2015 All-Hazards Mitigation Plan Update
Kent County, Delaware

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1. INTRODUCTION

1.1 Introduction

In an effort to reduce the Nation's mounting natural disaster losses, the United States Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) to provide new and revitalized approaches to mitigation planning. Section 322 of DMA 2000 emphasizes the need for state and local entities to closely coordinate mitigation planning and makes the development of a hazard mitigation plan a specific eligibility requirement for any local government applying for Federal mitigation grant funds. These funds include the Hazard Mitigation Grant Program (HMGP) and the Pre-Disaster Mitigation (PDM) program, both of which are administered by the Federal Emergency Management Agency (FEMA). Communities with an adopted and Federally approved hazard mitigation plan thereby become pre-positioned and more apt to receive available mitigation funds before and after the next disaster strikes.

This 2015 Plan Update is conducted in coordination with the Federal Emergency Management Agency (FEMA) and the Delaware Emergency Management Agency (DEMA) to ensure that it meets all applicable DMA 2000 planning requirements. A Local Mitigation Plan Review Tool, included in the Plan Update, provides a summary of FEMA's current minimum standards of acceptability and notes the location within the Plan where each planning requirement is met.

This Chapter provides a general introduction to the 2015 Kent County Multi-jurisdictional Hazard Mitigation Plan Update. It is comprised of the following sections: Background, Purpose, Scope, Authority, and Organization of the Plan.

1.2 Background

The occurrence of natural hazards, such as floods, tornadoes and severe winter storms is inevitable, and while there is little that can be done to control their force and intensity, a lot can be done to be better prepared to face these hazards.

Kent County is vulnerable to a wide range of natural hazards, including flooding, drought, tropical storms and hurricanes, and winter storms. It is also vulnerable to a variety of human-caused hazards, including chemical releases, spills or explosions associated with the fixed storage or mobile transport of hazardous materials. These hazards threaten the life and safety of county residents, and have the potential to damage or destroy both public and private property and disrupt the local economy and overall quality of life.

While the threat from hazardous events can never be fully eliminated, there is much we can do to lessen their potential impact upon our community and our citizens. By minimizing the impact of hazards upon our built environment, we can prevent such events from resulting in disasters. The concept and practice of reducing risks to people and property from known hazards is generally referred to as hazard mitigation.

Hazard Mitigation is defined by the Federal Emergency Management Agency (FEMA) as "sustained action taken to reduce or eliminate long-term risk to people and property from hazards and their effects". The hazard mitigation planning process involves the coordination of actions taken to reduce injuries, deaths, property damage, economic losses, and degradation of natural resources caused by natural and man-made disasters. Hazard mitigation is considered one of four phases in the emergency management cycle. Others include: emergency preparedness, emergency response, and recovery.

- Hazard mitigation activities involve actions that reduce or eliminate the probability of an occurrence or reduce the impact of a disaster. The goal of the mitigation phase is to make communities more resistant to disasters and thereby decrease the need for a response. Mitigation occurs long before a disaster.
- Preparedness activities include planning and preparing for when a disaster strikes and includes response capability actions to ensure an effective and efficient use of resources and efforts to minimize damage. Preparedness occurs just before a disaster.
- Emergency response activities include providing emergency assistance to victims and minimizing property loss. The response phase begins during or immediately after the onset of a disaster.
- Recovery activities include short and long-term projects that help return individuals and communities to normalcy as soon as possible. Recovery actions involve clean-up efforts, temporary housing, and replacement of infrastructure. Recovery activities typically commence several days or weeks after a disaster and are long-term.

Hazard mitigation techniques include both structural measures, such as strengthening or protecting buildings and infrastructure from the destructive forces of potential hazards, and non-structural measures, such as the adoption of sound land use policies and the creation of public awareness programs. It is widely accepted that the most effective mitigation measures are implemented at the local government level, where decisions on the regulation and control of development are ultimately made. A comprehensive mitigation approach addresses hazard vulnerabilities that exist today and in the foreseeable future. Therefore it is essential that projected patterns of future development are evaluated and considered in terms of how that growth will increase or decrease a community's overall hazard vulnerability.

One of the most effective means that a community can implement a comprehensive approach to hazard mitigation is to develop, adopt, and update as needed, a local hazard mitigation plan. A mitigation plan establishes the broad community vision and guiding principles for reducing hazard risk, and further proposes specific mitigation actions to eliminate or reduce identified vulnerabilities.

The 2015 Kent County Hazard Mitigation Plan Update (hereinafter referred to as "Hazard Mitigation Plan Update" or "Plan Update") is a logical first step toward continuing to incorporate hazard mitigation principles and practices into the routine government activities and functions of Kent County and its municipalities. The Plan Update recommends specific actions to combat the forces of nature and/or human-caused threats and protect its residents from losses to those hazards that pose the

greatest risk. These mitigation actions go beyond simply recommending structural solutions to reduce existing vulnerability, such as elevation, retrofitting and acquisition projects. Local policies on community growth and development, incentives for natural resource protection, and public awareness and outreach activities are examples of other actions considered to reduce Kent County's future vulnerability to identified hazards.

The Plan Update is designed to be a living document, with implementation and evaluation procedures included to help achieve meaningful objectives and successful outcomes. The original Plan, created in 2004 and promulgated in January 2005, was updated first in 2009 and is subsequently being updated in 2015.

1.3 Purpose

The purpose of this Hazard Mitigation Plan Update is:

- To protect life, safety and property by reducing the potential for future damages and economic losses that result from natural or human-caused hazards
- To qualify for additional grant funding, in both the pre-disaster and post-disaster environment
- To speed recovery and redevelopment following future disaster events
- To demonstrate a firm local commitment to hazard mitigation principles
- To comply with Federal legislative requirements for local hazard mitigation plans.

The 2015 Plan is to serve as an update to the 2009 Plan and various hazards and vulnerabilities have been investigated and mitigation actions revisited, as part of the 2015 Plan Update. The Plan Update is intended to enable the County and its municipalities to effectively respond to hazards as they occur and reduce the potential risks of these hazards to the health, safety and welfare of the residents. The overall goal for the Update is to continue to allow Kent County and its municipalities to be eligible for a range of financial assistance following hazard events.

The 2015 Plan Update consists of a thorough review of the 2009 Plan, which was used as a base document. Each chapter in the 2015 version has been updated and a summary is included at the beginning of each chapter to indicate how this Plan was updated from the 2009 version.

- The Plan Update involves the review of data on potential hazards and reprioritization of these hazards in terms of frequency and severity.
- The Plan Update includes a review of mitigation actions, which were revised, deleted, or modified to address the high priority hazards.
- The Plan Update includes Plan Maintenance and Monitoring sections.

1.4 Scope

In November of 2014, the Kent County Emergency Management Agency contracted with the Vision Planning and Consulting Team (comprised of Vision Planning and Consulting (VPC) from Fulton, Maryland and the Eastern Shore Regional GIS Cooperative from Salisbury University in Salisbury, Maryland) to develop the Plan Update in compliance with the requirements of the Disaster Mitigation Act of 2000. The Hazard Mitigation Plan Update was funded by Hazard Mitigation Assistance (HMA) funds from the Federal Emergency Management Agency (FEMA) and administered by the Delaware Emergency Management Agency (DEMA).

It must be noted that future funding for mitigation projects will be contingent upon having each jurisdiction in Kent County adopt the 2015 Plan Update after the County has adopted it. Any jurisdiction that does not adopt the 2015 Plan Update will become ineligible for pre- and post-disaster mitigation funds.

The overall planning area for the Plan Update includes the all incorporated and unincorporated areas of Kent County. This includes the following 20 jurisdictions:

- Town of Bowers Beach
- Town of Camden
- Town of Cheswold
- Town of Clayton
- City of Dover
- Town of Farmington
- Town of Felton
- Town of Frederica
- City of Harrington
- Town of Hartly
- Town of Houston
- Town of Kenton
- Town of Leipsic
- Town of Little Creek
- Town of Magnolia
- City of Milford
- Town of Smyrna
- Town of Viola
- Town of Woodside
- Town of Wyoming

Note: The Towns of Smyrna and Clayton has portions of territory that are within New Castle County, however, since the majority of these towns are located within Kent County their plan components are in the Kent County Mitigation Plan Update.

This Hazard Mitigation Plan Update addresses those hazards determined to be "high risk" and "moderate risk" through a detailed hazard risk assessment for Kent County (see Section 4: Risk Assessment). Other hazards that pose a low or negligible risk will continue to be evaluated during future updates to the Plan, but they will not be fully addressed until they are determined to be of high or moderate risk to Kent County.

1.5 Authority

This Plan Update has been adopted by the Kent County Levy Court under the authority granted to counties under Title 9 (Counties) of the Delaware Code and by Kent County's participating incorporated jurisdictions under the authority granted to municipalities under Title 22 of the Delaware Code (Municipalities). Copies of all local resolutions to adopt the Plan are included in the Appendix.

This Plan was developed in accordance with current Federal rules and regulations governing local hazard mitigation plans. The Plan shall be routinely monitored to maintain compliance with the following legislation:

Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) and by FEMA's Interim Final Rule published in the Federal Register on February 26, 2002, at 44 CFR Part 201.

1.6 Organization of the Plan

The 2015 Hazard Mitigation Plan Update comprises seven chapters. Chapter 1 provides an introduction to the Plan Update process and includes the background, scope, process, and authority. Chapter 2 includes an overview and update of the socio-economic and demographic characteristics. Chapter 3 discusses the planning process. Chapter 4 comprises the hazard identification and risk assessment and examines vulnerability and the potential losses from the top priority hazards. Chapter 4 also includes a historic profile of hazard types and associated losses, and a vulnerability assessment. Chapter 5 contains a municipal capability assessment. Chapter 6 discusses the mitigation strategy including updated mitigation goals and objectives, mitigation actions, and the method for prioritization and implementation of mitigation actions. Chapter 7 outlines how the County and its municipalities will implement the Plan once it is adopted and ways to monitor progress and ensure continued public involvement.

2. PLANNING PROCESS

2.1 Plan Update Summary

This Chapter describes the planning process undertaken by Kent County and the VPC Team in preparation of the 2015 All Hazard Mitigation Plan Update. Specific topics include:

- Overview of hazard mitigation planning
- Preparing the Plan Update
- Hazard Mitigation Steering Committee
- Meetings and workshops
- Involving the public
- Involving stakeholders
- Multi-jurisdictional participation

2.2 Overview of Hazard Mitigation Planning

Typically, mitigation planning is described as having the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster loss. A core assumption of hazard mitigation is that pre-disaster investments will significantly reduce the demand for post-disaster assistance by lessening the need for emergency response, repair, recovery and reconstruction. Furthermore, mitigation practices will enable local residents, businesses and industries to re-establish themselves in the wake of a disaster, getting the community economy back on track sooner and with less interruption.

The benefits of mitigation planning go beyond solely reducing hazard vulnerability. Measures such as the acquisition or regulation of land in known hazard areas can help achieve multiple community goals, such as preserving open space, maintaining environmental health and enhancing recreational opportunities. Thus, it is vitally important that any local mitigation planning process be integrated with other concurrent local planning efforts, and any proposed mitigation strategies must take into account other existing community goals or initiatives that will help complement or hinder their future implementation.

2.3 Preparing the Plan Update

44 CFR 201.6(c)(1): *The plan shall include documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process and how the public was involved.*

The Plan Update process included six tasks that were completed over the course of four months, each of which, resulted in critical elements, which collectively make up the Plan Update. The following sub-tasks were conducted as part of the 2015 Kent County Plan Update process:

Task 1: Organize Resources – Planning Process

- Participation in planning process meetings which included the public, neighboring communities, agencies, businesses, academia, nonprofits and other interested parties involved in the process.
- Communication with key stakeholders and agencies to obtain information on any related mitigation efforts: Delaware Emergency Management Agency, Delaware Office of State Planning, Delaware Department of Natural Resources and Environmental Control, Delaware Department of Transportation, and Delaware Geological Survey.
- Mitigation strategy workshop with the Committee and municipalities to update existing and identify new mitigation strategies.
- Review and update of the Community Profile

Task 2: Hazard Identification and Risk Assessment

- Review and update of the Hazard Analysis for incidents since 2009.
- Update of Hazard Vulnerability.
- Identification of development trends and areas that may be proposed for intense development that are located in high hazard areas.

Task 3: Goals and Objectives

- Review and update of mitigation goals and objectives of the current plan to reduce or avoid long term vulnerabilities to the identified hazards.

Task 4: Mitigation Strategy

- Alignment of the Plan Update with FEMA revisions to regulations governing these plans.
- Reissue of the mitigation capability assessment to identify how the fiscal, administrative, and local mitigation capabilities have changed since 2009 to illustrate each jurisdiction's overall hazard risk in comparison to their overall capacity.
- Mitigation strategy workshop to update existing and collect new mitigation strategies.
- Update of the mitigation actions to include a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure including actions related to continued compliance with the National Flood Insurance Program (NFIP).
- Update of the action plan describing how the actions will be prioritized, implemented, and administered by the local jurisdiction.
- Identification of the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged or deferred.

Task 5: Plan Maintenance

- Update of the method and schedule of monitoring, evaluation, and update of the mitigation plan within a five-year cycle.
- Review and update of the process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvements plans, when appropriate.

- Identification of any additional local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan.
- Continued public participation.

Task 6: Plan Adoption

- Submittal of the draft Plan Update to the Delaware Emergency Management Agency and Federal Emergency Management Agency Region III.
- Draft Plan Update approval by FEMA Region III.
- Plan adoption by the County and municipalities.

2.4 Hazard Mitigation Steering Committee

Kent County reconvened its 2009 Steering Committee for this Plan Update. Stakeholders, residents, and local government officials played a major role in reviewing the Plan. Table 2.1 includes the members of the Kent County Steering Committee, the make-up of which, was similar to that of the previous Planning Committee, especially for those communities with multiple representatives. Those members who were no longer with the County or municipality were replaced on the Committee.

Table 2.1 – Kent County 2015 Hazard Mitigation Steering Committee

Name	Agency	Name	Agency
Robert Devitt	Bowers	Nancy Goodfellow	Leipsic
Aaron Chaffinch	Camden	Glenn Gauvry	Little Creek
Harold Scott Jr.	Camden	Ed Strouse	Little Creek
Theon Callender	Cheswold	James Frazier	Magnolia
Shadina Jones	Cheswold	Diane Cahall	Magnolia
Jeff Hurlock	Clayton		Milford City Manager
Kay Sass	Dover	David Hugg III	Smyrna
Ronald Vincent	Farmington	Gina Miserendino	Viola
Rebecca Greene	Felton	Michael Warren	Woodside
Ricky Maddox	Frederica	Pamela Haddick	Wyoming
Teresa Tieman	Harrington	Nicole Armour	Wyoming
Alan Moore	Harrington	Brandon Olenik	Kent County
Raymond Morris Jr.	Hartly	Michael Scott	ESRGC
Connie Morgan	Houston	Deepa Srinivasan	Vision Planning and Consulting
Jessica Penawell	Kenton Mayor	Craig Pugh	Leipsic

2.5 Community Meetings and Workshops

The planning process for the most part, was similar to the process followed during the 2009 Plan Update as it was deemed effective. It comprised a series of meetings and workshops for facilitating discussion and initiating data collection efforts with state and local municipal and county officials as well as stakeholders. Two Steering Committee meetings and one public meeting were held for the County and municipalities in addition to one mitigation planning workshop that was held specifically for municipal input and awareness.

Initial Project Kickoff Meeting

The initial kick off meeting was held on 30th October 2014, with the Kent County Emergency Management staff. The purpose of this meeting was to finalize the contract as well as discuss the specific steps in the project including schedule and deliverables.

Steering Committee Meeting #1

The first Steering Committee meeting was held on 10th December 2014 at the Kent County Public Safety Building in Dover. At this meeting, VPC Consultants:

- Discussed schedule and deliverables
- Reviewed sections of the 2009 Plan with the Committee and identified sections that needed to be updated
- Reviewed data on the hazard identification and ranked risks
- Solicited input on risks from various hazards
- Discussed data from the hazard vulnerability and risk assessment
- Reviewed goals and objectives

First Steering Committee Meeting held on 10 December 2014 at the EMA

Steering Committee Meeting #2

The second Committee Meeting was held on 10th March 2015 at the Kent County Public Safety Building in Dover. At this meeting, VPC Consultants:

- Discussed and updated mitigation actions
- Discussed loss estimates
- Prioritized mitigation actions
- Developed an implementation strategy for each mitigation action.

Second Steering Committee Meeting held on 10 March 2015 at the EMA

Municipal Workshop

Meeting invitations and reminders for the Municipal Mitigation Workshop were sent via e-mail and follow up calls were made to further urge municipal participation. The Municipal Mitigation Workshop was held on the same evening as the first Steering Committee Meeting and was facilitated by the Consultants, providing an opportunity for municipal officials to attend and become educated on various aspects of the planning process including the hazard identification, vulnerability assessment, and mitigation strategy.

A series of exhibits were developed for the workshop, which include maps of the northern, central, and southern segments of the County. Attendees were encouraged to partake in discussion and mark up maps to indicate missing data with respect to problematic/vulnerable areas. Examples of potential mitigation projects were shared and municipalities were encouraged to recommend additional mitigation projects based on past hazard experiences.

Municipal Workshop held on 10 December 2015 at the County Public Safety Building in Dover

At the workshop, municipal officials:

- Reviewed maps and identified high-hazard areas by marking up maps;
- Identified critical facilities within their municipality;
- Discussed risks and vulnerabilities within their municipality;
- Identified past mitigation projects and discussed potential mitigation projects; and
- Discussed future participation opportunities and next steps.

2.6 Involving the Public

44 CFR Part 201.6(b) (1): *The planning process shall include an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.*

Community-based input enables a greater understanding of local concerns and ensures a higher degree of mitigation success promoting community "buy-in" from those directly affected by the decisions of public officials. As citizens become more involved in decisions that affect their safety, they are more likely to gain greater knowledge of the natural hazards present in their community and take personal steps to reduce their potential impact. Public awareness is a key component of an overall mitigation strategy aimed at making a home, neighborhood, school, business, or city safer from the potential effects of natural hazards.

The structure of the public meeting was kept simple and advertised in the local newspapers. It was held following the second Committee meeting prior to the completion of the draft Plan. The public meeting was held to present the findings of the risk and capability assessments, and verify any unique hazard concerns and possible mitigation actions to address those concerns.

Public Meeting

The countywide planning workshop for Kent County was held on 10th March 2015 at the Public Safety Building in Dover. At this meeting, an overview of the planning process was presented and the mitigation actions for the County and municipalities were discussed while soliciting comments from the public. The meeting was advertised through the local newspaper and the County's website.

Following the release of the draft Plan Update, it was made available for public review comment through the Kent County website. Copies of the Draft Plan were also available in the public library and with the Office of Emergency Management.

Public Meeting held on 10 March 2015 at the County Public Safety Building in Dover

2.7 Involving Stakeholders

44 CFR Part 201.6(b)(2): *The planning process shall include an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process.*

The development and coordination of County's and municipal risk and mitigation actions involved the assistance of several state agencies, including Delaware Emergency Management Agency, Office of State Planning Coordination, Department of Natural Resources and Environmental Control, Delaware Geological Survey, Delaware Department of Transportation, Office of the Delaware State Climatologist and Department of Environment Observing System, and American Red Cross, in order to obtain input on their activities with respect to hazard mitigation. A summary of each of these departments' services related to mitigation activities is elaborated below:

Delaware Emergency Management Agency

The Delaware Emergency Management Agency in involved in all aspects of emergency management – preparedness, mitigation, response, and recovery. The State agency prepares and updates the State Hazard Mitigation Plan every five years. The State Plan informs and is informed by the three county plans. DEMA officials are closely involved in the local plan update processes and also review and approve the plan before it is submitted to FEMA Region III for final review and approval. The agency has a successful working relationship with the Department of Natural Resources and Environmental Control and the Department of Transportation, two important stakeholders in mitigation activities around the State.

Office of State Planning Coordination

The Office of State Planning Coordination has been involved in planning activities as well as a neighborhood buyout project in Kent County. This Office is responsible for developing the State as well as the counties' comprehensive plans. These plans are used to provide guidelines for development and growth throughout the State and continue to be sources of information for the local hazard mitigation plans. This Office has a very strong interest in being involved in the mitigation planning process and has conducted several environmental and other studies, and developed plans that could be valuable resources for local mitigation planning and be used to develop mitigation strategies and activities. The Office also has a successful working relationship with the Department of Natural Resources and Environmental Control and the Department of Transportation, two important stakeholders in mitigation activities around the State.

Department of Natural Resources and Environmental Control (DNREC)

DNREC has worked closely with the State on various mitigation activities, as well as being responsible for floodplain mapping activities. DNREC provided the necessary information regarding National Flood Insurance Program (NFIP) compliance, and repetitive loss information for the Local Mitigation Plans. DNREC's primary mitigation activities include overseeing NFIP ordinances and regulations, and guiding local jurisdictions on developing and adopting regulations to manage development in floodplains. They also conduct inspections of construction in floodplains to ensure compliance with NFIP guidelines. Specifically, DNREC worked with DelDOT on a FEMA funded buy-out of several properties that were demolished and turned in to open space, where DelDOT then became the landowner. DNREC is interested in having an active role in the development of the current mitigation plans and is willing to work with the three counties and the City of Wilmington on the development of their hazard identification and risk assessments, and mitigation strategies, as well as providing any available NFIP data.

Office of the Delaware State Climatologist and the Delaware Environmental Observing System (DEOS)

The Office of the Delaware State Climatologist works with various State agencies including DEMA, DelDOT and DNREC on mitigation projects and activities. The Office of the Delaware State Climatologist also monitors and maintains DEOS. DEOS is a support tool for decision makers

involved with emergency management, natural resource monitoring, transportation, and other activities throughout the State of Delaware. Their primary goal is to provide state agencies and the citizens of Delaware with immediate information about environmental conditions in and around the State. DEOS also archives data for historical environmental studies and research. This agency has been invaluable in categorizing and quantifying rainfall, flood, and wind activities during storms. Some of this information is reflected in Vulnerability Assessment section of this plan. This information has also been critical to justifying many of the mitigation projects and actions completed in the past.

American Red Cross

While the primary role of the Red Cross is to serve as a source of information and education, the organization participates in mitigation, wherever possible. The Red Cross also participates in mitigation through the creation and distribution of preparedness brochures to educate the public and teach the importance of being prepared, and the steps to take before a hazardous event such as a flood or a hurricane. The Red Cross indicated a continued interest in being involved in the hazard mitigation planning process.

Delaware Geological Survey

Delaware Geological Survey provides funding for coastal monitoring and the development of alert systems for the City of Bowers Beach in Kent County. They also monitor stream gauges on the Red Clay and White Clay creeks and the Brandywine River that provide real time information on flood stages, water quality, and potential drought conditions. Due to limited staffing and time constraints, the Delaware Geological Survey is unable to take on an in-depth role in the current mitigation planning process. However, they are interested in providing technical assistance and input during the planning process by reviewing plan sections, particularly those dealing with flood, drought, and earthquakes. Delaware Geological Survey has worked closely with DEMA and other State agencies on mitigation and continues to indicate an interest in being involved in the hazard mitigation process.

Delaware Department of Transportation

The Delaware Department of Transportation works closely with all three Delaware counties on transportation related issues. Part of the agency's recent efforts includes coordination to test traffic flow impedances due to flooding and testing some of their existing plans to deal with such issues. They continue to engage in opportunities to improve their relationship and collaborate with local governments as well as with DNREC on mitigation related issues.

2.8 Multi-Jurisdictional Participation

44 CFR Part 201.6(a) (3): *Multi-jurisdictional plans may be accepted as long as each jurisdiction has participated in the planning process.*

This Plan Update includes the participation of Kent County and all of its incorporated municipalities. In order to involve the municipalities in the planning process as well as to satisfy the multi-jurisdictional participation requirements, the local jurisdictions were required to perform various tasks as part of the 2015 Plan Update. The level of participation varied between the jurisdictions during the planning process and is documented in Table 2.2.

Public Meeting held on 10 March 2015 at the County Public Safety Building in Dover

The message that "each jurisdiction must participate on their own, adhere to the hazard mitigation planning process, or they cannot adopt the Plan and will not be eligible for pre- and post-disaster funding" was emphasized to all jurisdictions to solicit their participation in the Plan Update process. An extensive municipal participation strategy was established to allow for maximum participation throughout the process.

A Letter of Intent to Participate was mailed to all jurisdictions in that explained the hazard mitigation process, Federal requirements, and deliverables. Municipalities were required to sign onto or opt-in to the County planning process (and commit to participation) or opt-out of the process (in which case, they would be responsible for developing their own plan in order to obtain Federal funding following a disaster). Those who decided to opt-in were required to identify and provide information for a local point of contact.

Table 2.2 – Municipal Participation in the Planning Process

Municipality	Capability Assessment Review	Mitigation Actions Review	Attendance at Municipal Workshop (10 Dec 2014)	Attendance at Public Meeting (10 Mar 2015)	Draft Plan Review
Bowers Beach	1	1		1	1
Camden	1	1	1	1	1
Cheswold	1	1	1		1
Clayton	1	1			1
Dover		1			1
Farmington					1
Felton		1			1
Frederica					1
Harrington		1			1
Hartly					1
Houston					1
Kenton	1	1			1
Leipsic	1			1	1
Little Creek	1	1		1	1
Magnolia	1	1			1
Milford		1			1
Smyrna	1	1			1
Viola					1
Woodside					1
Wyoming					1

In October 2014, an introduction letter for the Plan Update was sent to all jurisdictions in the County that explained the plan update process, Federal requirements, and expected level of participation. Feedback on the mitigation capabilities was sent to all municipalities. The feedback forms include questions related to: past hazard events; critical facilities in high hazard areas; mitigation projects, and municipal mitigation capabilities (technical and staffing). The Consultants sent reminder emails and made follow-up phone calls to encourage municipalities to complete their municipal capability updates and attend a Municipal Mitigation Workshop scheduled for 10 December 2014. A total of 9 municipalities completed and returned their questionnaires and two municipalities were represented at the workshop. All municipalities reviewed the draft plan and those how had any comments provided them to the County via email. A total of 8 communities participated actively in the Plan Update process. The remaining 12 communities will need to review the HIRA, update the mitigation strategy, and complete the Mitigation Capability Assessment questionnaire in order to be considered eligible for pre- and post-disaster funding.

Municipal Workshop held on 10 December 2014 at the County Public Safety Building in Dover

Meeting invitations and reminders for the Municipal Mitigation Workshop were sent via e-mail and follow up calls were made to further urge municipal participation. The Municipal Mitigation Workshop was held at the Emergency Management Agency in Dover on the same evening as the first Steering Committee Meeting and was facilitated by the Consultants, providing an opportunity for municipal officials to attend and become educated about the plan update, planning process, hazard identification, and vulnerability assessment.

A series of exhibits were developed for the workshop including maps of critical facilities, and floodplains. Attendees were encouraged to stimulate discussion and mark up maps to indicate updated or missing data. Examples of potential mitigation projects were shared and municipalities were encouraged to recommend additional mitigation projects based on past hazard experiences.

- Update the local Capability Assessment
- Attend the Municipal workshop
- Attend the Steering Committee and Public meeting
- Update municipal actions

- Review the draft plan
- Adopt the Hazard Mitigation Plan Update, once the County has adopted the Plan Update.

3. COMMUNITY PROFILE

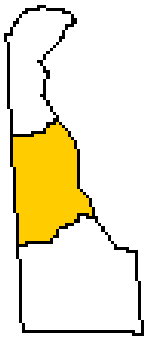
3.1 Introduction

This Chapter provides a general overview of Kent County's unincorporated areas as well as its incorporated municipal jurisdictions. It is broken down into the following five sections:

- Geography and the Environment
- Population and Demographics
- Housing, Infrastructure and Land Use
- Employment and Industry
- Disaster Declarations.

3.2 Geography and the Environment

Kent County is the central county in Delaware and is bordered by New Castle County, Delaware to the north, Maryland to the west, Sussex County, Delaware to the south, and Delaware Bay to the east. The County's location affords easy access to the major metropolitan areas of the Northeast United States — the cities of Baltimore, New York, Philadelphia and Washington, D.C. are all approximately within a two-hour drive or less. The county seat is the City of Dover, Delaware's state capital, which has a population of 37,366 residents.



Kent County has a total area of 594 square miles. The area's topography is generally flat, ranging from sea level along the shores of Delaware Bay to approximately 80 to 85 feet above sea level.

Kent County has a moderate climate, with an average annual temperature of 57 degrees Fahrenheit, and a mean daily temperature ranges from 35 degrees in January to 78 degrees in July. Normal annual rainfall is 46 inches per year and annual snowfall totals approximately 16 inches.

Kent County has a total water area of 210 square miles, and has numerous waterways flowing through it; including Murderkill River, Choptank River, the Saint Jones River, Marshy Hope creek, and Silver Lake. Kent County lies within six watersheds: Delaware Bay, Chesapeake Bay, Broadkill-Smyrna, Chester-Sassafras, Choptank, and Nanticoke.

Most of Kent County lies within the Delaware River Basin, which drains 13,539 square miles in Delaware, New Jersey, New York and Pennsylvania. The River's main stem is 330 miles long and extends from the confluence of its east and west branches at Hancock, New York to the mouth of the Delaware Bay just south of Wilmington. It is the longest free-flowing (un-dammed) river east of the Mississippi.

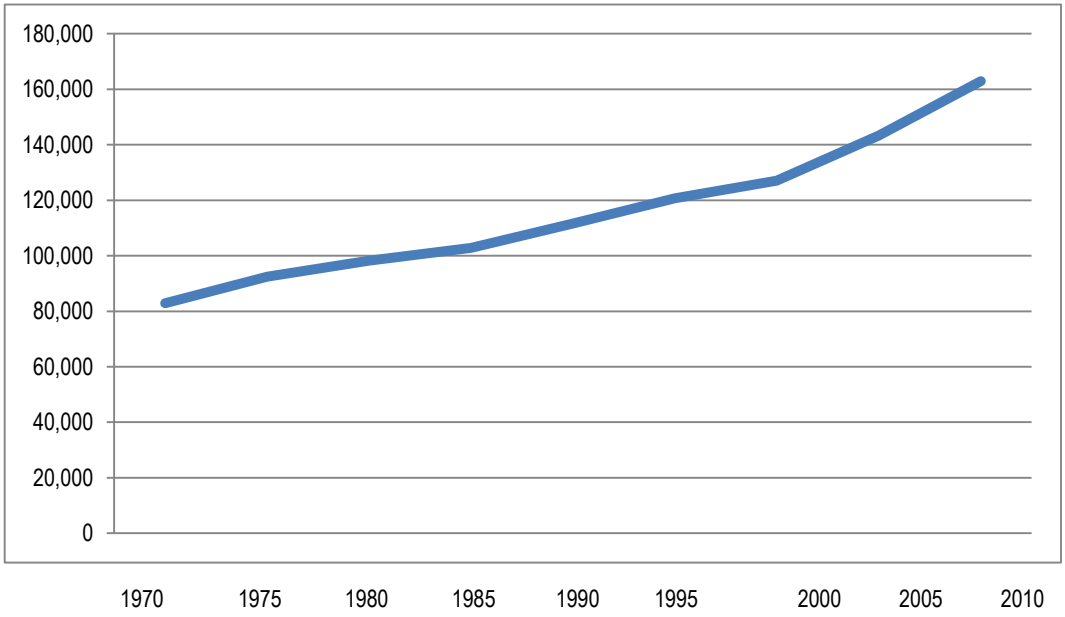
Geologically, Kent County is a part of the "Coastal Plain Province" composed of overlapping beds of unconsolidated or semi-consolidated clay, silt, sand and gravel. Delaware Bay is the area's most marked natural feature. About one-third of the region is wooded with about equal divisions between soft and hard woods.

3.3 Population and Demographics

Recent data from the 2013 U.S. Census estimates and other sources has been included where available. In cases where more recent data was not available, information from the 2000 Census has been retained.

Population growth in Kent County had leveled off until the 1950s, but in recent decades the population has been steadily climbing. **Figure 3.1** shows the population growth of Kent County from 1970 to 2010.

Figure 3.1
Population Growth of Kent County, 1970-2010



Source: U.S. Census Bureau

The 2013 U.S. Census estimates the population of Kent County at 169,416, which is a 25.2 percent increase over the 2006 census population. In comparison, the State's population has increased by 15.9 percent during this period. Kent County has continually exhibited a high growth rate since 1950 and this trend continues. According to the Delaware Population Consortium (DPC) Kent County is expected to grow to approximately 189,431 persons by 2030 (Figure 3.2). While the population is projected to continue to increase through 2030, the rate of increase is projected to decrease markedly.[1]

There are 20 incorporated municipalities in Kent County. The County is approximately 590 square miles and includes the City of Dover. The City of Dover indicated a population of 37,366 persons (2013 estimate) and a 7 percent increase between 2006 and 2013. Dover's land area is approximately 22 square miles.

[1] 2007 Kent County Comprehensive Plan

Figure 3.2
Population Growth of Kent County, 2000-2030

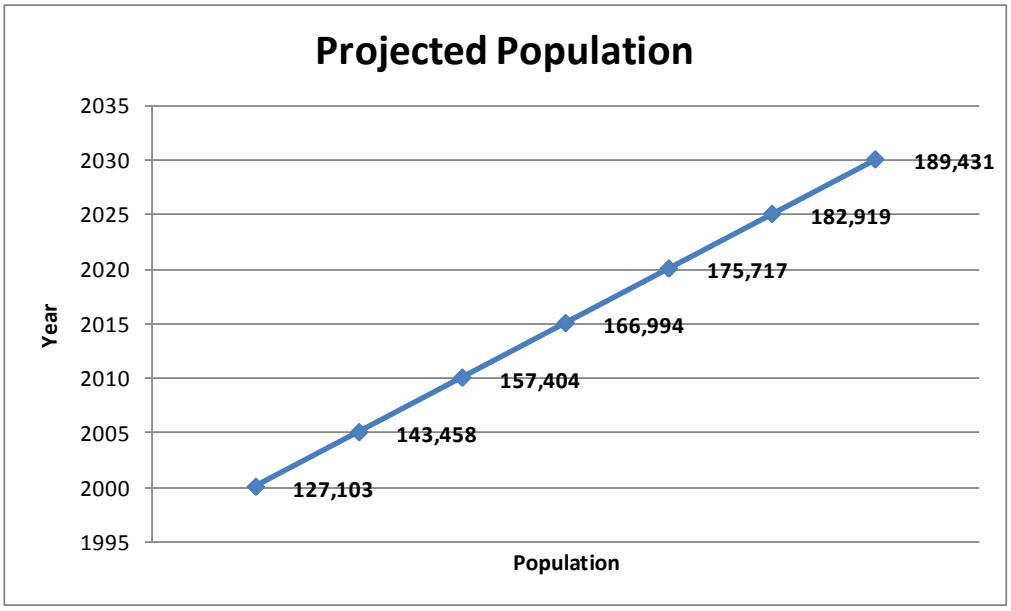


Table 3.1 shows the population for each of the incorporated municipalities in Kent County and the unincorporated area according to U.S. Census 2013.

According to the 2010 U.S. Census , the median age for persons in Kent County is 36.6 years, slightly younger than the statewide average of 36.7 years. Persons 65 years old and over make up 14.5 percent of the total population and those under five years of age comprise 3.4 percent. Approximately 53.7 percent of the population is married, and 72.3 percent own their own homes. Of all persons more than 25 years of age, approximately 85.5 percent are high school graduates and 21.4 percent have a Bachelor's degree or higher. In terms of race, 2013 estimates indicated that the County is comprised 68.1 percent White, a decrease from the 2000 figure of 72.4 percent.

Table 3.1
Municipal Populations for Kent County, 2010

Jurisdiction	Population
Kent County Unincorporated Area*	70,629
Bowers Beach	349
Camden	3,510
Cheswold	1,423
Clayton	3,037
Dover	37,366
Farmington	112
Felton	1,362
Frederica	806
Harrington	3,715
Hartly	76
Houston	391
Kenton	271
Leipsic	193
Little Creek	235
Magnolia	237
Milford	10,122
Smyrna	10,960
Viola	165
Woodside	192
Wyoming	1,406
TOTAL	**169,416**

*Includes Census Designated Places (CDP)
Source: U.S. Census Bureau

3.4 Housing, Infrastructure and Land Use

As of 2013, there were 66,839 housing units, an increase of 7 percent from the 61,640 housing units 2007. 2014 census figures indicate 92.2 percent of these housing units as occupied, of which, 64.4 percent were owner-occupied. The average household size for the county is 2.62 persons in 2014. Median home values in Kent County are $199,500 for owner-occupied units and 13.3 percent of all housing units were located in multi-unit structures between 2009 - 2013. Source: http://www.census.gov/quickfacts

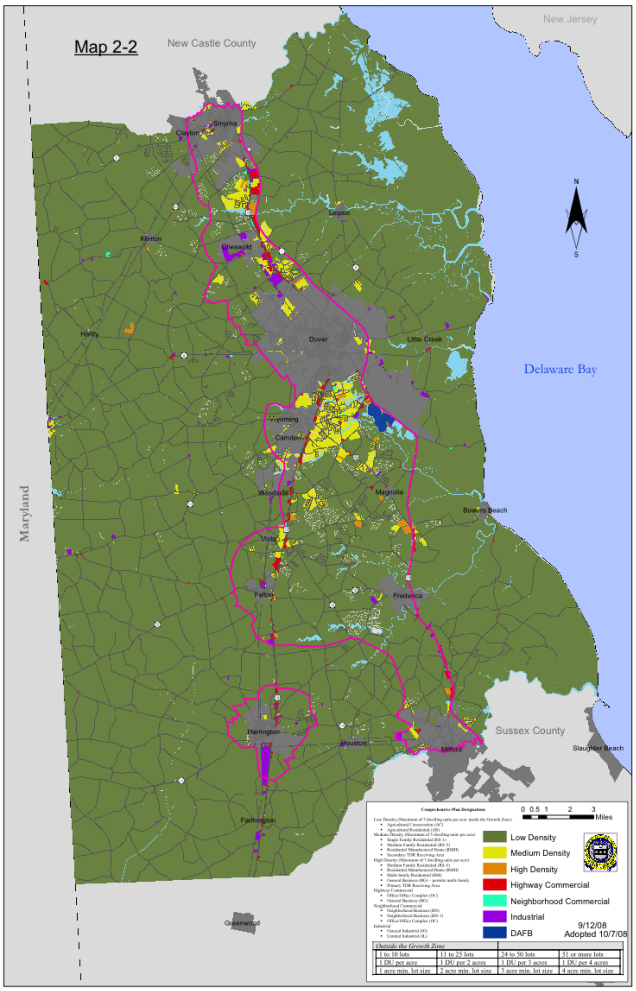
Kent County is a hub of transportation ways. These include U.S. Highways 13,113, and 9; and State Route 1. State Route 1, the largest project in the history of the Delaware Department of Transportation, has relieved congestion on the state's major north-south corridor, Route 13. The County is located

approximately a one-hour drive south of the Port of Wilmington, providing access to Atlantic shipping lanes. Norfolk Southern and Maryland and Delaware Shortline railroads provide service to Kent County.

Kent County has undergone significant growth over the past few decades and typical land use patterns are no longer predominately agricultural as they were in the earlier part of the 1900s. The County experienced significant residential development between 2000 and 2007 when the average annual single-family dwelling building permits issued was 1,153. However this has declined since 2007. While the County has experienced significant residential development in the past several years, commercial and industrial development has been evident mostly in the municipalities. The County continues to maintain the 2002 Growth Zone Overlay that encourages residential and nonresidential development and infrastructure investments around existing developed areas including municipalities. The predominant land use outside the Growth Zone Overlay is agriculture. Other sensitive environmental features such as wetlands, woodlands, and critical habitat exist outside the Growth Zone.

Figure 3.2
Future Land Use Map

Future Land Use Map



The goals from the 2007 Comprehensive Plan build on the concept of community centers at central locations that provide greater access to employment, services, and recreation. The Comprehensive Plan also supports green infrastructure and encourage the protection of the rural character of the County and the preservation of its open spaces.

3.5 Land Use Development Trends

The attached Future Land Use Map shows the Kent County Growth Zone. It was designated because services exist already or are planned. The following development applications were approved in the past five years: 7 applications in 2009 (4 telecommunications towers, 2 childcare centers, and a county recreation center); the Landingsa and Lahey &Mensch Property/Calico Circle in 2010; Loganberry Village and Norty Nine Pines Phase 2/Easter Pines in 2011; Villages at Nobles Pond Phases 3A and 4A and Cherrington in 2012; and Big Oak in 2014. It should be noted that while these plans have been approved, there is no guarantee they will be constructed (particularly the subdivisions). The County has development restrictions within natural areas and floodplains.

3.6 Employment and Industry

Delaware has one of the strongest state economies in the region and remains an above average performer in comparison to the national economy. With lower than average unemployment, a fair and equitable tax system and a well-trained workforce, the State's economic climate has shown dramatic improvement since the early 1980s, partially in response to stable fiscal policies, careful debt management, conservative spending programs, and personal income tax reductions. Delaware's economy continues to have increasing levels of job growth, although more moderate than in previous years.

In 2010, the median household income for Kent County was $55,149, a 14 percent increase from $47,407 in 2007. The State's median income also increased from $55,988 to $59,878 in 2014. The County's per capita income in 2014 was $24,851, compared with a statewide average of $29,818. In 2014, Kent County had an unemployment rate of 6.1 percent, the statewide average was 7.9 percent. The County's poverty rate increased from 12.1 percent in 2007 to 12.9 percent in 2014 (statewide average in 2014 was 11.7%).

Kent County sustains a diversified economy, with most firms concentrated in the government and services-related sectors. In 2014, health care and social assistance, Government, and retail and wholesale trade were the leading industries in the region. **Table 3.2** provides an overview of firms in Kent County by sector.

Table 3.2
Firms by Sector for Kent County, 2014

Industry Description	# of Firms	Average Employment
Agriculture, forestry, fishing and hunting	35	*
Mining	2	*
Utilities	7	189
Construction	389	2,385
Manufacturing	70	4,624
Wholesale trade	145	1,116
Retail trade	509	9,077
Transportation and warehousing	99	2,108
Information	36	412
Finance and insurance	165	1,135
Real estate and rental and leasing	121	477
Professional and technical services	306	1,813
Management of companies and enterprises	11	212
Administrative and waste services	244	1,914
Educational services	28	474
Health care and social assistance	468	8,616
Arts, entertainment, and recreation	53	2,753
Accommodation and food services	265	5,194
Other services, except public administration	328	1,642
Total Government	174	18,805
Total Industries	3,455	63,193

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Total Government	174	18,805
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Note: * indicates non-releasable data
Source: Delaware Department of Labor

Kent County's largest employer is the State of Delaware and Dover Air Force Base. Among the County's largest private employers are the Bayhealth Medical Center, Dover Downs Casino and Kraft Foods. **Table 3.3** lists Kent County's top private employers.

Table 3.3
Kent County's Top Ten Private Employers

Employer
Bayhealth Medical Center (Kent General)
Dover Downs Inc.
Harrington Raceways & Slots
Kent-Sussex Industries
Kraft Foods Inc.
Perdue Farms
University of Delaware
Delaware Home & Hospital For the Chronically Ill
Safeway Inc.
Wal-Mart Associates Inc.

Source: Delaware Economic Development Office

3.6 Disaster Declarations

Since 1965, Kent County has experienced a total of five Presidential disaster declarations, shown in **Table 3.4**. Prior to 1965, any presidential declarations did not have county designations. The county has also experienced additional emergencies and disasters that were not severe enough to require Federal disaster relief through a presidential

declaration. This includes a blizzard in March 1993 that resulted in an emergency declaration (3111-EM) for Kent County that made limited Federal assistance available through the Public Assistance program for snow removal. The most recent declaration for the County was in 2012 during the Hurricane Sandy.

Table 3.4
Presidential Disaster Declarations for Kent County, 1965– 2014

Event	Declaration Date	Type of Assistance	Declaration Number
Water Shortage	08/15/65	Individual Assistance Public Assistance	DR-207
Blizzard of '96 (Severe Snow Storm)	01/12/96	Public Assistance	DR-1082
Hurricane Floyd	09/21/99	Public Assistance	DR-1297
Hurricane Isabel	09/20/03	Individual Assistance Public Assistance	DR-1494
Tropical Storm Henri	09/23/03	Individual Assistance Public Assistance	DR-1495
Hurricane Jeanne	11/15/04	Public Assistance	DR-1572
Hurricane Katrina	09/30/05	Individual Assistance Public Assistance	DR-3263
Severe Storms and Flooding	06/23/06	Public Assistance	DR- 1654
Severe Winter Storms and Snow	02/05/11	Public Assistance	DR-1896
Hurricane Irene	08/26/11	Public Assistance	DR - 4037
Hurricane Sandy	10/27/12	Public Assistance	DR-4090

Source: Federal Emergency Management Agency

4.1 HAZARD IDENTIFICATION

4.1.1 Introduction

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the type … of all natural hazards that can affect the jurisdiction*

The United States and its communities are vulnerable to a wide array of natural and human-caused hazards that threaten life and property. These hazards include:

Natural

- Flood
- Hurricanes and Coastal Storms
- Severe Thunderstorms and Tornadoes
- Wildfire
- Drought/Extreme Heat
- Winter Storms and Freezes
- Hail
- Erosion
- Dam/Levee Failure
- Earthquakes, Sinkholes and Landslides
- Tsunami
- Volcano

Human-caused

- Terrorism
- Hazardous Materials (HazMat)
- Energy Pipeline Failures

Some of these hazards are interrelated (i.e., hurricanes can cause flooding and tornadoes), and some consist of hazardous elements that are not listed separately (i.e., severe thunderstorms can cause lightning; hurricanes can cause coastal erosion). In addition, terrorist-related incidents or accidents involving chemical, radiological or biological agents can coincide with natural hazard events, such as flooding caused by destruction of a dam or an accidental chemical release caused by a tornado. It should also be noted that some hazards, such as severe winter storms, may impact a large area yet cause little damage, while other hazards, such as a tornado, may impact a small area yet cause extensive damage. This section provides a general description for each of the hazards listed above along with their hazardous elements, written from a national perspective.

