Mitigation Plan. Since 1989, Baykeeper has been protecting, preserving and restoring the Hudson-Raritan Estuary. We are continuing our work to create more resilient communities within the Estuary. The comments have been organized according to their corresponding sections within the plan.

Section 5.4.6, Coastal Increased Inundation Areas

- For the Hazard Mitigation Plan (HMP), each municipality should be required to include an assessment of their town's vulnerability based on each level of sea level rise and storm surge data projected for the next 50 years. This would allow for smart long-term planning and reduce the amount of spending on projects that may meet current standards but will quickly be put at risk again due to rising sea levels and higher protection standards. There is no point in spending money repairing something to current standards if we have good reason to know that that will not be enough to protect it ten years from now. The money would be spent more efficiently by protecting structures to the highest extent the first time around.

    - In Section 9.1 under the Essex County Strategic Recovery Planning Report (SRPR) it states that "The spatial analysis conducted for the Hazard Mitigation Plan appears in the SRPR for the flood, storm surge, and sea level rise hazards." However, I did not see sea level rise or storm surge data on any of the maps for individual municipalities, nor did I see it specifically referred to except that it posed a general hazard. Additionally, there was no indication of which sea level rise reference tool is or should be used. By recommending a specific reference tool it will provide a standard for consistency.

Section 9.1, Essex County

- Page 7- Under Land Use Planning it states that the Planning Department supports integration of natural hazard risk into planning programs. We fully support this initiative as it promotes the follow through of mitigation actions listed in the plan. We think that this initiative should be strengthened by appointing someone to create and hold training sessions for local officials and planning board members. This will give them the knowledge needed to integrate hazard risk into daily planning and activities.
- In the HMP the following towns outright stated that their floodplain administrators did not feel that they were qualified or had enough training to fulfill their responsibilities:
    - Belleville

- Livingston
- Maplewood
- Millburn
- Montclair
- Newark
- Roseland
- West Caldwell
- West Orange
- In addition, Glen Ridge, Nutley, and Verona indicated that they feel qualified but would also appreciate additional training.

The following statement was made "The major barrier to running a more effective floodplain management program in X Township is a lack of training. More in-depth training and exposure to floodplain management implementation would help the program greatly and be welcomed." With such a large need voiced across multiple municipalities, it becomes the county's responsibility to provide such training.

Recommendation: In the section Public Education/Outreach Programs/Training (page 7), the county should include an initiative to provide training to have designated NFIP Floodplain Administrators (FPA), and other local officials who would benefit, become Certified Floodplain Managers (CFM) through the Association of State Floodplain Managers (ASFPM) and New Jersey Association for Floodplain Management (NJAFM), and pursue relevant continuing education training such as FEMA Benefit-Cost Analysis (BCA) and Substantial Damage Estimation (SDE). Additional outreach should be conducted to ensure that municipalities are aware of this training.

- Multiple communities expressed interest in learning more about the Community Rating System (CRS) if a seminar was presented within the county. The following municipalities indicated in the HMP that they would like more information about CRS:
  - Glen Ridge
  - Bloomfield
  - Livingston
  - Maplewood
  - Millburn
  - Montclair
  - Newark
  - Nutley
  - South Orange
  - Verona
  - West Caldwell
  - West Orange

Recommendation: Bergen and Passaic Counties jointly hosted an informational seminar on the CRS on September 15, 2014. Essex County would benefit by hosing a similar seminar for interested municipalities.

- Page 8- Number 4 of Future Planning Mechanisms states the need to update land development regulations. This is a highly important task as oftentimes new hazard information and flood maps are not used to update zoning and poor land use decisions are then made. Someone should be designated to complete this action.
- Page 8- Number 8 of Future Planning Mechanisms states that "The long term impacts of future sea level rise should be projected and studied for Newark Bay and the tidal portions of the Passaic River." This is extremely important and we are glad that the county has addressed this need. This should be given priority status and a person should be appointed to completing this project as this knowledge is necessary to begin protecting the city.
- Proposed Hazard Mitigation Initiatives- In some of the municipality past mitigation initiatives sections, they indicated that projects were discontinued because they fell under county jurisdiction and referenced section 9.1 of the plan. Some of these initiatives were carried over to the county plan, such as flood mitigation along Bloomfield Avenue, but others did not appear under the county initiatives. One example is the action to mitigate Forest Avenue streams against flooding in West Caldwell. When will these actions be addressed?