4.1.2 Flood

Flooding is the most frequent and costly natural hazard in the United States, a hazard that has caused more than 10,000 deaths nationwide, since 1900. Nearly 90 percent of presidential disaster declarations have resulted from natural events in which flooding was a major component.

Floods are generally the result of excessive precipitation, and can be classified under two categories: general floods, precipitation over a given river basin for a long period of time; and flash floods, the product of heavy localized precipitation in a short time period over a given location. The severity of a flooding event is determined by the following: a combination of stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing.

General floods are usually long-term events that may last for several days. The primary types of general flooding include riverine, coastal, and urban flooding. Riverine flooding is a function of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Coastal flooding is typically a result of storm surge, wind-driven waves, and heavy rainfall produced by hurricanes, tropical storms, nor'easters, and other large coastal storms. Urban flooding occurs where man-made development has obstructed the natural flow of water and decreased the ability of natural groundcover to absorb and retain surface water runoff.

A total of 534 counties in nine states were declared for Federal disaster aid as a result of the Midwest Floods in June 1994. Homes, businesses and personal property were all destroyed by the high flood levels; 168,340 people registered for Federal assistance. (FEMA News Photo)

Flash flooding events usually occur from a dam or levee failure within minutes or hours of heavy amounts of rainfall, or from a sudden release of water held by an ice jam. Most flash flooding is caused by slow-moving thunderstorms in a local area or by heavy rains associated with hurricanes and tropical storms. Although flash flooding occurs often along mountain streams, it is also common in urbanized areas where much of the ground is covered by impervious surfaces. Flash flood waters move at very high speeds—"walls" of water can reach heights of 10 to 20 feet. Flash flood waters and the accompanying debris can uproot trees, roll boulders, destroy buildings, and obliterate bridges and roads.

The periodic flooding of lands adjacent to rivers, streams, and shorelines (land known as floodplain) is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

Floodplains are designated by the frequency of the flood that is large enough to cover them. For example, the 10-year floodplain will be covered by the 10-year flood and the 100-year floodplain by the 100-year flood. Flood frequencies such as the 100-year flood are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur. Another way of expressing the flood frequency is the chance of occurrence in a given year, which is the percentage of the probability of flooding each year. For example, the 100-year flood has a 1 percent chance of occurring in any given year.

Table 4.1-1 shows flood loss values by fiscal year from a national perspective.

Table 4.1-1
National Flood Losses by Fiscal Year (Oct.-Sept.), 1983-2013

Fiscal Year	Damage (Billions of Current Dollars)	Inflation Adjustment	Damage (Billions of 2013 Dollars)	U.S. Population (Millions)	Damage Per Capita (2013 Dollars)
1983	4.014	2.34	9.392	233.79	40.17
1984	3.866	2.24	8.635	235.82	36.62
1985	0.524	2.17	1.137	237.92	4.78
1986	6.261	2.13	13.337	240.13	55.54
1987	1.526	2.05	3.129	242.29	12.91
1988	0.242	1.97	0.476	244.5	1.94
1989	1.190	1.88	2.236	246.82	9.06
1990	1.855	1.78	3.302	249.62	13.23
1991	1.961	1.71	3.354	252.98	13.26
1992	0.880	1.66	1.461	256.51	5.70
1993	18.63	1.61	29.997	259.92	115.41
1994	1.259	1.57	1.977	263.13	7.51
1995	5.829	1.53	8.918	266.28	33.49
1996	7.026	1.48	10.399	269.39	38.60
1997	9.866	1.45	14.306	272.65	52.47
1998	2.816	1.43	4.027	275.85	14.60
1999	6.119	1.40	8.596	279.04	30.81
2000	1.521	1.35	2.054	282.16	7.28
2001	8.334	1.32	11.001	284.97	38.60
2002	1.371	1.29	1.769	287.63	6.15
2003	2.787	1.27	3.540	290.11	12.20
2004	15.241	1.23	18.746	292.81	64.02
2005	45.264	1.19	53.864	295.52	182.27
2006	3.976	1.16	4.612	298.38	15.46
2007	2.552	1.12	2.858	301.23	9.49
2008	6.082	1.08	6.569	304.09	21.60
2009	0.982	1.09	1.070	306.77	3.49
2010	5.108	1.07	5.466	309.33	17.67
2011	8.521	1.04	8.862	311.59	28.44
2012	0.511	1.01	0.516	313.59	1.65
2013	2.152	1.00	2.152	316.98	6.79

Source: Hydrologic Information Center, National Weather Service

4.1.3 Hurricanes and Coastal Storms

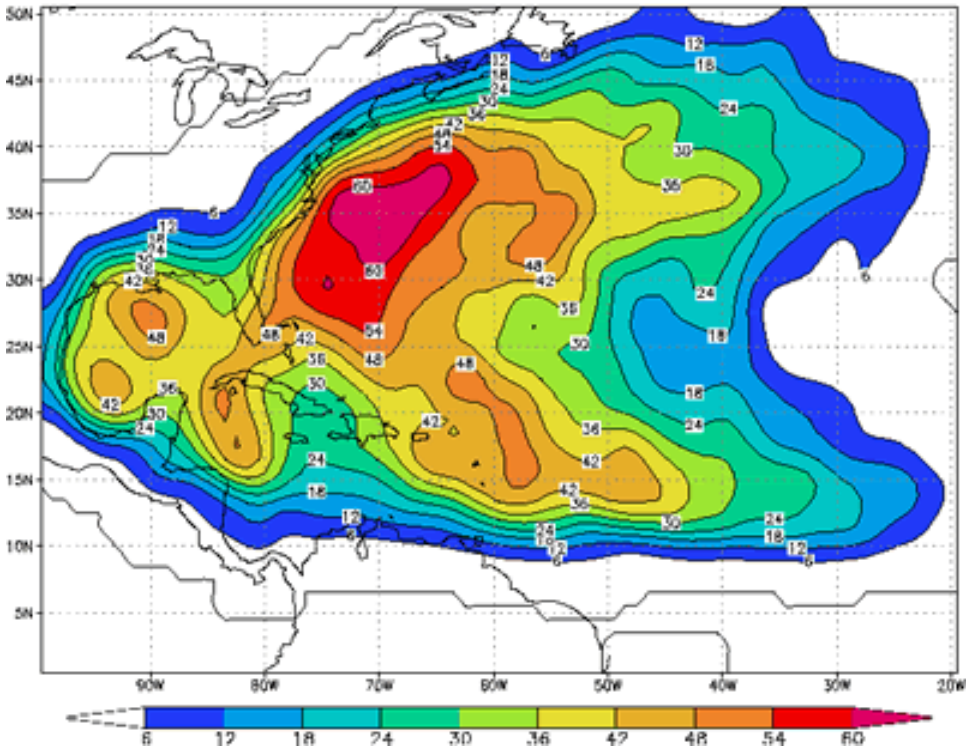
Hurricanes, tropical storms, nor'easters and typhoons, also classified as cyclones, are any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. A tropical cyclone refers to any such circulation that develops over tropical waters. Tropical cyclones act as a "safety-valve," limiting the continued build-up of heat and energy in tropical regions by maintaining the atmospheric heat and moisture balance between the tropics and the pole-ward latitudes. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation, and tornadoes. Coastal areas are also vulnerable to the additional forces of storm surge, wind-driven waves, and tidal flooding which can be more destructive than cyclone wind.

The key energy source for a tropical cyclone is the release of latent heat from the condensation of warm water. Their formation requires a low-pressure disturbance, warm sea surface temperature, rotational force from the spinning of the earth, and the absence of wind shear in the lowest 50,000 feet of the atmosphere. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season, which encompasses the months of June through November. The peak of the Atlantic hurricane season is in early to mid-September and the average number of storms that reach hurricane intensity per year in this basin is about six (6).

Wind and rain from Hurricane Lili damage road signs along I-10 in Louisiana October 3, 2002. (Photo by Lauren Hobart/FEMA News Photo)

Figure 4.1-1 shows for any particular location what the chance is that a tropical storm or hurricane will affect the area sometime during the whole June to November Atlantic hurricane season. The figure was created by the National Oceanic and Atmospheric Administration's Hurricane Research Division using data from 1944 to 1999 and counting hits when a storm or hurricane was within approximately 100 miles (165 km) of each location.

Figure 4.1-1
Empirical Probability of a Named Storm



Source: National Oceanic and Atmospheric Administration, Hurricane Research Division

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Scale, which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense.

The Saffir-Simpson Scale is shown in **Table 4.1-2**.

Table 4.1-2
Saffir-Simpson Wind Scale

Category	Maximum Sustained Wind Speed (mph)
1	74-95 mph
2	96-110 mph
3	111-129 mph
4	130-156 mph
5	157 mph or higher

Source: National Hurricane Center

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential, which are combined to estimate potential damage. Categories 3, 4, and 5 are classified as "major" hurricanes, and while hurricanes within this range comprise only 20 percent of total tropical cyclone landfalls, they account for over 70 percent of the damage in the United States. **Table 4.1-3** describes the damage that could be expected for each category of hurricane.

Table 4.1-3
Hurricane Damage Classification

Category	Damage Level	Description
1	MINIMAL	**Very dangerous winds will produce some damage:** Well-constructed frame homes 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	MODERATE	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	EXTENSIVE	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	EXTREME	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	CATASTROPHIC	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center

A storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from four to five feet in a Category 1 hurricane up to 20 feet in a Category 5 storm. The storm surge arrives ahead of the storm's actual landfall and the more intense the hurricane is, the sooner the surge arrives. Water rise can be very rapid, posing a serious threat to those who have not yet evacuated flood-prone areas. A storm surge is a wave that has outrun its generating source and become a long period swell. The surge is always highest in the right-front quadrant of the direction in which the hurricane is moving. As the storm approaches shore, the greatest storm surge will be to the northeast of the hurricane eye. Such a surge of high water topped by waves driven by hurricane force winds can be devastating to coastal regions, causing severe beach erosion and property damage along the immediate coast.

Storm surge heights, and associated waves, are dependent upon the shape of the continental shelf (narrow or wide) and the depth of the ocean bottom (bathymetry). A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water close to the shoreline, tends to produce a lower surge but higher and more powerful storm waves.

Damage during hurricanes may also result from spawned tornadoes and inland flooding associated with heavy rainfall that usually accompanies these storms. Hurricane Floyd, as an example, was at one time a Category 4 hurricane racing towards the North Carolina coast. As far inland as Raleigh, the state capital located more than 100 miles from the coast, communities were preparing for extremely damaging winds exceeding 100 miles per hour. However, Floyd made landfall as a Category 2 hurricane and will be remembered for causing the worst inland flooding disaster in North Carolina's history. Rainfall amounts were as high as 20 inches in certain locales and 67 counties sustained damages.

Hurricane Floyd brought a devastating 15 feet of storm surge that damaged or destroyed hundreds of houses along the ocean front of Long Beach on Oak Island, North Carolina in September 1999. A prime example of successful hazard mitigation, the elevated home (right) survived while the older, ground-level block foundation of the home on the left was crushed. (Photo by Dave Gatley/FEMA News Photo)

Similar to hurricanes, nor'easters are ocean storms capable of causing substantial damage to coastal areas in the Eastern United States due to their associated strong winds and heavy surf. Nor'easters are named for the winds that blow in from the northeast and drive the storm up the East Coast along the Gulf Stream, a band of warm water that lies off the Atlantic coast. They are caused by the interaction of the jet stream with horizontal temperature gradients and generally occur during the fall and winter months when moisture and cold air are plentiful.

Nor'easters are known for dumping heavy amounts of rain and snow, producing hurricane-force winds, and creating high surfs that cause severe beach erosion and coastal flooding. There are two main components to a nor'easter: (1) a Gulf Stream low-pressure system (counter-clockwise winds) generated off the southeastern U.S. coast, gathering warm air and moisture from the Atlantic, and pulled up the East Coast by strong northeasterly winds at the leading edge of the storm; and (2) an Arctic high-pressure system (clockwise winds) which meets the low-pressure system with cold, arctic air blowing down from Canada. When the two systems collide, the moisture and cold air produce a mix of precipitation and have the potential for creating dangerously high winds and heavy seas. As the low-pressure system deepens, the intensity of the winds and waves will increase and cause serious damage to coastal areas as the storm moves northeast.

Table 4.1-4 shows an intensity scale proposed for nor'easters that is based upon levels of coastal degradation.

Table 4.1-4
Dolan-Davis Nor'easter Intensity Scale

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

Source: North Carolina Division of Emergency Management

4.1.4 Severe Thunderstorms and Tornadoes

According to the National Weather Service, more than 100,000 thunderstorms occur each year, though only about 10 percent of these storms are classified as "severe." Although thunderstorms generally affect a small area when they occur, they are very dangerous because of their ability to generate tornadoes, hailstorms, strong winds, flash flooding, and damaging lightning. While thunderstorms can occur in all regions of the United States, they are most common in the central and southern states because atmospheric conditions in those regions are most ideal for generating these powerful storms.

Multiple cloud-to-ground and cloud-to-cloud lightning strokes observed during a nighttime thunderstorm. (Photo courtesy of NOAA Photo Library, NOAA Central Library; OAR/ERL/ National Severe Storms Laboratory)

Thunderstorms are caused when air masses of varying temperatures meet. Rapidly rising warm moist air serves as the "engine" for thunderstorms. These storms can occur singularly, in lines, or in clusters. They can move through an area very quickly or linger for several hours.

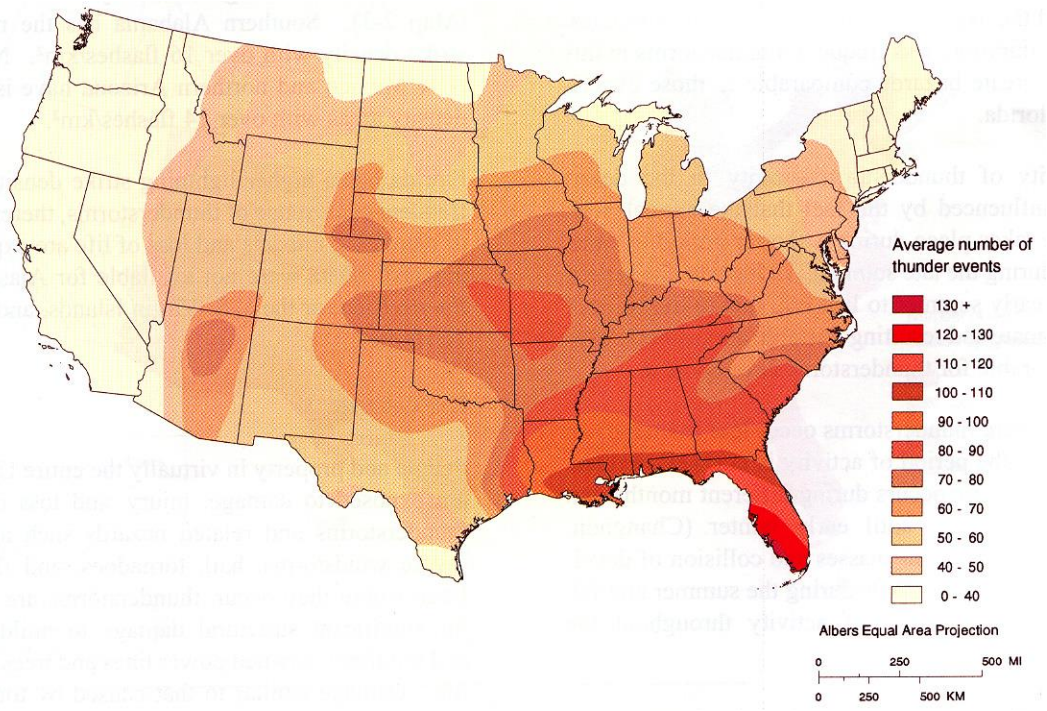
Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a "bolt" when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes thunder. On average, 89 people are killed each year by lightning strikes in the United States.

The National Weather Service collected data for thunder days, number and duration of thunder events, and lightening strike density for the 30-year period from 1948 to 1977. A series of maps was generated showing the annual

average thunder event duration, the annual average number of thunder events, and the mean annual density of lightning strikes.

Figure 4.1-2 illustrates thunderstorm hazard severity based on the annual average number of thunder events from 1948 to 1977.

Figure 4.1-2
Annual Average Number of Thunder Events



Source: Federal Emergency Management Agency

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes and other coastal storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. According to the National Weather Service, tornado wind speeds normally range from 40 to more than 300 miles per hour. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles.

The most comprehensively observed tornado in history, this tornado south of Dimmitt, Texas developed June 2, 1995 curving northward across Texas Highway 86 where it entirely removed 300 feet of asphalt from the road tossing it more than 600 feet into an adjacent field. It also caused F4 damage at an isolated rural residence just north of the road. (NOAA Photo Library, NOAA Central Library; OAR/ERL/National Severe Storms Laboratory)

Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2002). They are more likely to occur during the spring and early summer months of March through June and can occur at any time of day, but are likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch down briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long.

Waterspouts are weak tornadoes that form over warm water and are most common along the Gulf Coast and southeastern states. Waterspouts occasionally move inland, becoming tornadoes that cause damage and injury. However, most waterspouts dissipate over the open water causing threats only to marine and boating interests. Typically a waterspout is weak and short-lived, and because they are so common, most go unreported unless they cause damage.

The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light construction such as residential homes (particularly mobile homes), and tend to remain localized in impact. The Fujita-Pearson Scale for Tornadoes (**Table 4.1-5**) was developed to measure tornado strength and associated damages.

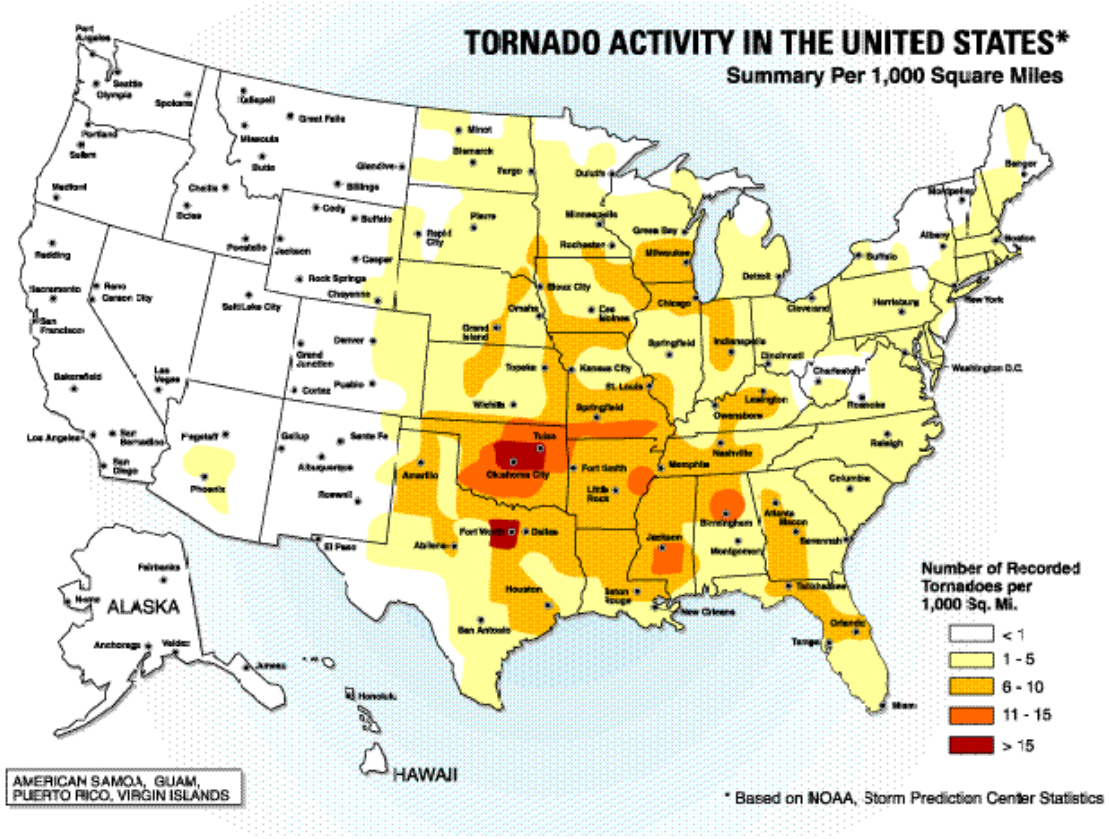
Table 4.1-5
Enhanced Fujita Scale for Tornadoes

EF-Scale Number	3 Second Gust (mph)	Type of Damage Done
EF0	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	86-110	Moderate Damage: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	Considerable Damage: Roofs torn off well-constructed houses; mobile homes demolished; large trees snapped or uprooted; light object missiles generated; cars lifted off ground.
EF3	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	166-200	Devastating Damage: Whole frame houses, well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200	Incredible Damage: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100m (109 yd); high-rise buildings have significant structural deformation; incredible phenomena will occur.

Source:NOAA's NWS Storm Prediction Center

According to the NOAA Storm Prediction Center (SPC), the highest concentration of tornadoes in the United States has been in Oklahoma, Texas, Kansas and Florida respectively. Although the Great Plains region of the Central United States does favor the development of the largest and most dangerous tornadoes (earning the designation of "tornado alley"), Florida experiences the greatest number of tornadoes per square mile of all U.S. states (SPC, 2002). **Figure 4.1-3** shows tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles.

Figure 4.1-3
Tornado Activity in the United States

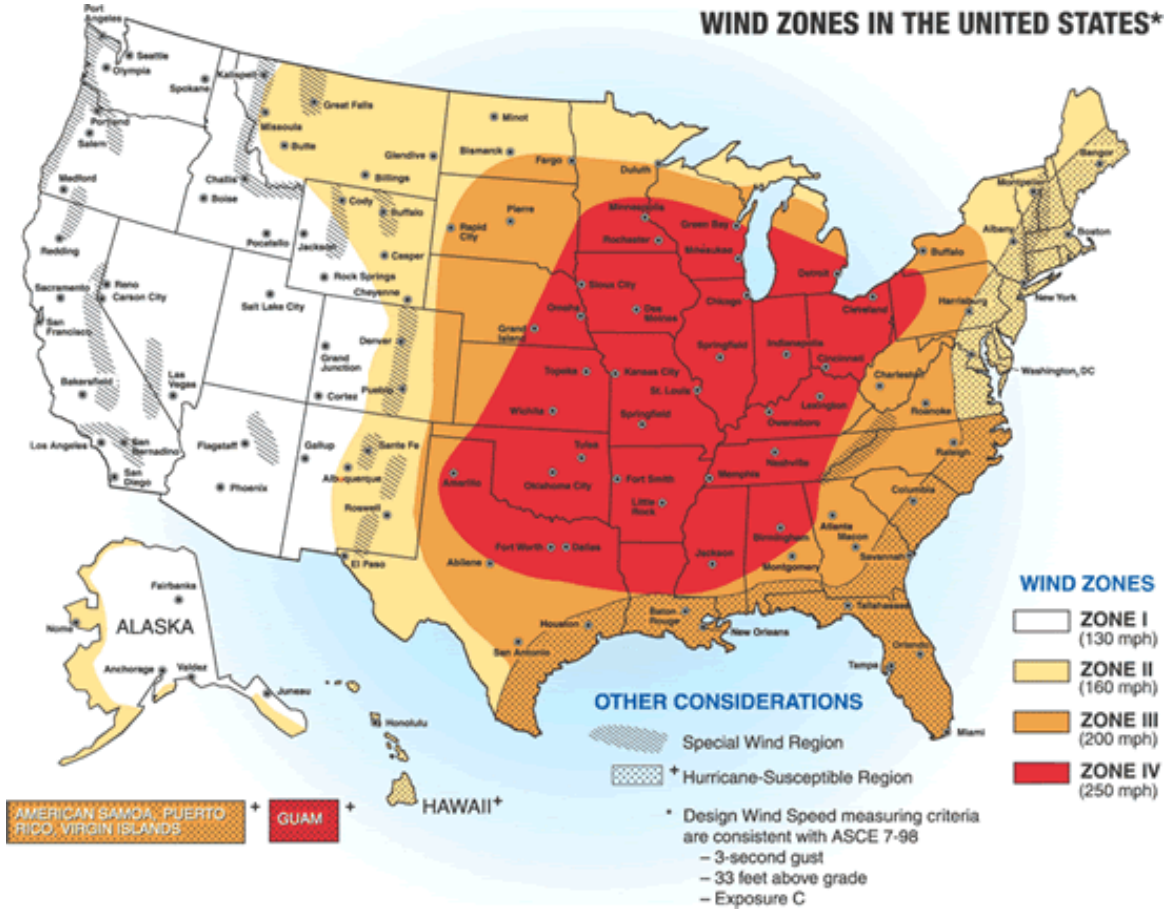


Source: American Society of Civil Engineers

The tornadoes associated with tropical cyclones are most frequent in September and October when the incidence of tropical storm systems is greatest. This type of tornado usually occurs around the perimeter of the storm, and most often to the right and ahead of the storm path or the storm center as it comes ashore. These tornadoes commonly occur as part of large outbreaks and generally move in an easterly direction.

Figure 4.1-4 shows how the frequency and strength of extreme windstorms vary across the United States. The map was produced by the Federal Emergency Management Agency and is based on 40 years of tornado history and over 100 years of hurricane history. Zone IV, the darkest area on the map, has experienced both the greatest number of tornadoes and the strongest tornadoes. As shown by the map key, wind speeds in Zone IV can be as high as 250 MPH.

Figure 4.1-4
Wind Zones in the United States



Source: Federal Emergency Management Agency

4.1.5 Wildfire

A wildfire is any fire occurring in a wildland area (i.e., grassland, forest, brush land) except for fire under prescription. Wildfires are part of the natural management of the Earth's ecosystems, but may also be caused by natural or human factors. Over 80 percent of forest fires are started by negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning.

There are three classes of wildland fires: surface fire, ground fire, and crown fire. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire (muck fire) is usually started by lightning or human carelessness and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees. Wildland fires are usually signaled by dense smoke that fills the area for miles around.

On Sunday, August 6, 2000, several forest fires converged near Sula, Montana, forming a firestorm that overran 100,000 acres and destroyed 10 homes. Temperatures in the flame front were estimated at more than 800 degrees. Note the elk gathering near the East Fork of the Bitterroot River. (Photo by John McColgan/U.S. Forest Service Firefighter)

State and local governments can impose fire safety regulations on home sites and developments to help curb wildfire. Land treatment measures such as fire access roads, water storage, helipads, safety zones, buffers, firebreaks, fuel breaks, and fuel management can be designed as part of an overall fire defense system to aid in fire control. Fuel management, prescribed burning, and cooperative land management planning can also be encouraged to reduce fire hazards.

Fire probability depends on local weather conditions, outdoor activities such as camping, debris burning, and construction, and the degree of public cooperation with fire prevention measures. Drought conditions and other natural disasters (tornadoes, hurricanes, etc.) increase the probability of wildfires by producing fuel in both urban and rural settings. Forest damage from hurricanes and tornadoes may block interior access roads and fire breaks, pull down overhead power lines, or damage pavement and underground utilities.

Many individual homes and cabins, subdivisions, resorts, recreational areas, organizational camps, businesses, and industries are located within high fire hazard areas. The increasing demand for outdoor recreation places more people in wildlands during holidays, weekends, and vacation periods. Unfortunately, wildland residents and visitors are rarely educated or prepared for the inferno that can sweep through the brush and timber and destroy property in minutes.

4.1.6 Drought/Extreme Heat

Drought is a natural climatic condition caused by an extended period of limited rainfall beyond that which occurs naturally in a broad geographic area. High temperatures, high winds, and low humidity can worsen drought conditions, and can make areas more susceptible to wildfire. Human demands and actions can also hasten drought-related impacts.

Droughts are frequently classified as one of following four types:

- Meteorological
- Agricultural
- Hydrological
- Socio-economic.

Meteorological droughts are typically defined by the level of "dryness" when compared to an average, or normal amount of precipitation over a given period of time. Agricultural droughts relate common characteristics of drought to their specific agricultural-related impacts. Emphasis tends to be placed on factors such as soil water deficits, water needs based on differing stages of crop development, and water reservoir levels. Hydrological drought is directly related to the effect of precipitation shortfalls on surface and groundwater supplies. Human factors, particularly changes in land use, can alter the hydrologic characteristics of a basin. Socio-economic drought is the result of water shortages that limit the ability to supply water-dependent products in the marketplace.

A USGS streamflow gaging station at the Ogeechee River near Eden, Georgia in July 2000 illustrates the drought conditions that can severely affect water supplies, agriculture, stream water quality, recreation, navigation, and forest resources. (Photo courtesy of the United States Geological Survey)

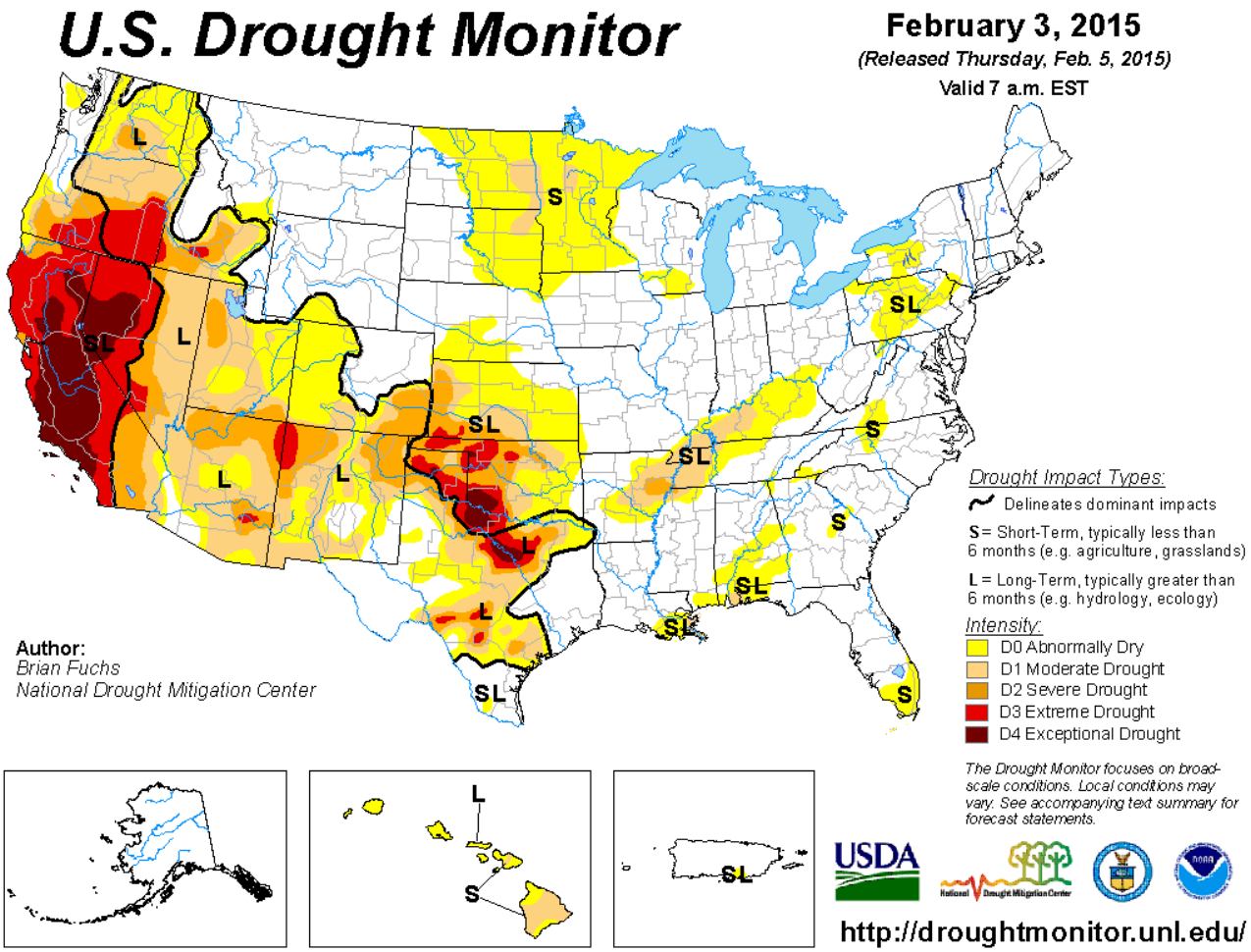
While drought mostly impacts land and water resources, extreme heat can pose a significant risk to humans. Extreme heat can be defined as temperatures that hover 10 degrees or more above the average high temperature for the region, last for prolonged periods of time, and are often accompanied by high humidity. Under normal conditions, the human body's internal thermostat produces perspiration that evaporates and cools the body. However, in extreme heat and high humidity, evaporation is slowed and the body must work much harder to maintain a normal temperature. Elderly persons, young children, persons with respiratory difficulties, and those who are sick or overweight are more likely to become victims of extreme heat. Because men sweat more than women, they are more susceptible to heat-related illness because they become more quickly dehydrated. Studies have shown that a significant rise in heat-related illness occurs when excessive heat persists for more than two days. Spending at least two hours per day in air conditioning can significantly reduce the number of heat-related illnesses. Therefore, cooling stations are often an effective emergency response, as well as warnings in the media about the danger of over-exposure to the extreme heat.

Extreme heat in urban areas can create health concerns when stagnant atmospheric conditions trap pollutants, thus adding unhealthy air to excessively hot temperatures. In addition, the "urban heat island effect" can produce

significantly higher nighttime temperatures because asphalt and concrete (which store heat longer) gradually release heat at night.

Figure 4.1-5 shows a U.S. Drought Monitor summary map from the United States Department of Agriculture for August 25, 2009. Drought Monitor summary maps identify general drought areas and label droughts by intensity, with D1 being the least intense and D4 being the most intense.

Figure 4.1-5
U.S. Drought Monitor



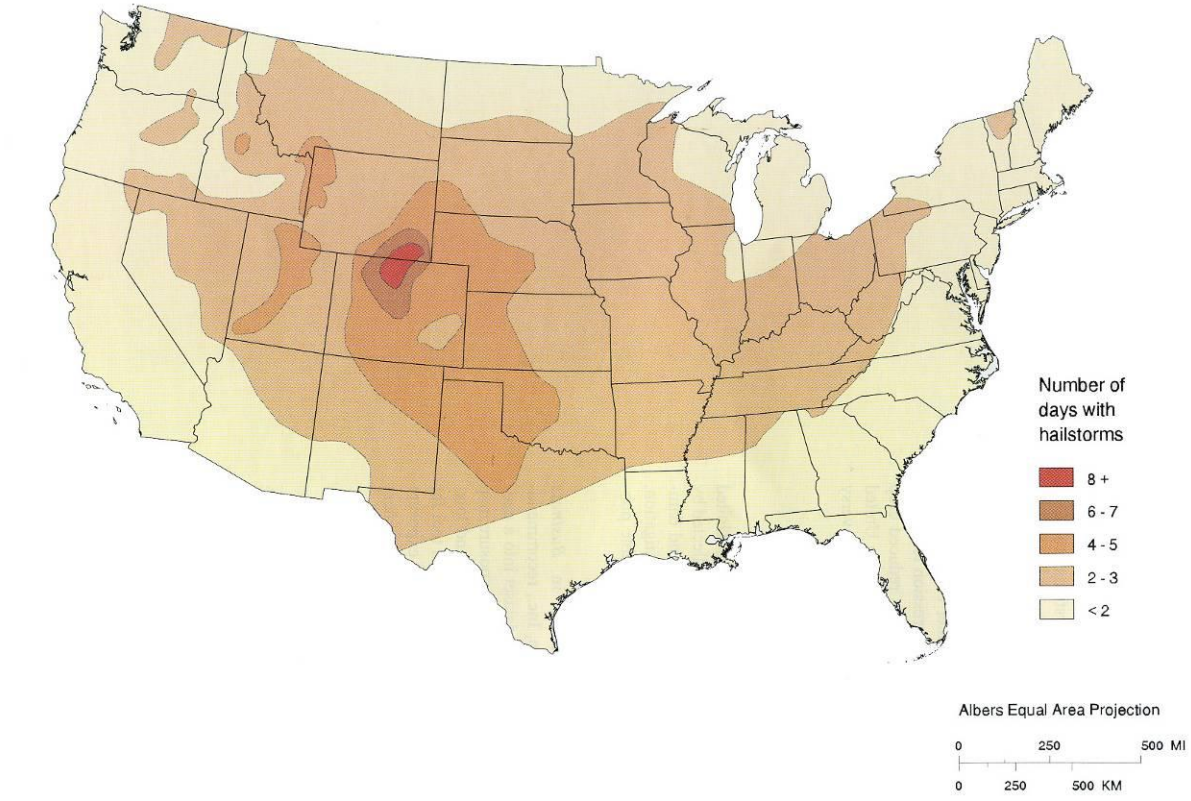
Weekly-updated maps may be obtained online from The Drought Monitor Web site, maintained by the National Drought Mitigation Center, located at the following Web address: http://drought.unl.edu/dm.

4.1.7 Hail

Hailstorms are an outgrowth of severe thunderstorms. Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation—as balls or irregularly shaped masses of ice greater than 0.75 in. (1.91 cm) in diameter. The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Higher temperature gradients relative to elevation above the surface result in increased suspension time and hailstone size. **Figure 4.1-6** shows the annual frequency of hailstorms in the United States.

Large hail collects on streets and grass during a severe thunderstorm. Larger stones appear to be nearly two to three inches in diameter. (NOAA Photo Library, NOAA Central Library; OAR/ERL/National Severe Storms Laboratory)

Figure 4.1-6
Annual Frequency of Hailstorms in the United States



Source: Federal Emergency Management Agency

4.1.8 Winter Storms and Freezes

A winter storm can range from a moderate snow over a period of a few hours to blizzard conditions with blinding wind-driven snow that lasts for several days. Some winter storms may be large enough to affect several states, while others may affect only a single community. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely impair visibility.

Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Sleet—raindrops that freeze into ice pellets before reaching the ground—usually bounce when hitting a surface and do not stick to objects; however, sleet can accumulate like snow and cause a hazard to motorists. Freezing rain is rain that falls onto a surface with a temperature below freezing, forming a glaze of ice. Even small accumulations of ice can cause a significant hazard, especially on power lines and trees. An ice storm occurs when freezing rain falls and freezes immediately upon impact. Communications and power can be disrupted for days, and even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

A heavy layer of ice was more weight than this tree in Kansas City, Missouri could withstand during a January 2002 ice storm that swept through the region bringing down trees, power lines and telephone lines. (Photo by Heather Oliver/FEMA News Photo)

A freeze is weather marked by low temperatures, especially when below the freezing point (zero degrees Celsius or thirty-two degrees Fahrenheit). Agricultural production is seriously affected when temperatures remain below the freezing point.

Winter storms and extreme cold snaps affect certain populations disproportionately, namely the impoverished, the elderly, and those with acute (and sometimes chronic) health conditions. This disproportionate outcomes are a result of the sensitivity to populations to the cold and their inability to get warm, but also because these conditions are often accompanied with power loss, and a general lack of mobility. Evacuation shelters with independent power generation can be a effective mitigation measure. Additionally, education of social service providers to be extra vigilant during times of winter storms can make a difference in the potential mortality rate.

4.1.9 Erosion

Erosion is the gradual breakdown and movement of land due to both physical and chemical processes of water, wind, and general meteorological conditions. Natural, or geologic, erosion has occurred since the Earth's formation and continues at a very slow and uniform rate each year.

There are two types of soil erosion: wind erosion and water erosion. Wind erosion can cause significant soil loss. Winds blowing across sparsely vegetated or disturbed land can pick up soil particles and carry them through the air, thus displacing them. Water erosion can occur over land or in streams and channels. Water erosion that takes place over land may result from raindrops, shallow sheets of water flowing off the land, or shallow surface flow, which is concentrated in low spots. Stream channel erosion may occur as the volume and velocity of water flow increases

enough to cause movement of the streambed and bank soils. Major storms such as hurricanes may cause significant erosion by combining high winds with heavy surf and storm surge to significantly impact the shoreline.

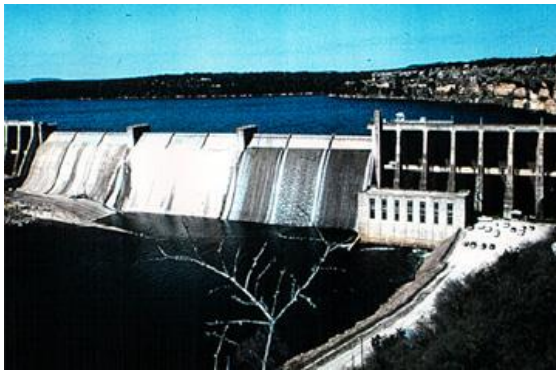
An area's potential for erosion is determined by four factors: soil characteristics, vegetative cover, topography climate or rainfall, and topography. Soils composed of a large percentage of silt and fine sand are most susceptible to erosion. As the content of these soils increases in the level of clay and organic material, the potential for erosion decreases. Well-drained and well-graded gravels and gravel-sand mixtures are the least likely to erode. Coarse gravel soils are highly permeable and have a good capacity for absorption, which can prevent or delay the amount of surface runoff. Vegetative cover can be very helpful in controlling erosion by shielding the soil surface from falling rain, absorbing water from the soil, and slowing the velocity of runoff. Runoff is also affected by the topography of the area including size, shape and slope. The greater the slope length and gradient, the more potential an area has for erosion. Climate can affect the amount of runoff, especially the frequency, intensity and duration of rainfall and storms. When rainstorms are frequent, intense, or of long duration, erosion risks are high. Seasonal changes in temperature and rainfall amounts define the period of highest erosion risk of the year.

During the past 20 years, the importance of erosion control has gained the increased attention of the public. Implementation of erosion control measures consistent with sound agricultural and construction operations is needed to minimize the adverse effects associated with increasing settling out of the soil particles due to water or wind. The increase in government regulatory programs and public concern has resulted in a wide range of erosion control products, techniques, and analytical methodologies in the United States. The preferred method of erosion control in recent years has been the restoration of vegetation.

4.1.10 Dam/Levee Failure

Worldwide interest in dam and levee safety has risen significantly in recent years. Aging infrastructure, new hydrologic information, and population growth in floodplain areas downstream from dams and near levees have resulted in an increased emphasis on safety, operation and maintenance.

There are about 80,000 dams in the United States today, the majority of which are privately owned. Other owners include state and local authorities, public utilities, and federal agencies. The benefits of dams are numerous: they provide water for drinking, navigation, and agricultural irrigation. Dams also provide hydroelectric power, create lakes for fishing and recreation, and save lives by preventing or reducing floods.



Dam failure can result from natural events, human-induced events, or a combination of the two. Failures due to natural events such as hurricanes, earthquakes or landslides are significant because there is generally little or no advance warning. The most common cause of dam failure is prolonged rainfall that produces flooding. (Photo: Michael Baker Corporation)

Though dams have many benefits, they also can pose a risk to communities if not designed, operated, and maintained properly. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and great property damage if development exists downstream of the dam. If a levee breaks, scores of properties are quickly submerged in floodwaters and residents may become trapped by this rapidly rising water. The failure of dams and levees has the potential to place large numbers of people and great amounts of property in harm's way.

4.1.11 Earthquakes, Sinkholes and Landslides

Earthquake

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock in the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of caverns. Earthquakes can affect hundreds of thousands of square miles; cause damage to property measured in the tens of billions of dollars; result in loss of life and injury to hundreds of thousands of persons; and disrupt the social and economic functioning of the affected area.

Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site and regional geology. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (mountain regions and along hillsides), and liquefaction, in which ground soil loses the ability to resist shear and flows much like quick sand. In the case of liquefaction, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

Many roads, including bridges and elevated highways, were damaged by the 6.7 magnitude earthquake that impacted the Northridge, California area January 17, 1994. Approximately 114,000 structures were damaged and 72 deaths were attributed to the event. Damage costs were estimated at $25 billion. (FEMA News Photo)

Most earthquakes are caused by the release of stresses accumulated as a result of the rupture of rocks along opposing fault planes in the Earth's outer crust. These fault planes are typically found along borders of the Earth's ten tectonic plates. These plate borders generally follow the outlines of the continents, with the North American plate following the continental border with the Pacific Ocean in the west, but following the mid-Atlantic trench in the east. As earthquakes occurring in the mid-Atlantic trench usually pose little danger to humans, the greatest earthquake threat in North America is along the Pacific Coast.

The areas of greatest tectonic instability occur at the perimeters of the slowly moving plates, as these locations are subjected to the greatest strains from plates traveling in opposite directions and at different speeds. Deformation along plate boundaries causes strain in the rock and the consequent buildup of stored energy. When the built-up stress exceeds the rocks' strength, a rupture occurs. The rock on both sides of the fracture is snapped, releasing the stored energy and producing seismic waves, generating an earthquake.

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Moment Magnitude (M_w) Scale and is equal to the rigidity of the Earth multiplied by the average amount of slip on the fault and the size of the area that slipped. (see **Table 4.1-6**). Each unit increase in magnitude on the M_w Scale corresponds to a logarithmic increase in energy released. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using roman numerals, with a I corresponding to imperceptible (instrumental) events, IV corresponding to moderate (felt by people awake), to XII for catastrophic (total destruction). A detailed description of the Modified Mercalli Intensity Scale of earthquake intensity and its correspondence to the M_w Scale is given in **Table 4.1-7**.

Table 4.1-6
Moment Magnitude Scale

Moment Magnitude (M_w)	Earthquake Effects
2	Felt indoors, but may not be recognized as an earthquake
3	Felt by most; some windows, dishes break; tall objects may fall
4	Very noticeable, damage to weaker buildings on fill; driving automobiles notice
5	Walls, monuments, chimneys, bookcases fall, liquefaction; driving is difficult
5 – 6	Buildings shifted off foundations, cracked and twisted; ground is cracked and underground pipes are broken
6 – 7	Most structures severely damaged to destroyed; ground is cracked, rails are bent, landslides on steep slopes
7 – 8	Total damage; can see the earthquake wave move through the ground; gravity overcome and objects thrown into the air

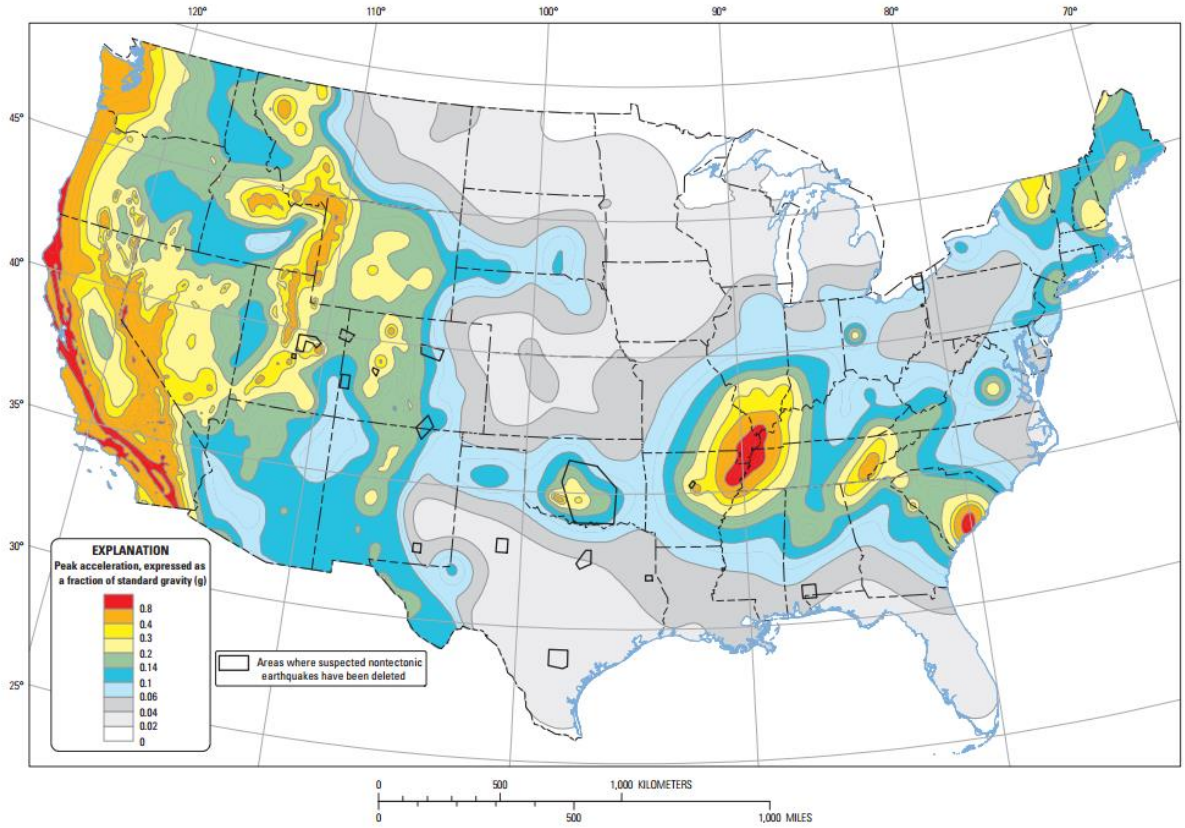
Table 4.1-7
Modified Mercalli Intensity Scale for Earthquakes

Scale	Intensity	Description of Effects	Corresponding M_w Scale Magnitude
I	Instrumental	Detected only on seismographs	
II	Feeble	Some people feel it	
III	Slight	Felt by people resting; like a truck rumbling by	2
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	3
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves	
VII	Very Strong	Mild Alarm; walls crack; plaster falls	4
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	5
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	5.5 – 6
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	6 – 6.5
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	6.5 – 7
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	7+

Source: North Carolina Division of Emergency Management

Figure 4.1-7 shows the probability that ground motion will reach a certain level during an earthquake in the Eastern US. The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 2 percent probability of exceedance in 50 years. The map was compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards.

Figure 4.1-7
2% probability of exceedance in 50 years map of peak ground acceleration



Source: United States Geological Survey, 2014

Sinkholes

Sinkholes are a natural and common geologic feature in areas with underlying limestone and other rock types that are soluble in natural water. Most limestone is porous, allowing the acidic water of rain to percolate through their strata, dissolving some limestone and carrying it away in solution. Over time, this persistent erosional process can create extensive underground voids and drainage systems in much of the carbonate rocks. Collapse of overlying sediments into the underground cavities produces sinkholes.

The three general types of sinkholes are: subsidence, solution, and collapse. Collapse sinkholes are most common in areas where the overburden (the sediments and water contained in the unsaturated zone, surficial aquifer system, and the confining layer above an aquifer) is thick, but the confining layer is breached or absent. Collapse sinkholes can form with little warning and leave behind a deep, steep sided hole. Subsidence sinkholes form gradually where the overburden is thin and only a veneer of sediments is overlying the limestone. Solution sinkholes form where no overburden is present and the limestone is exposed at land surface.

Sinkholes occur in many shapes, from steep-walled holes to bowl or cone shaped depressions. Sinkholes are dramatic because the land generally stays intact for a while until the underground spaces get too big. If there is not enough support for the land above the spaces, then a sudden collapse of the land surface can occur. Under natural conditions, sinkholes form slowly and expand gradually. However, human activities such as dredging, constructing reservoirs, diverting surface water, and pumping groundwater can accelerate the rate of sinkhole expansions, resulting in the abrupt formation of collapse sinkholes.

Although a sinkhole can form without warning, specific signs can signal potential development:

- Slumping or falling fence posts, trees, or foundations;
- Sudden formation of small ponds;
- Wilting vegetation;
- Discolored well water; and/or
- Structural cracks in walls, floors.

Collapses, such as the sudden formation of sinkholes, may destroy buildings, roads, and utilities. (Photo: Bettmann)

Sinkhole formation is aggravated and accelerated by urbanization. Development increases water usage, alters drainage pathways, overloads the ground surface, and redistributes soil. According to the Federal Emergency Management Agency (FEMA), the number of human-induced sinkholes has doubled since 1930, insurance claims for damages as a result of sinkholes has increased 1,200 percent from 1987 to 1991, costing nearly $100 million.

Landslides

A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation, which is driven by gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes, volcanic eruptions, and changes in groundwater levels.

There are several types of landslides: rock falls, rock topple, slides, and flows. Rock falls are rapid movements of bedrock, which result in bouncing or rolling. A topple is a section or block of rock that rotates or tilts before falling to the slope below. Slides are movements of soil or rock along a distinct surface of rupture, which separates the slide material from the more stable underlying material. Mudflows, sometimes referred to as mudslides, mudflows, lahars or debris avalanches, are fast-moving rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, such as heavy rainfall or rapid snowmelt, changing the soil into a flowing river of mud or "slurry." Slurry can flow rapidly down slopes or through channels, and can strike with little or no warning at avalanche speeds. Slurry can travel several miles from its source, growing in size as it picks up trees,

cars, and other materials along the way. As the flows reach flatter ground, the mudflow spreads over a broad area where it can accumulate in thick deposits.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly.

Among the most destructive types of debris flows are those that accompany volcanic eruptions. A spectacular example in the United States was a massive debris flow resulting from the 1980 eruptions of Mount St. Helens, Washington. Areas near the bases of many volcanoes in the Cascade Mountain Range of California, Oregon and Washington are at risk from the same types of flows during future volcanic eruptions.

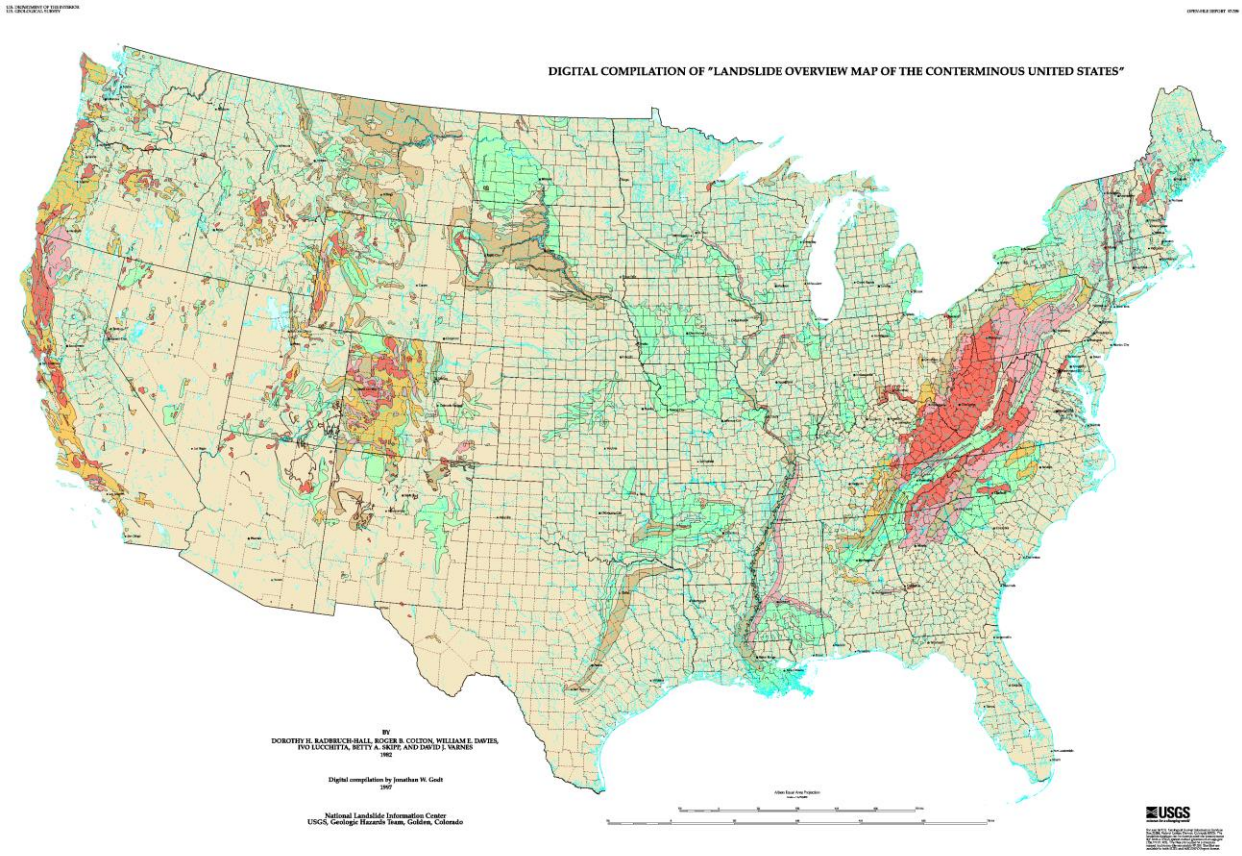
Areas that are generally prone to landslide hazards include previous landslide areas; the bases of steep slopes; the bases of drainage channels; and developed hillsides where leach-field septic systems are used. Areas that are typically considered safe from landslides include areas that have not moved in the past; relatively flat-lying areas away from sudden changes in slope; and areas at the top or along ridges, set back from the tops of slopes.

Landslides can damage or destroy roads, railroads, pipelines, electrical and telephone lines, mines, oil wells, buildings, canals, sewers, bridges, dams, seaports, airports, forests, parks, and farms. (Photo by Lynn Forman)

In the United States, it is estimated that landslides cause up to $2 billion in damages and from 25 to 50 deaths annually. Globally, landslides cause billions of dollars in damage and thousands of deaths and injuries each year.

Figure 4.1-8 delineates areas where large numbers of landslides have occurred and areas, which are susceptible to landsliding in the conterminous United States. This map layer is provided in the U.S. Geological Survey Professional Paper 1183, Landslide Overview Map of the Conterminous United States, available online at http://landslides.usgs.gov/html_files/landslides/nationalmap/national.html.

Figure 4.1-8
Landslide Overview Map of the Conterminous United States



EXPLANATION

LANDSLIDE INCIDENCE

- Low (less than 1.5% of area involved)
- Moderate (1.5%-15% of area involved)
- High (greater than 15% of area involved)

LANDSLIDE SUSCEPTIBILITY/INCIDENCE

- Moderate susceptibility/low incidence
- High susceptibility/low incidence
- High susceptibility/moderate incidence

Susceptibility not indicated where same or lower than incidence. Susceptibility to landsliding was defined as the probable degree of response of [the areal] rocks and soils to natural or artificial cutting or loading of slopes, or to anomalously high precipitation. High, moderate, and low susceptibility are delimited by the same percentages used in classifying the incidence of landsliding. Some generalization was necessary at this scale, and several small areas of high incidence and susceptibility were slightly exaggerated.

Source: United States Geological Survey

4.1.12 Tsunami

The word tsunami is Japanese and means "harbor wave." A tsunami is a series of great waves that are created by undersea disturbances such as earthquakes or volcanic eruptions. From the area of disturbance, tsunami waves will travel outward in all directions. Tsunamis can originate hundreds or even thousands of miles away from coastal areas.

The time between wave crests may be five to 90 minutes and the open ocean wave speed may average 450 miles per hour. As tsunami waves approach shallow coastal waters, they appear normal size and the speed decreases until the waves near the shoreline, where it may grow to great height and crash into the shore. Areas at greatest risk are less than 50 feet above sea level and within one mile of the shoreline. Rapid changes in the ocean water level may indicate that a tsunami is approaching. Most deaths during a tsunami are the result of drowning. Associated risks include flooding, polluted water supplies, and damaged gas lines.

Tsunami Hazard Zone signs are posted at coastal access points or other low-lying areas that would clearly be vulnerable to a large, locally generated tsunami. Signs are placed at locations agreed upon by local and state governmental authorities. Tsunami Evacuation Route markers are used to designate the evacuation routes established by local jurisdictions in cooperation with emergency management officials. (Photos courtesy of Washington State Department of Transportation)

In the United States, tsunamis have historically affected the West Coast, but the threat of tsunami inundation is also possible on the Atlantic Coast. Pacific Ocean tsunamis are classified as local, regional, or Pacific-wide. Regional tsunamis are most common. Pacific-wide tsunamis are much less common, with the last one being recorded in 1964, but are larger waves, which have high potential to cause destruction.

In 1949 the Pacific Tsunami Warning Center was established at Ewa Beach, Hawaii to monitor conditions in the Pacific Ocean and to provide warnings in case of tsunamis. According to the Pacific Tsunami Warning Center, 796 tsunamis were observed or recorded in the Pacific Ocean between 1900 and 2001. Approximately 117 caused casualties and damage and at least nine caused widespread destruction throughout the Pacific. The greatest number of tsunamis during any one-year was 19 in 1938, but all were minor and caused no damage. There was no single year of the period that was free of tsunamis.

4.1.13 Volcano

Over 75 percent of the Earth's surface above and below sea level, including the seafloors and some mountains, originated from volcanic eruption. Emissions from these volcanoes formed the Earth's oceans and atmosphere. Volcanoes can also cause tsunamis, earthquakes, and dangerous flooding.

A volcano is a vent in the Earth's crust that emits molten rock and steam. They are evidence that the physical makeup of our planet is ever-changing. Volcanoes are relatively site specific, but the molten rock, steam, and other gases they release can have an impact on much larger areas.

The May 18, 1980 eruption of Mount St. Helens created an eruptive cloud that rose to an altitude of more than 12 miles in 10 minutes. The swirling ash particles in the eruptive cloud generated lightning, which in turn ignited forest fires. Other fires were ignited by the initial blasts and later pyroclastic flows. Nearly 550 million tons of ash fell over a 22,000 square mile area. (Photo courtesy of Department of Natural Resources, State of Washington)

Lahar is the mudflow of debris and water caused by a volcano. It is also known as debris flow or volcanic mudflow. Lahar is most often triggered by rainfall washing down the debris from the slopes of volcanoes. However, lahar flows can also be triggered by rapidly melting snow and ice, debris avalanches and breakouts of lakes that were dammed by volcanic debris.

Tephra is the general term used to describe the ash and other materials that are released into the air after a volcanic eruption. Tephra ranges in size from fine powder to larger rock-sized particles. Volcanic ash can contaminate water supplies, cause electrical storms, and collapse roofs, and can affect people hundreds of miles away.

Volcanic explosions, which are directed sideways, are called lateral blasts. Lateral blasts can throw large pieces of rock at very high speeds for several miles. These explosions can kill by impact, burial, or heat and may have enough force to knock down entire forests of trees. The majority of deaths attributed to the Mount St. Helens volcano were a result of lateral blast and tree blow-down.

There are more than 500 active volcanoes in the world. More than half of these volcanoes are part of the "Ring of Fire," a region that encircles the Pacific Ocean. More than 50 volcanoes in the United States have erupted one or more times in the past 200 years. The most volcanically active regions of the nation are in Alaska, Hawaii, California, Oregon and Washington. The danger area around a volcano covers approximately a 20-mile radius. Some danger may exist 100 miles or more from a volcano.

4.1.14 Terrorism

The Federal Emergency Management Agency, in its guidance on integrating human-caused hazards into state and local hazard mitigation plans (FEMA Publication 386-7), has established a set of categories that can be applied to the profiling of intentional acts of terrorism. These categories are: contamination; energy release (i.e., explosives, arson, etc.); and disruption of a service.

4.1.15 Contamination

Contamination, as it relates to terrorist activity, refers to the intentional release of **chemical**, **biological** or **radiological** agents, as well as **nuclear** hazards. Contamination can apply to human and animal life, a geographic area, agriculture/food supplies (as in "agriterrorism"), and even the electronic world of computers and information via the Internet and e-mail (as in "**cyberterrorism**.")

Cleanup of hazardous materials and contaminated debris following a terrorist attack can be an arduous 24-hour-a-day operation, as captured in this photo of debris removal from Ground Zero of the 9/11 attack to the Staten Island landfill. (Photo by Andrea Booher/FEMA News Photo)

According to Jane's Chem-Bio Handbook, **chemical** agents are liquid or aerosol contaminants that can be dispersed using sprayers or other aerosol generators, by liquids vaporizing from puddles or containers, or munitions. Chemical agents may pose viable threats for hours to weeks depending on the agent used and the conditions, which exist at the exposed area. This type of hazard is especially volatile as contamination can be carried beyond the initial target zone by persons, vehicles, water and even the wind. Chemicals may also be corrosive or otherwise damaging *over time*, if not dealt with appropriately. **Biological** agents are liquid or solid contaminants that can be dispersed using sprayers or aerosol generators, or by point or line sources such as munitions, covert deposits or moving sprayers. Biological hazards may pose a danger for a period of hours to years, depending on the type of agent used and the conditions in which it exists. Contamination can be spread via water and/or wind, and infection can be spread via humans and/or animals.

FEMA's Radiological Emergency Management Course states that **radiological** agents can also be dispersed using sprayers or aerosol generators, or by point or line sources such as munitions, covert deposits and moving sprayers. Radiological contaminants may remain hazardous for seconds to years depending on the material used. The initial effects of a radiological attack are likely to be localized to the site of the attack; however, depending on meteorological conditions, the subsequent behavior of contaminants may become more dynamic. **Nuclear** hazards include the detonation of a nuclear device underground, on the Earth's surface, in the air, or at a high altitude. Heat flashes and blast waves resulting from a detonation would last for seconds, however nuclear radiation and fallout hazards can continue on for years. In addition, an electromagnetic pulse, resulting from a high-altitude detonation and lasting for a few seconds, can affect unprotected electronic systems. The initial light, heat and blast effects of a subsurface, ground or air burst are static and are determined by the device's characteristics. The fallout of radioactive contaminants may be dynamic depending on meteorological conditions.

Cyberterrorism is a relatively new concept. According to the National Strategy for Homeland Security, terrorists may seek to cause widespread disruption and damage, including casualties, by attacking electronic and computer networks which are linked to critical infrastructures such as energy, financial and securities networks. In addition,

terrorist groups are known to exploit information technology and the Internet to plan attacks, raise funds, circulate propaganda, gather information and communicate. In terms of hazard mitigation, cyberterrorism is often explored as a component in business continuity planning.

4.1.16 Energy Release

Energy release refers primarily to the use of explosive devices, such as conventional bombs, and incendiary operations such as arson attacks. The detonation of an explosive device whether on or near a target has an instantaneous effect, which can be compounded and/or prolonged by the use of multiple devices. The extent of damage caused by an explosion is, of course, determined by the type and quantity of explosive used. It should be noted that explosive incidents can result in cascading effects, such as the incremental failure of a structure or system.

Arson and other incendiary attacks refer to the initiation of fire (which can be of an explosive nature) on or near a target. This type of event can last for minutes or hours, and possibly longer depending on the type and quantity of device or accelerant used and the materials (fuels) present at the location of the attack. This type of attack can also result in cascading failures of structures or systems.

4.1.17 Disruption of Service

Disruption of service refers to the interruption, failure or denial of a service due to terrorist attack, such as the sabotage or designed breakdown of infrastructure as with an attack on transportation facilities, utilities and other public services. While the Federal Bureau of Investigation found no evidence of terrorism or criminal activity in its investigation of the August 2003 blackout in the Northeast United States, and the paralyzing blackout in London, England the same month has been labeled a “freak event,” it is clear to see the potential damage and disruption that could be caused by intentional terrorist attack on a nation’s power grids.

4.1.18 Weapons of Mass Destruction

The term “Weapons of Mass Destruction” (WMD) has various definitions, however common to all is the assumption that WMDs may consist of any of the agents discussed above: chemical, biological, radiological, nuclear, explosive or incendiary. The purpose of a WMD is to cause death or serious injury to persons or significant damage to property, typically assumed to be of a scale, which has the potential to overwhelm the capabilities of many local and state governments.

4.1.19 Hazardous Materials (HazMat)

Hazardous materials (HazMat) incidents can apply to fixed facilities as well as mobile, transportation-related accidents in the air, by rail, on the Nation's highways and on the water. Approximately 6,774 HazMat events occur each year, 5,517 of which are highway incidents, 991 are railroad incidents and 266 are due to other causes (FEMA, 1997). In essence, HazMat incidents consist of solid, liquid and/or gaseous contaminants that are released from fixed or mobile containers, whether by accident or by design as with an intentional terrorist attack. A HazMat incident can last hours to days, while some chemicals can be corrosive or otherwise damaging over longer periods of time. In addition to the primary release, explosions and/or fires can result from a release, and contaminants can be extended beyond the initial area by persons, vehicles, water, wind and possibly wildlife as well.

Propane tanks, gasoline, oil and other hazardous materials and debris in Princeville, North Carolina were cleaned up by Environmental Protection Agency crews following Hurricane Floyd in September 1999. The town remained off limits to residents for some time due to health-related concerns. (Photo by Dave Saville/FEMA News Photo)

HazMat incidents can also occur as a result of or in tandem with natural hazard events, such as floods, hurricanes, tornadoes and earthquakes, which in addition to causing incidents can also hinder response efforts. In the case of Hurricane Floyd in September 1999, communities along the Eastern United States were faced with flooded junkyards, disturbed cemeteries, deceased livestock, floating propane tanks, uncontrolled fertilizer spills and a variety of other environmental pollutants that caused widespread toxological concern.

4.1.20 Energy Pipeline Failures

The energy infrastructure of the United States is comprised of many components, including the physical network of pipes for oil and natural gas, electricity transmission lines, and other means for transporting energy to the Nation's consumers. This infrastructure also includes facilities that convert raw natural resources into energy products, as well as the rail network, trucking lines and marine transportation. (U.S. Department of Energy, 2003) Much of this infrastructure is aging, and in addition to the challenges of keeping the infrastructure up-to-date with the latest technological advances and consumer needs, the potential for an energy pipeline failure to become a hazard in-and-of-itself must be considered.

Virtually all natural gas in the United States is moved via pipeline. (Photo courtesy of the Department of Energy)

The two million miles of oil pipelines in the United States are the principal mode for transporting oil and petroleum products such as gasoline, and virtually all natural gas in the United States is moved via pipeline as well. (DOE, 2003) Much of this oil pipeline infrastructure is old, requiring

regular safety and environmental reviews to ensure its safety and reliability. The potential risk of pipeline accidents is a significant national concern.

The energy infrastructure is vulnerable to physical and cyber disruption, either of which could threaten its integrity and safety. (DOE, 2003) Disruptions could originate with natural events such as geomagnetic storms and earthquakes, or could result from accidents, equipment failures or deliberate interference. In addition, the Nation's transportation and power infrastructures have grown increasingly complex and interdependent—consequently, any disruption could have far-reaching consequences.

The preceding section included data about and description of environmental hazards from a wide variety of sources. Every attempt has been made to include the most accurate and up-to-date information about the hazards that Kent County faces and how those hazards are distributed nationwide to help provide context for the following sections. The data sources used for the preceding hazard identification are as follows:

Data Sources

American Society of Civil Engineers (ASCE), "Facts About Windstorms."
Web site: www.windhazards.org/facts.cfm

Bureau of Reclamation, U.S. Department of the Interior
Web site: www.usbr.gov

Federal Emergency Management Agency (FEMA)
Web site: www.fema.gov

National Climatic Data Center (NCDC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: http://lwf.ncdc.noaa.gov/oa/ncdc.html

National Drought Mitigation Center, University of Nebraska-Lincoln
Web site: www.drought.unl.edu/index.htm

National Severe Storms Laboratory (NSSL), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: www.nssl.noaa.gov

National Weather Service (NWS), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: www.nws.noaa.gov

Storm Prediction Center (SPC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service
Web site: www.spc.noaa.gov

The Tornado Project, St. Johnsbury, Vermont
Web site: www.tornadoproject.com

United States Department of Energy
Web site: www.energy.gov

United States Geological Survey (USGS), U.S. Department of the Interior
Web site: www.usgs.gov

4.2 HAZARD ANALYSIS

4.2.1 Introduction

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan **shall** include information on previous occurrences of hazard events and on the probability of future hazard events.*

The *Hazard Analysis* chapter provides information on historical hazard occurrences in Kent County for the hazards listed below. This listing differs slightly in terminology, order and grouping from the *Hazard Identification* section as those hazards affecting Kent County are more fully explored.

Natural

- Flood
    - Storm Surge/ Tide
    - Coastal Flooding
- Severe Winds
    - Hurricanes
    - Coastal Storms
- Thunderstorms
- Tornadoes
- Wildfire
- Drought
- Extreme Temperatures
- Hail
- Winter Storms
- Coastal Erosion
- Dam/Levee Failure
- Earthquakes
- Tsunami
- Volcano

Human-caused

- Terrorism
- Hazardous Materials (HazMat)
- Energy Pipeline Failures

Historical records, such as those available from the National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC), are used to identify the level of risk. The methodological assumption is that the data sources cited are the best data available, however not always complete. To the extent possible, other sources have been used to supplement NCDC records.

4.2.2 Flood

According to the National Climatic Data Center, 59 flood events were reported in Kent County between March 13, 1993 and July 31, 2014. These 59 events resulted in (0) deaths, (0) injuries and a total of approximately $1,874,000 in property damage (NCDC, 2014). Descriptions of major flooding events that have impacted people, property and the environment are below

Kent County, October 29, 2012, 10:00 a.m. ET through October 30, 2012, 5:00 a.m. ET
Post Tropical Storm Sandy caused an estimated $5.5 million dollars of damage across the three counties in Delaware. The damage estimates from the state were broken down to $2.8 million in New Castle County, $832,000 in Kent County and $1.9 million in Sussex County. Damages were due to tidal flooding as significant wave action resulted during multiple high tide cycles, due to increasing onshore winds prior to landfall. Damages were also due in part to inland flooding caused by excessive rainfall, as up to 10 inches of rain were reported. In addition, high winds resulted in many trees and wires coming down statewide. This created 100,000 power outages and resulted in many road closures due to downed trees and flooding. The hardest hit county was New Castle County. All power was restored by November 2nd. No direct deaths or injuries were reported in Delaware due to the storm and the overall number of traffic accidents was low because of driving restrictions.

Kent County, August 27, 2011, 8:00p.m. ET through August 28, 2011, 5:00 a.m. ET
Hurricane Irene produced heavy flooding rain, widespread tropical storm force wind gusts, a confirmed tornado near Lewes in Sussex County, moderate to severe coastal flooding and beach erosion and caused two flooding related deaths, forced evacuations near the coast over the weekend of August 27th and 28th in Delaware. About 100,000 people were evacuated from the Atlantic Coast. Numerous roadways were flooded and closed and thousands of trees were knocked down. About 100,000 utility customers lost power. In addition, chickens were killed by flooding and agricultural crops were damaged by the flooding. Delaware received federal disaster declaration.

Central Kent County, August 22, 2009, 4:15 p.m. ET
A strong cold front was approaching from the west during the 22nd, while Hurricane Bill passed well to our east. An abundance of moisture in place combined with enough instability, which resulted in showers and thunderstorms with locally torrential rainfall and flooding. Two day event precipitation totals ranged from around 1.5 to around 6.5 inches, highest in Kent County.

Southern Kent County, July 6, 2008, 2:10 p.m. ET
Thunderstorms with torrential downpours caused roadway, stream and poor drainage flooding along the Milford and Mispillion border in southern Kent County. Doppler radar storm total estimates reached 3.1 inches within an hour in that area.

Kent County, May 12, 2008, 3:00 – 6:00 a.m. ET
Early on the morning of the 12th, a storm was centered over the southern Delmarva. The prolonged northeast flow combined with higher than normal tides, caused widespread minor to moderate tidal flooding along the coast of Delaware. Heavy rain also impacted the state, especially central and southern sections. In South Bowers (Kent County), the dunes that were between the surf's edge and the elevated homes were essentially wiped away. Several boats appeared to have been missing as a result of the wind and storm surge. The homes on Route 36 before the bridge were those that were primarily affected by the flooding. West Milford (Kent County) was covered with between one and two feet of water during the storm that roared through the region on the morning of the 12th. Several downtown structures suffered minor water damage, including the Department of Health and Social Service building

on Southeast Front Street, which was closed until the 16th. In Milford (Kent County), police evacuated employees from two state service centers, one on Church Street and the other on Walnut Street, as the Mispillion River overflowed its banks starting the night of the 11th. Bicentennial Park was under water, as were portions of Washington Street, Park Avenue and North East Front Street. The flooding persisted until early on the 13th. Some 150 residents of Kent County along the Delaware Bay were evacuated from their homes early on the 12th as high winds and heavy rains from a Nor'easter caused severe coastal flooding. Some took shelter at the Little Creek Fire Hall. The coastal regions of Kitts Hummock and Pickering Beach received the brunt of the high water, with reports of flooding nearing 6 feet. About 175 people were evacuated from Kitts Hummock and about 50 from Pickering Beach

Dover and Cheswold, April 15, 2007, 11:00 a.m. ET through April 16, 2007, 6:00 a.m. ET
The heavy rain caused flooding in and around Dover. Flooding occurred along the Saint Jones River, Silver Lake and Puncheon Run within Dover. Flood waters encroached about four to five homes in the Pinewood Acres development between Dover and Cheswold. The higher than normal tides and the heavy rain caused flooding of roadways in Woodland and Bowers Beach as well as Kitts Hummock.

Coastal Kent County, November 22, 2006, 8:00 a.m. through November 23, 2006, 12:00 0a.m. ET
A northeaster brought heavy rain, strong winds, rough surf and tidal flooding to Delaware on the 22nd and 23rd (Thanksgiving Day). The rain and strong winds arrived together, just before sunrise on the 22nd. The rain fell at its steadiest and heaviest for about a 24 hour period from 7 a.m. EST on the 22nd through 7 a.m. EST on the 23rd. Storm totals averaged around two inches. The strong onshore flow caused minor tidal flooding during the morning high tides on the 22nd and 23rd. This extended into the back bays and in Delaware Bay. The strong winds also caused a pounding, heavy surf on both days.

Coastal Kent County, September 1, 2006, 1:00 p.m. through September 2, 2006, 9:00 a.m. ET
The combination of the remnants of Tropical Storm Ernesto and a large high pressure system over eastern Canada produced heavy rain and flooding, strong and in some cases damaging winds, tidal flooding and beach erosion in Delaware. Delmarva Electric reported that 151,000 of its customers along the peninsula lost power (including Delaware). All power was restored in Delaware by the night of the 4th. About 17,500 Delaware Electric Cooperative customers also lost power in Kent and Sussex Counties. Ten to twelve foot waves were crashing along the shore line and enhanced rip currents and rough surf persisted through the 5th.. In Kent County, many trees were knocked down especially in and around Dover and Smyrna. One home was damaged by a downed tree. Along Delaware Bay, a Sports Utility Vehicle was struck by large waves at Woodland Beach.

Northern Kent County, July 12, 2004, 3:30 p.m. through July 13, 2004, 2:00 a.m.
A series of thunderstorms with torrential downpours caused flooding from Clayton and Smyrna southeast through Dover. Hardest hit was Smyrna, which declared a state of emergency after 11.10 inches of rain fell. This represents approximately a once in five hundred year storm. Major roads were closed, hundreds of homes were flooded, drivers were stranded and had to be rescued, horses were rescued, fields and yards became ponds, wells became compromised and over 100 people were evacuated. Both U.S. Route 13 and Delaware State Route 1 were closed near Smyrna. The damage was estimated at $625,000. In Smyrna, a state of emergency was declared because of the flooding. Even Lake Como overflowed. The worst damage occurred along Locust Street and West North Street. Four homes were condemned (two on each street) because of collapsed basements. Over 50 families were evacuated by boat from the Holly Hill Trailer Park to the local hospital and school. Only minor damage occurred at the trailer park. Over 100 homes were flooded. Floating propane tanks were secured. Many well heads were submerged in flood waters and homeowners were urged to boil their well water before drinking or cooking. Duck Creek Shopping Plaza also flooded. Lake Como was closed to swimmers because of high bacteria count. Wheatley's

Pond overflowed. The Southern States apartment building suffered the most damage as up to eight feet of water amassed in about 20 basements. In Cheswold, there were several stranded vehicles and residents.

Dover, June 25, 2004, 4:45 p.m. ET
Thunderstorms with very heavy rain caused poor drainage and small stream flash flooding within Dover. Several vehicles became stranded on flooded roadways. Flooding affected several roadways including southern parts of Governor Avenue (U.S. Route 13A). Doppler Radar storm total estimates reached 4 inches just southwest of Dover.

Coastal Kent County, October 14, 2001, 5 p.m.-10 p.m. ET
The combination of spring astronomical tides caused by the new moon and a strong southeast onshore flow preceding a cold front produced minor tidal flooding at the time of high tide during the evening of the October 14 along the Delaware Coast and Bay. Minor tidal flooding extended into Delaware Bay and on the Delaware River as far north as New Castle County. High tide at Reedy Island (New Castle County) reached 7.49 feet above mean lower low water. (Minor tidal flooding begins at 7.2 feet above mean lower low water.) No deaths, injuries or property damage was reported.

Central Kent County, August 19, 2001, 7 p.m. ET
Thunderstorms with very heavy downpours produced flash flooding of streams and creeks in central Kent County, along with flood problems associated with poor drainage. Doppler Radar storm total estimates reached between four (4) and five (5) inches, all of which fell within three hours. Flooding from the Pratt and Hudson Branches covered U.S. Route 13 north of Felton. No deaths, injuries or significant damages were reported.

Kent County, September 16, 1999, 8:30 a.m. ET
Hurricane Floyd battered the State of Delaware with damaging winds and torrential rains that caused widespread flash flooding. Storm totals averaging around nine (9) inches fell within a 12-hour period from early morning through late afternoon. Dover Air Force Base recorded 8.44 inches. Reported property damage was $224,000.

Eastern Kent County, August 20, 1999, 12:15 p.m. ET
Thunderstorms with torrential downpours dropped as much as five (5) inches of rain, most of which fell within an hour across sections of eastern Kent County. The heaviest rain fell just northeast of Dover around Little Creek and also around Thompsonville in the southeast part of the county. Numerous roads were flooded and closed in Little Creek. Storm totals included five (5) inches in Little Creek, 1.75 inches in Milford and 1.17 inches in Dover. The latter two were west of the torrential rain bands. No deaths, injuries or significant damages were reported.

Northwest Kent County, August 10, 1998, 4:30 p.m. ET
Slow moving thunderstorms brought torrential downpours and flash flooding in the northern half of Kent County, impacting the northwestern part of the county the most severely. Doppler Radar storm total estimates reached 11.4 inches between Kenton and Hartly. Other storm totals included 8.80 inches at 2.5 miles west of Cheswold, 7.93 inches in Smyrna, 3.44 inches in Dover and 2.83 inches at the Dover Air Force Base. Streams flooded in Cheswold threatening several homes, and firefighters were forced to pump water from a number of basements in Smyrna. One foot of water was recorded on U.S. Route 13 near Smyrna. Stream flooding resulted in the closure of several roads within the county, but no washouts or damage occurred. No deaths or injuries were reported.

Coastal Kent County, February 4, 1998, 1 p.m. through February 9, 1998, 9 a.m. ET
The strongest nor'easter of the winter of '98 battered Kent County with damaging winds, severe coastal flooding, extensive beach erosion and heavy rain. Several dune breaches were reported, and tidal flooding inundated bayside homes in Woodland Beach, Port Mahon, Kitts Hummock and South Bowers. Flooding was also observed along

Delaware State Routes 6 and 9 inland. Five injuries were reported, with no known deaths. Property damage was reported at $1.7 million.

Coastal Kent County, January 28, 1998, 6 a.m. ET through January 29, 12 p.m. ET
An intense nor'easter pounded Kent County with tidal flooding, beach erosion, strong winds and heavy rain. Conditions were progressively worse closer to the coast. All roadways in beach areas were covered with water during high tide on the 28th. About 10 roads were closed due to tidal flooding near the bay. Several inland roads were closed due to heavy inland rain and flooding. Three roads were still closed through the morning high tide on the 29th. Hardest hit were the townships of Bowers Beach along the shore and Frederica inland. About 500 homes and businesses in Clayton lost power due to strong winds. No deaths or injuries were reported. Property damage was reported as $1.3 million.

Northern Kent County, June 19, 1996, 5 p.m. ET
Slow moving thunderstorms with torrential downpours washed out two bridges, caused widespread street and highway flooding, and closed many roads in the northern part of the county. The two bridges, Massey's Mill Pond Bridge and one near Cheswold, were washed out overnight. Workers labored through the night to save the U.S. Route 13 Bridge at Garrison's Lake—the lake itself had begun flooding at 7 p.m. on the 19th. Four persons were rescued from flooded cars. Flooding also forced the evacuation of a mobile home park near Hartley. The City of Dover reported 3.11 inches of rain from the event. No deaths or injuries were reported. Damages were estimated to have been $300,000 in property damage and $0 in crop damage.

City of Harrington, July 3, 1994, 5 p.m. ET
Two feet of standing water was reported, along with several road closures due to the flooding. Damages were reported to have been $100,000 in property damage and $0 in crop damage.

Coastal Kent County, March 13, 1993, 12 p.m.-3:30 p.m. ET
A major winter storm that had developed over the Gulf of Mexico moved northeast across the Mid-Atlantic region on March 13 and 14 producing a variety of inclement weather conditions. Minor coastal flooding occurred at times of high tide Saturday and early Sunday morning. Sea water, with pizza-sized chunks of ice, flooded roads in Bowers Beach. Property damage was reported as $50,000.

4.2.3 Hurricanes and Tropical Storms

Severe wind events resulting from hurricanes, tropical storms and nor'easters can cause widespread damage and loss of life, as evidenced by the numerous coastal events that have impacted the State of Delaware. Although Delaware has not experienced a direct strike from a major hurricane in more than two decades (a fact often attributed to the geographic position of North Carolina), Delaware has experienced the effects of as many as 16 hurricanes and at least one significant tropical storm since the 1920s. Details of these events are presented below. **Figure 4.2-1** graphically illustrates the paths of nine (9) storms that passed directly through Kent County since 1861.

Hurricanes and Tropical Storms[1]

Hurricane Sandy (2012)

Post Tropical Storm Sandy caused an estimated $5.5 million dollars of damage across the three counties in Delaware. The damage estimates from the state were broken down to $2.8 million in New Castle County, $832,000 in Kent County and $1.9 million in Sussex County. Damages were due to tidal flooding as significant wave action resulted during multiple high tide cycles, due to increasing onshore winds prior to landfall. Damages were also due in part to inland flooding caused by excessive rainfall, as up to 10 inches of rain were reported. In addition, high winds resulted in many trees and wires coming down statewide. This created 100,000 power outages and resulted in many road closures due to downed trees and flooding. The hardest hit county was New Castle County. All power was restored by November 2nd. No direct deaths or injuries were reported in Delaware due to the storm and the overall number of traffic accidents was low because of driving restrictions.

Hurricane Irene (2011)

Hurricane Irene Hurricane Irene produced heavy flooding rain, widespread tropical storm force wind gusts, a confirmed tornado near Lewes in Sussex County, moderate to severe coastal flooding and beach erosion and caused two flooding related deaths, forced evacuations near the coast over the weekend of August 27th and 28th in Delaware. About 100,000 people were evacuated from the Atlantic Coast. Numerous roadways were flooded and closed and thousands of trees were knocked down. About 100,000 utility customers lost power. In addition, chickens were killed by flooding and agricultural crops were damaged by the flooding. Delaware received federal disaster declaration.

Tropical Storm Hanna (2008)

Tropical Storm Hanna brought heavy rain and strong winds in Delaware and some minor tidal flooding in Delaware Bay on the 6th. Rain moved into the region during the morning, fell heavy at times in the afternoon and ended during the early evening. Storm totals ranged from around 1 to around 3.5 inches. The strongest winds occurred during the late morning and afternoon with peak gusts as high as 53 mph. About 10,000 homes and businesses lost power on the Delmarva Peninsula. All power was restored by the 7th. Minor tidal flooding occurred in Delaware Bay during the afternoon as the surge averaged two to three feet. Many planned outdoor activities were cancelled. The heavy rain caused minor roadway and low lying area flooding. The unseasonably dry weather leading into Hanna prevented stream and river flooding from occurring. The pounding surf caused about a three foot vertical cut to occur at Rehoboth Beach. Peak wind gusts included 44 mph in Dover (Kent County).

Hurricane Isabel (2003)

Isabel developed as a tropical storm September 6 about 600 miles west of the Southern Cape Verde Islands. The following day the storm was upgraded to a hurricane and within five days Isabel became the first Category 5 hurricane in the Atlantic since Hurricane Mitch in 1998. Isabel made landfall along the U.S. East Coast on September 18 as a Category 2 storm. Seven federal disaster declarations were issued as a result of Isabel, including the State of Delaware. Isabel may become best known for the wide-spread

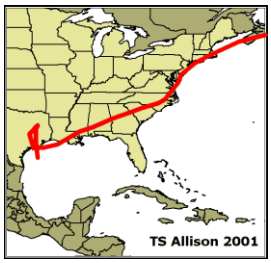
[1] Photos courtesy of the National Aeronautics and Space Administration (NASA). Historic hurricane track graphics courtesy of the National Hurricane Center.

power outages it caused. Two days after Isabel lashed Delaware with wind and rain, approximately 60,000 of Conectiv's 280,000 customers were without power. A spokesperson for the power company said that trees falling across power lines caused most of the outages.