General Comments on Section 9 (all municipalities)

- Many municipalities indicated that they were not keeping track of the properties that had experienced flood damage or expressed interest in mitigation. In order to reduce future spending on repairs. Municipalities need to be aware of which properties are at high risk of damage. Municipalities should be encouraged or required to keep a list of all properties that experienced damage and had to receive grant money, and a list of all property owners who are interested in mitigation. This would make it easier for municipalities to address these issues.
- A large number of municipalities included a proposed action of starting a public outreach program to inform residents of natural hazard risks. We highly support this initiative and are pleased to see that so many municipalities are taking action on this. There were several municipalities which did not include this action: Irvington, Millburn, North Caldwell, Roseland, Orange, Verona and West Caldwell. What is the reason that these municipalities have not included this low cost outreach initiative? Do they already have such programs in place?
- We support the post event disaster assessment program initiative put forward by several municipalities. This will help communities to quickly rebound from a disaster and help residents in need.
- The municipalities indicating that they have repetitive loss and/or severe repetitive loss properties should include a mitigation strategy to address these properties.
- We are glad that the section was included on how the HMP will be included in daily activities. This is vital to the action initiatives actually being put to use and implemented. In this section many municipalities simply provided a link to their website when they referenced ordinances. It would be helpful if the ordinances related to hazard risk were listed out.

Section 9.2- Belleville

- Belleville indicated that their floodplain administrator did not feel he had adequate training. The township should add an initiative to have their floodplain administrator become a Certified Floodplain Manager (CFM).

Section 9.6- East Orange City

- There are multiple highlighted sections that were not completed/ addressed by the city.
- Proposed action 7 states that they will develop mitigation actions to address flooding in areas (the areas are not identified in the plan). These mitigation actions and flood areas should already be identified and included in the HMP. At the very least, if the actions could not be identified in time for the plan, the city should appoint someone to be in charge of developing the actions and creating a schedule for implementation.

Section 9.7- Essex Fells Borough

- The borough identifies several actions that were not completed in the past due to lack of funding. These actions should include a list of possible sources that they can apply to for funding so that they can be completed. Someone from the borough should be put in charge of targeting funding.
- Proposed action 6- Coordinate this action with other municipalities. Caldwell is also doing a flood study on Pine Brook. There is the possibility of cost sharing the expense, and the municipalities will see better results if the mitigation measures taken are cohesive and coordinated.
- Proposed action 7- Be proactive in mitigating the identified properties. Set up a meeting with the property owners to discuss Blue Acres and other available options. Contact Blue Acres to have a specialist come out to provide additional information.

Section 9.8 and 9.12- Fairfield and Maplewood

- We commend the townships for having an ordinance which restricts development in the floodplain.

Section 9.13- Millburn

- We commend the township for prohibiting development within the floodplain and other environmentally sensitive or unsafe areas.

Section 9.16- North Caldwell

- Currently the borough has very few properties in the flood zone, but has just approved 5 new buildings to be built within the flood zone. As part of the HMP the county states that it will discourage municipalities from approving development within hazardous areas. We hope that the Borough of North Caldwell does not continue on this trend of putting properties in danger by allowing development within the floodplain.

Section 9.17- Nutley

- There were several projects listed in the Future Growth section that were approved within the floodplain despite frequent flooding and flood hazards within the community.
- We support the proposed action 12 which will update ordinances pertaining to stormwater and floodplain management.

Section 9.18- Orange City

- Under the section Integration of Hazard Mitigation into Existing and Future Planning Mechanisms, the city has essentially no plans to include the HMP in daily activities. The city needs to be more specific than just "will be used to guide the addition of hazard information for inclusion in the next Master Plan update". This line is highlighted in the draft which gives me the impression that someone at the municipality was supposed to address this and did not.
- The Proposed Hazard Mitigation Initiatives table needs to be completed; especially the priority levels of the old projects (page 9.18-16).
- The city states that after Hurricanes Irene and Sandy the pumping stations were offline due to a loss of power. The city should include a proposed action initiative to install a backup power source at the pumping stations to ensure continuing service.

Section 9.19- Roseland

- Table 9.19-6 should be completed to indicate the planning and regulatory tools available to the borough.
- Several highlighted sections in the draft were not addressed/ completed.
- The plan states that the Eagle Rock Avenue Bridge will be replaced but not elevated under this project. It is not cost effective to complete two projects on the same bridge when the mitigation actions could easily be completed at the same time. They should be searching for additional funding sources so that the bridge can be replaced at a higher elevation. The plan also states that this is a project between jurisdictions. Between two jurisdictions they should be able to find funding to do this project once and not waste taxpayer money on inefficient spending.
- The proposed initiative actions 1 and 3 appear to be the same thing; both are for generators for traffic signal control.