Tropical Storm Henri (Remnants—2003)

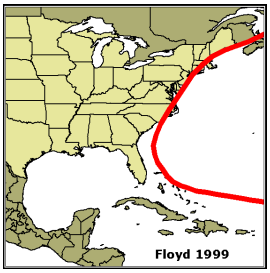
The National Weather Service reported that over a two-day period remnants of Tropical Storm Henri dumped eight (8) to 10 inches of rain in a narrow, slow-moving band that included central and northern Delaware, with 7.08 inches reported in Hockessin over a period of a few hours. Much of the region already had received above-normal rainfall in recent weeks.

Tropical Storm Allison (Remnants—2001)



Showers and thunderstorms associated with the remnants of Tropical Storm Allison dropped heavy rain across New Castle County from the mid-afternoon through the early evening of the 16th. The heavy rain caused flooding on some of the smaller steams in the county as well as some urban and poor drainage flooding. As the low moved east of the New Jersey coast during the morning of the 17th, heavy rain fell again for a couple of hours near dawn. Storm totals averaged between two (2) and four (4) inches and included 3.94 inches at the Dover Air Force Base. No serious damages or injuries were reported.

Hurricane Floyd (1999)



According to the National Climatic Data Center, one notable hurricane has impacted the State of Delaware in recent history—Hurricane Floyd, which brought torrential rains and damaging winds on September 16, 1999. The hurricane caused widespread flash flooding as storm totals averaged around nine inches (10.58 inches in Sussex County). Most of this rain fell within a 12-hour period establishing a new state record. A total of $8 million in property damage was reported, along with two fatalities—the first hurricane-related deaths in the state since Hurricane Hazel in 1954. In addition, there were a number of injuries, at least two of which were serious. Overall, the event most heavily affected New Castle County, Kent County's neighbor to the north.

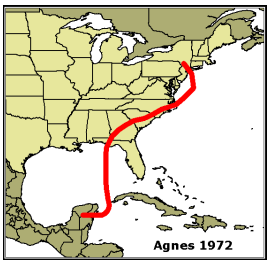
Hurricane Dennis (1999)

The combination of swells from Hurricane Dennis and a stiff northeast flow caused by a strong high pressure system building over the New England States produced rip currents and minor tidal flooding. Rip currents from Dennis started along the Delaware Beaches on Sunday August 29th. About 100 rescues occurred with a few minor injuries. On the 30th, swimming was banned at most of the Delaware Beaches. As Dennis pulled east of North Carolina on the 31st and weakened, the rip currents slowly ceased. A major contributing factor to the winds and rip currents was a very strong high pressure system that built into eastern Canada and the New England States on the 30th and 31st. The northeast flow around it and Hurricane Dennis produced wind gusts up to 50 MPH on the 30th and caused some minor tidal flooding from around noon on the 30th into the afternoon of the 31st. Minor tidal flooding extended into the back bays and inlets as the northeast winds prevented the tide from receding. As both Dennis and the high pressure system weakened, tides subsided after the afternoon of the 31st. The constant pounding and strong winds did cause beach erosion.

Hurricane Edouard (1996)
On August 30, 1996, a hurricane watch and tropical storm warning was issued from Cape Lookout, North Carolina northward to Cape Henlopen, Delaware (including the Pamlico and Albermarle Sounds) in preparation for the approach of Hurricane Edouard. The hurricane watch was extended northward the following day to include north of Cape Henlopen, Delaware to Plymouth, Massachusetts. Early on September 2, Edouard veered sharply toward the northeast and the center of the hurricane passed about 75 nautical miles southeast of Nantucket Island, its closest point of approach to the United States.

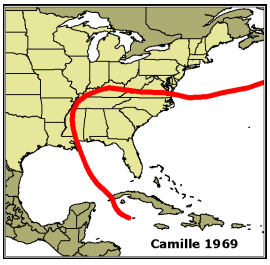
Tropical Storm Bertha (1996)
A weakening Tropical Storm Bertha passed across the state on July 13, 1996. While the long trip over land from Wilmington, North Carolina through Virginia to Delaware did weaken Bertha, some wind-related damage did occur in Kent and Sussex counties. The only tidal flooding reported was minor and occurred on Delaware State Route 54 near Fenwick Island, one of the most flood-prone roads in the state. Beach erosion was minor. The storm dropped between 1.5 and three inches of rain across most of the state, with locally higher amounts of around four inches reported in Sussex County just south of Kent County. This caused some poor drainage flooding, but the only river to flood was the Christina in New Castle County to the north.

Hurricane Agnes (1972)



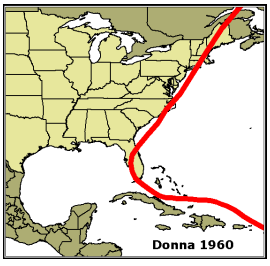
No description/details available.

Hurricane Camille (1969)



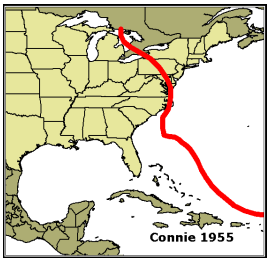
No description/details available.

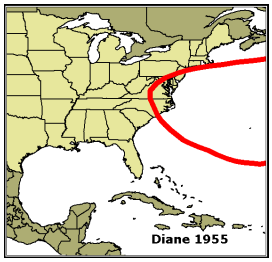
Hurricane Donna (1960)



No description/details available.

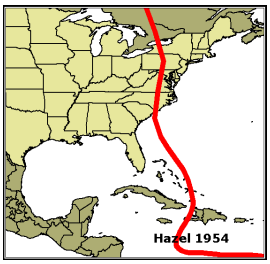
Hurricanes Connie and Diane (1955)





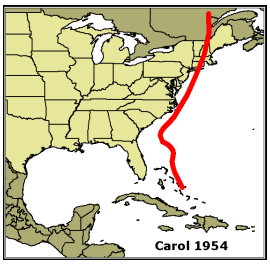
No description/details available.

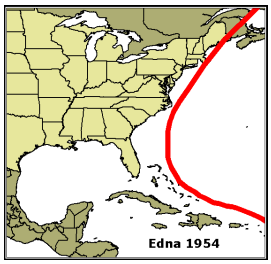
Hurricane Hazel (1954)



Hurricane Hazel was first spotted east of the Windward Islands on October 5, 1954 and by October 15 the storm had turned north and accelerated—making landfall as a Category 4 hurricane near the North Carolina-South Carolina border. Subsequent rapid motion over the next 12 hours took the storm from the coast across the eastern United States and into southeastern Canada as it became extratropical. High winds occurred over large portions of the eastern United States. Washington, D.C. reported 78 MPH sustained winds, and peak gusts of over 90 MPH occurred as far northward as inland New York State. A storm surge of up to 18 feet inundated portions of the North Carolina coast. Heavy rains of up to 11 inches occurred as far northward as Toronto, Canada resulting in severe flooding. Hazel was responsible for 95 deaths (including at least one death in Delaware) and $281 million in damage in the United States; 100 deaths and $100 million in damage in Canada; and an estimated 400 to 1,000 deaths in Haiti.

Hurricanes Carol and Edna (1954)



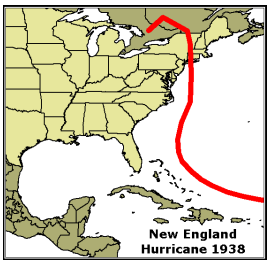


No description/details available.

Great Atlantic Hurricane (1944)

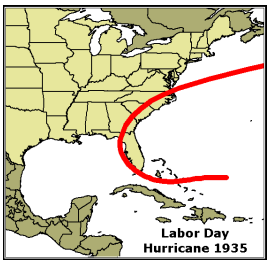
No description/details available.

New England Hurricane (1938)



No description/details available.

Florida Keys Labor Day Hurricane (1935)



The Labor Day Hurricane of 1935 caused a bridge to collapse in the City of Milford.

San Felipe-Okeechobee Hurricane (1928)

No description/details available.

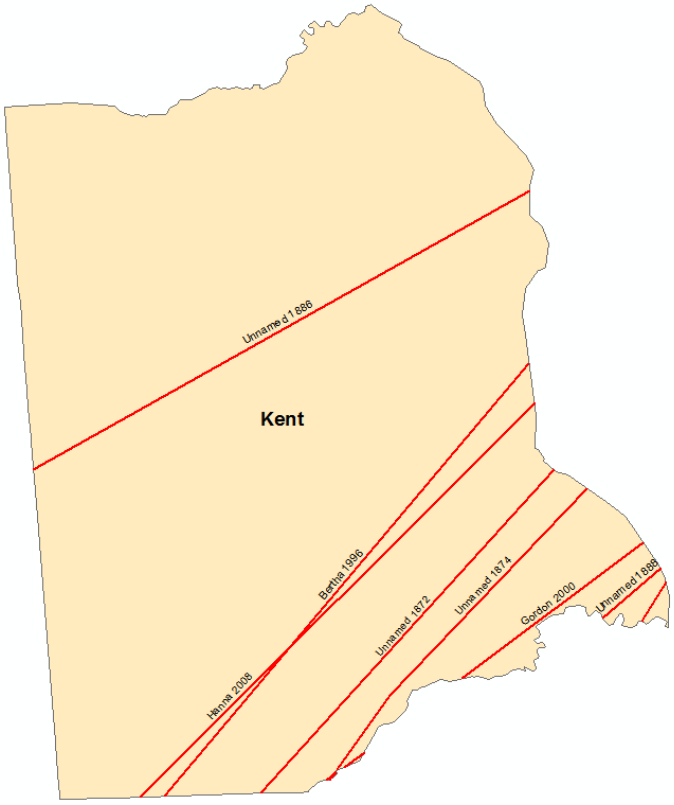
Unnamed Hurricane (1904)

The effects of this storm are known to have impacted the City of Milford to some extent.

Unnamed Tropical Storm (1877)

All that is known about this unnamed event is that it passed directly through Sussex County on October 4, 1877, just south of Kent County, with wind speeds estimated to have been in excess of 55 MPH. No information is available with regard to any property damages, injuries or deaths that may have occurred as a result of this storm.

Figure 4.2-1
Historical Coastal Storm Tracks Directly Through Kent County



4.2.4 Thunderstorms

According to the National Climatic Data Center, Kent County experienced 286 thunderstorm events, including thunderstorm wind, strong wind, lightning, and high wind for the period January 1950 through July 2014. These events resulted in 0 deaths, (1) injuries and a total of approximately $3,273,000 in property damage and $100,000 in crop damage (NCDC, 2014). **Table 4.2-1** provides a breakdown of this thunderstorm activity.

Table 4.2-1
Summary of Thunderstorm Activity in Kent County (1950-2014)

Storm Location	Date	Time	Event Specifics	Magnitude	Deaths	Injuries	Property/Crop Damage
Countywide	08/25/1958	1400	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/16/1961	1500	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/21/1962	2000	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/21/1962	2030	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	04/23/1963	1900	Thunderstorm/Wind	53 kts.	0	0	0
Countywide	08/26/1964	1500	Thunderstorm/Wind	58 kts.	0	0	0
Countywide	06/16/1966	2100	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	08/25/1968	2055	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	06/18/1970	1730	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/04/1970	1550	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	01/26/1971	1245	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	01/26/1971	1400	Thunderstorm/Wind	50 kts.	0	0	0
Countywide	05/12/1974	1545	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	09/03/1974	1817	Thunderstorm/Wind	52 kts.	0	0	0
Countywide	12/01/1974	1852	Thunderstorm/Wind	53 kts.	0	0	0
Countywide	04/03/1975	0830	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	06/19/1975	2100	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	03/13/1976	1100	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/06/1977	1700	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	06/03/1980	1533	Thunderstorm/Wind	58 kts.	0	0	0
Countywide	06/03/1980	1540	Thunderstorm/Wind	60 kts.	0	0	0
Countywide	06/15/1980	1900	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	08/03/1980	1700	Thunderstorm/Wind	52 kts.	0	0	0

Storm Location	Date	Time	Event Specifics	Magnitude	Deaths	Injuries	Property/Crop Damage
Countywide	08/11/1980	2100	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/21/1981	1500	Thunderstorm/Wind	50 kts.	0	0	0
Countywide	04/03/1982	1720	Thunderstorm/Wind	55 kts.	0	0	0
Countywide	06/16/1982	2215	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	06/16/1982	2230	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	06/16/1982	2245	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	06/16/1982	2300	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	05/15/1983	1430	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	05/15/1983	1430	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/21/1983	1905	Thunderstorm/Wind	62 kts.	0	0	0
Countywide	07/21/1983	1930	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	08/11/1983	1800	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	08/22/1983	1930	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	11/15/1983	1730	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	05/08/1984	1620	Thunderstorm/Wind	55 kts.	0	0	0
Countywide	09/03/1984	1830	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	09/03/1984	1830	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/31/1985	1640	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/12/1987	1110	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/21/1987	1700	Thunderstorm/Wind	70 kts.	0	0	0
Countywide	06/07/1988	1449	Thunderstorm/Wind	57 kts.	0	0	0
Countywide	08/15/1988	1800	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	08/15/1988	1800	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	03/18/1989	1515	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	06/15/1989	1815	Thunderstorm/Wind	57 kts.	0	0	0
Countywide	11/16/1989	0800	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	02/23/1990	2130	Thunderstorm/Wind	0 kts.	0	1	0
Countywide	06/08/1990	1708	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/10/1990	1820	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	07/10/1992	1743	Thunderstorm/Wind	0 kts.	0	0	0

Storm Location	Date	Time	Event Specifics	Magnitude	Deaths	Injuries	Property/Crop Damage
Harrington	04/26/1993	1445	Thunderstorm Wind	N/A	0	0	$50,000
Dover/Cheswold	06/27/1994	1200	Thunderstorm Wind	N/A	0	0	0
Felton	07/27/1994	1850	Thunderstorm Wind	N/A	0	0	$200,000
Countywide	11/11/1995	1900	High Wind	0 kts.	0	0	0
Countywide	01/19/1996	08:00 AM	High Wind	52 kts.	0	0	0
Countywide	03/19/1996	05:10 PM	High Wind	0 kts.	0	0	0
Dover	04/30/1996	04:00 PM	Thunderstorm/Wind	0 kts.	0	0	0
Smyrna	02/22/1997	01:20 PM	Thunderstorm/Wind	0 kts.	0	0	0
Camden	02/22/1997	01:35 PM	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	03/06/1997	05:00 AM	High Wind	0 kts.	0	0	0
Countywide	03/31/1997	08:00 AM	Wind	N/A	0	0	0
Countywide	04/01/1997	12:00 AM	Wind	N/A	0	0	0
Smyrna	06/22/1997	04:30 PM	Thunderstorm/Wind	0 kts.	0	0	0
Smyrna	06/22/1997	04:30 PM	Lightning	N/A	0	0	0
Milford	08/17/1997	05:30 PM	Lightning	N/A	0	0	0
Countywide	01/28/1998	04:00 AM	Wind	N/A	0	0	0
Countywide	02/04/1998	10:00 AM	High Wind	70 kts.	0	0	0
Countywide	02/25/1998	06:00 AM	Wind	N/A	0	0	0
Harrington	05/06/1998	04:30 PM	Lightning	N/A	0	0	0
Countywide	06/01/1998	12:30 AM	Thunderstorm/Wind	50 kts.	0	0	0
Hartly	06/13/1998	04:33 PM	Thunderstorm/Wind	50 kts.	0	0	0
Milford	06/16/1998	07:45 PM	Thunderstorm/Wind	50 kts.	0	0	0
Dover	06/26/1998	04:00 PM	Thunderstorm/Wind	70 kts.	0	0	$1,500,000
Marydel	06/26/1998	05:25 PM	Thunderstorm/Wind	50 kts.	0	0	0
Smyrna	08/10/1998	03:30 PM	Lightning	N/A	0	0	0
Viola	08/18/1998	04:50 PM	Thunderstorm/Wind	50 kts.	0	0	0
Camden	09/02/1998	08:20 AM	Thunderstorm/Wind	50 kts.	0	0	0
Countywide	12/22/1998	07:00 AM	Wind	N/A	0	0	0
Countywide	12/30/1998	07:00 AM	Wind	N/A	0	0	0
Countywide	01/03/1999	05:00 AM	Wind	N/A	0	0	0

Storm Location	Date	Time	Event Specifics	Magnitude	Deaths	Injuries	Property/Crop Damage
Countywide	03/04/1999	04:00 AM	Wind	N/A	0	0	0
Countywide	03/07/1999	04:00 AM	Wind	N/A	0	0	0
Countywide	03/18/1999	09:00 AM	Wind	N/A	0	0	0
Cheswold	04/09/1999	06:45 PM	Lightning	N/A	0	0	0
Countywide	09/16/1999	03:00 AM	High Wind	57 kts.	0	0	0
Countywide	11/02/1999	02:00 PM	High Wind	50 kts.	0	0	0
Countywide	01/11/2000	11:00 AM	Wind	N/A	0	0	0
Countywide	01/13/2000	01:00 PM	Wind	N/A	0	0	0
Canterbury	02/25/2000	06:00 PM	Thunderstorm/Wind	0 kts.	0	0	0
Countywide	04/08/2000	11:00 AM	Wind	N/A	0	0	0
Countywide	04/09/2000	04:00 AM	Wind	N/A	0	0	0
Dover	05/13/2000	07:45 PM	Thunderstorm/Wind	50 kts.	0	0	0
Petersburg	05/13/2000	08:00 PM	Thunderstorm/Wind	50 kts.	0	0	0
Dover	06/02/2000	07:20 PM	Thunderstorm/Wind	50 kts.	0	0	0
Smyrna	06/26/2000	01:00 AM	Thunderstorm/Wind	52 kts.	0	0	0
Dover	08/16/2000	04:30 AM	Lightning	N/A	0	0	0
Marydel	09/19/2000	02:15 PM	Thunderstorm/Wind	50 kts.	0	0	0
Countywide	11/10/2000	04:45 AM	High Wind	0 kts.	0	0	0
Countywide	12/12/2000	08:30 AM	High Wind	50 kts.	0	0	0
Countywide	12/17/2000	03:00 AM	Wind	N/A	0	0	0
Countywide	02/10/2001	06:00 AM	Wind	N/A	0	0	0
Smyrna	04/09/2001	08:10 PM	Thunderstorm/Wind	52 kts.	0	0	0
Countywide	09/04/2001	07:15 PM	Thunderstorm/Wind	52 kts.	0	0	0
Countywide	01/13/2002	07:00 AM	Wind	N/A	0	0	0
Countywide	02/04/2002	03:00 PM	Wind	N/A	0	0	0
Countywide	03/10/2002	06:00 AM	Wind	N/A	0	0	0
Countywide	03/21/2002	08:00 PM	Wind	N/A	0	0	0
Leipsic	04/28/2002	09:25 PM	Thunderstorm/Wind	50 kts.	0	0	0
Blackiston	05/12/2002	05:12 PM	Thunderstorm/Wind	50 kts.	0	0	0
Dover AFB	05/12/2002	07:09 PM	Thunderstorm/Wind	74 kts.	0	0	0

Storm Location	Date	Time	Event Specifics	Magnitude	Deaths	Injuries	Property/Crop Damage
Countywide	01/20/2003	12:00 PM	Strong Wind	N/A	0	0	$100
Countywide	02/04/2003	01:00 PM	Strong Wind	N/A	0	0	$250
Countywide	02/12/2003	08:00 AM	Strong Wind	N/A	0	0	$250
Countywide	02/23/2003	12:00 PM	Strong Wind	N/A	0	0	$250
Countywide	05/12/2003	11:00 AM	Strong Wind	N/A	0	0	$2,000
Frederica	06/21/2003	06:15 PM	Lightning	N/A	0	0	$80,000
Hartly	08/17/2003	12:45 AM	Lightning	N/A	0	0	$10,000
Countywide	10/15/2003	09:00 AM	Strong Wind	40 kts.	0	0	$1,000
Countywide	11/13/2003	07:00 AM	High Wind	61 kts.	0	1	$25,000
Countywide	11/19/2003	01:00 PM	Strong Wind	40 kts.	0	0	$4,000
Countywide	11/29/2003	12:00 PM	Strong Wind	40 kts.	0	0	$1,000
Countywide	04/04/2004	08:00 PM	Strong Wind	40 kts.	0	0	$1,000
Felton	05/25/2004	08:30 PM	Lightning	N/A	0	0	$10,000
Smyrna	07/12/2004	02:30 PM	Lightning	N/A	0	0	$10,000
Countywide	11/05/2004	04:00 AM	Strong Wind	41 kts.	0	0	$1,000
Countywide	12/01/2004	09:00 AM	Strong Wind	46 kts.	0	0	$20,000
Countywide	12/19/2004	11:00 PM	Strong Wind	45 kts.	0	0	$1,000
Countywide	03/02/2005	07:00 AM	Strong Wind	31 kts.	0	0	$50,000
Countywide	03/08/2005	11:00 AM	Strong Wind	45 kts.	0	0	$1,000
Countywide	04/02/2005	12:00 PM	Strong Wind	40 kts.	0	0	$2,000
Milford	06/22/2005	07:30 PM	Lightning	N/A	0	0	$3,000
Countywide	11/10/2005	03:00 AM	Strong Wind	40 kts.	0	0	$1,000
Countywide	11/22/2005	10:00 AM	Strong Wind	40 kts.	0	0	$1,000
Countywide	01/14/2006	05:00 PM	High Wind	62 kts.	0	0	$5,000
Countywide	01/18/2006	05:00 AM	Strong Wind	40 kts.	0	0	$50,000
Countywide	01/18/2006	05:00 AM	High Wind	50 kts.	0	0	$5,000
Countywide	02/12/2006	01:00 AM	Strong Wind	40 kts.	0	0	$2,000
Countywide	02/17/2006	07:00 AM	Strong Wind	40 kts.	0	0	$3,000
Countywide	02/24/2006	07:00 AM	Strong Wind	40 kts.	0	0	$2,000
Countywide	03/14/2006	10:00 AM	Strong Wind	40 kts.	0	0	$1,000

Storm Location	Date	Time	Event Specifics	Magnitude	Deaths	Injuries	Property/Crop Damage
Countywide	03/15/2006	07:00 AM	Strong Wind	40 kts.	0	0	$1,000
Countywide	04/05/2006	07:00 AM	High Wind	51 kts.	0	0	$5,000
Countywide	09/01/2006	02:00 AM	Strong Wind	41 kts.	0	0	$50,000
Countywide	09/01/2006	01:00 PM	Strong Wind	54 kts.	0	0	$50,000
Countywide	09/01/2006	10:00 PM	High Wind	54 kts.	0	0	$100,000
Countywide	10/20/2006	12:00 PM	Strong Wind	40 kts.	0	0	$1,000
Countywide	10/29/2006	03:00 AM	Strong Wind	44 kts.	0	0	$1,000
Countywide	11/16/2006	12:00 PM	Strong Wind	40 kts.	0	0	$1,000
Countywide	12/01/2006	03:00 PM	Strong Wind	40 kts.	0	0	$3,000
Countywide	01/20/2007	07:00 AM	Strong Wind	40 kts.	0	0	$1,000
Countywide	02/14/2007	03:00 PM	Strong Wind	40 kts.	0	0	$2,000
Countywide	02/23/2007	12:00 AM	Strong Wind	40 kts.	0	0	$1,000
Countywide	03/02/2007	05:30 AM	Strong Wind	41 kts.	0	0	$1,000
Countywide	03/05/2007	02:00 PM	Strong Wind	40 kts.	0	0	$1,000
Countywide	04/16/2007	03:00 AM	Strong Wind	43 kts.	0	0	$1,000
Countywide	12/03/2007	10:00 AM	Strong Wind	47 kts.	0	0	$1,000
Countywide	12/16/2007	06:00 PM	Strong Wind	40 kts.	0	0	$1,000
Countywide	01/30/2008	09:00 AM	Strong Wind	43 kts.	0	0	$2,500
Countywide	02/10/2008	11:00 AM	Strong Wind	48 kts.	0	0	$5,000
Countywide	03/08/2008	04:00 PM	Strong Wind	42 kts.	0	0	$50,000
Countywide	03/20/2008	04:00 AM	Strong Wind	40 kts.	0	0	$1,000
Countywide	05/12/2008	03:00 AM	High Wind	52 kts.	0	0	$50,000
Dover	09/09/2008	11:32 AM	Lightning	N/A	0	0	$5,000
Countywide	10/28/2008	12:00 PM	High Wind	55 kts.	0	0	$5,000
Countywide	12/07/2008	10:00 AM	Strong Wind	40 kts.	0	0	$1,250
Countywide	12/11/2008	10:00 PM	Strong Wind	40 kts.	0	0	$1,000
Countywide	12/21/2008	09:00 PM	Strong Wind	40 kts.	0	0	$4,000
Countywide	12/24/2008	08:00 PM	Strong Wind	40 kts.	0	0	$250
Countywide	12/31/2008	12:00 PM	High Wind	64 kts.	0	0	$25,000
Countywide	02/12/2009	07:00 AM	High Wind	50 kts.	0	0	$25,000

Storm Location	Date	Time	Event Specifics	Magnitude	Deaths	Injuries	Property/Crop Damage
Countywide	02/19/2009	02:00 PM	Strong Wind	40 kts.	0	0	$500
Countywide	02/22/2009	01:00 PM	Strong Wind	40 kts.	0	0	$250
Countywide	03/02/2009	12:00 AM	High Wind	54 kts.	0	0	$10,000
Countywide	04/03/2009	07:00 PM	Strong Wind	40 kts.	0	0	$1,250
Little Creek	04/06/2009	06:15 AM	Lightning	N/A	0	0	$1,000
Countywide	04/15/2009	01:00 PM	Strong Wind	40 kts.	0	0	$1,000
Blackiston	06/09/2009	05:13 PM	Thunderstorm Wind	56 kts.	0	0	$100,000
Vernon	06/13/2009	04:00 PM	Thunderstorm Wind	70 kts.	0	0	$100,000
Countywide	09/10/2009	11:00 PM	Strong Wind	40 kts	0	0	$10,000
Countywide	10/07/2009	08:00 AM	Strong Wind	40 kts	0	0	$1,000
Countywide	12/09/2009	06:00 AM	Strong Wind	40 kts	0	0	$1,250
Countywide	01/02/2010	10:00 PM	Strong Wind	42 kts	0	0	$6,250
Countywide	01/25/2010	06:00 AM	Strong Wind	45 kts	0	0	$5,000
Countywide	03/13/2010	05:00 AM	High Wind	50 kts	0	0	$10,000
Countywide	05/08/2010	02:00 PM	Strong Wind	42 kts	0	0	$2,500
Harrington	06/28/2010	03:10 PM	Thunderstorm Wind	50 kts	0	0	$10,000
Countywide	09/30/2010	09:00 AM	Strong Wind	35 kts	0	0	$1,250
Countywide	11/17/2010	09:00 AM	Strong Wind	40 kts	0	0	$1,250
Countywide	12/01/2010	07:00 AM	Strong Wind	40 kts	0	0	$1,250
Countywide	12/26/2010	05:00 PM	Strong Wind	42 kts	0	0	$6,250
Countywide	02/08/2010	09:00 AM	Strong Wind	40 kts	0	0	$1,250
Countywide	02/14/2011	01:00 PM	Strong Wind	42 kts	0	0	$1,250
Countywide	02/19/2011	12:00 PM	High Wind	50 kts	0	0	$10,000
Countywide	02/25/2011	03:00 PM	High Wind	55 kts	0	0	$25,000
Countywide	03/10/2011	04:00 PM	Strong Wind	40 kts	0	0	$3,000
Countywide	04/05/2011	04:00 AM	Strong Wind	43 kts	0	0	$1,250
Countywide	04/16/2011	03:00 PM	Strong Wind	40 kts	0	0	$6,250
Countywide	04/28/2011	08:00 AM	Strong Wind	45 kts	0	0	$1,330
Farmington	06/10/2011	12:00 AM	Lightning	N/A	0	0	$200,000
Clayton	08/19/2011	02:00 PM	Thunderstorm Wind	52 kts	0	0	$10,000

Storm Location	Date	Time	Event Specifics	Magnitude	Deaths	Injuries	Property/Crop Damage
Countywide	10/29/2011	09:00 AM	Strong Wind	41 kts	0	0	$10,000
Countywide	12/07/2011	09:00 PM	Strong Wind	40 kts	0	0	$5,000
Countywide	12/27/2011	04:00 PM	Strong Wind	40 kts	0	0	$5,250
Countywide	12/28/2011	09:00 AM	Strong Wind	40 kts	0	0	$1,250
Countywide	01/02/2012	04:00 AM	Strong Wind	40 kts	0	0	$1,250
Countywide	01/03/2012	10:00 AM	Strong Wind	40 kts	0	0	$1,330
Countywide	01/13/2012	04:00 AM	Strong Wind	40 kts	0	0	$1,000
Countywide	01/18/2012	02:30 AM	Strong Wind	40 kts	0	0	$1,250
Countywide	01/27/2012	02:00 PM	Strong Wind	40 kts	0	0	$1,000
Countywide	02/24/2012	10:00 PM	Strong Wind	40 kts	0	0	$2,500
Countywide	03/08/2012	11:00 AM	Strong Wind	40 kts	0	0	$250
Countywide	03/26/2012	11:00 AM	Strong Wind	40 kts	0	0	$500
Sandtown	06/29/2012	10:57 PM	Thunderstorm Wind	61 kts	0	0	$50,000
Smyrna	07/18/2012	05:07 PM	Thunderstorm Wind	52 kts	0	0	$1,000
Marydel	09/08/2012	04:25 PM	Thunderstorm Wind	52 kts	0	0	$1,000
Countywide	09/18/2012	10:00 AM	Strong Wind	40 kts	0	0	$2,500
Countywide	10/29/2012	04:00 PM	High Wind	51 kts	0	0	$132,000
Countywide	12/21/2012	01:00 AM	Strong Wind	40 kts	0	0	$1,000
Countywide	12/22/2012	09:00 AM	Strong Wind	40 kts	0	0	$1,250
Countywide	12/26/2012	06:00 PM	High Wind	56 kts	0	0	$5,000
Countywide	12/27/2012	10:00 AM	Strong Wind	40 kts	0	0	$1,250
Countywide	12/30/2012	09:00 AM	Strong Wind	40 kts	0	0	$1,000
Countywide	01/30/2012	11:00 PM	Strong Wind	49 kts	0	0	$2,500
Countywide	02/09/2012	01:00 AM	Strong Wind	41 kts	0	0	$1,000
Countywide	02/17/2012	12:00 PM	Strong Wind	40 kts	0	0	$1,250
Countywide	03/06/2012	11:00 AM	High Wind	50 kts	0	0	$10,000
Countywide	05/25/2012	09:00 AM	Strong Wind	40 kts	0	0	$1,250
Countywide	11/24/2013	06:00 AM	Strong Wind	40 kts	0	0	$2,500
Countywide	01/06/2014	07:30 AM	Strong Wind	40 kts	0	0	$1,000
Countywide	02/13/2014	05:30 AM	Strong Wind	45 kts	0	0	$2,000

Storm Location	Date	Time	Event Specifics	Magnitude	Deaths	Injuries	Property/Crop Damage
Dover	02/21/2014	01:40 PM	Thunderstorm Wind	50 kts	0	0	$1,000
Countywide	02/27/2014	02:00 PM	Strong Wind	40 kts	0	0	$500
Countywide	03/12/2014	08:00 PM	Strong Wind	43 kts	0	0	$2,000
Countywide	04/15/2014	03:00 PM	Strong Wind	40 kts	0	0	$1,000
Marydel	07/02/2014	11:21 PM	Thunderstorm Wind	52 kts	0	0	$1,000
Hartly	07/02/2014	11:29 PM	Thunderstorm Wind	52 kts	0	0	$25,000
Smyrna	07/02/2014	11:35 PM	Thunderstorm Wind	56 kts	0	0	$25,000
				TOTALS:	**0**	**1**	**$3,273,010**

Source: National Climatic Data Center

4.2.5 Tornadoes

In an assessment conducted by the National Weather Service Storm Prediction Center covering the 30 year period from 1980 to 2009, the State of Delaware ranked #45 in the Nation for number of tornadoes (31), #30 in number of fatalities (2), #36 in number of F2 or greater tornadoes (7)

Independent of the Storm Prediction Center state ranking project, the National Climatic Data Center indicates that the geographic area of the State of Delaware experienced 60 tornado events from January 1, 1950 through July 31, 2014. NCDC data supports the statistics of two deaths and (74) injuries, and reflects a total of approximately $13 million in property damage, with an additional $5,000 in crop damage. In addition, The Tornado Project (www.tornadoproject.com) has identified 16 tornadoes that occurred prior to 1950, dating as far back as 1789.

Table 4.2-2 lists 20 tornadoes that were reported to the National Climatic Data Center as having touched down in Kent County. These events are responsible for (2) deaths, (56) injuries and $5,158,000 in property damages in the county.

Table 4.2-2
Summary of Tornado Activity in Kent County (1950-2014)

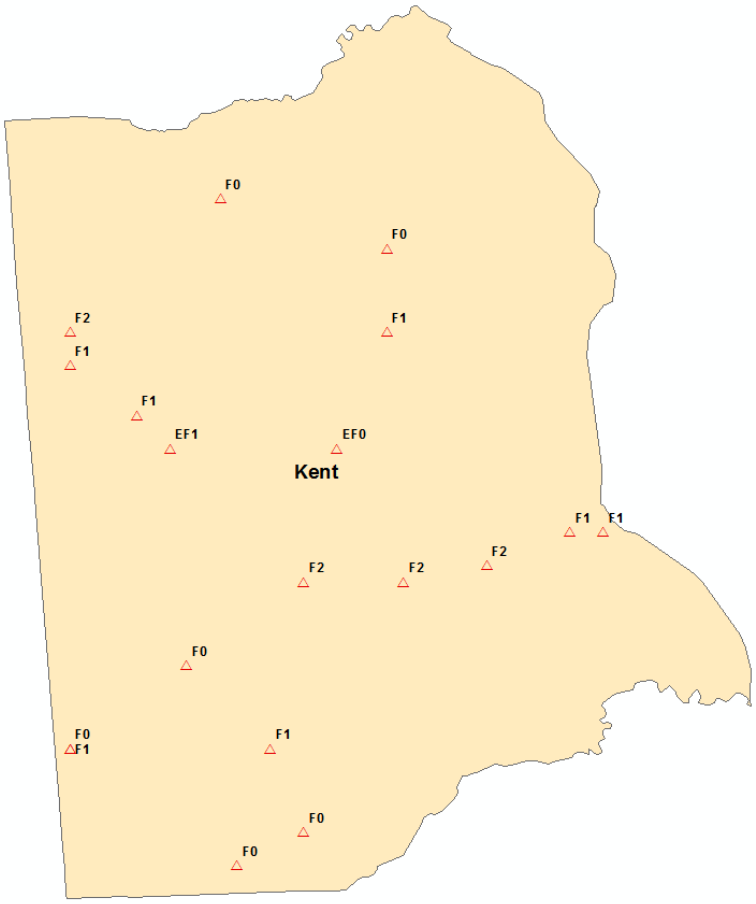
Tornado Location	Date	Time	Magnitude	Deaths	Injuries	Property Damage
County	03/26/1964	02:00 PM	F1	0	0	$3,000
County	01/27/1967	01:30 PM	F2	0	7	$250,000
County	04/03/1975	09:30 AM	F1	0	3	$250,000
County	08/04/1975	06:30 PM	F0	0	0	0
County	03/13/1977	06:20 PM	F1	0	0	$25,000
County	06/09/1977	09:57 AM	F2	0	1	$250,000

Tornado Location	Date	Time	Magnitude	Deaths	Injuries	Property Damage
County	07/21/1983	06:50 PM	F2	2	9	$250,000
County	06/07/1988	02:35 PM	F1	0	30	$2,500,000
County	07/08/1991	01:15 PM	F0	0	0	$250,000
County	07/31/1992	05:00 PM	F1	0	0	$25,000
County	07/31/1992	05:20 PM	F2	0	0	$250,000
Harrington	04/01/1993	07:20 PM	F0	0	0	$5,000
Bowers Beach	04/01/1993	07:47 PM	F1	0	0	$50,000
Petersburg	06/27/1994	12:00 PM	F1	0	0	0
Farmington	07/27/1994	06:35 PM	F0	0	4	$200,000
Harrington	07/27/1994	06:40 PM	F1	0	0	$400,000
County	07/27/1994	06:47 PM	F0	0	0	$200,000
Leipsic	07/12/2004	03:10 PM	F0	0	0	0
Wyoming	09/03/2012	02:20 PM	EF0	0	0	$100,000
Marydel	05/22/2014	03:54 PM	EF1	0	2	$150,000
			TOTALS	**2**	**56**	**$5,158,000**

Source: National Climatic Data Center

Figure 4.2-2 illustrates graphically historical tornado occurrences within Kent County.

Figure 4.2-2
Historical Tornado Occurrences (1950 – 2014)



4.2.6 Wildfire

According to the Delaware Fire Service, the greatest wildfire danger is in those marshes along the Delaware Bay that contain large amounts of phragmites. One such example is the 400 acre fire that occurred at Prime Hook in 2002. Otherwise, the climate, forest types and terrain (flat, interspersed with cropland, ditches, roads, etc.) in Delaware do not promote large wildfires. Most of the wildfires within the state are small, ground fires that are fairly easily extinguished and seldom do much damage. (Austin Short, Delaware Forest Service, austin.short@state.de.us).

Table 4.2-3
Summary of Wildfire Events in Kent County (1950-2014)

Location	Date	Time	Area(s) Affected	Acres Affected	Injuries
Farmington	08/22/2002	01:00 PM	Along Flatiron Road in Farmington	500	0
Little Creek	04/17/2005	09:20 AM	Port Mahon Road	400	0

Source: National Climatic Data Center

4.2.7 Drought

According to the National Climatic Data Center, Kent County has experienced 53 reported droughts and/or periods of unseasonably dry weather from 1950 through July 2014, most of which affected the entire forecast zone of New Castle, Kent and Sussex counties.

All crop damage reported for this period ($8 million) is tied to a single event—the drought that gripped the Middle Atlantic States throughout much of the growing season of 1999, which eased in mid-August of that year. Normal, and in some cases heavier than normal, rainfall returned, and on September 8 Governor Thomas Carper lifted the mandatory watering restrictions in northern Delaware. The drought, for all intents and purposes, ended with the arrival of the record-breaking rain associated with Hurricane Floyd on September 16. As much as 10.5 inches of rain (or about three months worth of normal rainfall) fell from Floyd across Delaware. The drought emergency was lifted by Governor Carper on September 21, however the heavy rain came too late to help farmers. Agricultural losses throughout the state were estimated at $29.1 million. The 1999 corn harvest was 2.6 million bushels less than 1998 and the smallest crop since 1988. The soybean harvest in 1999 was 1.9 million bushels less than 1998 and the smallest harvest since 1995. The drought also greatly affected pastures and produced a later and smaller than usual pumpkin crop.

4.2.8 Extreme Temperature

According to the National Climatic Data Center, Kent County has experienced 95 reported cases of either extreme heat or extreme cold, including cold/wind chill, excessive heat, extreme cold/ wind chill, freezing fog, frost/ freeze, and heat, from 1995 through July 2014 (**Table 4.2-4**). These heat waves and cold snaps have caused 3 deaths, 6 injuries, and no reported damage.

Table 4.2-4
Summary of Extreme Temperature Occurrences in Kent County (1995-2014)

Storm Location	Date	Time	Type	Deaths	Injuries	Property Damage
Countywide	02/04/1996	06:00 PM	Extreme Cold	0	0	0
Countywide	05/19/1996	10:00 AM	Excessive Heat	0	0	0
Countywide	01/03/1997	10:00 AM	Unseasonably Warm	0	0	0
Countywide	01/17/1997	01:00 AM	Extreme Cold	0	0	0
Countywide	02/19/1997	11:00 AM	Unseasonably Warm	0	0	0
Countywide	02/26/1997	12:00 PM	Unseasonably Warm	0	0	0
Countywide	02/28/1997	11:59 PM	Unseasonably Warm	0	0	0
Countywide	03/01/1997	12:00 AM	Unseasonably Warm	0	0	0
Countywide	04/09/1997	01:00 AM	Unseasonably Cold	0	0	0
Countywide	06/21/1997	09:00 AM	Excessive Heat	0	0	0
Countywide	07/12/1997	10:00 AM	Excessive Heat	0	0	0
Countywide	08/16/1997	09:00 AM	Excessive Heat	0	0	0
Countywide	01/04/1998	10:00 AM	Unseasonably Warm	0	0	0
Countywide	01/31/1998	11:59 PM	Unseasonably Warm	0	0	0
Countywide	02/28/1998	11:59 PM	Unseasonably Warm	0	0	0
Countywide	03/27/1998	10:00 AM	Unseasonably Warm	0	0	0
Countywide	06/25/1998	09:00 AM	Hot Spell	0	0	0
Countywide	07/20/1998	09:00 AM	Excessive Heat	0	0	0
Countywide	08/22/1998	10:00 AM	Heat Wave	0	0	0
Countywide	09/27/1998	09:00 AM	Unseasonably Hot	0	0	0
Countywide	09/30/1998	11:59 PM	Unseasonably Warm And Dry	0	0	0
Countywide	11/28/1998	10:00 AM	Unseasonably Warm	0	0	0
Countywide	12/01/1998	12:00 AM	Unseasonably Warm	0	0	0
Countywide	12/31/1998	11:59 PM	Unseasonably Warm And Dry	0	0	0
Countywide	06/07/1999	09:00 AM	Excessive Heat	0	0	0
Countywide	07/04/1999	08:00 AM	Excessive Heat	0	0	0
Countywide	07/16/1999	09:00 AM	Excessive Heat	0	0	0
Countywide	07/23/1999	09:00 AM	Excessive Heat	0	3	0

Storm Location	Date	Time	Type	Deaths	Injuries	Property Damage
Countywide	07/31/1999	11:59 PM	Unseasonably Warm And Dry	0	0	0
Countywide	08/01/1999	12:00 AM	Excessive Heat	0	0	0
Countywide	11/30/1999	11:59 PM	Unseasonably Warm	0	0	0
Countywide	01/02/2000	10:00 AM	Unseasonably Warm	0	0	0
Countywide	01/23/2000	08:30 PM	Freezing Fog	0	0	0
Countywide	03/08/2000	10:00 AM	Unseasonably Warm	0	0	0
Countywide	03/31/2000	11:59 PM	Unseasonably Warm/wet	0	0	0
Countywide	05/02/2001	11:00 AM	Unseasonably Hot	0	0	0
Countywide	08/06/2001	09:00 AM	Excessive Heat	0	0	0
Countywide	11/30/2001	11:59 PM	Unseasonably Warm	0	0	0
Countywide	12/01/2001	08:00 AM	Unseasonably Warm	0	0	0
Countywide	12/31/2001	11:59 PM	Unseasonably Warm	0	0	0
Countywide	01/27/2002	06:00 PM	Unseasonably Warm	0	0	0
Countywide	02/28/2002	11:59 PM	Unseasonably Warm	0	0	0
Countywide	06/24/2002	09:00 AM	Excessive Heat	0	0	0
Countywide	07/01/2002	09:00 AM	Excessive Heat	0	0	0
Countywide	07/15/2002	09:00 AM	Excessive Heat	0	0	0
Countywide	07/28/2002	09:00 AM	Excessive Heat	0	0	0
Countywide	08/01/2002	12:00 AM	Excessive Heat	0	0	0
Countywide	08/11/2002	11:00 AM	Excessive Heat	0	0	0
Countywide	01/14/2003	03:00 AM	Extreme Cold/wind Chill	0	0	0
Countywide	06/24/2003	09:00 AM	Excessive Heat	0	0	0
Countywide	01/09/2004	06:00 PM	Extreme Cold/wind Chill	0	0	0
Countywide	01/15/2004	12:00 PM	Extreme Cold/wind Chill	0	0	0
Countywide	12/20/2004	12:00 AM	Extreme Cold/wind Chill	0	0	0
Countywide	01/18/2005	04:00 AM	Extreme Cold/wind Chill	0	0	0
Countywide	01/23/2005	06:00 PM	Extreme Cold/wind Chill	0	0	0
Countywide	01/28/2005	12:00 AM	Extreme Cold/wind Chill	0	0	0
Countywide	07/25/2005	09:00 AM	Excessive Heat	0	0	0
Countywide	08/02/2005	09:00 AM	Excessive Heat	0	0	0

Storm Location	Date	Time	Type	Deaths	Injuries	Property Damage
Countywide	08/11/2005	09:00 AM	Excessive Heat	0	0	0
Countywide	08/01/2006	09:00 AM	Excessive Heat	2	0	0
Countywide	01/26/2007	03:00 AM	Cold/wind Chill	0	0	0
Countywide	02/05/2007	03:00 AM	Extreme Cold/wind Chill	0	0	0
Countywide	02/06/2007	03:00 AM	Extreme Cold/wind Chill	1	1	0
Countywide	03/06/2007	03:00 AM	Cold/wind Chill	0	0	0
Countywide	06/26/2007	11:00 AM	Excessive Heat	0	0	0
Countywide	07/08/2007	11:00 AM	Excessive Heat	0	0	0
Countywide	08/07/2007	11:00 AM	Excessive Heat	0	0	0
Countywide	08/25/2007	10:00 AM	Excessive Heat	0	0	0
Countywide	06/07/2008	09:00 AM	Excessive Heat	0	0	0
Countywide	07/16/2008	09:00 AM	Excessive Heat	0	0	0
Countywide	01/16/2009	12:00 AM	Cold/wind Chill	0	0	0
Countywide	08/10/2009	09:00 AM	Excessive Heat	0	0	0
Countywide	06/23/2010	09:00 AM	Excessive Heat	0	0	0
Countywide	06/27/2010	09:00 AM	Excessive Heat	0	0	0
Countywide	07/05/2010	09:00 AM	Excessive Heat	0	0	0
Countywide	07/23/2010	09:00 AM	Excessive Heat	0	0	0
Countywide	08/10/2010	09:00 AM	Heat	0	0	0
Countywide	06/09/2011	09:00 AM	Heat	0	2	0
Countywide	07/21/2011	09:00 AM	Excessive Heat	0	0	0
Countywide	06/20/2012	11:00 AM	Heat	0	0	0
Countywide	06/29/2012	11:00 AM	Heat	0	0	0
Countywide	07/01/2012	11:00 AM	Heat	0	0	0
Countywide	07/04/2012	11:00 AM	Heat	0	0	0
Countywide	07/17/2012	11:00 AM	Heat	0	0	0
Countywide	07/18/2013	09:00 AM	Excessive Heat	0	0	0
Countywide	01/04/2014	01:00 AM	Extreme Cold/Wind Chill	0	0	0
Countywide	01/22/2014	12:00 AM	Extreme Cold/Wind Chill	0	0	0
Countywide	06/18/2014	11:00 AM	Heat	0	0	0

Storm Location	Date	Time	Type	Deaths	Injuries	Property Damage
Countywide	07/01/2014	10:00 AM	Heat	0	0	0
			TOTALS:	**3**	**6**	**0**

Source: National Climatic Data Center

4.2.9 Hail

According to the National Climatic Data Center, Kent County experienced 24 hail events from 1950 through July 2014 (see **Table 4.2-5**), with no hail stones exceeding 1.75 inches in diameter. These events total approximately $105,000 in property damage (NCDC, 2014).