Section 9.20 South Orange

- The past initiative 2- Sewer system problems, will not be carried over to the new plan for the municipality because it was a larger project than anticipated and should be handled by the county. It is not listed under Section 9.1 Essex County Proposed Initiatives. Will the county be addressing this initiative? If not, it needs to be addressed/ resolved since it is too high of a burden for the township alone to handle. An additional comment to this is that the municipality should have planned updates to infrastructure into their budget when approving additional development which required the infrastructure. By not doing this they had falsely low tax rates.

Thank you for your consideration and review of the above comments.

Sincerely,

Jessica Evans
Post Hurricane Sandy Fellow
NY/NJ Baykeeper

This appendix includes the Action Worksheet template, including instructions for its completion, used by the participating jurisdictions to document applicable projects identified in their mitigation strategy. This also includes a summary of the action evaluation and prioritization process.

Action Worksheet

Please complete <u>one sheet per **NEW action/project**</u> with as much detail as possible, using the guidance beginning on page 3.

Name of Jurisdiction: _____
Action Number: _____
Mitigation Action/Initiative: _____

Assessing the Risk	
Hazard(s) addressed:	
Specific problem being mitigated:	
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting):	1.
	2.
	3.
Action/Project Intended for Implementation	
Description of Selected Action/Project	
Action/Project Category	
Goals/Objectives Met	
Applies to existing and or new development, or not applicable	
Benefits (losses avoided)	
Estimated Cost	
Priority*	
Plan for Implementation	
Responsible Organization	
Local Planning Mechanism	
Potential Funding Sources	
Timeline for Completion	
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

*** Refer to results of Prioritization (page 2)**

Prioritization

Number:
Mitigation Action/Initiative:

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety		
Property Protection		
Cost-Effectiveness		
Technical		
Political		
Legal		
Fiscal		
Environmental		
Social		
Administrative		
Multi-Hazard		
Timeline		
Agency Champion		
Other Community Objectives		
Total		
Priority (High/Med/Low)		

Guidance to Complete the Mitigation Action Worksheet

The following provides additional guidance on how to complete the Mitigation Project Capture Sheet. If you have any questions, please contact: *Paul Miller (paul.miller@tetratech.com) or Alison Miskiman (alison.miskiman@tetratech.com) at Tetra Tech.*

Assessing the Risk

Hazard(s) addressed: Please enter the hazard of concern you are mitigating.

Specific problem being mitigated: Please describe the specific problem being mitigated.

Evaluation of Potential Actions/Projects

Actions/Projects Considered: Please consider different options to mitigate the problem identified. One alternative is always to accept the current level or risk (tolerate the vulnerability/problem) by deciding to take no action at this time. If you choose to take no action, please complete the worksheet up to and including this section and this will be noted in the Plan.

Please include the name of the action considered and a brief reason as to why the action was not selected. The reasoning documents the consideration of these alternatives.

Action/Project Intended for Implementation

Description of the Selected Project: Please provide a brief description of the selected project.

Mitigation Action Type:

- Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.

- Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.

- Natural Systems Protection (NRP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.

- Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities.

Goals/Objectives: Please insert the goals and objectives (found in Section 6 of your HMP) that would be met if the action/project is implemented.

Benefits: Please describe the losses avoided when the project is implemented. This includes physical property damage; loss of function; road closing/detours; etc.

Estimated Cost:
Please provide the estimated cost or use the following ranges:
Low = < $10,000 Medium = $10,000 to $100,000 High = > $100,000

Priority: Please enter High/Medium/Low. Refer to the prioritization exercise and table.

Plan for Implementation

Potential Funding Source: Please identify the anticipated funding source, which could be "Grant funding with local cost share". Sources may include federal, state and local sources.

Timeline for Completion: Short = 1 to 5 years. Long Term= 5 years or greater. OG = On-going program.

Reporting on Progress

Please provide a status update on the selected action/project. Along with this description, please indicate if the action/project is completed or not completed.