4.2.10 Winter Storms

According to the National Climatic Data Center, Kent County experienced 110 distinct winter storm events, including blizzards, heavy snow, ice storm, winter storm, and winter weather, from 1993 through July 2014 (see **Table 4.2-6**). In recent history, the three most powerful and costly storms to affect Delaware were the Blizzard of 1996, a storm over President's Day Weekend 2003, and the winter storm on February 9, 2010. The 110 Kent County events resulted in $3,650,000 in property damage, (0) deaths, and (5) reported injuries.

Table 4.2-5
Hail Activity in Kent County (1950-2014)

Location	Date	Time	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damages
Countywide	07/02/1968	1545	Hail	1.75 in.	0	0	0	0
Countywide	04/19/1969	1400	Hail	1.50 in.	0	0	0	0
Countywide	03/21/1974	0915	Hail	1.00 in.	0	0	0	0
Countywide	06/19/1975	2100	Hail	1.75 in.	0	0	0	0
Countywide	06/03/1980	1533	Hail	1.75 in.	0	0	0	0
Countywide	08/11/1983	1800	Hail	1.75 in.	0	0	0	0
Countywide	04/24/1991	1400	Hail	1.75 in.	0	0	0	0
Dover	04/01/1993	1830	Hail	1.75 in.	0	0	$5,000	0
Blackiston	04/09/1999	06:30 PM	Hail	0.75 in.	0	0	0	0
Smyrna	04/28/2002	09:15 PM	Hail	1.00 in.	0	0	$100,000	0
Smyrna	06/06/2002	03:55 PM	Hail	1.50 in.	0	0	0	0
Dover	06/06/2002	04:25 PM	Hail	0.75 in.	0	0	0	0
Hartly	06/19/2002	02:45 PM	Hail	0.75 in.	0	0	0	0
Bowers	06/21/2003	05:05 PM	Hail	0.75 in.	0	0	0	0
Felton	07/22/2003	04:15 PM	Hail	0.88 in.	0	0	0	0
Wyoming	04/24/2006	12:30 AM	Hail	0.75 in.	0	0	0	0
Dover	04/24/2006	12:40 AM	Hail	0.75 in.	0	0	0	0
Dover	09/30/2008	10:22 PM	Hail	0.75 in.	0	0	0	0
Houston	05/29/2009	04:27 PM	Hail	1.00 in.	0	0	0	0
Milford	05/29/2009	04:40 PM	Hail	1.00 in.	0	0	0	0
Clayton	06/09/2009	05:13 PM	Hail	0.88 in.	0	0	0	0
Hazletsville	06/09/2009	05:40 PM	Hail	0.88 in.	0	0	0	0
Smyrna	05/19/2011	01:06 PM	Hail	0.75 in.	0	0	0	0
Clayton	06/11/2011	03:25 PM	Hail	0.88 in.	0	0	0	0
				TOTALS:	**0**	**0**	**$105,000**	**$0**

Source: National Climatic Data Center

Table 4.2-6
Winter Storm Activity in Kent County (1993-2014)

Location	Date	Time	Type	Deaths	Injuries	Property Damage
Countywide	01/06/1996	11:00 PM	Winter Storm	0	0	$500,000
Countywide	02/02/1996	03:00 AM	Winter Storm	0	0	0
Countywide	02/16/1996	06:00 AM	Heavy Snow	0	0	0
Countywide	01/09/1997	10:00 AM	Freezing Rain	0	0	0
Countywide	01/11/1997	01:00 AM	Snow	0	0	0
Countywide	02/08/1997	06:00 AM	Heavy Snow	0	0	0
Countywide	12/23/1998	04:00 PM	Wintry Mix	0	0	0
Countywide	01/02/1999	10:00 PM	Wintry Mix	0	0	0
Countywide	01/08/1999	08:00 AM	Wintry Mix	0	0	0
Countywide	01/14/1999	04:00 AM	Wintry Mix	0	0	0
Countywide	03/09/1999	12:00 PM	Snow	0	0	0
Countywide	01/20/2000	04:00 AM	Heavy Snow	0	0	0
Countywide	01/23/2000	09:30 PM	Freezing Drizzle	0	0	0
Countywide	01/25/2000	01:00 AM	Winter Storm	0	0	0
Countywide	01/30/2000	02:00 PM	Wintry Mix	0	0	0
Countywide	02/18/2000	06:00 AM	Snow	0	0	0
Countywide	12/19/2000	09:00 PM	Snow	0	0	0
Countywide	12/22/2000	01:00 AM	Snow	0	0	0
Countywide	01/05/2001	11:00 AM	Snow	0	0	0
Countywide	01/20/2001	09:00 PM	Wintry Mix	0	0	0
Countywide	02/12/2001	09:00 PM	Wintry Mix	0	0	0
Countywide	02/22/2001	12:00 PM	Heavy Snow	0	0	0
Countywide	03/26/2001	03:00 AM	Snow	0	0	0
Countywide	01/19/2002	09:30 AM	Wintry Mix	0	0	0
Countywide	12/05/2002	02:00 AM	Winter Storm	0	0	0
Countywide	01/05/2003	11:00 AM	Winter Weather/Mix	0	0	0
Countywide	01/29/2003	03:00 AM	Winter Weather/Mix	0	0	0
Countywide	01/30/2003	03:00 PM	Winter Weather/Mix	0	0	0

Location	Date	Time	Type	Deaths	Injuries	Property Damage
Countywide	02/06/2003	08:30 PM	Heavy Snow	0	0	0
Countywide	02/10/2003	08:00 AM	Winter Weather/Mix	0	0	0
Countywide	02/15/2003	12:00 AM	Winter Weather/Mix	0	0	0
Countywide	02/16/2003	03:00 AM	Winter Storm	0	0	$1,300,000
Countywide	02/27/2003	04:30 PM	Heavy Snow	0	0	0
Countywide	12/06/2003	12:00 AM	Winter Weather/mix	0	0	0
Countywide	01/17/2004	07:00 PM	Winter Weather/mix	0	0	0
Countywide	01/25/2004	09:00 PM	Heavy Snow	0	0	0
Countywide	01/27/2004	06:00 PM	Winter Weather/mix	0	0	0
Countywide	02/05/2004	10:00 PM	Winter Weather/mix	0	0	0
Countywide	02/17/2004	03:00 PM	Winter Weather/mix	0	0	0
Countywide	12/19/2004	01:00 AM	Winter Weather/mix	0	0	0
Countywide	12/19/2004	07:00 PM	Winter Weather/mix	0	0	0
Countywide	01/19/2005	11:00 AM	Winter Weather/mix	0	0	0
Countywide	01/22/2005	09:00 AM	Winter Storm	0	0	0
Countywide	01/29/2005	09:00 PM	Winter Storm	0	0	0
Countywide	02/07/2005	08:00 PM	Winter Weather/mix	0	0	0
Countywide	02/24/2005	06:00 AM	Heavy Snow	0	0	0
Countywide	02/28/2005	10:00 AM	Winter Weather/mix	0	0	0
Countywide	03/01/2005	12:00 AM	Winter Weather/mix	0	0	0
Countywide	03/08/2005	10:30 AM	Winter Weather/mix	0	0	0
Countywide	12/06/2005	04:00 AM	Heavy Snow	0	0	0
Countywide	12/09/2005	03:00 AM	Winter Weather	0	0	0
Countywide	01/25/2006	05:00 AM	Winter Weather	0	0	0
Countywide	02/12/2006	02:00 AM	Winter Storm	0	0	0
Countywide	01/21/2007	04:30 PM	Winter Weather	0	0	0
Countywide	01/25/2007	07:00 PM	Winter Weather	0	0	0
Countywide	02/13/2007	07:00 AM	Winter Storm	0	0	0
Countywide	02/13/2007	07:00 AM	Winter Weather	0	0	0
Countywide	02/25/2007	12:00 PM	Winter Storm	0	0	0
Countywide	02/25/2007	12:00 PM	Winter Weather	0	0	0

Location	Date	Time	Type	Deaths	Injuries	Property Damage
Countywide	03/07/2007	08:00 AM	Winter Weather	0	0	0
Countywide	03/16/2007	06:00 PM	Winter Weather	0	0	0
Countywide	12/05/2007	10:00 AM	Winter Weather	0	0	0
Countywide	01/24/2008	11:00 AM	Winter Weather	0	0	0
Countywide	02/12/2008	12:00 PM	Winter Weather	0	0	0
Countywide	02/14/2008	12:00 AM	Winter Weather	0	0	0
Countywide	02/20/2008	01:00 PM	Winter Weather	0	0	0
Countywide	02/22/2008	12:00 AM	Winter Weather	0	0	0
Countywide	11/21/2008	06:00 PM	Winter Weather	0	0	0
Countywide	12/21/2008	03:00 AM	Winter Weather	0	0	0
Countywide	01/18/2009	05:15 PM	Winter Weather	0	0	0
Countywide	01/27/2009	03:30 AM	Winter Storm	0	5	$50,000
Countywide	02/03/2009	03:00 AM	Winter Weather	0	0	0
Countywide	03/01/2009	04:30 PM	Winter Storm	0	0	0
Countywide	12/19/2009	12:00 AM	Winter Storm	0	0	0
Countywide	12/31/2009	04:00 AM	Winter Weather	0	0	0
Countywide	01/08/2010	01:30 AM	Winter Weather	0	0	0
Countywide	01/30/2010	10:00 AM	Heavy Snow	0	0	0
Countywide	02/02/2010	08:00 PM	Winter Weather	0	0	0
Countywide	02/05/2010	03:00 PM	Winter Storm	0	0	0
Countywide	02/09/2010	06:00 PM	Winter Storm	0	0	$1,800,000
Countywide	02/10/2010	12:00 PM	Blizzard	0	0	0
Countywide	02/25/2010	02:00 AM	Winter Weather	0	0	0
Countywide	12/16/2010	01:00 PM	Winter Weather	0	0	0
Countywide	12/26/2010	09:00 AM	Heavy Snow	0	0	0
Countywide	01/08/2011	04:00 AM	Heavy Snow	0	0	0
Countywide	01/11/2011	03:00 PM	Winter Weather	0	0	0
Countywide	01/17/2011	07:00 PM	Winter Weather	0	0	0
Countywide	01/26/2011	04:00 AM	Winter Weather	0	0	0
Countywide	02/01/2011	01:00 AM	Winter Weather	0	0	0
Countywide	02/09/2011	10:30 PM	Winter Weather	0	0	0

Location	Date	Time	Type	Deaths	Injuries	Property Damage
Countywide	02/21/2011	08:00 PM	Winter Weather	0	0	0
Countywide	01/04/2012	11:00 PM	Winter Weather	0	0	0
Countywide	01/09/2012	03:00 PM	Winter Weather	0	0	0
Countywide	01/21/2012	01:00 PM	Winter Weather	0	0	0
Countywide	02/11/2012	06:00 PM	Winter Weather	0	0	0
Countywide	01/25/2013	03:00 PM	Winter Weather	0	0	0
Countywide	01/28/2013	06:00 AM	Winter Weather	0	0	0
Countywide	02/01/2013	05:30 AM	Winter Weather	0	0	0
Countywide	02/02/2013	07:30 PM	Winter Weather	0	0	0
Countywide	03/25/2013	04:00 AM	Winter Weather	0	0	0
Countywide	12/08/2013	11:30 AM	Winter Weather	0	0	0
Countywide	01/02/2014	06:00 PM	Heavy Snow	0	0	0
Countywide	01/10/2014	06:30 AM	Winter Weather	0	0	0
Countywide	01/21/2014	11:17 AM	Heavy Snow	0	0	0
Countywide	01/25/2014	12:00 PM	Winter Weather	0	0	0
Countywide	01/28/2014	09:00 PM	Heavy Snow	0	0	0
Countywide	02/04/2014	10:00 PM	Winter Weather	0	0	0
Countywide	02/09/2014	05:30 PM	Winter Weather	0	0	0
Countywide	02/12/2014	08:30 PM	Winter Storm	0	0	0
Countywide	02/18/2014	02:00 AM	Winter Weather	0	0	0
Countywide	02/25/2014	07:00 AM	Winter Weather	0	0	0
Countywide	02/26/2014	06:00 AM	Winter Weather	0	0	0
Countywide	03/03/2014	03:00 AM	Winter Storm	0	0	0
Countywide	03/16/2014	05:00 PM	Heavy Snow	0	0	0
Countywide	03/25/2014	12:00 PM	Heavy Snow	0	0	0
			TOTALS:	**0**	**5**	**$3,650,000**

Source: National Climatic Data Center

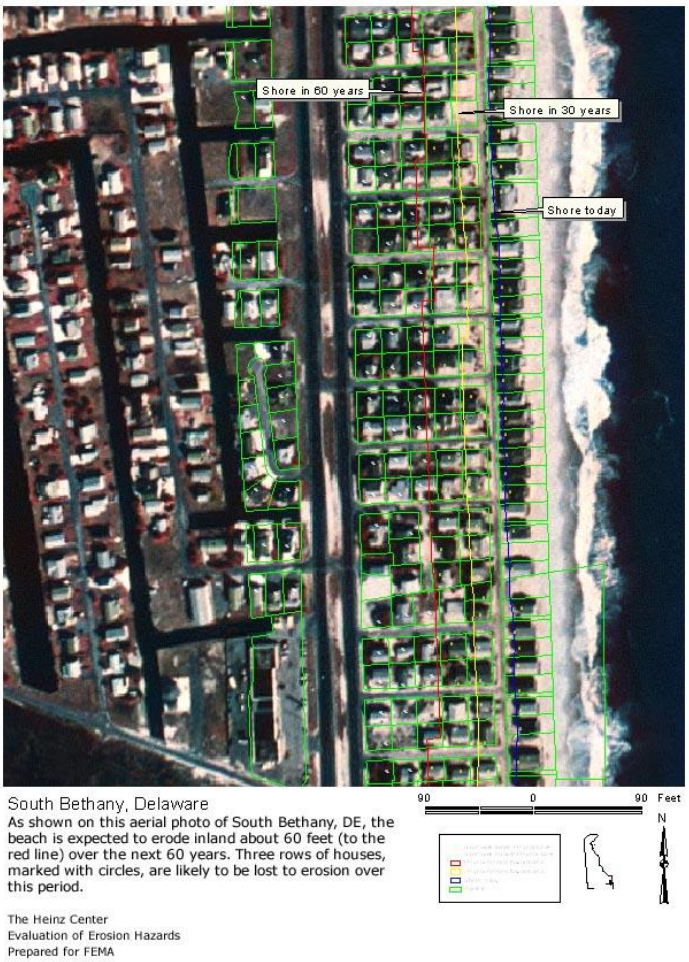
4.2.11 Coastal Erosion

An evaluation of erosion hazards in the United States was conducted as a collaborative project of The H. John Heinz III Center for Science, Economics and the Environment in April 2000, a study prepared for the Federal Emergency Management Agency (www.heinzcenter.org). The Heinz Center evaluation provides an assessment of coastal erosion and the potential loss of property along U.S. shorelines.

In 1990, the State of Delaware had an estimated 1,000 people living within 500 feet of the Atlantic shoreline, according to data derived from analyzing U.S. Census Block Groups. Sussex County, south of Kent County and one of the 18 counties studied in The Heinz Center's evaluation, is known to experience an average annual erosion rate of three (3) to four (4) feet per year. And, according to the study, an estimated 25 percent of those homes within 500 feet of U.S. coastlines and Great Lakes coastlines are likely to be lost to erosion by 2060.

Figure 4.2-4 shows one Delaware community, South Bethany in Sussex County, and the expectation that the beach will erode inland approximately 60 feet over the next 60 years resulting in the hypothetical loss of three rows of housing.

Figure 4.2-4
The Heinz Center Evaluation of Erosion Hazards (Delaware)



A further, separate study of sea level and the resulting coastal erosion was not conducted as part of this Hazard Mitigation Plan Update. With regard to the sea level rise impact on flooding, the hazard and vulnerability analysis conducted for riverine and coastal flooding will suffice as it goes above and beyond all reasonable estimates of the sea level rise, and therefore creating mitigation actions that deal with periodic flooding will also benefit those areas vulnerable to sea level rise. With regard to the coastal erosion impacts, a separate analysis was conducted as part of the preparation of the report *Preparing for Tomorrow's High Tide: Sea Level Rise Vulnerability Assessment for the State of Delaware* in 2012. Many of the mitigation actions from that report from DNREC have been incorporated into this plan by reference.

4.2.12 Dam/Levee Failure

According to National Inventory of Dams, there are 16 regulated dams in Kent County. Fourteen (14) are considered High Hazard and two (2) are considered Significant Hazard. Overall, nearly 60 percent of the dams within the state are considered to be high or significant hazard facilities.

Dam hazard definitions, as accepted by the National Interagency Committee on Dam Safety, are as follows:

1. Low Hazard Potential — Dams assigned the low hazard potential classification are those where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

2. Significant Hazard Potential — Dams assigned the significant hazard potential classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

3. High Hazard Potential — Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life.

Table 4.2-7
County Dam Hazard Data

Name of Dam	General Location	Owner	Year Built	Hazard Potential
Duck Creek Pond Dam	Green Spring Branch	Duck Creek Investment Corp	N/A	Low
Wheatley Pond Dam	Green's Branch	Wheatley Pond HOA	N/A	High
Cartanza/ez Farms Dam	Little River	Cartanza/ez Farms	N/A	Low
Wyoming Lake Dam	Isaac Branch	Carlton Fifer	1925	Low
Blairs Pond Dam	Tantrough Br-Mispillion River	DNREC	N/A	High
Tub Mill Pond Dam	Swan Creek Trib Mispillion R.	DNREC	N/A	High
Denoname 2	Browns Branch	City of Harrington	1971	Significant
Lake Como Dam	Mill Creek-Smyrna River	DelDOT	1938	High
Masseys Mill Pond Dam	Little Duck Creek - Leipsic River	DelDOT	1933	Low

Garrisons Lake Dam	Leipsic River	DNREC	1964	Significant
Haven Lake Dam	Mispillion River	DNREC	1956	High
Silver Lake Dam - Dover	St. Jones River	City of Dover	1900	High
Silver Lake Dam - Milford	Mispillion River	DNREC	1964	High
Killen Pond Dam	Murderkill River	DNREC	1969	Low
Coursey Pond Dam	Murderkill River	DelDOT	1967	High
Derby Pond Dam	Tidbury Creek	DNREC	1967	High
Voshell Pond Dam	Tidbury Creek- St. Jones River	Margaret Lingo and H. Kline	1969	High
Wyoming Lake Dam	Isaac Branch- St. Jones River	Papen and Feifer (?)	1925	Significant
Moores Lake Dam	Isaac Branch of St Jones	DNREC	1967	High
Andrews Lake Dam		DelDOT; DNREC DFW		Significant

Source: National Inventory of Dams, USACE

4.2.13 Earthquakes

According to the Delaware Geological Survey, 58 earthquakes have been impacted the State of Delaware during a period from 1638 through 2014. The greatest of these, in terms of the Modified Mercalli Intensity (MMI) scale for earthquakes, was the October 9, 1871 earthquake reported to have had an intensity of VII on the MMI scale in New Castle County, Kent County's neighbor to the north.. An event registering 7 would correspond to a ranking between 5.4 and 6.1 on the Richter Scale, and would be considered a "very strong" earthquake. The lower end of the spectrum for Delaware consists of several earthquakes classified as a II on the MMI scale, for instance the October 20, 1985 earthquake documented in the City of Wilmington in New Castle County. No damage estimates are currently available for these events.

Table 4.2-8 lists all recorded earthquakes in the State of Delaware for the period 1638 through 2014, along with their intensity. Earthquake events specifically associated with Kent County are highlighted in bold typeface for quick reference. For some events, the intensity appears as a range due to variations in distances across the impacted areas.

Table 4.2-8
Recorded Earthquakes in the State of Delaware (1638-2014)

Date of Occurrence	Felt Area	Modified Mercalli Intensity (If Known)
October 9, 1871	Wilmington	VII
March 25, 1879	**Dover**	**IV-V**
May 8, 1906	Seaford	IV
December 3, 1937	Georgetown	IV
January 8, 1944	Wilmington	< V
July 14, 1971	SW Wilmington	III-IV
December 29, 1971	SW Wilmington	IV-V
January 2, 1972	SW Wilmington	III-IV

Date of Occurrence	Felt Area	Modified Mercalli Intensity (If Known)
January 2, 1972	SW Wilmington	III-IV
January 6, 1972	SW Wilmington	III-IV
January 22, 1972	SW Wilmington	III-IV
January 22, 1972	SW Wilmington	III-IV
January 23, 1972	SW Wilmington	III-IV
February 10, 1972	ENE Newark	V
February 11, 1972	SW Wilmington	III
August 13, 1972	SW Wilmington	III-IV
August 13, 1972	SW Wilmington	III-IV
November 25, 1972	SW Wilmington	III-IV
November 27, 1972	SW Wilmington	III-IV
February 28, 1973	**Entire State**	**V-VI**
March 1, 1973	Claymont	I
March 2, 1973	Claymont	I
March 2, 1973	Claymont	I
March 3, 1973	Claymont	I
March 3, 1973	Claymont	I
March 3, 1973	Claymont	I
March 3, 1973	Claymont	I
July 10, 1973	Wilmington-Claymont	IV
April 28, 1974	Wilmington	V
February 10, 1977	Wilmington	V
June 5, 1977	Georgetown	-
August 2, 1977	Georgetown	-
February 25, 1980	Wilmington	I
November 17, 1983	Trolley Square area of Wilmington	V
November 17, 1983	Trolley Square area of Wilmington	-
December 12, 1983	NW Wilmington	IV
December 12, 1983	NW Wilmington	I-II
January 19, 1984	Wilmington	I-II
January 19, 1984	Wilmington	IV
February 15, 1984	N Wilmington	I-II
October 10, 1985	N Wilmington	III-IV
October 20, 1985	Wilmington	III-IV
November 8, 1993	Wilmington	I-II
February 11, 1994	Wilmington Area	II

Date of Occurrence	Felt Area	Modified Mercalli Intensity (If Known)
April 23, 1994	Wilmington	II-III
October 16, 1995	Wilmington	I-II
October 17, 1995	Wilmington	II-III
December 20, 1995	Wilmington	I-II
June 13, 1996	Wilmington	II-III
June 23, 1996	Wilmington	I-II
January 28, 1997	Wilmington	II
April 15, 1997	Wilmington	III-IV
March 15, 1998	Wilmington	III
March 19, 1998	Wilmington	I-II
March 19, 1998	Wilmington	III
October 27, 1998	Near Montchanin	II
August 13, 2003	Near Newark	II
April 9, 2005	North Wilmington	I-II

Source: Delaware Geological Survey

4.2.14 Landslides and Sinkholes

Landslides and sinkholes, discussed in the *Hazard Identification* section, were not analyzed in detail due to extremely low probability of occurrence within the State of Delaware.

4.2.15 Tsunami

Though tsunamis are more likely to affect Pacific Rim states, historical evidence does show that tsunamis have affected the Eastern United States and Gulf of Mexico, including Delaware. Forty tsunamis and tsunami-like waves have been documented in the Eastern United States since 1600. To cite one commonly referred to example in terms of Atlantic tsunamis, a severe earthquake (7.2 on the Richter Scale) on November 18, 1929 in the Grand Banks of Newfoundland generated a tsunami that caused considerable damage and loss of life at Placentia Bay, Newfoundland and is also known to have impacted upon the Maine shoreline to some degree. Due to the relatively low probability of a tsunami significantly impacting the State of Delaware, no further analysis or vulnerability assessment will be conducted for this hazard at this time.

4.2.16 Volcanoes

There are no active volcanoes in the State of Delaware, thus no historical evidence of volcanic eruption exists within the planning area. There is also no indication that this hazard is a significant enough threat to the state to warrant further analysis or a vulnerability assessment at this time.

4.2.17 Terrorism

Because of the relevantly recent, or heightened, focus being placed on managing terrorism and consequences of terrorism in the United States, no historical database is currently available for cataloging acts of terrorism. However, at the time of this Plan's development, no significant historical occurrences of terrorism were known to have taken place within Kent County planning area.

4.2.18 Hazardous Materials (HazMat)

Table 4.2-9 shows National Response Center (NRC) data for Kent County for the last 5 years with regard to number of incidents, injuries, deaths and damages incurred as the result of hazardous materials incidents. From 2009 to 2014, there were 42 incidents, 0 injuries, 1 death, and no damage.

Table 4.2-9
NRC HazMat Data for Kent County

Year	Type of Incident							Injuries	Fatalities	Damages
	Fixed	Mobile	Rail	Tank	Vessel	Pipeline	Other			
2009	0	1	4	0	3	0	0	0	0	0
2010	4	1	2	1	2	0	0	0	0	0
2011	4	0	2	1	0	0	2	0	0	0
2012	2	0	3	0	1	0	0	0	0	0
2013	1	1	3	1	2	1	0	0	1	0
Total	11	3	14	3	8	1	2	0	1	0

4.2.19 Energy Pipeline Failures

A history of hazards is not currently available for energy pipeline failures in Kent County.

4.2.20 Probability of Future Events in Kent County

The final step of any hazard analysis is calculating the likelihood of future events. Given the number of events that have occurred in the past and the time period over which those events have occurred, one can calculate the number of events that occur per year. This gives a sense of the probability of future occurrences. The results of this calculation for Kent County are presented in **Table 4.2-10**. For floods, the events that are tallied are generally nuisance events without a great deal of damage. The probability of a 100-year flood (and its predicted extent) is 1% in any given year. Earthquakes require a similar explanation. While 59 total events have taken place according to the historical record, only one of those was capable of causing any damage at all, however slight. Finally, there is no historical record of occurrence for several hazards.

Table 4.2-10
Probability of Future Events (All Hazards)

Hazard	Number of Events	Time Period	Events per Year	Probability of Future Occurrence
Flood	59	1993 – 2014	2.810/0.0100	High/Low
Tropical Storm	24	1877 – 2014	0.175	Low
Severe Thunderstorm	286	1950 – 2014	4.469	High
Tornado	20	1950 – 2014	0.313	Medium
Wildfire	2	1993 – 2014	0.095	Low
Drought	53	1995 – 2014	2.789	High
Extreme Temperature	95	1995 – 2014	5.000	High
Hail	24	1950 – 2014	0.375	Medium
Winter Storm	110	1993 – 2014	5.238	High
Coastal Erosion	Unknown	N/A	Unknown	Low
Dam Failure	Unknown	N/A	Unknown	Low
Earthquake	58 (1 MMI >= VI)	1871 – 2014	0.406/0.007	Medium/Low
Sinkhole/Landslide	Unknown	N/A	Unknown	Low
Tsunami	Unknown	N/A	Unknown	Low
Volcano	Unknown	N/A	Unknown	Low
Terrorism	Unknown	N/A	Unknown	Low
Hazardous Material Release	42	2009-2014	8.400	High
Energy Pipeline Failure	Unknown	N/A	Unknown	Low

The preceding section included data about and description of environmental hazards from a wide variety of sources. Every attempt has been made to include the most accurate and up-to-date information about the type and frequency of hazards that Kent County faces. The data sources used for the preceding hazard identification are as follows:

Data Sources

American Society of Civil Engineers (ASCE), "Facts About Windstorms."
Web site: www.windhazards.org/facts.cfm

Bureau of Reclamation, U.S. Department of the Interior
Web site: www.usbr.gov

Federal Emergency Management Agency (FEMA)
Web site: www.fema.gov

National Climatic Data Center (NCDC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: http://lwf.ncdc.noaa.gov/oa/ncdc.html

National Geophysical Data Center, "Tsunamis and Tsunami-Like Waves of the Eastern United States"
Web site: http://www.ngdc.noaa.gov/seg/hazard/tsu.shtml

National Inventory of Dams, U.S. Department of the Interior
Web site: http://crunch.tec.army.mil/nid/webpages/nid.cfm

National Hurricane Center, National Oceanic & Atmospheric Administration (NOAA)
Web site: http://www.nhc.noaa.gov/http://www.nhc.noaa.gov/HAW2/english/history/opal_1995_map.gif

National Severe Storms Laboratory (NSSL), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: www.nssl.noaa.gov

National Weather Service (NWS), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: www.nws.noaa.gov

Storm Prediction Center (SPC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service
Web site: www.spc.noaa.gov

The Tornado Project, St. Johnsbury, Vermont
Web site: www.tornadoproject.com

United States Geological Survey (USGS), U.S. Department of the Interior
Web site: www.usgs.gov

4.3 VULNERABILITY ASSESSMENT

Requirement §201.6(c)(2)(ii): *[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community*

4.3.1 Introduction

A high-level, detailed vulnerability assessment was completed for Kent County for flood (riverine and coastal), severe winds (hurricanes and coastal storms), thunderstorms, tornadoes, drought, hail, winter storms, dam/levee failure, earthquakes, terrorism, hazardous materials and energy pipeline failures, due to the higher level of vulnerability for these hazards compared to others. It is important to note that this vulnerability assessment is based on best available data and represents a base-level assessment for the planning area. Additional work could be done on an ongoing basis to enhance, expand and further improve the accuracy of the baseline established here.

The loss estimates provided in this section have resulted in an *approximation* of vulnerability. These estimates should be used to understand relative vulnerability from hazards and potential losses. However, it is important to understand that uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications that are necessary for a comprehensive analysis (such as abbreviated inventories, demographics or economic parameters).

To conduct the vulnerability assessment effort, two distinct hazard vulnerability assessment methodologies were applied; utilizing both HAZUS-MH® version 2.2 (FEMA's loss estimation software) and a statistical vulnerability assessment methodology. Both approaches provide estimates for the potential impact by using a common, systematic framework for evaluation.

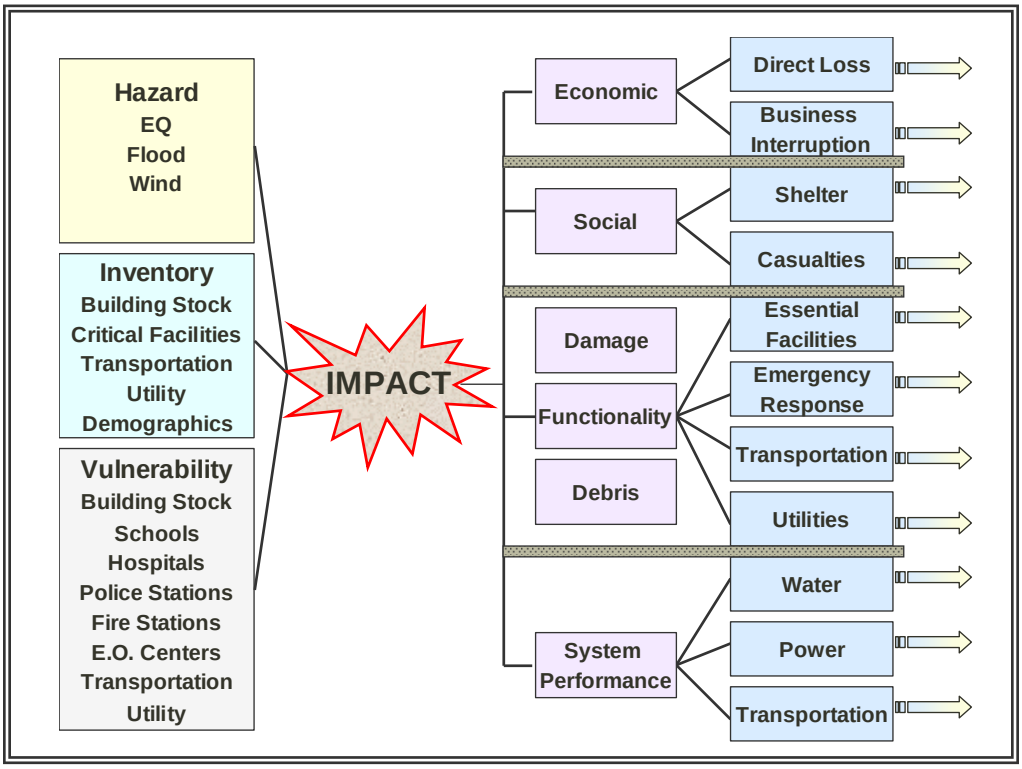
The HAZUS-MH vulnerability assessment methodology is parametric, in that distinct hazard and inventory parameters (for example, wind speed and building types) were modeled using the HAZUS-MH software to determine the impact (damages and losses) on the built environment. The HAZUS-MH software was used to estimate losses from coastal winds, earthquake and flood hazards.

The second methodology, a statistical vulnerability assessment methodology, was applied to analyze hazards of concern that are outside the scope of the HAZUS-MH software. The methodology uses a statistical approach and mathematical modeling of vulnerability to predict a hazard's frequency of occurrence and estimated impacts based on recorded or historic damage information.

4.3.2 Explanation of HAZUS-MH Risk Assessment Methodology

HAZUS-MH is FEMA's standardized loss estimation software program, built upon an integrated geographic information system (GIS) platform (**Figure 4.3-1**). This vulnerability assessment applied HAZUS-MH to produce regional profiles and estimate losses for three of the seven hazards addressed in this section: flood, hurricane winds and earthquake.

Figure 4.3-1
Conceptual Model of HAZUS-MH Methodology



4.3.3 Explanation of Regional Vulnerability Assessment Methodology

Vulnerabilities associated with other natural hazards were analyzed using a regional assessment methodology developed and used specifically for this effort. This approach is based on the principal that any spatially-nonspecific hazard event is essentially a random occurrence within a region and had just as much chance of occurring within the study area as outside. Historical data for each hazard are used and statistical evaluations are performed using manual calculations. The general steps used in the statistical vulnerability assessment methodology are summarized below:

- Buffer the study area to determine the regional assessment area;
- Compile hazard occurrence data for the regional area from national and local sources;
- Categorize hazard parameters for each hazard to be modeled (e.g., tornado);
- Calculate the annualized occurrence and loss estimates for each regional subdivision;
- Normalize the annualized occurrence and loss estimates by land area and number of housing units respectively; and
- Determine the overall regional average of annualized occurrence and loss

The economic loss results are presented here using two interrelated vulnerability indicators:

1) The Annualized Loss (AL), which is the estimated long-term value of losses to the general building stock in any single year in a specified geographic area (i.e., city or county)

2) The Annualized Loss Ratio (ALR), which expresses estimated annualized loss as a fraction of the building inventory replacement value

The estimated Annualized Loss (AL) addresses the two key components of vulnerability: the probability of the hazard occurring in the study area and the consequences of the hazard, largely a function of building construction type and quality, and of the intensity of the hazard event. By annualizing estimated losses, the AL factors in historic patterns of frequent smaller events with infrequent but larger events to provide a balanced presentation of the vulnerability.

The Annualized Loss Ratio (ALR) represents the AL as a fraction of the replacement value of the local building inventory. This ratio is calculated using the following formula:

"ALR = ANNUALIZED LOSSES / TOTAL EXPOSURE AT RISK"

The annualized loss ratio gauges the relationship between average annualized loss and building replacement value. This ratio can be used as a measure of relative vulnerability between areas and, since it is normalized by replacement value, it can be directly compared across different geographic units such as metropolitan areas or counties.

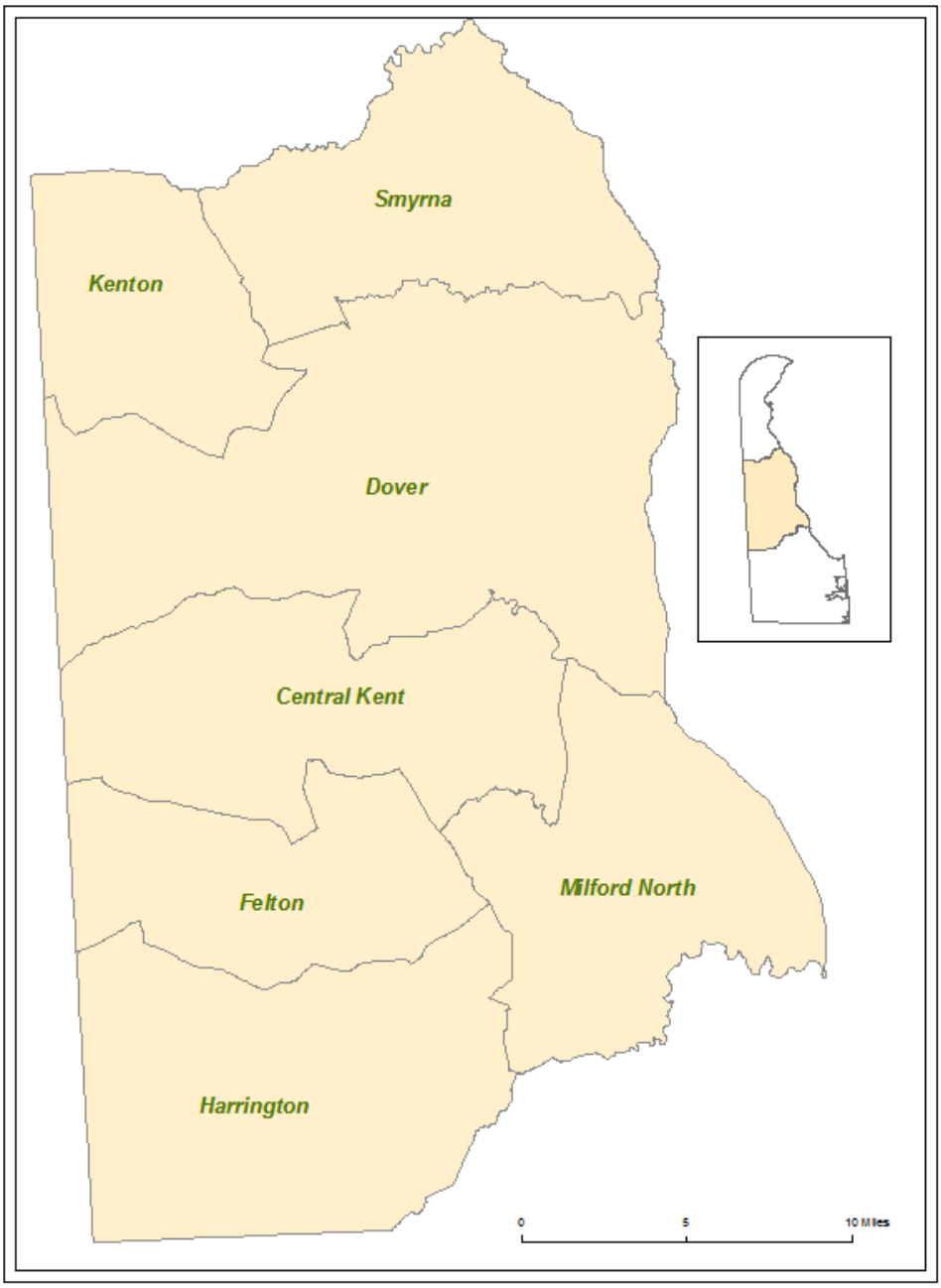
It is important to note that HAZUS-MH was used to produce "worst case scenario" results. The outputs in this document are considered to be the result of a worst case scenario event for each hazard, and it is understood that any smaller events would most likely create fewer losses than those calculated here.

Census County Divisions (CCDs)

Many of the tables presented in the Vulnerability Assessment use Census County Divisions (CCDs), which are defined by the US Census Bureau as areas delineated in cooperation with state, tribal, and local officials for statistical purposes. CCDs have no legal function and are not governmental units. CCD boundaries usually follow visible features and usually coincide with census tract boundaries. The name of each CCD is based on a place, county, or well-known local name that identifies its location (illustrated right). CCDs are recognized by the U.S. Census Bureau and are a national standard by which HAZUS-MH results are prepared (due in part to the reliance of HAZUS on U.S. Census data.)

In the studies conducted for Kent County, cities—such as Dover and Milford, for example—are separated from the CCDs in jurisdiction-level analyses. This was done in order to provide a more detailed cross section of the planning area and eliminate tendencies to double-count available information.

Figure 4.3-2
Census County Divisions (CCDs)



4.3.4 County Overview

Requirement §201.6(c)(2)(ii): *[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community*

Population and Dollar Exposure

According to the U.S. Census Bureau, the total population of Kent County in 2010 was 162,922. (The total population in 2010 for the state of Delaware as a whole was 899,673.) **Figure 4.3-3** shows the distribution of this population across the county's geographic area.

The latest value from HAZUS-MH of total dollar exposure within Kent County is estimated to be approximately $29,312,397,000. This modeled estimate consists of single-family residential buildings, multi-family residential buildings and commercial facilities. Fortunately, for the flood vulnerability analysis, actual tax parcel boundaries and their assessed valuations were available to be used. Using the data from the Kent County Government, the actual total dollar exposure in the county is $3,284,595,900. It was the consensus of the Steering Committee, however, that the assessed valuations are, in some cases, considerably lower than the actual market value of the property.

Development Trends

The resident population of the State of Delaware is projected to increase from 899,673 in 2010 to approximately 1,068,155 by 2040 (Delaware Population Consortium, October 2014). From April 1, 2000 to April 1, 2010, Delaware's rate of population change was 14.6% and rate of change in housing units was 18.3% (U.S. Census Bureau). These trends demonstrate that Delaware's population is increasing, and consequently the number of residential structures and the associated exposure of residential buildings will increase as well. Assuming a multiplier of 1.008[1], the total residential exposure of Kent County could reach an estimated dollar value of $3,585,484,089 by 2025. This estimate does not of course take into account many other development factors, such as available land for new residential construction. Future Plan updates will address development trends in more detail through assessments, historical data analysis, and discussions with the County Planning Department, in particular for hazards with a physical hazard boundary (i.e., flood, storm surge, etc.) The planning department will be involved in addressing development trends and ensuring that future development is not planned in high hazard areas. This information will be reviewed and incorporated in the 5-year update.