Actions which are not complete may be dropped with a rational provided (e.g., project deemed unfeasible…). Other incomplete actions should clearly be indicated as continuing; indicate percent complete, and identify any hurdles/obstacles/reasons for change in schedule. Even actions that have had no progress to date can be identified as continuing. For any action that is not yet complete and will continue, always consider modifying the action to promote implementation.

Please note this report on progress should be done, at minimum, each year prior to the annual Planning Committee update outlined in the plan maintenance procedures in Section 7 (Plan Maintenance).

Guidance to Complete the Evaluation/Prioritization Table

Complete this table to help evaluate and prioritize each mitigation action being considered by your municipality. Please use these 14 criteria to assist in evaluating and prioritizing new mitigation actions identified. Specifically, for each new mitigation action, assign a numeric rank (-1, 0, or 1) for each of the 14 evaluation criteria in the provided table, defined as follows:

- 1 = Highly effective or feasible
- 0 = Neutral
- -1 = Ineffective or not feasible

Use the numerical results of this exercise to help prioritize your actions as "Low", "Medium" or "High" priority. Your municipality may recognize other factors or considerations that affect your overall prioritization; these should be identified in narrative in the Priority field of the worksheet.

The 14 evaluation/prioritization criteria are:

1. Life Safety – How effective will the action be at protecting lives and preventing injuries?

2. Property Protection – How significant will the action be at eliminating or reducing damage to structures and infrastructure?

3. Cost-Effectiveness – Are the costs to implement the project or initiative commensurate with the benefits achieved?

4. Technical – Is the mitigation action technically feasible? Is it a long-term solution? Eliminate actions that, from a technical standpoint, will not meet the goals.

5. Political – Is there overall public support for the mitigation action? Is there the political will to support it?

6. Legal – Does the jurisdiction have the authority to implement the action?

7. Fiscal - Can the project 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?

8. Environmental – What are the potential environmental impacts of the action? Will it comply with environmental regulations?

9. Social – Will the proposed action adversely affect one segment of the population? Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?

10. Administrative – Does the jurisdiction have the personnel and administrative capabilities to implement the action and maintain it or will outside help be necessary?

11. Multi-hazard – Does the action reduce the risk to multiple hazards?

12. Timeline - Can the action be completed in less than 5 years (within our planning horizon)?

13. Local Champion – Is there a strong advocate for the action or project among the jurisdiction's staff, governing body, or committees that will support the action's implementation?

14. Other Local Objectives – Does the action advance other local objectives, such as capital improvements, economic development, environmental quality, or open space preservation? Does it support the policies of other plans and programs?

This appendix includes FEMA 386-4 Guidance worksheets to facilitate plan maintenance and review by the Essex County planning partnership.

Worksheet #1 Progress Report step 2

Progress Report Period: _____ to _____
(date) (date)

Project Title: _____ Project ID#: _____

Responsible Agency: _____

Address: _____

City/County: _____

Contact Person: _____ Title: _____

Phone #(s): _____ email address: _____

List Supporting Agencies and Contacts:

_____

_____

_____

Total Project Cost: _____

Anticipated Cost Overrun/Underrun: _____

Date of Project Approval: _____ Start date of the project: _____

Anticipated completion date: _____

Description of the Project (include a description of each phase, if applicable, and the time frame for completing each phase): _____

_____

_____

Milestones	Complete	Projected Date of Completion

Plan Goal(s)/Objective(s) Addressed:

Goal: _____

Objective: _____

Indicator of Success (e.g., losses avoided as a result of the acquisition program):

In most cases, you will list losses avoided as the indicator. In cases where it is difficult to quantify the benefits in dollar amounts, you will use other indicators, such as the number of people who now know about mitigation or who are taking mitigation actions to reduce their vulnerability to hazards.

_____

_____

Status (Please check pertinent information and provide explanations for items with an asterisk. For completed or canceled projects, see Worksheet #2 — to complete a project evaluation):

Project Status

☐ Project on schedule

☐ Project completed

☐ Project delayed*

*explain: _____

_____

☐ Project canceled

Project Cost Status

☐ Cost unchanged

☐ Cost overrun*

*explain: _____

_____

☐ Cost underrun*

*explain: _____

_____

Summary of progress on project for this report:

A. What was accomplished during this reporting period?

_____

_____

_____

_____

B. What obstacles, problems, or delays did you encounter, if any?

_____

_____

_____

C. How was each problem resolved?

_____

_____

_____

Next Steps: What is/are the next step(s) to be accomplished over the next reporting period?

Other comments:

Adapted from the North Carolina HMGP Progress Report Form at http://www.dem.dcc.state.nc.us/mitigation/document_index.htm.