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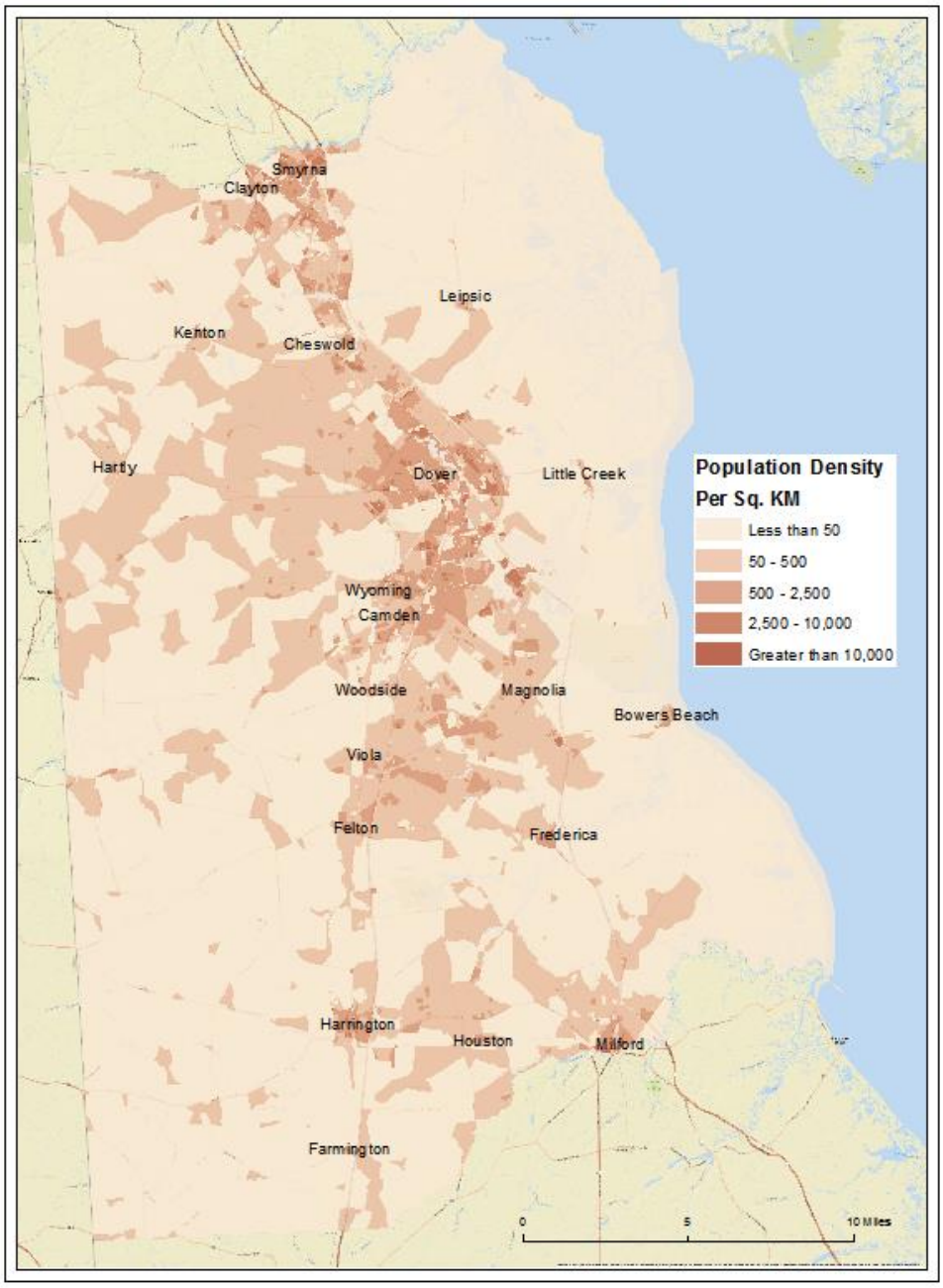
[1] Based on the percent change in housing units for a two-year period and weighted for Kent County.

Figure 4.3-3
Population Distribution (U.S. Census 2010)



Critical Facilities

For the purposes of this risk assessment, the label "critical facility" refers to five categories of locations that will be very important during the response and recovery phase of a hazard event. Those categories are: Medical Care Facilities, Emergency Operations Centers, Fire Departments, Police Departments and Schools. According to HAZUS-MH 2.2, there are a total of 100 critical facilities in Kent County, Delaware

4.3.5 Flood

In May 2014, FEMA released a new coastal flood study of Kent County, complete with a 1% chance per year depth grid that was created with state-of-the-art methods. Because this data was available and determined by the Hazard Mitigation Plan Update Steering Committee to be authoritative, it was directed to be used as the basis for the flood vulnerability assessment. Because only coastal flooding depths were predicted in the May 2014 study, additional analysis was conducted, using the HAZUS-MH Flood Information Tool and the Digital Flood Insurance Rate Maps, to calculate the predicted depths from a 1% chance per year riverine flooding event. Unfortunately, only a 1% chance per year flood depth grid was available, rather than the typical range of various return periods.

Because the actual property parcels with assessed values were available from Kent County, there was an opportunity to examine the potential damage from flooding at the parcel level, rather than the census tract level available in HAZUS-MH. The GIS process used to accomplish this is:

1. Select all of the property parcels in Kent County that intersect the 1% chance per year flood extent.
2. Reduce the assessed value of the parcel's structures by the percentage that the parcel is flooded. This assumes that the impact of a flood would be even across a parcel. This is a best practice in GIS analysis generally when the specific configuration of buildings on a parcel is not known.
3. Convert the raster flood depth grid into polygons for every 6" of flood depth.
4. For each property parcel, determine the flood depth polygon with the greatest intersecting area. In other words, pick the flood depth polygon value that intersects each property parcel the most.
5. Using the type of property, assume the height of the building foundation and remove this value from the flood depth. For example, if a parcel is predicted to be flooded by 3 ft of water in a 1% chance per year scenario, and the primary structure is assumed to have an 18 inch foundation (crawl space), then one can assume 1.5 ft of flood water impacting the structure.
6. Finally, use the depth-damage curves from HAZUS-MH to relate the depth of the floodwater to the percent damaged. This damage percent, for both the building and its content, is multiplied by the reduced assessed value to calculate the estimated damage amount.

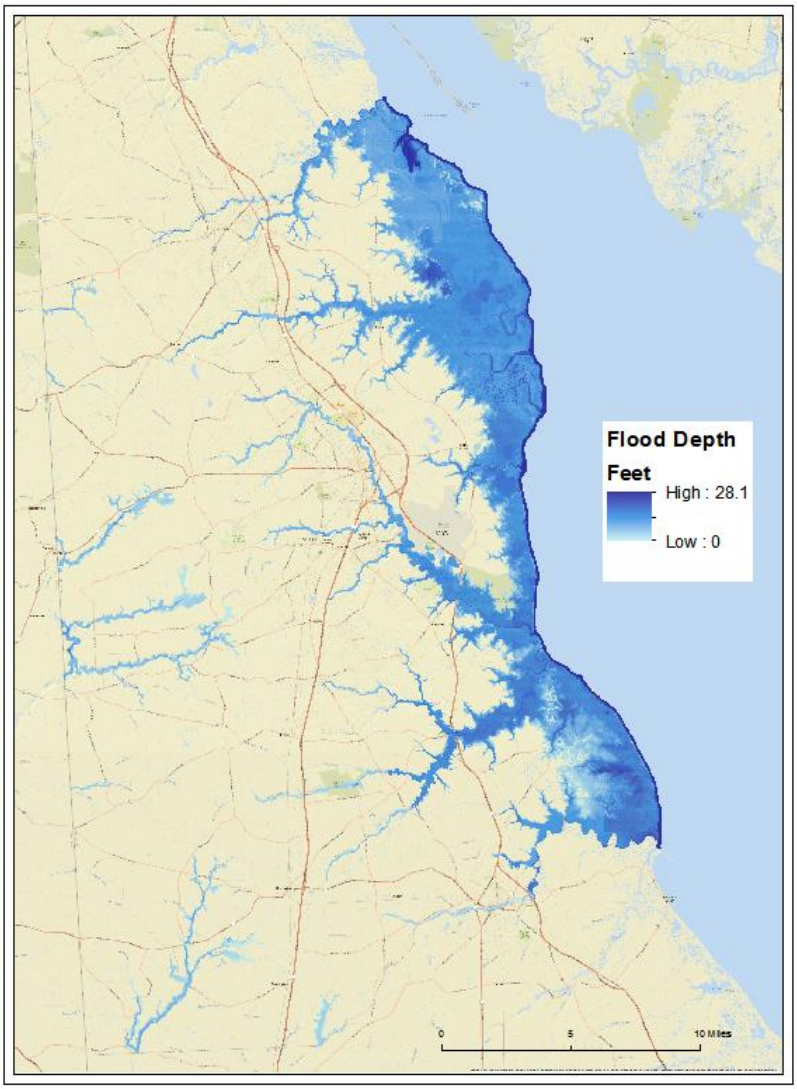
The result of this process is parcel-based map of the potential flood damage from both riverine and coastal flood events in Kent County. This parcel-based vulnerability map may now be used to identify which properties are the most at risk from flooding in the County, what are their characteristics, and whom to contact to discuss potential mitigation options. It could also now be used to track the change in vulnerability over time as either the data regarding individual properties improves, or more up-to-date assessment valuations are considered.

Approximately 20.1% of Kent County land area falls within the 1% chance per year flood zone (**Figure 4.3-4**). Also, 5,503 out of 84,657 property parcels (6.5%) intersect the flood zone. The predicted depth of flood water is between 0 and 28.1 ft (**Figure 4.3-5**). However, the upper end of the predicted depths includes portions of the grid that lie just

off the coast, exaggerating the depths. The deepest values on land are found in the northern coastal part of the county and average about 12 ft deep.

Figure 4.3-4
FEMA 100-Year Flood Zone in Kent County

Figure 4.3-5
Modeled 1%-chance Flood Depth

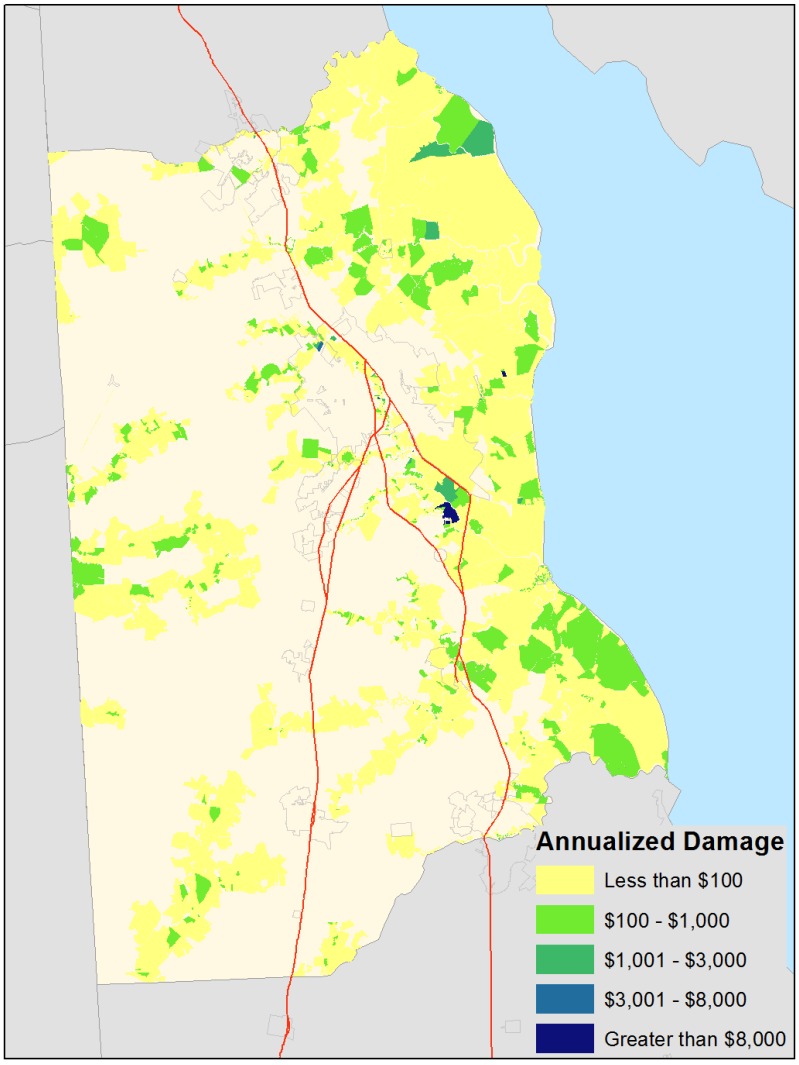


The total built property exposure (both building and contents) in the county is $91,646,903 (**Table 4.3-1**). The total estimated annualized losses equal $406,999, yielding a loss ratio of 0.0044. Loss ratios in the county's municipalities range from 0.0000 in Houston and Kenton to 0.0067 in Bowers Beach. Among the CCDs, Kenton is most vulnerable to flooding (0.0051). Again, this analysis has only used a 1% chance per year flood; including the 10%, 4%, 2%, and 0.2% chance per year flood depths would increase the loss ratio significantly.

Table 4.3-1
Potential Annualized Losses from Flooding

Jurisdiction	Assessed Value	Estimated Losses	Loss Ratio
Bowers Beach	$7,182,154	$47,822	0.0067
Camden	$501,113	$1,820	0.0036
CCD Central Kent	$12,515,068	$51,842	0.0042
CCD Dover	$26,091,393	$125,421	0.0048
CCD Felton	$748,624	$2,173	0.0029
CCD Harrington	$3,804,884	$9,456	0.0025
CCD Kenton	$787,557	$4,055	0.0051
CCD Milford North	$9,860,679	$48,347	0.0049
CCD Smyrna	$5,678,818	$27,206	0.0048
Cheswold	---	---	---
Clayton	$24,776	$84	0.0034
Dover	$10,024,425	$44,658	0.0045
Farmington	---	---	---
Felton	---	---	---
Frederica	$732,038	$4,353	0.0059
Harrington	---	---	---
Hartly	---	---	---
Houston	$1	$0	0.0000
Kenton	$10	$0	0.0000
Leipsic	$1,476,303	$6,209	0.0042
Little Creek	$1,086,487	$5,481	0.0050
Magnolia	---	---	---
Milford	$8,075,453	$17,901	0.0022
Smyrna	$1,819,447	$4,937	0.0027
Viola	---	---	---
Woodside	---	---	---
Wyoming	$1,168,544	$4,773	0.0041
TOTAL	**$91,646,903**	**$406,999**	**0.0044**

Figure 4.3-6
Losses per Parcel from 1% chance per year Flood in Kent County



Another means of gauging the vulnerability within Kent County to flooding was determined to be the vulnerability of critical facilities to the 1% chance per year flood return periods. Within the county, 100 critical facilities were assessed with regard to flood risk (**Table 4.3-2**). In summary, during a 1% chance per year flood event, 4 facilities (South Bowers Fire Company in the Milford North CCD, North Dover Elementary School in Dover, Leipsic Volunteer Fire Company in Leipsic, and the Milford Police Department in Milford) are predicted to sustain slight damage (1 to 5 percent damage) and 1 facilities (Bowers Volunteer Fire Department in Bowers Beach) are predicted to sustain moderate damage (5 to 30 percent damage).

Table 4.3-2
Potential Damage to Critical Facilities from Flood[2]

Jurisdiction	Total Number of Critical Facilities	1% chance per year Flood		
		Moderate Damage	Slight Damage	Negligible Damage
Bowers Beach	1	1	0	0
Camden	9	0	0	9
CCD Central Kent	5	0	0	5
CCD Dover	17	0	0	17
CCD Felton	2	0	0	2
CCD Harrington	1	0	0	1
CCD Kenton	2	0	0	2
CCD Milford North	1	0	1	0
CCD Smyrna	1	0	0	1
Cheswold	1	0	0	1
Clayton	3	0	0	3
Dover	24	0	1	23
Farmington	N/A	0	0	N/A
Felton	3	0	0	3
Frederica	2	0	0	2
Harrington	5	0	0	5
Hartly	1	0	0	1
Houston	1	0	0	1
Kenton	N/A	0	0	N/A
Leipsic	1	0	1	0
Little Creek	1	0	0	1
Magnolia	2	0	0	2
Milford	5	0	1	4
Smyrna	8	0	0	8
Viola	N/A	0	0	N/A
Woodside	1	0	0	1
Wyoming	3	0	0	3
TOTAL	**100**	**1**	**4**	**95**

[2] The definitions used are as follows. Negligible: less than 1 percent damage. Slight: 1 to 5 percent damage. Moderate: 5 to 30 percent damage. Extensive (where applicable): 30 to 60 percent damage.

Requirement §201.6(c)(2)(ii): *[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community*

A repetitive loss property is an NFIP-insured property that has had at least four paid flood losses of more than $1,000, or has had two paid flood losses within 10 years that, in aggregate, equal or exceed the value of the property, or has had three or more paid losses that, in aggregate, equal or exceed the value of the property. Addressing repetitive loss properties through the implementation of specific mitigation projects represent one of the most effective ways to reduce future flood losses. **Table 4.3-3** contains a tally of the number of repetitive loss properties in the County and individual municipalities, the number of flood insurance policies currently in force (as of April 2014), and the percentage of current policies that represent repetitive loss properties. Of the two repetitive loss properties in Kent County, one is a single-family residential property and one is a non-residential property. The one repetitive loss property in the Town of Bowers is a single-family residential property. **Table 4.3-4** contains the same information but for the severe repetitive loss properties in Kent County. A severe repetitive loss property is one that has had at least four claim payments greater than $5,000, or the cumulative amount of the four payments exceeds $20,000, or has had two cumulative claim payments that exceed the value of the property. Of the six severe repetitive loss properties in Kent County, five are single-family residential properties and one is a non-residential property. Both of the severe repetitive loss properties in the Town of Bowers and the Town of Smyrna are single-family residential properties. The location of the repetitive loss properties in relation to the dFIRM floodplain may be found in **Figure 4.3-7**.

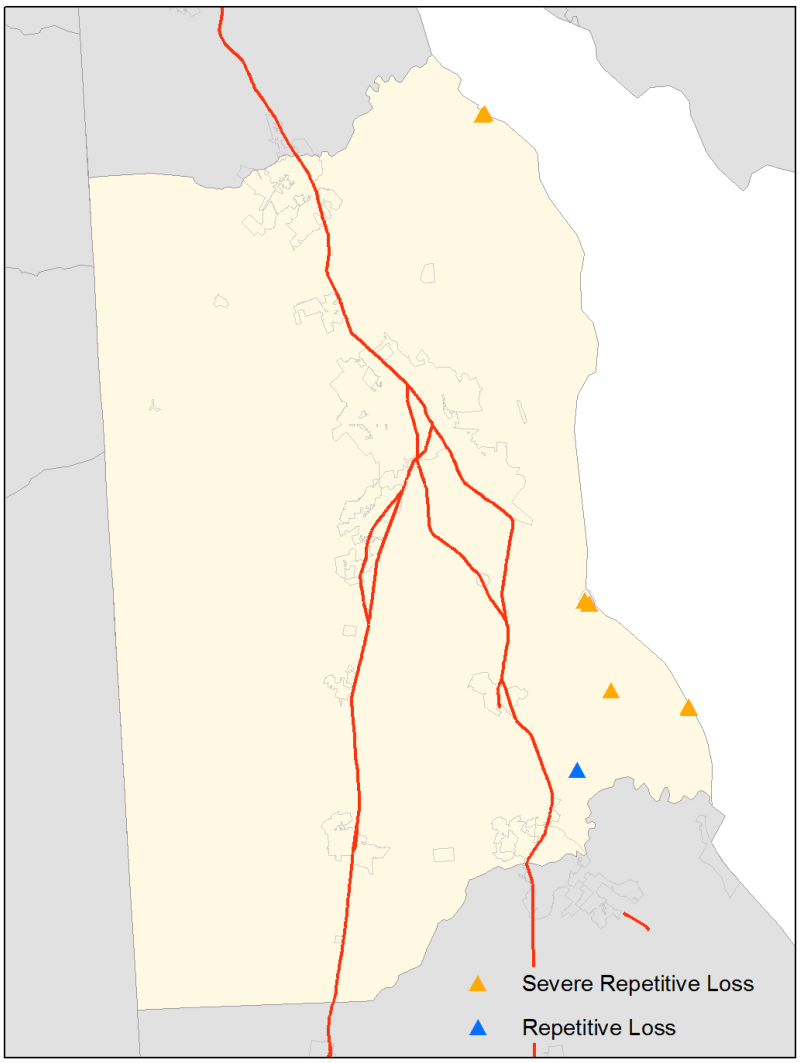
Table 4.3-3
Repetitive Loss Properties as of April 2014

Jurisdiction	Number of Properties	Total Number of Policies per Jurisdiction	Total Payments	Average Payment per Claim
Kent County	2	699	$218,060	$54,515
Town of Bowers	1	119	$107,019	$53,509

Table 4.3-4
Severe Repetitive Loss Properties as of April 2014

Jurisdiction	Number of Properties	Total Number of Policies per Jurisdiction	Total Payments	Average Payment per Claim
Kent County	6	699	$625,752	$36,499
Town of Bowers	2	119	$147,943	$36,986
Town of Smyrna	1	30	$133,366	$33,342

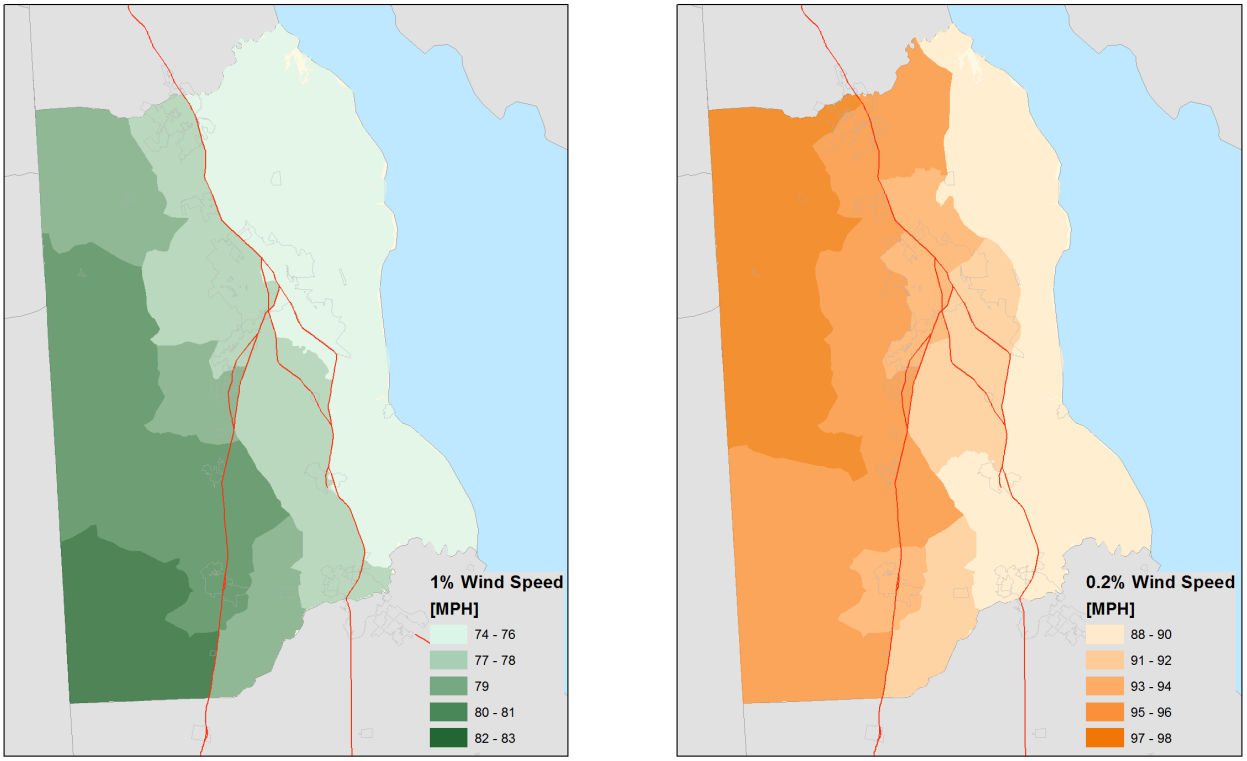
Figure 4.3-7
Location of Repetitive Loss Properties



4.3.6 Coastal Winds

Historical evidence shows that the State of Delaware is vulnerable to severe, hurricane and tropical storm-force winds. The approach for determining vulnerability to coastal winds included a number of factors. HAZUS-MH was used for wind speed data as well as an inventory and in-house damage functions, which were used in estimating losses. The potential hurricane wind gusts that could affect the area range from 74 to 83 mph for a 1% chance per year event to 88 to 98 mph for a 0.2% chance per year event, with the stronger winds being on the western side of the county (**Figure 4.3-8**).

Figure 4.3-8
Potential Hurricane Wind Gusts for 1% and 0.2% per year Wind Events



Modeled from HAZUS-MH, the total built property exposure to coastal winds (both building and contents) in the county is $29,312,397,000 (**Table 4.3-5**). Comparing this to the total building assessed value from the County's property data (around $3 billion), it seems that HAZUS-MH's estimates of exposure are quite a bit higher than one would expect. Thus, the total estimated annualized losses of $$2,730,424 need to be understood in context as also being extraordinarily elevated. The standardized loss ratio of 0.000093 (or 47x less potential annual damage from wind as flooding) makes more sense given historical loss records. Loss ratios in the county's municipalities range from 0.000056 in Clayton to 0.000165 in Houston. Among the CCDs, Felton and Harrington are most vulnerable to coastal wind (0.000137).

Table 4.3-5
Potential Annualized Losses from Coastal Winds by Jurisdiction

Jurisdiction	Total Exposure	Estimated Losses	Loss Ratio
Bowers Beach	$1,959,060	$296	0.000151
Camden	$690,147,652	$65,887	0.000095
CCD Central Kent	$3,724,126,139	$501,094	0.000135
CCD Dover	$6,942,615,339	$625,933	0.000090
CCD Felton	$839,347,820	$115,294	0.000137
CCD Harrington	$1,977,116,154	$270,947	0.000137
CCD Kenton	$1,013,716,423	$79,347	0.000078
CCD Milford North	$1,468,837,441	$186,014	0.000127
CCD Smyrna	$3,347,087,475	$242,770	0.000073
Cheswold	$108,001,640	$8,418	0.000078
Clayton	$417,190,844	$23,309	0.000056
Dover	$6,627,391,313	$431,697	0.000065
Farmington	$456,140	$63	0.000138
Felton	$11,117,125	$1,527	0.000137
Frederica	$49,009,710	$6,498	0.000133
Harrington	$166,140,453	$18,097	0.000109
Hartly	$1,126,738	$91	0.000081
Houston	$11,372,236	$1,876	0.000165
Kenton	$3,537,283	$277	0.000078
Leipsic	$2,083,950	$305	0.000146
Little Creek	$6,219,291	$585	0.000094
Magnolia	$19,179,584	$2,807	0.000146
Milford	$650,899,383	$63,420	0.000097
Smyrna	$931,797,557	$55,980	0.000060
Viola	$5,581,948	$689	0.000123
Woodside	$5,446,047	$672	0.000123
Wyoming	$290,569,541	$26,490	0.000091
TOTAL	**$29,312,397,000**	**$2,730,424**	**0.000093**

Another means of gauging the vulnerability within Kent County to coastal wind was the vulnerability of critical facilities to the 1% chance per year and 0.2% chance per year wind return periods. During a 1% chance per year wind event, only 1 critical facility has more than a 50% chance of sustaining minor, moderate, or severe damage, namely Kent General Hospital in Dover. In a 0.2% chance per year wind event, just 1 facility has a better than 50% chance of sustaining severe (10 to 50%) damage, namely Kent General Hospital in Dover (**Table 4.3-6**).

Table 4.3-6
Potential Damage to Critical Facilities from Coastal Winds by Jurisdiction[3]

Jurisdiction	Total Number of Critical Facilities	1% chance per year Wind			0.2% chance per year Wind		
		> 50 % Chance of Minor Damage	> 50 % Chance of Moderate Damage	> 50 % Chance of Severe Damage	> 50 % Chance of Minor Damage	> 50 % Chance of Moderate Damage	> 50 % Chance of Severe Damage
Bowers Beach	1	0	0	0	0	0	0
Camden	9	0	0	0	0	0	0
CCD Central Kent	5	0	0	0	0	0	0
CCD Dover	17	0	0	0	0	0	0
CCD Felton	2	0	0	0	0	0	0
CCD Harrington	1	0	0	0	0	0	0
CCD Kenton	2	0	0	0	0	0	0
CCD Milford North	1	0	0	0	0	0	0
CCD Smyrna	1	0	0	0	0	0	0
Cheswold	1	0	0	0	0	0	0
Clayton	3	0	0	0	0	0	0
Dover	24	0	0	1	0	0	1
Farmington	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Felton	3	0	0	0	0	0	0
Frederica	2	0	0	0	0	0	0
Harrington	5	0	0	0	0	0	0
Hartly	1	0	0	0	0	0	0
Houston	1	0	0	0	0	0	0
Kenton	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Leipsic	1	0	0	0	0	0	0
Little Creek	1	0	0	0	0	0	0
Magnolia	2	0	0	0	0	0	0
Milford	5	0	0	0	0	0	0
Smyrna	8	0	0	0	0	0	0
Viola	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Woodside	1	0	0	0	0	0	0
Wyoming	3	0	0	0	0	0	0
TOTAL	**100**	**0**	**0**	**1**	**0**	**0**	**1**

[3] The definitions used are as follows. Negligible: less than 1 percent damage. Slight: 1 to 5 percent damage. Moderate: 5 to 30 percent damage. Extensive (where applicable): 30 to 60 percent damage.

4.3.7 Severe Thunderstorm/Wind

Kent County, according to historical records, is affected by severe thunderstorms several times a year. The strong winds and lightning generated from severe thunderstorms pose a threat to the residents, the built environment, and particularly the trees within the County. However, because severe thunderstorms are not spatially-constrained, one must consider the entire County at risk. In addition, the extent of damage from severe thunderstorm wind may be either localized or widespread but it is rarely consistent across space. Therefore, it is impossible to predict if certain areas of the county may be more vulnerable than others and even to estimate the number of buildings that may suffer loss from a severe thunderstorm wind.

Therefore, the approach to determining the County's vulnerability to severe thunderstorm wind is to examine not just severe thunderstorm events in the County boundary, but to look at all of the events of the neighboring counties within 25 miles of the boundary of the County as well. A severe thunderstorm that impacts Caroline County, MD (to the west of Kent County) could have just as easily impacted Kent County instead. The actual location of the severe thunderstorm at this scale of analysis is simply a matter of luck rather than any of the County's unique geographical factors. Because the neighboring jurisdictions are of differing sizes and densities, the results for must be scaled appropriately. For example, Kent County had 5.68 severe thunderstorm events per year, compared to New Castle County's 7.09 events per year. But, Kent County is bigger than New Castle – one would expect the larger county to have more thunderstorm events. In fact, Kent County is 137.5% the size of New Castle County. Therefore, a county the size of New Castle should have been impacted by 9.75 events per year if the county had been the same size as Kent. The annualized losses are scaled similarly, but use numbers of housing units as a proxy for differences in building exposure.

Table 4.3-7 shows the number of events in Kent County and those counties within 25 miles of Kent County. **Table 4.3-8** shows the number of annual events and the amount of annual loss in Kent County and those counties within 25 miles of the County after the appropriate scale factor has been applied. **Table 4.3-9** shows annualized expected losses from severe thunderstorm wind events by jurisdiction within Kent County. The total estimated annualized losses for the county equal $88,589 or a loss ratio of 0.000027.

Table 4.3-7
Losses from Severe Thunderstorm Wind Events (NOAA)

County	Total Events	Total Loss	Years	Annual Events	Annual Loss	Deaths	Injuries
Kent County, DE	318	$3,473,000	56	5.68	$62,018	0	2
New Castle County, DE	383	$14,942,000	54	7.09	$276,704	1	6
Sussex County, DE	600	$8,185.000	57	10.53	$143,596	1	7
Kent County, MD	231	$710,480	46	5.02	$15,445	0	10
Queen Anne's County, MD	221	$1,253,000	40	5.53	$31,325	0	4
Caroline County, MD	188	$769,800	58	3.24	$13,373	0	1
Average	**323.5**	**$4,888,880**	**51.8**	**6.18**	**$90,410**	**0.3**	**5.0**

Table 4.3-8
Normalized Occurrences and Losses from Severe Thunderstorm Wind Events

County	Annual Events	Area Scale Factor	Scaled Events	Annual Loss	HU Scale Factor	Scaled Annual Loss
Kent County, DE	5.68	1.000	5.68	$62,018	1.000	$62,018
New Castle County, DE	7.09	1.375	9.75	$276,704	0.306	$84,608
Sussex County, DE	10.53	0.626	6.59	$143,596	0.528	$75,825
Kent County, MD	5.02	2.116	10.62	$15,445	6.298	$97,279
Queen Anne's County, MD	5.53	1.576	8.72	$31,325	3.301	$103,389
Caroline County, MD	3.24	1.835	5.95	$13,373	4.966	$66,412
Normalized Average			**7.88**			**$88,589**

Table 4.3-9
Potential Losses from Thunderstorm Wind by Jurisdiction

Jurisdiction	Total Exposure	% of Total Exposure	Estimated Losses
Bowers Beach	$7,182,154	0.219	$194
Camden	$73,141,732	2.227	$1,972
CCD Central Kent	$444,420,828	13.530	$11,981
CCD Dover	$628,957,377	19.149	$16,956
CCD Felton	$109,659,741	3.339	$2,957
CCD Harrington	$179,225,267	5.183	$4,589
CCD Kenton	$115,083,828	3.504	$3,103
CCD Milford North	$124,164,839	3.780	$3,347
CCD Smyrna	$231,377,241	7.044	$6,237
Cheswold	$16,991,783	0.518	$459
Clayton	$52,294,064	1.592	$1,410
Dover	$844,922,049	25.724	$22,778
Farmington	$1,300,648	0.040	$35
Felton	$21,167,271	0.644	$570
Frederica	$10,837,285	0.330	$292
Harrington	$59,117,411	1.800	$1,594
Hartly	$983,149	0.030	$27
Houston	$5,452,527	0.166	$147
Kenton	$3,322,168	0.101	$89
Leipsic	$2,459,068	0.075	$66
Little Creek	$2,361,793	0.072	$64
Magnolia	$3,135,862	0.095	$84
Milford	$111,284,044	3.388	$3,000
Smyrna	$215,816,547	6.571	$5,819
Viola	$2,160,536	0.066	$58
Woodside	$2,997,870	0.091	$81
Wyoming	$23,586,371	0.718	$636
TOTAL	**$3,284,595,900**	**100.0**	**$88,589**

4.3.8 Tornado

Historical evidence shows that Kent County is vulnerable to tornadic activity. This particular hazard may result from severe thunderstorm activity or may occur during a tropical storm or hurricane. Because it cannot be predicted where a tornado may touch down, all buildings and facilities are considered to be exposed to this hazard and could potentially be impacted. It is also not possible to estimate the number of residential, commercial, and other buildings or facilities that may experience losses.

The approach to determining vulnerability to tornadoes is similar to that used for severe thunderstorm wind. Historical tornado loss data from the National Oceanic and Atmospheric Administration (NOAA) was gathered for Kent County and the neighboring counties within 25 miles of the boundary of the County. All historical losses were scaled to account for inflation, and average historic tornado losses were calculated (**Table 4.3-10**). As with severe thunderstorms (above), because the neighboring jurisdictions are of differing sizes and densities, the results must be normalized appropriately using the method described previously (**Table 4.3-11**). **Table 4.3-12** shows annualized expected losses from tornado events by jurisdiction within Kent County. The total estimated annualized losses for the county equal $45,532 or a loss ratio of 0.000013. The location and magnitude of past tornado events within the county, in relation to population density, is presented in **Figure 4.3-9**.

Table 4.3-10
Losses from Tornado Events (NOAA)

County	Total Events	Total Loss	Years	Annual Events	Annual Loss	Deaths	Injuries
Kent County, DE	20	$5,158,000	50	0.40	$103,160	2	56
New Castle County, DE	23	$7,413,000	60	0.38	$123,550	0	8
Sussex County, DE	19	$593,500	59	0.32	$10,059	0	11
Kent County, MD	4	$502,500	64	0.06	$7,852	0	0
Queen Anne's County, MD	10	$526,000	49	0.20	$10,735	0	0
Caroline County, MD	5	$375,250	62	0.08	$6,052	0	0
Average	**13.5**	**$2,428,042**	**57.3**	**0.240**	**$43,568**	**0.3**	**12.5**

Table 4.3-11
Normalized Occurrences and Losses from Tornado Events

County	Annual Events	Area Scale Factor	Scaled Events	Annual Loss	HU Scale Factor	Scaled Annual Loss
Kent County, DE	0.40	1.000	0.40	$103,160	1.000	$103,160
New Castle County, DE	0.38	1.375	0.52	$123,550	0.306	$37,778
Sussex County, DE	0.32	0.626	0.20	$10,059	0.528	$5,312
Kent County, MD	0.06	2.116	0.13	$7,852	6.298	$49,455
Queen Anne's County, MD	0.20	1.576	0.32	$10,735	3.301	$35,431
Caroline County, MD	0.08	1.835	0.15	$6,052	4.966	$30,055
Normalized Average			**0.285**			**$45,532**

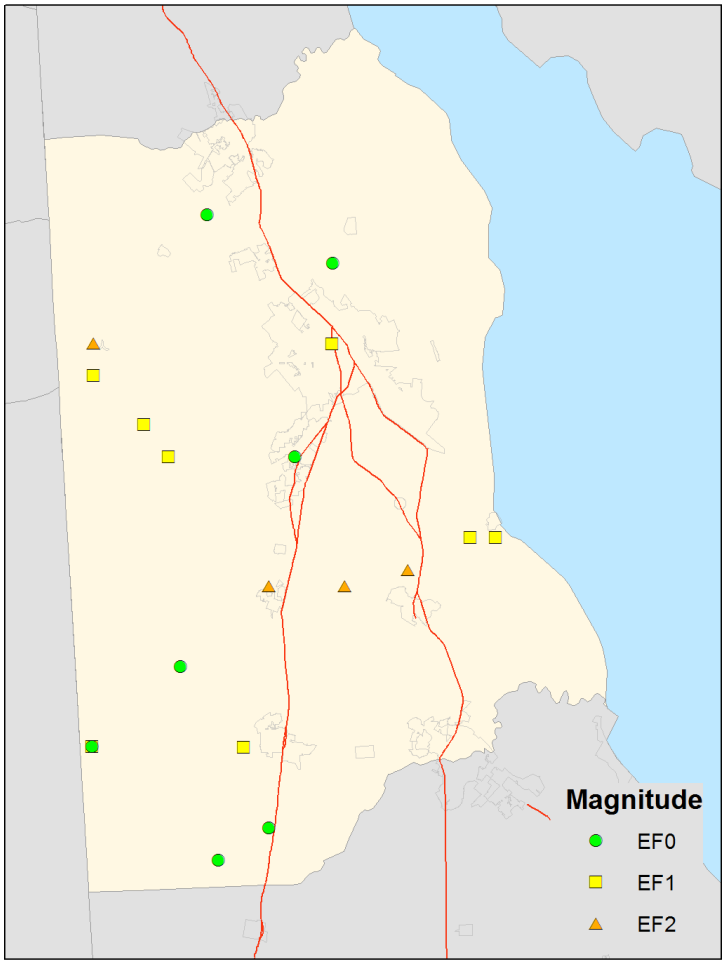
Table 4.3-12

Potential Annualized Losses from Tornado by Jurisdiction

Jurisdiction	Total Exposure	% of Total Exposure	Estimated Losses
Bowers Beach	$7,182,154	0.219	$100
Camden	$73,141,732	2.227	$1,014
CCD Central Kent	$444,420,828	13.530	$6,160
CCD Dover	$628,957,377	19.149	$8,719
CCD Felton	$109,659,741	3.339	$1,520
CCD Harrington	$179,225,267	5.183	$2,360
CCD Kenton	$115,083,828	3.504	$1,595
CCD Milford North	$124,164,839	3.780	$1,721
CCD Smyrna	$231,377,241	7.044	$3,207
Cheswold	$16,991,783	0.518	$236
Clayton	$52,294,064	1.592	$725
Dover	$844,922,049	25.724	$11,713
Farmington	$1,300,648	0.040	$18
Felton	$21,167,271	0.644	$293
Frederica	$10,837,285	0.330	$150
Harrington	$59,117,411	1.800	$820
Hartly	$983,149	0.030	$14
Houston	$5,452,527	0.166	$76
Kenton	$3,322,168	0.101	$46
Leipsic	$2,459,068	0.075	$34
Little Creek	$2,361,793	0.072	$33
Magnolia	$3,135,862	0.095	$43
Milford	$111,284,044	3.388	$1,543
Smyrna	$215,816,547	6.571	$2,992
Viola	$2,160,536	0.066	$30
Woodside	$2,997,870	0.091	$41
Wyoming	$23,586,371	0.718	$327
TOTAL	**$3,284,595,900**	**100.0**	**$45,532**

Figure 4.3-9

Location and Magnitude of Past Tornado Events



4.3.9 Drought

Although the State of Delaware as a whole is vulnerable to drought, estimated potential losses are somewhat difficult to calculate because drought causes little damage to the built environment, mostly affecting crops and farmland. Therefore, it is assumed that all buildings and facilities are exposed to drought but would experience negligible damage in the occurrence of a drought event.

The approach used to determine vulnerability within Kent County consisted of a number of factors. Statistical data for the past 100 years from the University of Nebraska, developed based on Palmer Drought and Crop Severity Indices, was analyzed. Drought event frequency/impact was then determined for Kent County. Also used was USDA agriculture data from 2012. Drought impact on the non-irrigated agriculture products profile was then determined. **Table 4.3-13** shows annualized expected losses from drought events by rural jurisdiction within Kent County. The total estimated annualized losses for the county equal $470,588. Given the total value of land in farms in Kent County is $1,377,914,128, which yields an annualized loss ratio of 0.00034.

Figure 4.3-10 shows the hazard profile for drought in the geographic area surrounding Kent County[4].

4.3.10 Hail

The State of Delaware is minimally vulnerable to hail storms. Hail does occur in the Mid-Atlantic but is usually not large enough nor widespread enough to cause any significant damage to the built environment. It does, however, have the potential of harming crops in the agricultural areas of Kent County.

The approach to determining vulnerability to hail is similar to that used for severe thunderstorm wind. Historical hail loss data from the National Oceanic and Atmospheric Administration (NOAA) was gathered for Kent County and the neighboring counties within 25 miles of the boundary of the County. All historical losses were scaled to account for inflation, and average historic losses were calculated (**Table 4.3-14**). As with severe thunderstorms (above), because the neighboring jurisdictions are of differing sizes and densities, the results must be normalized appropriately using the method described previously (**Table 4.3-15**). Because the total estimated annualized losses for the county is negligible ($2,779), annualized expected losses from hail events by jurisdiction were not calculated.

[4] This information was obtained from the National Drought Mitigation Center (www.drought.unl.edu), which helps people and institutions develop and implement measures to reduce societal vulnerability to drought, stressing preparedness and risk management rather than crisis management.

Table 4.3-13
Potential Losses from Drought by Jurisdiction

Jurisdiction	Total Exposure	% of Total Exposure	Estimated Losses
CCD Central Kent	$110,973,070	8.054	$37,900
CCD Dover	$168,612,596	12.237	$57,585
CCD Felton	$179,812,282	13.050	$61,410
CCD Harrington	$235,572,333	17.096	$80,453
CCD Kenton	$132,051,022	9.583	$45,098
CCD Milford North	$360,440,289	26.158	$123,098
CCD Smyrna	$190,452,535	13.822	$65,044
TOTAL	**$1,377,914,128**	**100.0**	**$470,588**

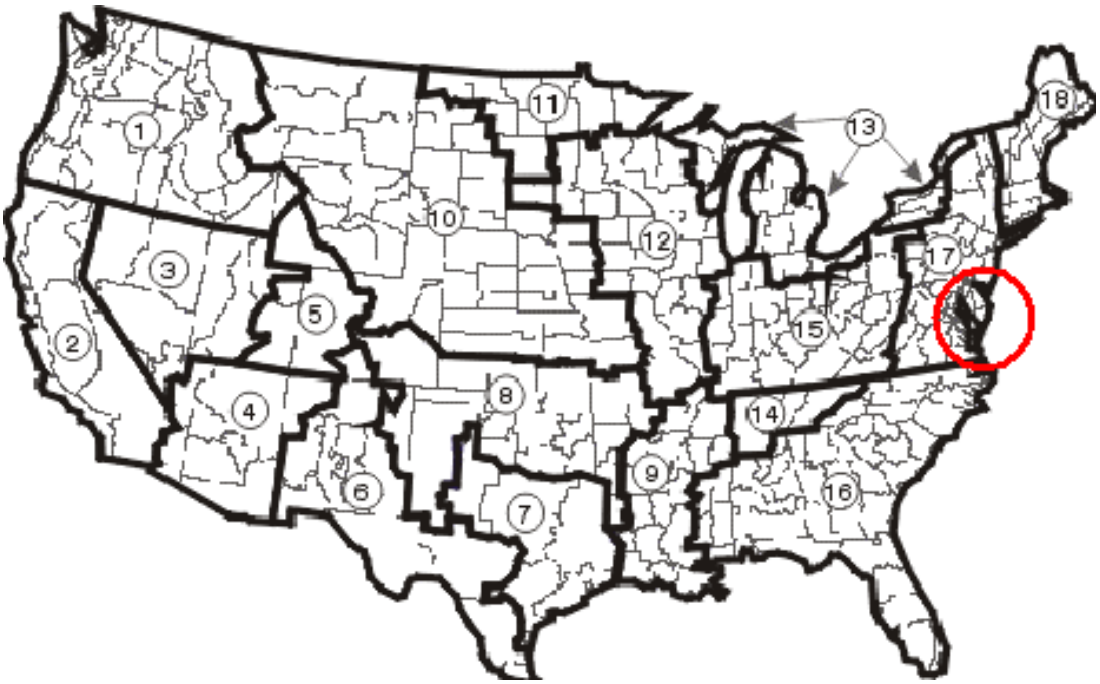
Table 4.3-14
Losses from Hail Events (NOAA)

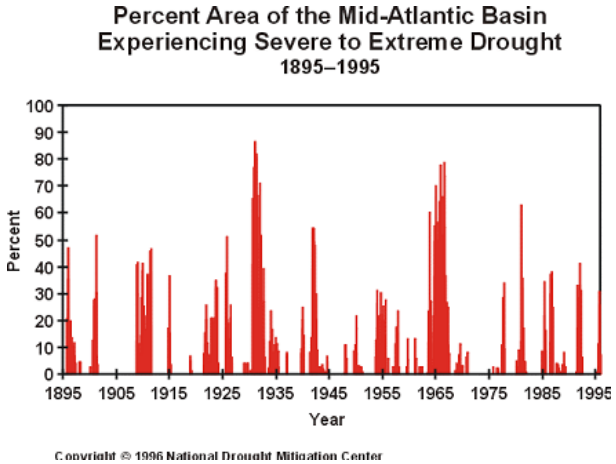
County	Total Events	Total Loss	Years	Annual Events	Annual Loss	Deaths	Injuries
Kent County, DE	24	$105,000	46	0.52	$2,283	0	0
New Castle County, DE	53	$5,000	44	1.20	$114	0	0
Sussex County, DE	31	$310,000	46	0.67	$6,739	0	0
Kent County, MD	15	$0	39	0.38	$0.00	0	0
Queen Anne's County, MD	10	$0	30	0.33	$0.00	0	0
Caroline County, MD	13	$50,000	23	0.57	$2,174	0	0
Average	**24.3**	**$78,333.33**	**38.0**	**0.533**	**$1,885**	**0**	**0**

Table 4.3-15
Normalized Occurrences and Losses from Hail Events

County	Annual Events	Area Scale Factor	Scaled Events	Annual Loss	HU Scale Factor	Scaled Annual Loss
Kent County, DE	0.52	1.000	0.52	$2,283	1.000	$2,283
New Castle County, DE	1.20	1.375	1.65	$114	0.306	$35
Sussex County, DE	0.67	0.626	0.42	$6,739	0.528	$3,559
Kent County, MD	0.38	2.116	0.80	$0.00	6.298	$0
Queen Anne's County, MD	0.33	1.576	0.52	$0.00	3.301	$0
Caroline County, MD	0.57	1.835	1.05	$2,174	4.966	$10,796
Normalized Average			**0.83**			**$2,779**

Figure 4.3-10
Hazard Profile for Drought In and Around Kent County





4.3.11 Winterstorms

Historical evidence shows that Kent County is quite vulnerable to winter storms, with several occurring each year. Because winter storms generally impact large areas, all buildings and facilities are considered to be exposed to this hazard and could potentially be impacted. It is also not possible to estimate the number of residential, commercial, and other buildings or facilities that may experience losses.