Worksheet #2 Evaluate Your Planning Team step 3

When gearing up for the plan evaluation, the planning team should reassess its composition and ask the following questions:	YES	NO
Have there been local staffing changes that would warrant inviting different members to the planning team?		
Comments/Proposed Action:		
Are there organizations that have been invaluable to the planning process or to project implementation that should be represented on the planning team?		
Comments/Proposed Action:		
Are there any representatives of essential organizations who have not fully participated in the planning and implementation of actions? If so, can someone else from this organization commit to the planning team?		
Comments/Proposed Action:		
Are there procedures (e.g., signing of MOAs, commenting on submitted progress reports, distributing meeting minutes, etc.) that can be done more efficiently?		
Comments/Proposed Action:		
Are there ways to gain more diverse and widespread cooperation?		
Comments/Proposed Action:		
Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning?		
Comments/Proposed Action:		

If the planning team determines the answer to any of these questions is "yes," some changes may be necessary.

Worksheet #3 Evaluate Your Project Results step 3

Project Name and Number: _____

_____

Project Budget: _____

_____

Project Description: _____

_____

_____

Associated Goal and Objective(s): _____

_____

_____

Indicator of Success (e.g., losses avoided): _____

_____

_____

Insert location map.

Include before and after photos if appropriate.

Was the action implemented? ☐ **YES** ☐ **NO**

IF NO

Why not?

	YES	NO
Was there political support for the action?	☐	☐
Were enough funds available?	☐	☐
Were workloads equitably or realistically distributed?	☐	☐
Was new information discovered about the risks or community that made implementation difficult or no longer sensible?	☐	☐
Was the estimated time of implementation reasonable?	☐	☐
Were sufficient resources (for example staff and technical assistance) available?	☐	☐

IF YES

What were the results of the implemented action? _____

_____

_____

_____

_____

_____

_____

	YES	NO
Were the outcomes as expected? If No, please explain:		
Did the results achieve the goal and objective(s)? Explain how:		
Was the action cost-effective? Explain how or how not:		
What were the losses avoided after having completed the project?		
If it was a structural project, how did it change the hazard profile?		
Additional comments or other outcomes:		

Date: _____

Prepared by: _____

Worksheet #4 Revisit Your Risk Assessment step 4

Risk Assessment Steps	Questions	YES	NO	COMMENTS
Identify hazards	Are there new hazards that can affect your community?			
Profile hazard events	Are new historical records available?			
	Are additional maps or new hazard studies available?			
	Have chances of future events (along with their magnitude, extent, etc.) changed?			
	Have recent and future development in the community been checked for their effect on hazard areas?			
Inventory assets	Have inventories of existing structures in hazard areas been updated?			
	Is future land development accounted for in the inventories?			
	Are there any new special high-risk populations?			
Estimate losses	Have loss estimates been updated to account for recent changes?			

If you answered "Yes" to any of the above questions, review your data and update your risk assessment information accordingly.

Worksheet #3 Evaluate Your Project Results step 3

Project Name and Number:

Raging River Views Park Flood Acquisition Project (HVMP-2003-01)

Project Budget:

$360,000

Project Description:

Acquisition and demolition of 14 flood-prone structures

Associated Goal and Objective(s):

Goal: Minimize losses to existing and future structures within hazard areas

Objective: Reduce potential damages to the manufactured home park in the floodplain

Indicator of Success (e.g., losses avoided):

Losses avoided by acquisition and demolition of flood-prone structures

Town of Hazardville Composite Loss Map developed previously during risk assessment (see FEMA 386-2).

Was the action implemented? ☑ YES ☐ NO

IF NO

Why not?	YES	NO
Was there political support for the action?	☐	☐
Were enough funds available?	☐	☐
Were workloads equitably or realistically distributed?	☐	☐
Was new information discovered about the risks or community that made implementation difficult or no longer sensible?	☐	☐
Was the estimated time of implementation reasonable?	☐	☐
Were sufficient resources (for example staff and technical assistance) available?	☐	☐

IF YES

What were the results of the implemented action?

Of the 14 proposed properties, 10 were acquired. The benefit-cost ratio is 2.19, based on project benefits of $789,000 and costs of $360,274. Benefits are based on the net present value of the avoided damages over the project life. Furthermore, about 40 people are no longer in the path of a potential flood, making emergency rescue operations in that area less likely and evacuation easier.