The approach to determining vulnerability to winter storms is similar to that used for severe thunderstorm wind. Historical winter storm loss data from the National Oceanic and Atmospheric Administration (NOAA) was gathered for Kent County and the neighboring counties within 25 miles of the boundary of the County. All historical losses were scaled to account for inflation, and average historic losses were calculated (**Table 4.3-16**). As with severe thunderstorms (above), because the neighboring jurisdictions are of differing sizes and densities, the results must be normalized appropriately using the method described previously (**Table 4.3-17**). **Table 4.3-18** shows annualized expected losses from winter storm events by jurisdiction within Kent County. The total estimated annualized losses for the county equal $90,867[5] and an annualized loss ratio of 0.000028.

Table 4.3-16
Losses from Winter Storm Events (NOAA)

County	Total Events	Total Loss	Years	Annual Events	Annual Loss	Deaths	Injuries
Kent County, DE	110	$3,650,000	21	5.24	$173,810	0	5
New Castle County, DE	141	$5,350,000	21	6.71	$254,762	4	76
Sussex County, DE	185	$6,300,000	21	8.81	$300,000	1	15
Kent County, MD	102	$125,000	21	4.86	$5,952	0	0
Queen Anne's County, MD	101	$320,000	21	4.81	$15,238	1	1
Caroline County, MD	95	$200,000	21	4.52	$9,524	0	0
Average	**122.3**	**$2,657,500**	**21**	**5.83**	**$126,548**	**1.0**	**16.2**

Table 4.3-17
Normalized Occurrences and Losses from Winter Storm Events

COUNTY	ANNUAL EVENTS	AREA SCALE FACTOR	SCALED EVENTS	ANNUAL LOSS	HU SCALE FACTOR	SCALED ANNUAL LOSS
Kent County, DE	5.24	1.000	5.24	$173,810	1.000	$173,810
Kent County, DE	6.71	1.375	9.23	$254,762	0.306	$77,899
Cecil County, MD	8.81	0.626	5.52	$300,000	0.528	$158,413
Kent County, MD	4.86	2.116	10.28	$5,952	6.298	$37,488
Chester County, PA	4.81	1.576	7.58	$15,238	3.301	$50,293
Delaware County, PA	4.52	1.835	8.29	$9,524	4.966	$47,297
Normalized Average			**7.69**			**$90,867**

[5] It is important to note that for winter storm, some factors that contribute to a community's actual and perceived losses are not reflected in this analysis, such as removal of snow from roadways, debris clean-up, some indirect losses from power outages, etc.

Table 4.3-18
Potential Annualized Losses from Winter Storms by Jurisdiction

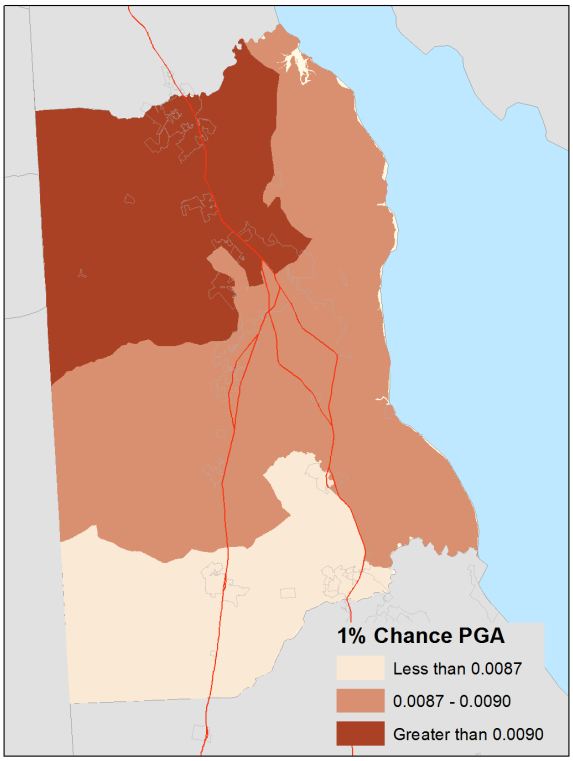
Jurisdiction	Total Exposure	% of Total Exposure	Estimated Losses
Bowers Beach	$7,182,154	0.219	$199
Camden	$73,141,732	2.227	$2,024
CCD Central Kent	$444,420,828	13.530	$12,294
CCD Dover	$628,957,377	19.149	$17,400
CCD Felton	$109,659,741	3.339	$3,034
CCD Harrington	$179,225,267	5.183	$4,710
CCD Kenton	$115,083,828	3.504	$3,184
CCD Milford North	$124,164,839	3.780	$3,435
CCD Smyrna	$231,377,241	7.044	$6.401
Cheswold	$16,991,783	0.518	$471
Clayton	$52,294,064	1.592	$1,447
Dover	$844,922,049	25.724	$23,375
Farmington	$1,300,648	0.040	$36
Felton	$21,167,271	0.644	$585
Frederica	$10,837,285	0.330	$300
Harrington	$59,117,411	1.800	$1,636
Hartly	$983,149	0.030	$27
Houston	$5,452,527	0.166	$151
Kenton	$3,322,168	0.101	$92
Leipsic	$2,459,068	0.075	$68
Little Creek	$2,361,793	0.072	$65
Magnolia	$3,135,862	0.095	$86
Milford	$111,284,044	3.388	$3,079
Smyrna	$215,816,547	6.571	$5,971
Viola	$2,160,536	0.066	$60
Woodside	$2,997,870	0.091	$83
Wyoming	$23,586,371	0.718	$652
TOTAL	**$3,284,595,900**	**100.0**	**$90,867**

4.3.12 Earthquake

Figure 4.3-11 shows the potential ground motion for a 100-year and 500-year earthquake. While Kent County has felt earthquakes every so often, none have been significant enough to cause any damage for well over 100 years. The coastal plain of the Mid-Atlantic is notorious for being a seismically quiet zone. However, if a serious earthquake were to occur, the losses would likely be significant. This explains the amount of potential annualized losses for the county of $43,454 (**Table 4.3-19**). **Table 4.3-20** shows potential damage to critical facilities from earthquake events by jurisdiction within Kent County.

Figure 4.3-11
Peak Ground Acceleration (Ground Motion) for 1% and 0.2% Chance per Year Events

1% Chance per Year Ground Motion



0.2% Chance per Year Ground Motion

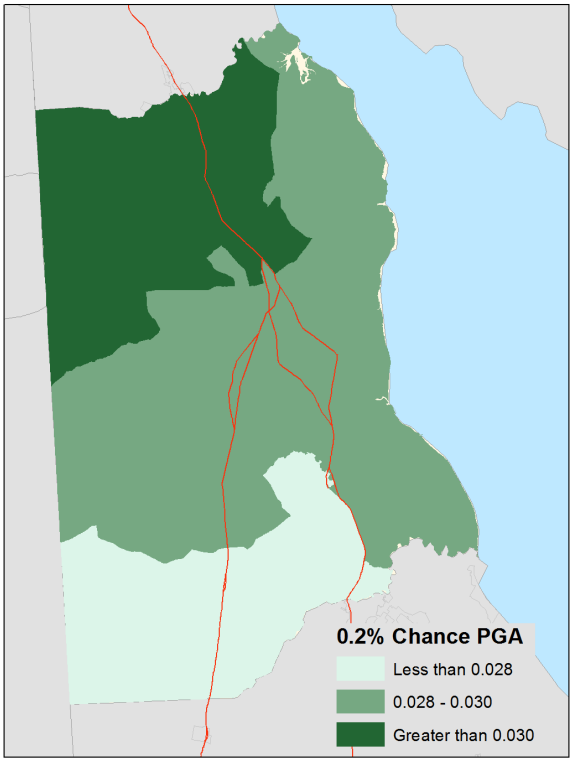


Table 4.3-19
Potential Annualized Losses from Earthquake per Jurisdiction

Jurisdiction	Total Exposure	Estimated Losses	Loss Ratio
Bowers Beach	$1,959,060	$6	0.0000031
Camden	$690,147,652	$1,964	0.0000028
CCD Central Kent	$3,724,126,139	$10,133	0.0000027
CCD Dover	$6,942,615,339	$21,737	0.0000031
CCD Felton	$839,347,820	$2,340	0.0000028
CCD Harrington	$1,977,116,154	$4,885	0.0000025
CCD Kenton	$1,013,716,423	$3,430	0.0000034
CCD Milford North	$1,468,837,441	$3,878	0.0000026
CCD Smyrna	$3,347,087,475	$11,560	0.0000035
Cheswold	$108,001,641	$361	.0.0000033
Clayton	$417,190,844	$1,464	0.0000035
Dover	$6,627,391,313	$22,238	0.0000034
Farmington	$456,140	$1	0.0000022
Felton	$11,117,125	$31	0.0000028
Frederica	$49,009,710	$129	0.0000026
Harrington	$166,140,453	$434	0.0000026
Hartly	$1,126,738	$4	0.0000036
Houston	$11,372,236	$27	0.0000024
Kenton	$3,537,283	$12	0.0000034
Leipsic	$2,083,950	$7	0.0000034
Little Creek	$6,219,291	$19	0.0000031
Magnolia	$19,179,584	$50	0.0000026
Milford	$650,899,383	$1,536	0.0000024
Smyrna	$931,797,557	$3,226	0.0000035
Viola	$5,581,948	$16	0.0000029
Woodside	$5,446,047	$15	0.0000028
Wyoming	$290,569,541	$838	0.0000029
TOTAL	**$29,312,397,000**	**$90,342**	**0.0000031**

Table 4.3-20
Potential Damage to Critical Facilities from Earthquakes per Jurisdiction[6]

Jurisdiction	Total Number of Critical Facilities	1% chance per year			0.2% chance per year		
		Moderate Damage	Slight Damage	Negligible Damage	Moderate Damage	Slight Damage	Negligible Damage
Bowers Beach	1	0	0	1	0	0	1
Camden	9	0	0	9	0	0	9
CCD Central Kent	5	0	0	5	0	0	5
CCD Dover	17	0	0	17	0	0	17
CCD Felton	2	0	0	2	0	0	2
CCD Harrington	1	0	0	1	0	0	1
CCD Kenton	2	0	0	2	0	0	2
CCD Milford North	1	0	0	1	0	0	1
CCD Smyrna	1	0	0	1	0	0	1
Cheswold	1	0	0	1	0	0	1
Clayton	3	0	0	3	0	0	3
Dover	24	0	0	24	0	0	24
Farmington	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Felton	3	0	0	3	0	0	3
Frederica	2	0	0	2	0	0	2
Harrington	5	0	0	5	0	0	5
Hartly	1	0	0	1	0	0	1
Houston	1	0	0	1	0	0	1
Kenton	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Leipsic	1	0	0	1	0	0	1
Little Creek	1	0	0	1	0	0	1
Magnolia	2	0	0	2	0	0	2
Milford	5	0	0	5	0	0	5
Smyrna	8	0	0	8	0	0	8
Viola	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Woodside	1	0	0	1	0	0	1
Wyoming	3	0	0	3	0	0	3
TOTAL	**100**	**0**	**0**	**100**	**0**	**0**	**100**

[6] The definitions used are as follows. Negligible: less than 1 percent damage. Slight: 1 to 5 percent damage. Moderate: 5 to 30 percent damage. Extensive (where applicable): 30 to 60 percent damage.

4.3.13 Dam/Levee Failure

The approach for determining vulnerability to dam and/or levee failure consists of a number of factors. Data from the USACE National Inventory of Dams (NID)[7] in addition to the HAZUS-MH demographic inventory was used, with an assumption that dam breaks most likely will occur at the time of maximum capacity.[8] The affected population was then calculated.

Table 4.3-21 shows estimated exposure of people to dam failure.

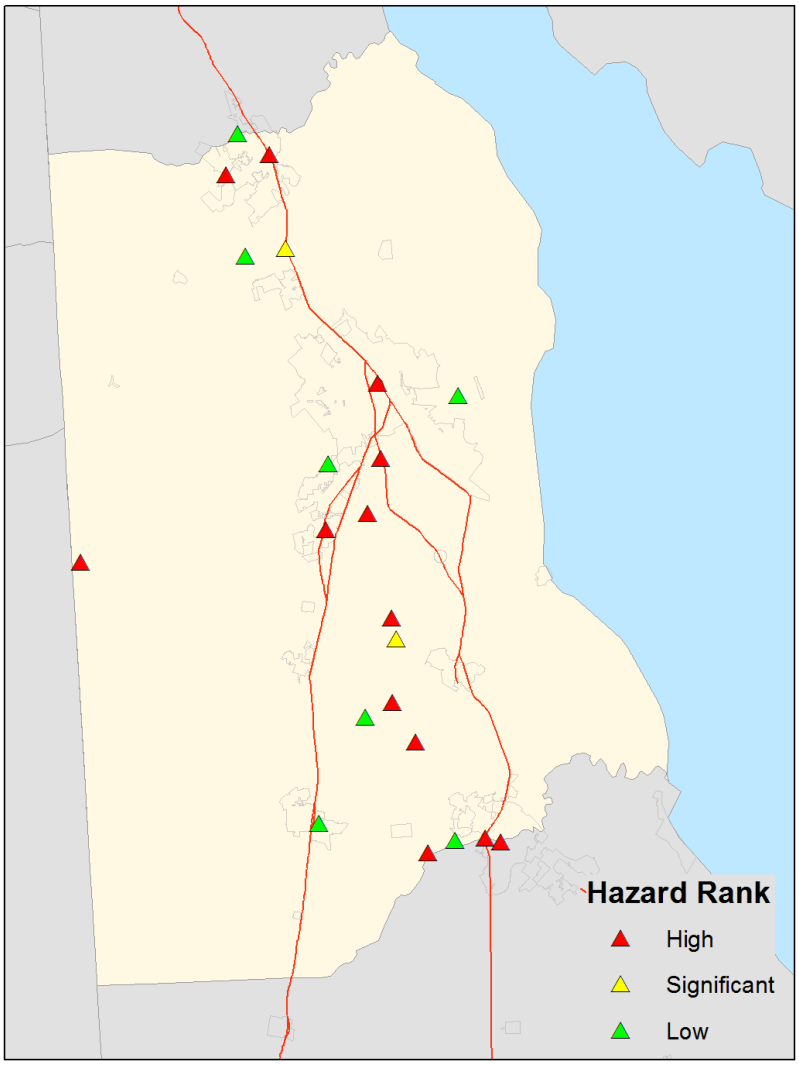
Table 4.3-21
Estimated Exposure of People to Dam Failure

Dam Name	Nearest City/Town	Potential People at Risk
Silver Lake Dam	Dover	2,329
Moores Lake Dam	Dover	1,308
Silver Lake Dam	Milford	1,003
Wyoming Lake Dam	Camden	979
Voshell Pond Dam	Rising Sun	810
Haven Lake Dam	Milford	659
Garrisons Lake Dam	Leipsic	313
Derby Pond Dam	Woodside	177
Tub Mill Pond Dam	Milford S	140
Coursey Pond Dam	Frederica	115

Figure 4.3-12 shows the location of dams within Kent County, along with their hazard ranking (high, significant or low), in relation to population density.

[7] With the National Dam Inspection Act of 1972, the U.S. Congress authorized the U.S. Army Corps of Engineers (USACE) to inventory dams located in the United States. The Water Resources Development Act of 1986 authorized USACE to maintain and periodically publish an updated National Inventory of Dams (NID).
[8] Downstream quarter-circle buffer proportional to the maximum capacity of dams are assumed to represent the maximum impact area.

Figure 4.3-12
Location of Dams



4.3.14 Weapons of Mass Destruction

Using FEMA Publication 426—Reference Manual to Mitigate Potential Terrorist Attacks in High Occupancy Buildings—as a basis, a vulnerability assessment was conducted for Weapons of Mass Destruction (WMDs) in order to expand the scope of the hazard mitigation planning process in the State of Delaware to include vulnerability to acts of terrorism. The methodology used employs a vulnerability ranking of 1 to 5 for certain transportation, water/hydrology, emergency and public safety, and utility elements. The sum total for each element is then multiplied against a value for that asset (also on a 1 to 5 scale) and multiplied against a factor representing the Department of Homeland Security Threat Level. For the purposes of this Plan, the Threat Level is assumed to be Orange (High). This part of the assessment is the same for all three counties in Delaware. In the final analysis, the total risk for each county is multiplied by a unique weighted factor to arrive at county-specific scores. For Kent County, a weighted factor of 1.15 was used. Abbreviated findings of this methodology are presented in **Table 4.3-22**. Complete information is stored in a Microsoft® Excel® file separate from this Plan.

Table 4.3-22
Assessment of Vulnerability to Weapons of Mass Destruction

	Based on FEMA 426: Reference Manual to Mitigate Potential Terrorist Attacks in High Occupancy Buildings																
	Asset Visibility	Target Value to Pot. Threat Element	Asset Accessability	Asset Mobility	Target Threat of CBR Hazard	Collateral Damage Potential	Site Population/Capacity	Pot. for Collateral Mass Casualties	SUM		Asset Value of Target Site		Homeland Security Threat Condition		Risk	X	Kent 0.85
Transportation																	
Major bridges	5	4	5	5	0	2	1	0	**22**	X	**4**	X	**6**	=	**528**	:	**449**
Airports	4	4	3	5	0	1	2	0	**19**	X	**4**	X	**6**	=	**456**	:	**388**
Water / Hydrology																	
Reservoirs	3	5	3	5	1	3	1	0	**21**	X	**5**	X	**6**	=	**630**	:	**536**
Dams	4	5	2	5	1	4	1	0	**22**	X	**5**	X	**6**	=	**660**	:	**561**
Emergency and Public Safety																	
Hospitals	4	3	4	5	4	2	2	2	**26**	X	**5**	X	**6**	=	**780**	:	**663**
Military Facilities	2	4	1	5	4	3	3	2	**24**	X	**5**	X	**6**	=	**720**	:	**612**
Schools	4	4	4	5	1	1	2	1	**22**	X	**3**	X	**6**	=	**396**	:	**337**
Utilities																	
Gas LNG plant	3	3	3	5	2	3	1	2	**22**	X	**3**	X	**6**	=	**396**	:	**337**
Electric substations	3	2	3	5	1	2	1	0	**17**	X	**2**	X	**6**	=	**204**	:	**173**

In order to give some perspective to these findings, the final scores for each element in Table 4.3-15 were compared to the maximum score defined in FEMA Publication 426 (**Table 4.3-23**). This comparison shows hospitals, military facilities and day care centers to have the three highest rankings compared to all other elements. These three elements are the focal point of the chemical and radiological agents sections.

Table 4.3-23
Comparison of Kent County and FEMA 426 Model

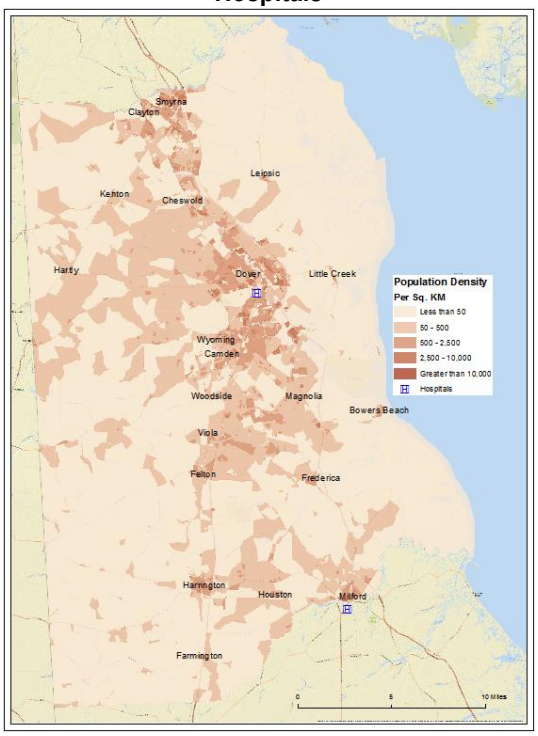
Facility	Threat	Percent Comparison
Maximum Score in FEMA 426 Model	**14.400**	**100%**
Hospitals	6.630	46%
Military Facilities	6.120	43%
Day Care Centers	5.865	41%
Hazardous Material Sites	5.610	39%
Dams	5.610	39%
Reservoirs	5.355	37%
Major Bridges	4.488	31%
All Gas Pipelines	0.867	6%
U.S. Roads	0.816	6%
State Roads	0.816	6%

Chemical Agents

In planning for the possible release of a chemical agent as an act of terrorism, Kent County identified one (1) hospital and 45 day care facilities throughout the county as potential targets. (**Figure 4.3-13** graphically illustrates the locations of these facilities.) In order to create a more complete assessment of the damage that would be inflicted should such an attack occur, Kent County also determined the surrounding population and building stock within both an 8-mile radius of the target (the "Immediate Response Zone") and a 20-mile radius (the "Protective Action Zone"). This approach is believed to more accurately represent the overall exposure of the county and its communities to the threat of a chemical agent. **Tables 4.3-24** and **4.3-25** offer the results of this analysis. In order to keep this planning document brief, only the top four day care facilities in terms of affected population are included in Table 16. Complete information for all 45 facilities is stored in a Microsoft® Excel® file separate from this Plan.

Figure 4.3-13
Location of Day Care Facilities and Hospitals in Kent County

Hospitals



Day Care Facilities

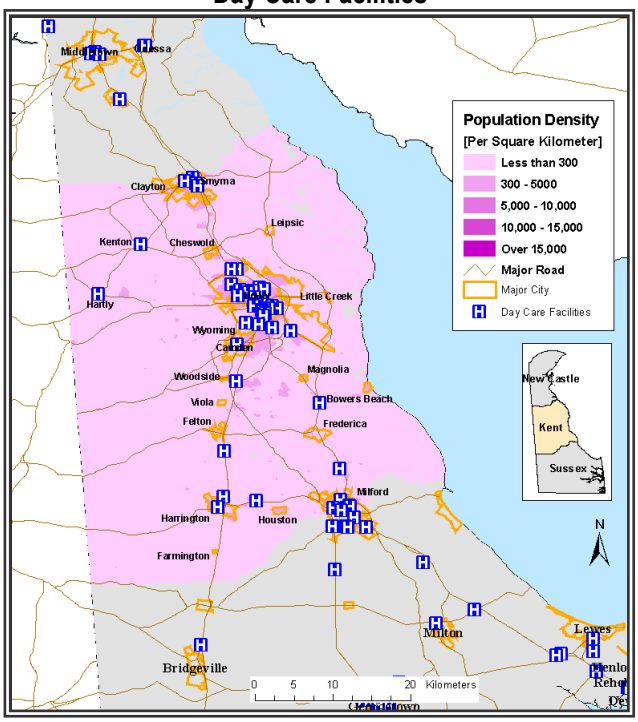


Table 4.3-24
Hospitals and Surrounding Exposure

Name of Hospital	City	Immediate Response Zone (IRZ) 8 miles from each hospital		Protective Action Zone (PAZ) 20 miles from each hospital	
		Population	Buildings	Population	Buildings
Bayhealth Medical Center	Dover	102,568	40,334	184,516	71,834

Table 4.3-25
Day Care Facilities and Surrounding Exposure[9]

Name of Day Care Facility	City	Immediate Response Zone (IRZ) 8 miles from each hospital		Protective Action Zone (PAZ) 20 miles from each hospital	
		Population	Buildings	Population	Buildings
Tot's Turf Child Care (DAPI)	Camden/Wyoming	110,639	43,403	188,812	73,529
Dover Early Learning Center	Dover	108,034	42,385	186,346	72,554
Brighter Beginnings	Dover	106,064	41,657	186,498	72,657
DTCC, Terry Campus (ECAP)	Dover	105,784	41,592	179,524	69,306

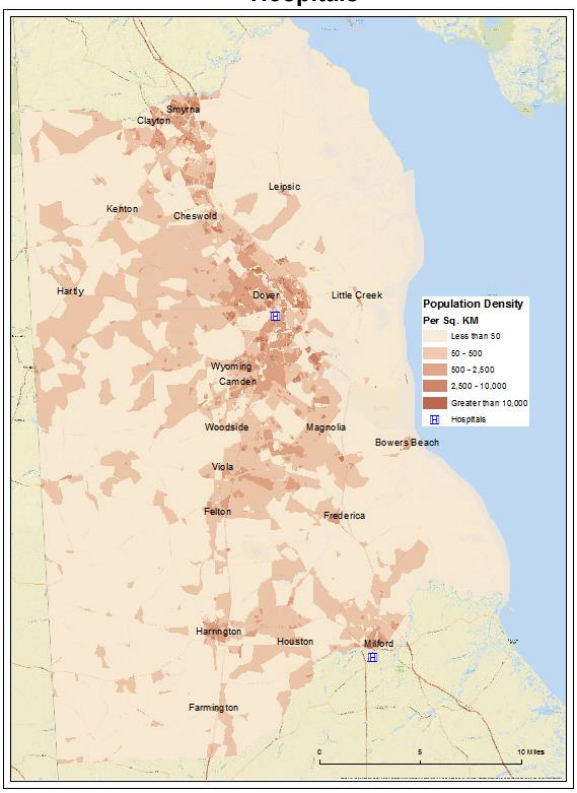
Radiological Agents

In planning for the possible release of a radiological agent as an act of terrorism, Kent County identified one (1) hospital and five (5) military facilities throughout the county as potential targets. (**Figure 4.3-14** graphically illustrates the locations of these facilities.) In order to create a more complete assessment of the damage that would be inflicted should such an attack occur, Kent County also determined the surrounding population and building stock within both an 8-mile radius of the target (the "Immediate Response Zone") and a 20-mile radius (the "Protective Action Zone"). This approach is believed to more accurately represent the overall exposure of the county and its communities to the threat of a radiological agent. **Tables 4.3-26** and **4.3-27** offer the results of this analysis.

[9] Complete information is stored in a Microsoft® Excel® file separate from this Plan.

Figure 4.3-14
Location of Hospitals and Military Facilities in Kent County

Hospitals



Military Facilities

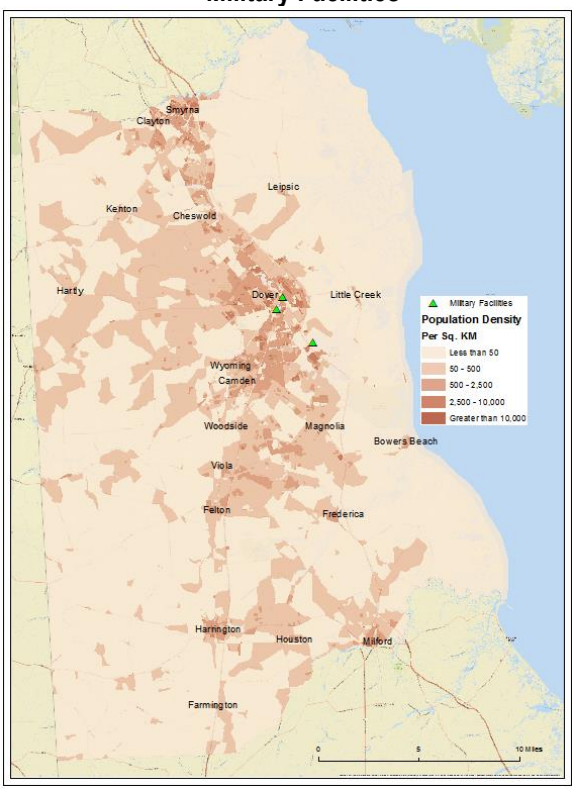


Table 4.3-26
Hospitals

Name of Hospital	City	Immediate Response Zone (IRZ) 8 miles from each hospital		Protective Action Zone (PAZ) 20 miles from each hospital	
		Population	Buildings	Population	Buildings
Bayhealth Medical Center	Dover	116,148	45,739	995,738	426,643

Table 4.3-27
Military Facilities

Name of Military Facility	Immediate Response Zone (IRZ) 8 miles from each hospital		Protective Action Zone (PAZ) 20 miles from each hospital	
	Population	Buildings	Population	Buildings
Army National Guard	121,134	47,457	992,541	420,905
Dover Armory	115,947	45,532	995,546	426,555
Dover Air Force Base	108,394	42,883	1,003,124	432,993
Delaware National Guard	60,313	23,767	499,266	230,181
Milford Armory	55,362	22,497	445,030	208,958

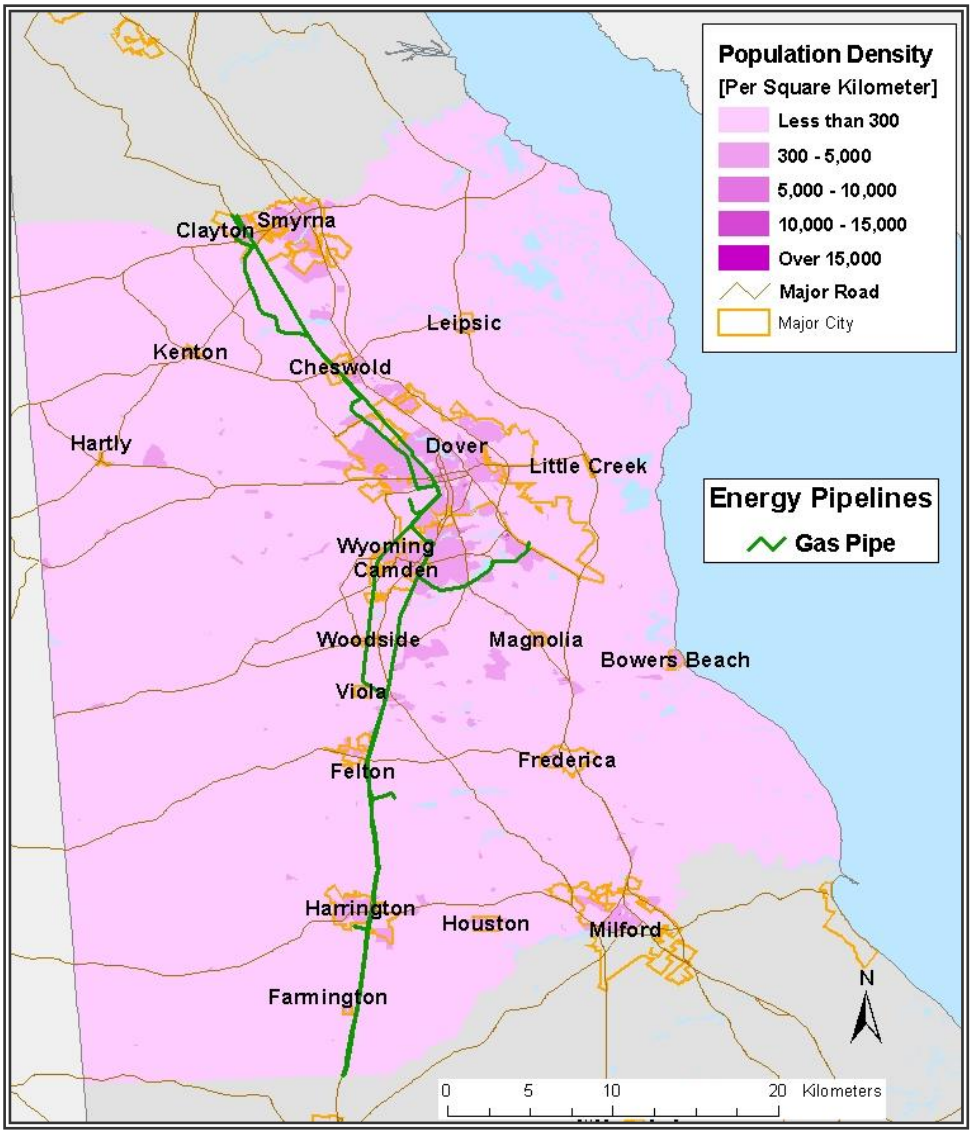
Biological Agents

The relative risk of Kent County to Delaware in terms of the release of a biological agent is 3.41 percent. This is based on a risk formula of "VULNERABILITY x HAZARD x EXPOSURE." Vulnerability in this case is a measure of the speed at which infection will spread among the population. Population was studied based on general occupancy class: residential, commercial, industrial, education, government, agricultural and religious. The hazard component was considered to be a measure of the introduction of the disease among the population. This also was broken down by occupancy class, in this case residential, commercial, industrial, education, government and religious. The exposure was determined using HAZUS-MH data.

4.3.15 Energy Pipelines

Energy pipelines cross most of the state of Delaware, and parts of Kent County. If any of these energy pipelines, oil or gas, were to rupture, such an event could endanger property and lives in the immediate area (within less than half a mile radius).

Figure 4.3-15
Energy Pipelines



4.3.16 Hazardous Materials

Assessing vulnerability to a hazardous materials (HazMat) release on a countywide scale can consist of a number of factors, such as the type(s) of hazardous materials present, the potential for mass casualties, potential consequences for the surrounding area, accessibility, public awareness, and the likelihood of being a terrorist target. The assessment conducted for Kent County focuses on the first three of these factors, and a comprehensive study was undertaken to document information for 15 identified hazardous material sites from State of Delaware exposure data[10]. High consequence events were then selected (high material toxicity and population density), and ALOHA[11] was used to calculate the potential area of impact. Affected population (based on Census 2010) and exposure value (HAZUS-MH) was then reported across selected events.

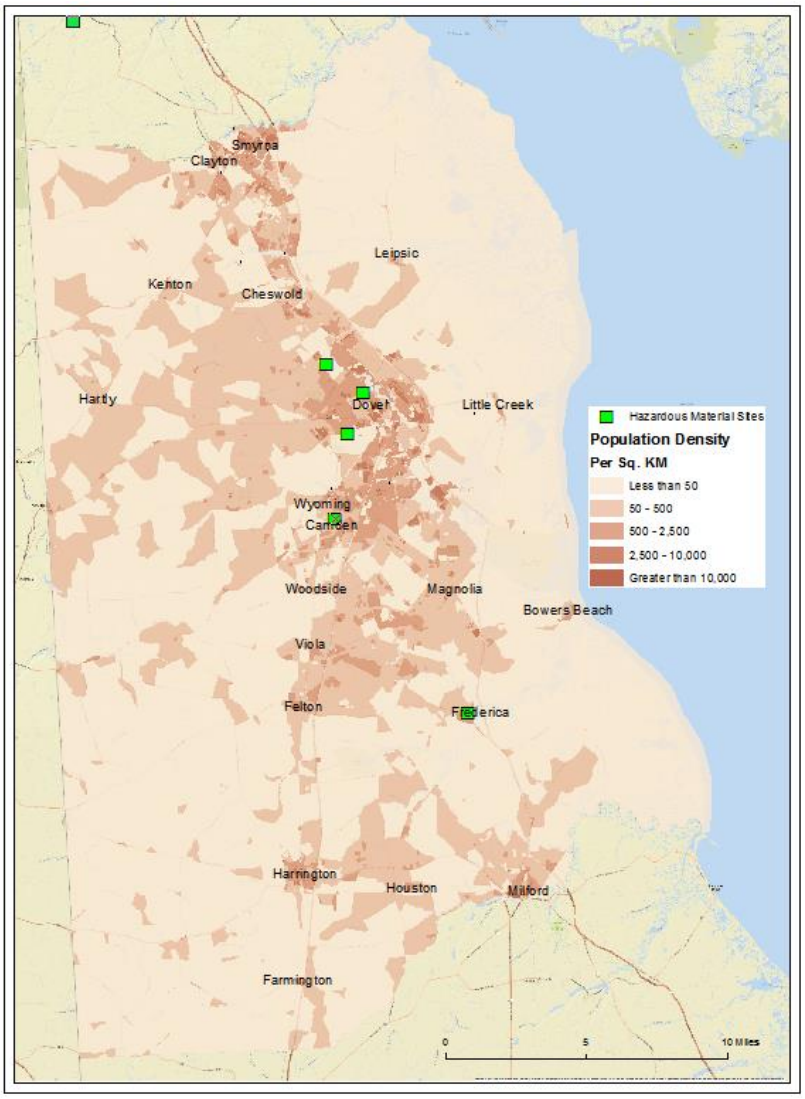
Table 4.3-28 offers the results of this analysis for all 15 HazMat facilities.

Table 4.3-28
Hazardous Materials Facilities (Abbreviated List)

Facility Name	City	Chemical Name	Potential Residential Population at Risk	Clean-up Area (square kms)
Hirsh Industries	Dover	Certain Glycol Ethers	4,095	29.431
Reichhold, Inc.	Cheswold	1,3-Butadiene	2,808	64.687
Reichhold, Inc.	Cheswold	Butyl Acrylate	2,069	51.094
Reichhold, Inc.	Cheswold	Vinyl Acetate	2,046	27.273
Reichhold, Inc.	Cheswold	Acrylonitrile	1,106	8.174
Playtex Products, Inc.	Dover	Chlorine	17	0.038
Hirsh Industries	Dover	N-Butyl Alcohol	5	0.008
Reichhold, Inc.	Cheswold	Acrylic Acid **Solid	3	0.019
General Clothing Co., Inc.	Smyrna	Toluene	8	0.021
Camdel Metals Corporation	Camden	Trichloroethylene	1	0.011
NRG Energy Center	Dover	Hydrochloric Acid	0	0.027
NRG Energy Center	Dover	Sulfuric Acid	0	0.012
NRG Energy Center	Dover	Mercury Compounds	0	0.011
Reichhold, Inc.	Cheswold	N-Methylolacrylamide	0	0.000
Reichhold, Inc.	Cheswold	Formaldehyde	0	0.000

[10] If a facility houses more than one hazardous material, it is treated as a separate entry in this table, partially due to the fact that potential population at risk and projected clean-up area could vary depending on the chemical.
[11] ALOHA (Areal Locations of Hazardous Atmospheres) is a computer program that uses information provided by its operator and physical property data from its extensive chemical library to predict how a hazardous gas cloud might disperse in the atmosphere after an accidental chemical release.

Figure 4.3-16
Location of Hazardous Materials Facilities in Relation to Population Density



4.3.17 Other Hazards

Though communities in the State of Delaware recognize that the state is vulnerable to other hazards such as wildfire, erosion, sinkholes, landslides and tsunamis, a high-level detailed risk assessment was not completed for Kent County due to the low level of risk and/or vulnerability for these hazards within the area as a whole as compared with other hazards.

4.3.18 Conclusions on Hazard Risk

Table 4.3-29 summarizes the annualized expected losses presented for each natural hazard in this section. Based upon the methodologies described in the beginning of this section, the risk from natural hazards in Kent County can be rated on a scale of Low, Moderate or High for each identified natural hazard based upon these annualized losses and an annualized loss ratio (**Table 4.3-30**). Because of the nature of human-caused hazards and the nature in which risk and vulnerability is presented for human-caused hazards, it is not possible to rank them fairly in direct comparison with natural hazards. In summary, all human-caused hazards addressed in this section—terrorism (chemical, radiological and biological agents), hazardous materials incidents (HazMat), and energy pipeline failures—warrant an overall rating of low risk for Kent County.

Table 4.3-29
Potential Annualized Losses Ratios per Jurisdiction

Jurisdiction	Flood	Coastal Wind	Thunder-storm	Tornado	Drought	Hail	Winter Storm	Earth-quake
Bowers Beach	0.0067	0.000151	0.000027	0.000013	---	---	0.000028	0.0000031
Camden	0.0036	0.000095	0.000027	0.000013	---	---	0.000028	0.0000028
CCD Central Kent	0.0042	0.000135	0.000027	0.000013	0.00034	---	0.000028	0.0000027
CCD Dover	0.0048	0.000090	0.000027	0.000013	0.00034	---	0.000028	0.0000031
CCD Felton	0.0029	0.000137	0.000027	0.000013	0.00034	---	0.000028	0.0000028
CCD Harrington	0.0025	0.000137	0.000027	0.000013	0.00034	---	0.000028	0.0000025
CCD Kenton	0.0051	0.000078	0.000027	0.000013	0.00034	---	0.000028	0.0000034
CCD Milford North	0.0049	0.000127	0.000027	0.000013	0.00034	---	0.000028	0.0000026
CCD Smyrna	0.0048	0.000073	0.000027	0.000013	0.00034	---	0.000028	0.0000035
Cheswold	---	0.000078	0.000027	0.000013	---	---	0.000028	.0.0000033
Clayton	0.0034	0.000056	0.000027	0.000013	---	---	0.000028	0.0000035
Dover	0.0045	0.000065	0.000027	0.000013	---	---	0.000028	0.0000034
Farmington	---	0.000138	0.000027	0.000013	---	---	0.000028	0.0000022
Felton	---	0.000137	0.000027	0.000013	---	---	0.000028	0.0000028
Frederica	0.0059	0.000133	0.000027	0.000013	---	---	0.000028	0.0000026
Harrington	---	0.000109	0.000027	0.000013	---	---	0.000028	0.0000026
Hartly	---	0.000081	0.000027	0.000013	---	---	0.000028	0.0000036
Houston	0.0000	0.000165	0.000027	0.000013	---	---	0.000028	0.0000024
Kenton	0.0000	0.000078	0.000027	0.000013	---	---	0.000028	0.0000034
Leipsic	0.0042	0.000146	0.000027	0.000013	---	---	0.000028	0.0000034
Little Creek	0.0050	0.000094	0.000027	0.000013	---	---	0.000028	0.0000031
Magnolia	---	0.000146	0.000027	0.000013	---	---	0.000028	0.0000026
Milford	0.0022	0.000097	0.000027	0.000013	---	---	0.000028	0.0000024
Smyrna	0.0027	0.000060	0.000027	0.000013	---	---	0.000028	0.0000035
Viola	---	0.000123	0.000027	0.000013	---	---	0.000028	0.0000029
Woodside	---	0.000123	0.000027	0.000013	---	---	0.000028	0.0000028
Wyoming	0.0041	0.000091	0.000027	0.000013	---	---	0.000028	0.0000029
TOTAL	**0.0044**	**0.000093**	**0.000027**	**0.000013**	**0.00034**	**---**	**0.000028**	**0.0000031**

Table 4.3-30
Estimated Level of Risk by Hazard (High, Moderate, Low)

Flood	Coastal Wind	Thunder storm	Tornado	Drought	Hail	Winter Storm	Earthquake
High	Moderate	Moderate	Low	High	Low	Moderate	Moderate

It should be noted that although some hazards may show Medium or Low risk, hazard occurrence is still possible. Also, any hazard occurrence could potentially cause a great impact and losses could be extremely high (e.g. an F5 tornado or a Category 5 hurricane).

Table 4.3-31
Overall Risk Ranking for Kent County

Hazard	Rank
Flood	1
Drought	2
Coastal Wind	3
Earthquake	4
Winter Storm	5
Thunderstorm	6
Tornado	7
Hail	8
Extreme Heat/Cold	Unranked
Wildfire	Unranked
Coastal Erosion	Unranked
Dam/Levee Failure	Unranked
Tsunami	Unranked
Volcano	Unranked
Terrorism	Unranked
HazMat Incident	Unranked
Pipeline Failure	Unranked

5. CAPABILITY ASSESSMENT

5.1 Plan Update Summary

This Chapter of the Plan discusses the capability of Kent County and the participating municipal jurisdictions to implement hazard mitigation activities. The capability assessment helps identify existing gaps, conflicts and/or shortcomings that may need to be addressed through future mitigation actions and helps to ensure that proposed mitigation actions are practical, while considering the County's and municipalities' capacity to implement these actions. It also examines completed or in-progress actions that merit continued support and enhancement through future efforts. It comprises two components:

1. Municipal Capability Assessment, which includes an analysis of the municipalities' capacity from a planning, policy, staffing, and training standpoint.
2. Document Review, which includes a review of the County's and municipalities' existing plans and ordinances and suggestions for incorporation of mitigation principles in these documents.

The majority of this Chapter is devoted to the Capability Assessment, which consists of four sections:

- What is a Capability Assessment
- Capability Assessment Update
- Capability Assessment Findings
- Conclusions on Local Capability

5.2 What is a Municipal Capability Assessment?

The purpose of conducting a capability assessment is to determine the ability of a local jurisdiction to implement a mitigation strategy and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs or projects. As in any planning process, it is important to try to establish which goals, objectives and actions are feasible, based on an understanding of the organizational capacity of those agencies or departments tasked with their implementation. A capability assessment helps to determine which mitigation actions are practical and likely to be implemented over time given the fiscal, technical, administrative and political framework of the community.

A capability assessment has two primary components: an inventory of a local jurisdiction and actions are feasible, based on an understanding of the organizational f its capacity to carry them out. Careful examination of local capabilities will detect any existing gaps, shortfalls or weaknesses with ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. A capability assessment also highlights the positive mitigation measures already in place or being implemented at the local government level, which should continue to be supported and enhanced if possible through future mitigation efforts.

The capability assessment completed for Kent County serves as a critical part of the foundation for designing an effective hazard mitigation strategy. Coupled with the *Risk Assessment*, the *Capability Assessment* helps identify and target meaningful mitigation actions for incorporation in the *Mitigation Strategy* portion of the Mitigation Plan Update. It not only helps establish the goals and objectives for Kent County to pursue under this Plan Update, but also ensures that those goals and objectives are realistically achievable under given local conditions.

5.3 Capability Assessment Update

Requirement §201.6(b)(3): The planning process must include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

The original Capability Assessment survey was developed in 2003 during the initial planning process. It was distributed to local government officials. The survey asked specific questions about existing local plans, policies, programs or ordinances that contribute to and/or hinder the communitycity to carry them out. Careful examination of localn addition, a series of questions were asked concerning each jurisdiction's technical, fiscal, administrative and political capabilities to implement mitigation actions. The survey summaries provided an extensive inventory of existing local plans, policies, programs and ordinances and required local officials to conduct a self-assessment of their jurisdictiontycity to carry them out.

The information provided by the participating jurisdictions in response to the survey questionnaire was incorporated into a database for further analysis. A general scoring methodology[1] was then applied to quantify and rank each jurisdictionons in response to the survey questionnaire was incorporated into a database for further analysis. A general scoring am was assigned a point value based on its relevance to hazard mitigation. Additional points were added based on each jurisdiction's self-assessment of their own fiscal, technical, administrative and political capability. A total score and general capability rating (High, Moderate or Limited) was then determined according to the total number of points received. The survey results also serve as a good source of introspection or those jurisdictions wishing to improve their capability, as identified gaps, weaknesses or conflicts may be recast as opportunities for specific mitigation actions.

During the 2015 Plan Update process, the Capability Assessment information was distributed to the municipalities and has been updated by municipal officials and areas where plans, ordinances, and political, fiscal, or administrative and technical capability had changed since 2009. This information was shared at the Committee meeting and has been incorporated into the overall Capability Assessment.

In addition to the results of the *Capability Assessment*, an inventory of some previously completed hazard mitigation projects in Kent County is included as part of this assessment. This inventory provided information on past mitigation efforts taken in Kent County to reduce the effect of identified hazards. Documenting past mitigation measures can also serve to help assess the degree to which local governments are willing to adopt future mitigation actions.

5.4 Capability Assessment Findings

The findings of the capability assessment are summarized in this Plan Update to provide insight into the capacity of Kent County with the effect of identified hazards. The documentation of past mitigation measures serves to assess the degree to which local governments have been successful in implementing these actions.
Table 5.1 provides a summary of the local plans and programs in place for Kent County that were received from the municipalities to assess the degree to which local governments are willing to adopt future mitigation actions. Additional information based on the narrative comments provided by local officials in response to the survey questionnaire follows.

[1] A copy of the survey and the scoring system used to assess county and municipal capabilities is available through Kent County upon request. Due to the length of the survey and the number of participating jurisdictions, the completed surveys were not included in this document.

Table 5.1
Relevant Plans and Programs in Place

Jurisdiction	HMP	DRP	CLUP	FMP	SMP	EOP	COOP	REP	SARA	TRANS	CIP	REG-PL	HPP	ZO	SO	FDPO	NFIP	CRS	BC
Kent County	X	X	X	X		X	X	X	X			X		X	X	X	X		X
Bowers Beach						X	X		X					X		X	X		X
Camden	X		X	X	X	X			X	X			X	X	X	X	X		X
Cheswold	X		X	X		X			X		X			X		X	X		X
Clayton			X	X					X					X	X	X	X		X
Dover	X		X	X		X			X	X	X	X	X	X	X	X	X		X
Farmington									X					X					X
Felton	X		X	X		X			X					X	X				X
Frederica			X						X							X	X		X
Harrington			X						X			X		X	X	X	X		X
Hartly									X					X					X
Houston									X					X	X				X
Kenton			X						X										X
Leipsic									X					X		X	X		X
	X		X	X					X					X		X	X		X
Magnolia									X					X	X				X
Milford	X		X						X							X	X		X
Smyrna			X			X			X	X	X	X	X	X	X	X	X		X
Viola			X						X										X
Woodside									X					X					X
Wyoming									X					X	X	X	X		X

Key to Table 5.1

HMP Hazard Mitigation Plan
DRP Disaster Recovery Plan
CLUP Comprehensive Land Use Plan
FMP Floodplain Management Plan / Flood Mitigation Plan
SMP - Stormwater Management Plan
EOP – Emergency Operations Plan
COOP - Continuity of Operations Plan
REP - Radiological Emergency Plan
SARA - SARA Title III Emergency Response Plan

TRANS - Transportation Plan
CIP - Capital Improvements Plan
REG-PL Regional Planning
HPP - Historic Preservation Plan
ZO - Zoning Ordinance
SO - Subdivision Ordinance
FDPO - Flood Damage Prevention Ordinance
NFIP - National Flood Insurance Program
CRS - Community Rating System
BC - Building Codes

Emergency Management Capabilities

Hazard mitigation is widely recognized as one of the four primary phases of emergency management. Other phases include preparedness, response, and recovery. In reality, each phase is inter-connected with hazard mitigation as **Figure 5.1** suggests. Planning for each phase is a critical part of a comprehensive emergency management program and a key to the successful implementation of hazard mitigation actions. As a result, the *Capability Assessment Survey* asked several questions across a range of emergency management plans in order to assess the jurisdictions - a key to the successful implementation of hazard mitigation actions.

Figure 5.1
The Four Phases of Emergency Management

Hazard Mitigation Plan: A hazard mitigation plan represents a communitymitigation actions. order to assess thce the impact of natural and human-caused hazards on people and the built environment. The essential elements of a hazard mitigation plan include a risk assessment, capability assessment and mitigation strategy.

Survey results indicate that seven (7) jurisdictions have hazard mitigation plans.

Disaster Recovery Plan: A disaster recovery plan serves to guide the physical, social, environmental and economic recovery and reconstruction process following a disaster. In many instances, hazard mitigation principles and practices are incorporated into local disaster recovery plans with the intent of capitalizing on opportunities to break the cycle of repetitive disaster losses.

- Survey results indicate that only Kent County has prepared a Disaster Recovery Plan. The plan was developed in 1992 as part of the Countya disaster. In many instances, hazard mi

- Many of the municipal officials indicated that their jurisdiction relies on the County for pre-disaster planning and post-disaster response and recovery operations.

Emergency Operations Plan: An emergency operations plan outlines responsibilities and the means by which resources are deployed following an emergency or disaster.

- Survey results indicate that seven (7) jurisdictions have an emergency operations plan. Kent County has an EOP that was last amended in 1992. The municipalities of Bowers Beach, Dover, Cheswold, Felton and Smyrna also have emergency operations plans covering their jurisdictions.

- Many of the municipal officials indicated that their jurisdiction relies on the County for emergency operations planning and management.

Continuity of Operation Plan: A continuity of operations plan establishes a chain of command, line of succession and plans for backup or alternate emergency facilities in case of an extreme emergency.

- Survey results indicate that three (3) jurisdictions have a continuity of operations plan. Kent County has a continuity of operations plan that was last amended in 1992.

Radiological Emergency Plan: A radiological emergency plan delineates roles and responsibilities for assigned personnel and the means to deploy resources in the event of a radiological accident.

- Survey results indicate that one (1) jurisdiction has a radiological emergency plan. Kent County indicated that their radiological emergency plan is a component of the State REP adopted in 1983 and last amended in 2001.

SARA Title III Emergency Response Plan: A SARA Title III Emergency Response Plan outlines the procedures to be followed in the event of a chemical emergency such as the accidental release of toxic substances. These plans are required by federal law under Title III of the Superfund Amendments and Re-authorization Act (SARA), also known as the Emergency Planning and Community Right-to-Know Act (EPCRA).

- The Kent County Local Emergency Planning Committee (LEPC) has developed an Emergency Response Plan for hazardous materials incidences throughout the county in coordination with the Delaware State Emergency Response Commission. The Plan was last amended in July 2002.

General Planning Capabilities

The implementation of hazard mitigation activities often involves agencies and individuals beyond the emergency management profession. Other stakeholders may include local planners, public works officials, economic development specialists and others. In many instances, concurrent local planning efforts will help to achieve or

complement hazard mitigation goals even though they are not designed as such. Therefore, the *Capability Assessment Survey* also asked questions regarding each jurisdictions often involves agencies and individuals beyond the emergency management profession. Other stakeholders may include lo

Regional Planning: Regional planning refers to any type of planning effort that involves a community working in conjunction with neighboring jurisdictions. For example, the development of this All Hazard Mitigation Plan is a regional planning effort.

- Survey results indicate that only four (4) jurisdictions participate in regional planning decisions. Kent County actively participates in planning efforts with their municipalities.
- The Dover/Kent County Metropolitan Planning Organization (MPO) is the federally-designated agency responsible for coordinating transportation planning and programming in Kent County. Plans and programs adopted by the MPO outline how federal transportation funds will be spent and must comply with federal laws governing clean air and transportation. The Cities of Dover and Smyrna are active members of the MPO while Kent Countyerally-designated agency responsible for coordinating transportation planniepresent them.
- All of Kent County's local jurisdictions are members of the Delaware League of Local Governments (DLLG). The DLLG is a statewide, nonprofit, nonpartisan association of city, town, and county governments established in 1963 to improve and assist local governments through legislative advocacy at the state and federal level. The DLLG also serves as a clearinghouse for important governmental and business-oriented information.
-

Comprehensive Plan: A comprehensive plan establishes the overall vision for what a community wants to be and a guide to future governmental decision-making. Typically a comprehensive plan is comprised of demographic conditions, land use, transportation elements and community facilities. Given the broad nature of the plan and its regulatory standing in many communities, the integration of hazard mitigation measures into the comprehensive plan can enhance the likelihood of achieving risk reduction goals, objectives and actions.

- The State of Delaware requires its counties to adopt and regularly update comprehensive plans in conformity with the *Quality of Life Act of 1988*. The Act requires the plans to include the following elements: Economic Development, Housing, Conservation (including Agriculture), Historic Preservation, Recreation and Open Space, Accomplishments, Intergovernmental Coordination, Mobility, Water and Sewer, Community Facilities and Future Land Use. An optional element is Community Design.

- Kent County's comprehensive strategy to get sprawl under control and direct intelligent growth to the local areas. The update was also reviewed and certified under the *Livable Delaware* guidelines.

- **Table 5.2** shows the progress made as of March 1, 2014 by the municipal jurisdictions in Kent County to update their comprehensive plans according to the Delaware Office of State Planning Coordination.

Table 5.2
Local Comprehensive Plan Updates

Jurisdiction	Plan Status
Bowers Beach	No Information
Camden	Certified (2003)
Cheswold	Certified (2010) Update due 2015
Clayton	Certified (2003)
Dover	Complete (2003)
Farmington	Contacted
Felton	Certified (2003)
Frederica	In Progress
Harrington	In Progress
Hartly	Contacted
Houston	No Information
Kenton	In Progress
Leipsic	In Progress
Little Creek	In Progress
Magnolia	No Information
Milford	Certified (2014)
Smyrna	Certified
Viola	In Progress
Woodside	No Information
Wyoming	In Progress

Source: Delaware Office of State Planning Coordination

- Survey results indicate that most jurisdictions do not address natural or human-caused hazards in their comprehensive plans.

Transportation Plan: A transportation plan identifies the means to gauge transportation demands and the options to meet those needs, while considering the social, economic and environmental characteristics of the area. The development of transportation networks can significantly impact the amount, type and location of future growth. As a result, transportation planning can have a dramatic effect on future hazard vulnerability.

- Survey results indicate that most jurisdictions do not have their own stand-alone transportation plan. Transportation planning (including emergency evacuation planning) is commonly addressed as an element to the local comprehensive plans and in coordination with the Delaware Department of Transportation and the Dover/Kent County Metropolitan Planning Organization.

Capital Improvements Plan: A capital improvements plan guides the scheduling of spending on public improvements. A capital improvement plan can serve as an important mechanism to guide future development away from identified hazard areas. Limiting pubic spending in hazardous areas is one of the most effective long-term mitigation actions available to local governments.

- Survey results indicate that three (3) jurisdictions have capital improvement plans that regulate the provision or extension of infrastructure in hazard areas.

Historic Preservation Plan: A historic preservation plan is intended to preserve historic structures or districts within a community. An often overlooked aspect of the historic preservation plan is the assessment of buildings and sites located in areas subject to natural hazards to include the identification of the most effective way to reduce future damages.[2] This may involve retrofitting or relocation techniques that account for the need to protect buildings that do not meet current building standards or are within a historic district that cannot easily be relocated out of harms way.

- Survey results indicate that three (3) jurisdictions have historic preservation plans.

Zoning Ordinances: Zoning represents the means by which land use is controlled by local governments. As part of a communityt do not meet current building standards or are within a historic district that cof those in a given jurisdiction that maintains zoning authority. A zoning ordinance is the mechanism through which zoning is typically implemented. Since zoning regulations enable municipal governments to limit the type and density of development, it can serve as a powerful tool when applied in identified hazard areas.

- Survey results indicate that seventeen (17) jurisdictions have a zoning ordinance.

Subdivision Ordinances: A subdivision ordinance is intended to regulate the development of housing, commercial, industrial or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Subdivision design that accounts for natural hazards can dramatically reduce the exposure of future development.[3]

- Survey results indicate that ten (10) jurisdictions have a subdivision ordinance.

- The Land and Subdivision Ordinance was updated in 2003 and prohibits subdivision development in the floodplain. It also addresses the protecting of wetlands and riparian areas as well as requirements for open space. It is available online.

[2] See Protecting the Past from Natural Disasters. 1989. Nelson, Carl. National Trust for Historic Preservation: Washington, D.C.

[3] For additional information regarding the use of subdivision regulations in reducing flood hazard risk, see Subdivision Design in Flood Hazard Areas. 1997. Morris, Marya. Planning Advisory Service Report Number 473. American Planning Association: Washington, D.C.

Building Codes, Permitting and Inspections: Building Codes regulate construction standards. In many communities, permits are issued for, and inspections of work take place on, new construction. Decisions regarding the adoption of building codes (that account for hazard risk), the type of permitting process required both before and after a disaster, and the enforcement of inspection protocols all affect the level of hazard risk faced by a community.

- Survey results indicate that all jurisdictions have adopted a local building code.

In addition to using survey results, the adoption and enforcement of building codes by local jurisdictions was assessed using the Building Code Effectiveness Grading Schedule (BCEGS) program developed by the Insurance Services Office, Inc. (ISO).[4] Under the BCEGS program, ISO assesses the building codes in effect in a particular community and how the community enforces its building codes, *with special emphasis on mitigation of losses from natural hazards*. The results of BCEGS assessments are routinely provided to ISOsct in a particular community and how the community enforces its building codes, fectiveness Grading Schedule (BCEGS) program developed by the Insurance Services Office, Inc. that communities with well-enforced, up-to-date codes should demonstrate better loss experience, and insurance rates can reflect that.

In conducting the assessment, ISO collects information related to personnel qualification and continuing education as well as number of inspections performed per day. This type of information, combined with local building codes, is used to determine a grade for that jurisdiction. The grades range from 1 to 10, with the lower grade being more ideal. A BCEGS grade of 1 represents exemplary commitment to building code enforcement, and a grade of 10 indicates less than minimum recognized protection.

BCEGS grades for each of Kent County are included in **Table 5.3**.

[4] Participation in BCEGS is voluntary and may be declined by local governments if they do not wish to have their local building codes evaluated.

Table 5.3
BCEGS Grades for Kent County Jurisdictions

Jurisdiction	BCEGS Grade
Kent County	6
Bowers Beach	6*
Camden	Declined Participation
Cheswold	6*
Clayton	6*
Dover	5
Farmington	6*
Felton	6*
Frederica	6*
Harrington	Declined Participation
Hartly	6*
Houston	6*
Kenton	6*
Leipsic	6*
Little Creek	6*
Magnolia	6*
Milford	7
Smyrna	6
Viola	Not Evaluated
Woodside	6*
Wyoming	Declined Participation

* Building code administered and enforced by Kent County.

Source: Insurance Services Office, Inc.

Floodplain Management Capability

Flooding represents the greatest natural hazard facing the nation. At the same time, the tools available to reduce the impacts associated with flooding are among the most developed when compared to other hazard-specific mitigation techniques. In addition to approaches that cut across hazards, such as education, outreach, and the training of local officials, the *National Flood Insurance Program* (NFIP) contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. Participation in the NFIP is voluntary for local governments, but the program is promoted by FEMA and DEMA as a first basic step for implementing and sustaining an effective hazard mitigation program. It is therefore used as a key indicator for measuring local capability as part of this assessment.

In order for a county or municipality to join the NFIP, they must adopt a local flood damage prevention ordinance that requires jurisdictions to follow established minimum building standards in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings will be protected from damage by the 100-year flood, and that new floodplain development will not aggregate existing flood problems or increase damage to other properties.

Another key service provided by the NFIP is the mapping of identified flood hazard areas. Once prepared, the Flood Insurance Rate Maps (FIRMs) are used to assess flood hazard risk, regulate construction practices and set flood insurance rates. FIRMs are an important source of information to educate residents, government officials and the private sector about the likelihood of flooding in their community.

Table 5.4 summarizes NFIP participation for each of Kent County's municipalities are included below.

Table 5.4
NFIP Participation in Kent County

Jurisdiction	NFIP Entry Date	Current Effective Map
Kent County	3/15/78	07/07/14
Bowers Beach	7/02/80	07/07/14
Camden	9/16/81	07/07/14
Cheswold	1/07/77	07/07/14
Clayton	6/01/77	07/07/14
Dover	9/16/82	07/07/14
Farmington	Not in NFIP	N/A
Felton	Not in NFIP	N/A
Frederica	1/02/81	07/07/14
Harrington	6/1/77	07/07/14
Hartly	Not in NFIP	N/A
Houston	Not in NFIP	N/A
Kenton	Not in NFIP	N/A
Leipsic	9/29/78	07/07/14
Little Creek	1/17/79	07/07/14
Magnolia	Not in NFIP	N/A
Milford	6/1/77	07/07/14
Smyrna	6/1/77	07/07/14
Viola	Not in NFIP	N/A
Woodside	Not in NFIP	N/A
Wyoming	3/16/81	07/07/14

Source: Federal Emergency Management Agency

An additional indicator of floodplain management capability is the number of participants in the *Community Rating System* (CRS). The CRS is an incentive-based program that encourages counties and municipalities to undertake defined flood mitigation activities that go beyond the minimum requirements of the NFIP, adding extra local measures to provide protection from flooding. All of the 18 creditable CRS mitigation activities are assigned a range of point values. As points are accumulated and reach identified thresholds, communities can apply for an improved CRS class. Class ratings, which run from 10 to 1, are tied to flood insurance premium reductions as shown in **Figure 5.2**. As class ratings improve (decrease), the percent reduction in flood insurance premiums for NFIP policy holders in that community increases.

Figure 5.2
CRS Premium Discounts, By Class

CRS Class	Premium Reduction
1	45%
2	40%
3	35%
4	30%
5	25%
6	20%
7	15%
8	10%
9	5%
10	0

Source: FEMA

Community participation in the CRS is voluntary. Any community that is in full compliance with the rules and regulations of the NFIP may apply to FEMA for a CRS classification better than Class 10. The CRS application process has been greatly simplified over the past several years based on community comments to make the CRS more user friendly as possible, and extensive technical assistance is also available for communities who request it.

Currently, there are no CRS communities in Kent County. However, several local jurisdictions expressed interest in joining the CRS program during the mitigation strategy workshop held during the development of this Plan.

Floodplain Management Plan: A floodplain management plan (or a flood mitigation plan) provides a framework for action regarding the corrective and preventative measures in place to reduce flood-related impacts.

- Survey results indicate that seven (7) jurisdictions have a floodplain management plan or flood mitigation plan.

Stormwater Management Plan: A stormwater management plan is designed to address flooding associated with stormwater runoff. The stormwater management plan is typically focused on design and construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding.

- Survey results indicate that one (1) of the jurisdictions in Kent County, Camden, has a stormwater management plan. However, stormwater management was identified as a critical area of concern at the mitigation strategy workshop held during the development of this Plan.

County and Municipal Self Assessment

In addition to the inventory and analysis of existing plans, programs and policies, the *Capability Assessment Survey* required each local jurisdiction to conduct a self assessment of its capability to implement hazard mitigation activities. As part of this process, county and municipal officials were encouraged to consider the barriers to implementing mitigation strategies in addition to the mechanisms that could further such strategies. In response to the survey questionnaire local officials classified the following capabilities as either "limited," "moderate" or "high":

- Technical capability
- Fiscal capability
- Administrative capability
- Political capability

Table 5.6 summarizes the results of the self-assessment process for technical, fiscal and administrative capabilities. As part of this process, county and municipal officials were encouraged to consider the barriers to implementing mitigation strategy. Information on these capabilities are summarized below.

Table 5.6
Self Assessment of Local Capability

Jurisdiction	Technical Capability	Fiscal Capability	Administrative Capability
Kent County	M	L	M
Bowers Beach	L	L	L
Camden	L	L	L
Cheswold	L	L	L
Clayton	L	L	L
Dover	L	L	L
Farmington	L	L	L
Felton	L	L	L
Frederica	M	L	M
Harrington	L	L	M
Hartly	L	L	L
Houston	L	L	L
Kenton	L	L	L
Leipsic	L	L	L
Little Creek	L	L	L
Magnolia	L	L	L
Milford	M	M	M
Smyrna	L	M	M
Viola	L	L	L
Woodside	L	L	L
Wyoming	L	L	M

Technical Capability

Technical capability can be defined as possessing the skills and tools needed to improve decision making, including the development and implementation of sound mitigation actions. For purposes of gauging the technical capability of Kent County for mitigation planning purposes, the *Capability Assessment Survey* focused on the local availability and application of Geographic Information Systems (GIS).

The analysis of the responses to the *Capability Assessment Survey* indicated that there is generally a *limited* technical capability of Kent County's application of Geographic Information Systems (GIS), decision making, including the development and implementation of sound mitigation actions.

Kent County maintains a GIS system and created data layers on identified hazards as part of their Flood Hazard Mitigation Plan. Most of the cities and towns donitigation actions. For purposes of gauging the technical capab financial limitations. Many local officials indicated that they are interested in gaining better access to GIS and related technical resources for their jurisdiction. The City of Milford increased its technical capability and mitigation awareness through participation in FEMAd M*Project Impact* initiative.

Recommendations: While technical resources are somewhat limited across the county, the development of a systematic protocol for sharing resources could significantly increase the level of technical capability to analyze natural hazards and develop meaningful actions to reduce their impact. This includes additional training to undertake GIS-driven risk assessments to identify potential mitigation opportunities and enhancing the ability to use information technologies to facilitate the formulation, development, implementation and monitoring of mitigation plans. The development of cooperative, countywide mitigation actions should also be used to assist in this effort.

Fiscal Capability

The ability to take action is often closely associated with the amount of money available to implement policies and projects.[5] This may take the form of grants received or state and locally-based revenue. The costs associated with policy and project implementation vary widely. In some cases, policies are tied primarily to staff costs associated with the creation and monitoring of a given program. In other cases, money is linked to an actual project, like the acquisition of flood-prone homes, which can require a substantial commitment from local, state and federal funding sources.

The analysis of the responses to the *Capability Assessment Survey* indicated that there is a *limited* fiscal capability of Kent County the ceived or state and locally-based revenue. The costs associated with policy and project implementation vary widely. In some cases, policies are tied primarily to) indicated they had moderate fiscal capability. None of the jurisdictions in Kent County have the ability to generate revenue for mitigation purposes, and most will continue to rely heavily upon monies available through state and federal grant programs.

Recommendations: The results of the local capability assessment should be used as a general guide to help craft mitigation actions that are achievable. When considering the effect of fiscal capability on the implementation of mitigation policies and projects, jurisdictions should consider whether the actions require monetary commitment or staff resources. If so, consideration should be given to available grant funding sources, or perhaps combining resources with the county or other municipalities to offset costs of implementation. Consideration should also be made as to whether the jurisdiction is willing to commit local revenue on a sustained or one-time basis.

[5] Gaining access to federal, state or other sources of funding is often an overriding factor driving the development of hazard mitigation plans. However, an important objective of local governments seeking a more sustainable future is the concept of self-reliance. Over time, counties and municipalities should seek the means to become less dependent on federal assistance, developing a more diversified approach that assesses the availability of federal, state and locally generated funding to implement mitigation actions. Additional assistance may be available from the business and corporate sector as well as certain non-profit groups. This should be coupled with an attempt to identify mitigation measures that cost little or no money, yet may compliment the larger array of actions identified in the plan.

In most cases, in order to implement mitigation projects and policies, some monetary commitment or staff resources will be required. This may take the form of a non-federal match requirement or the costs associated with staff time devoted to policy development, implementation and monitoring. The identification of eligible Pre-Disaster Mitigation projects, as well as other Federal funding sources identified in the Kent County Hazard Mitigation Plan Update, enables communities to compete nationally for available funding. The county and municipal governments should consider, whenever possible, combining financial and staff resources to address hazards, most of which tend to impact regions rather than individual jurisdictions.

Finally, if local governments have access to an ongoing source of revenue, rather than a strict reliance on grant funds, a more comprehensive and sustained mitigation effort can be achieved. Examples include the development of a stormwater utility fee or the development of a budgetary line item that specifically addresses hazard mitigation.

Administrative Capability

Administrative capability was evaluated by reviewing county and municipal staffing and the existing organizational structure for local governments to implement mitigation strategies. The ability of a local government to develop and implement mitigation projects, policies and programs is directly tied to its ability to direct staff time and resources for that purpose.

The analysis of the responses to the *Capability Assessment Survey* indicated that there is generally a *limited to moderate* administrative capability of Kent County reviewing county and municipal staffing and the existing organizational structure forted they had limited administrative capability, while (6) indicated they had moderate administrative capability. Local municipal jurisdictions in Kent County indicated that they work cooperatively with the county on many activities, helping to offset their administrative and staff limitations.

Recommendations: The results of the administrative capability assessment demonstrate that the county and larger municipalities tend to possess a stronger administrative capability than smaller communities. This is primarily due to fiscal limitations, as smaller jurisdictions by nature have a limited tax base to support local government services. The development of local administrative capability may best be achieved through enhanced intergovernmental cooperation, outreach, training and mentoring for smaller jurisdictions as well as the sharing of resources, when appropriate. Local governments wishing to improve their local internal staff's emergency management expertise should consider sending staff to the free or low-cost training seminars available through DEMA's Training Program and FEMA's Emergency Management Institute. In preparing local mitigation strategies, local governments should look to integrate hazard mitigation activities into routine governmental functions whenever possible.

Political Capability

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to reduce the impact of future hazard events. Hazard mitigation may not be a local priority or could mistakenly be seen by local officials as an impediment to other goals of the community, such as growth and economic development. The local political climate must be considered in designing mitigation strategies as it could be the most difficult hurdle to overcome in accomplishing their adoption or implementation.

The analysis of responses to the *Capability Assessment Survey* indicated that there is generally a *moderate* political capability of Kent County to the political will of a jurisdiction to enact meaningful policies and projects designed to reduce the impact of future hazard events.

Recommendations: Increasing local political capability to implement mitigation strategies is most often achieved through a coordinated approach to loss reduction that includes: (1) gaining community support from a wide range of

local interest groups (particularly those that may be affected by proposed actions); and (2) informing and educating the elected and executive officials of the community in advance of the formal decision making process.

Community support should be generated by identifying key stakeholders early in the process of designing and proposing mitigation strategies. For example, in considering the regulation of construction in floodplains of other hazard areas, the local building and development industry should be brought in to share their ideas and concerns for crafting mitigation strategies that can work. This will help eliminate or minimize potential impediments to acceptance before strategies become drafted or officially proposed.

Local elected and executive officials should become informed and educated on mitigation strategies in advance of any formal considerations or decisions. This will facilitate a greater understanding of specific mitigation objectives and expected outcomes, and lead to and indication as to whether proposed actions may need to be revised before moving forward. The information presented and shared with local officials should specifically target any known issues of concern and seek to alleviate those concerns.

Previously Implemented Mitigation Measures

The success of future mitigation efforts in a community can be gauged by past efforts. Previously implemented mitigation measures indicate that there is, or has been, a desire to reduce the effects of natural hazards. Past success of these projects can also be influential in building support for new mitigation efforts.

Hazard Mitigation Grant Program (HMGP) Projects

The Federal Emergency Management AgencyProjectsommunity can be gauged by past efforts. Previously implemented mitigation measures indicate that there is, or has been, a desire to reduce the effects of natural hazards. Past sucter declaration. According to DEMA, there have been one HMGP project completed in Kent County – the Wyoming minor localized flood control project.

Flood Mitigation Assistance Program

In the State of Delaware, the Department of Natural Resources and Environmental Control (DNREC) administers the FEMA Flood Mitigation Assistance program (FMA). The FMA is an annual pre-disaster mitigation grant program that provides funding for projects and plans that are aimed at reducing the number of insured properties that have incurred repetitive flood losses. According to DNREC, there has been one FMA project completed in Kent County totaling $78,000. This project is listed in **Table 5.7** along with a brief project description.

Pre-Disaster Mitigation Program

FEMA's Pre-Disaster Mitigation (PDM) program, authorized and established under the Disaster Mitigation Act of 2000, is designed to provide states and communities with annual funding to implement cost-effective hazard mitigation activities. Eligible activities may include the acquisition or elevation of flood-prone properties, retrofitting structures, education and outreach efforts, and mitigation planning. Although no PDM projects have been completed yet in Kent County, PDM planning funds were utilized by DEMA on behalf of Kent County in order to develop this All Hazard Mitigation Plan.

Other Local Mitigation Measures

Kent County recently adopted a flood hazard mitigation plan and is working toward implementation of a variety of mitigation measures, including actions related to the following:

- Floodproof Pump Station #13

- Regulatory and Codes Review
- Geographic Information System
- Hazardous Materials
- Flood-Prone Roads
- Evacuation Constraints and Development
- Informational Handouts
- Vulnerable Housing
- Mitigation Grants Administrative Plan
- Substandard Housing
- Public Building Vulnerability
- Web Page
- Community Rating System
- Contractor Awareness
- Flood Hazard Awareness
- Direct Mail
- Staff Qualifications

As part of the *Capability Assessment Survey*, local municipal officials were asked to provide additional information on any on-going or completed mitigation projects in their jurisdictions. **Table 5.8** lists their responses to the questionnaire. Most of the communities indicated that they had not completed any hazard mitigation projects.

5.5 Conclusions on Local Capability

The capability of local governments in Kent County varies greatly from jurisdiction to jurisdiction. However, much of this variation can be accounted for when assessing the size of each jurisdiction. According to the scoring methodology utilized for this assessment, the county and the larger municipalities tended to score higher, while smaller, more rural communities reported lower capabilities. **Table 5.9** shows the results of the capability assessment using the following scoring methodology. Based on the updated information received from the County and municipalities, there is no change to the capability ratings in any of the jurisdictions.

Points System for Capability Ranking

46 points max:

0-14 points = Limited overall capability
15-29 points = Moderate overall capability
30-46 points = High overall capability

Yes=3 points No=0 points
Hazard Mitigation Plan
Radiological Emergency Plan
SARA Title III/Hazardous Material Facility Emergency Response Plan
Participate in CRS Program
BCEGS Grade of 1 to 5

Yes=2 points No=0 points
Emergency Operations Plan

Comprehensive Plan (that addresses natural hazards)
Disaster Recovery Plan
Continuity of Operations Plan
Regional Planning
Stormwater Management Plan
Participate in NFIP
Floodplain Management Plan
BCEGS Grade of 6 to 9

Yes=1 point No=0 points
Any of the above plans under County Jurisdiction

Yes=1 point No=0 points
Comprehensive Plan (but does not address natural hazards)
Transportation Plan
Capital Improvements Plan
Historic Preservation Plan
Zoning Ordinance
Subdivision Ordinance
Adopted building code

High=2 points Moderate=1 points Low=0 points (Self-ranked by jurisdiction)
Technical Capability
Fiscal Capability
Administrative Capability
Political Capability

No points
Flood Damage Prevention Ordinance (required if participate in NFIP)

****This methodology is based on best available information. If a jurisdiction does not provide information on any of the above items, a point value of zero (0) will be assigned for that item.*

Table 5.9
Capability Assessment Results

Jurisdiction	Capability Score	Capability Rating
Kent County	30	High
Bowers Beach	11	Limited
Camden	8	Limited
Cheswold	8	Limited
Clayton	11	Limited
Dover	14	Limited
Farmington	4	Limited
Felton	7	Limited
Frederica	9	Limited
Harrington	9	Limited
Hartly	4	Limited
Houston	5	Limited
Kenton	6	Limited
Leipsic		Limited
Little Creek	15	Moderate
Magnolia	5	Limited
Milford	12	Limited
Smyrna	18	Moderate
Viola	5	Limited
Woodside	4	Limited
Wyoming	6	Limited

Kent Countyk tingment Resultson best available information. If a jurisdiction does not provide information on any of the above items, a point value of zero (0) will be assigned for that item. pability ratings in any of the jurisdictions. ilized for thisn applying hazard mitigation principles through local government programs, and should serve as a mentor to its neighboring communities in Kent County. As the above findings indicate, Kent County has significantly more capability than its municipal jurisdictions and should serve as a clearinghouse for information and be the prime facilitator for enhancing and maintaining intergovernmental cooperation and coordination on local mitigation activities.

This All Hazard Mitigation Plan provides the vehicle to begin this process. However, in order to succeed, it will require clearly articulating the benefits of participating in and sustaining the countywide mitigation planning process. One of the best ways to obtain local buy-in and long-term success is to identify and implement achievable mitigation actions (as listed in this Plan pr*Mitigation Strategy*) that will facilitate continued intergovernmental coordination not only across the county, but with state and federal agencies as well.

Linking the Capability Assessment, the Risk Assessment, and the Mitigation Strategy

The conclusions of the *Capability Assessment* and *Risk Assessment* serve as the foundation for a meaningful hazard mitigation strategy. During the process of identifying the goals and mitigation actions, each jurisdiction must consider not only their level of hazard risk but also their existing capability to minimize or eliminate that risk. **Figure 5.3** shows the foundation for a meaningful hazard mitigation strategy by comparing the hazard risk with the overall capability.

Figure 5.3
Risk and Capability Matrix

		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited			

In jurisdictions where the overall hazard risk is considered to be HIGH, and local capability is considered LIMITED, then specific mitigation actions that account for these conditions should be considered. This may include less costly actions such as minor ordinance revisions or public awareness activities. Further, if necessary, specific capabilities may need to be improved in order to better address recurring threats. Similarly, in cases where the hazard vulnerability is LIMITED and overall capability is HIGH, more emphasis can be placed on actions that may impact future vulnerability such as guiding development away from known hazard areas.

5.6 Document Review

***Requirement §201.6(b)**: Review and incorporate, if appropriate, existing plans, studies, reports, and technical information.*

The purpose of a plan/ordinance review is tri-fold:

- To provide an inventory and review of sample plans and ordinances and identify sections in these documents that address hazard mitigation-related issues; and
- To provide a platform to integrate plans and other documents so recommendations and strategies are not in contradiction with one another (e.g., between the hazard mitigation plan and comprehensive plan).
- To offer suggestions for incorporation of hazard mitigation principles into the County's and municipalities' existing plans and ordinances and offer options for integration.

As part of the Document Review process, several plans and ordinances at the County and municipal level will be reviewed and a summary and options to integrate hazard mitigation principles into other planning mechanisms will be included. Examples of departments and areas for coordination are listed below:

Department	Relevant Documents
Planning Department	Comprehensive Plan/Land Use Plan, Zoning/Subdivision Regulations, Floodplain Ordinance
Public Works/Transportation Department	Stormwater Management (SWM) Plan, Sediment and Erosion Control Plan, Culvert and Bridge Maintenance Plans Long Range Transportation Plan
Emergency Management Department	Evacuation Plan, Emergency Operations/Response Plan
Environmental Planning	Climate Change Plan, Dam Safety Regulations, Wetland Regulations
Parks and Recreation	Open Space Plan

Each year, when the jurisdictions provide an annual update of their actions, they should be encouraged to indicate how and where these mitigation efforts are being implemented and integrated.

Typically the Document Review task should be conducted as part of the Plan Update process. In Kent County's case, this task will be performed as part of a Plan Integration initiative undertaken by FEMA Region III. This is elaborated below.

In 2013-2014, FEMA Region III worked with the States of Maryland, Pennsylvania, and Delaware to introduce the concept of Plan Integration – Integration of hazard mitigation into local planning mechanisms and vice versa. One pilot community – Cecil County, Maryland, was selected and plan integration was conducted through close coordination of and involvement by, County departments and municipalities. A Plan Integration Guide was developed to provide a step-by-step process for communities to conduct plan integrations through the use of examples and illustrations. The Guide is intended for use by counties and municipalities nationwide to conduct plan integration.

FEMA Region III is now embarking upon Phase II of the Plan Integration Project. In order to continue provide a greater understanding of plan integration concepts and mechanisms as they pertain to hazard mitigation in FEMA Region III communities, they conducting plan integration in six communities in the States of Pennsylvania, Maryland, Delaware, Virginia, and West Virginia and the District of Columbia so the process may be applied at a national level. One community from each of the Region III states has been identified to serve as a pilot for the Phase II Plan Integration and Kent County has been selected to represent Delaware. Document review (part of the plan integration task) for Kent County is expected to be completed in summer of 2015 and will be include in the 2015 Kent County Hazard Mitigation Plan Update as an Appendix.

The review of one document *Preparing for Tomorrow's High Tide 2014 Sea Level Rise – 2014 Sea Level Rise Workshop Proceedings and Interim Implementation Plan* is included below that focuses on the integration of climate change and hazard mitigation based on the following excerpt from the 2013 State of Delaware Hazard Mitigation Plan Update.

Hazard Mitigation and Climate Change Adaptation - With the climate changing and thus increasing the threats from natural hazards, Delaware is becoming increasingly vulnerable to many natural hazards. Communicating risks related to climate change and sea-level rise can be challenging due to scientific uncertainties and long timeframes associated with impacts; the scientific debate has also become politically polarized. Yet most everyone will acknowledge that there is no benefit in waiting to see if projected changes attributed to climate change will impact a specific region. Given Delaware's known natural hazard risks and the ever-increasing certainty of climate change impacts, there are a number of reasons for individuals and communities to proactively mitigate natural hazards and

adapt to climate change. Because significant time is required to motivate, develop adaptive capacity, and implement changes, acting now will allow for the time needed to achieve these long-term goals. Additionally, many hazard mitigation measures and adaptation strategies that address existing problems, such as short-term impacts of coastal storms, also provide benefits that help in preparing and planning for long-term effects of sea-level rise. Another major reason to begin enhancing hazard mitigation efforts with climate change adaptation is that proactive planning is often more effective and less costly than reactive planning and can provide immediate benefits. In fact, many climate adaptation actions appropriate for long-term planning are identical to those employed to manage or mitigate severe and more immediate impacts of other hazards. Examples include floodplain management plans, beach and dune management strategies, and higher floor elevation requirements to mitigate flood hazards. Integration of hazard mitigation planning (with its focus on past events) with climate change adaptation (and its attention to what might happen in the future) results in a win-win, no-regrets strategy that will prepare individuals and communities for future risk, no matter what the cause.
Source: 2013 State of Delaware Hazard Mitigation Plan Update

Preparing for Tomorrow's High Tide 2014 Sea Level Rise – 2014 Sea Level Rise Workshop Proceedings and Interim Implementation Plan

Overview: This document contains the results of the workshop held in March 2014 titled "Preparing for Tomorrow's High Tide: Implementing the Recommendations of the Sea Level Rise Advisory Committee." The purpose of the workshop was to develop specific implementation actions for the sea level rise adaptation recommendations published by the Sea Level Rise Advisory Committee in September 2013. The document includes a list of specific actions for implementation by the Sea Level Rise Advisory Committee to guide efforts for sea level rise adaptation.

Options for integration into the Hazard Mitigation Plan

The following activities suggested in this document directly or indirectly relate to hazard mitigation principles.

Activity 1: Identify specific regulatory barriers for sea level rise adaptation projects - the need for consistency in local floodplain regulations. A comprehensive review of key regulations and procedures is necessary to understand where barriers and conflicts exist, particularly for emergency repairs and critical infrastructure.

Partners: DNREC, DEMA, DelDOT, FEMA, USACE, NOAA, Delaware Division of Historic and Cultural Affairs and Local Governments

Activity 2: Create an adaptation clearinghouse to help local communities to provide the public information to make educated decisions about adapting to sea level rise in their communities. This clearinghouse should have a link to a technical team that can answer any questions local communities have that are not being answered by the clearinghouse.

Partners: USACE, DNREC, Delaware Division of Historical and Cultural Affairs, NOAA, FEMA, DEMA and Delaware Sea Grant

Activity 3: Make elevation surveys available to the public - Providing the local communities with elevation surveys done by DelDOT, DNREC and private companies will limit the cost to local communities for adaptation project design. It will also minimize the workload some of these communities will have when addressing sea level rise. Community participation in sea level rise awareness and preparedness will increase if costs can be minimized.

Partners: Delaware Sea Grant, University of Delaware, DNREC, DEMA, DelDOT, Realtors, Private surveyors

Activity 4: Develop a regional inventory of sea level rise activities – A regional inventory could provide new ideas or improve existing ideas that Delaware has for adapting to sea level rise. The Mid-Atlantic Regional Council on the Ocean completed a regional inventory that could be encouraged to update it, benefitting Delaware and all of the Mid-Atlantic states.

Partners: Mid-Atlantic Regional Council on the Ocean, United States Fish and Wildlife Service, NOAA, NASA, DNREC

Activity 5: Host an annual regional meeting on sea level rise - A regional meeting about sea level rise could provide a venue for states to share their experiences and ideas about vulnerability and adaptation and to improve networks of regional experts. It could also provide an opportunity for implementers to share what has worked and what has not worked.

Partners: Sea Grant, University of Delaware, DNREC, DEMA, Local Governments, DelDOT, Mid-Atlantic Council on the Ocean, other state agencies

Activity 6: Include sea level rise considerations in municipal multi-jurisdictional master plans - The Delaware Office of State Planning Coordination is encouraging towns and counties to begin Master Planning processes. Master Plans are more specific than the required Comprehensive Development Plans and can be coordinated between towns and counties. Bridgeville, Georgetown and Southern New Castle County have initiated master planning projects. These master plans could be a venue for identifying on-the-ground sea level rise adaptation strategies, particularly for flooding issues that cross municipal boundaries.

Partners: Sea Grant, University of Delaware, DNREC, DEMA, Local Governments, DelDOT, Utility Companies, Office of State Planning Coordination

Recommendation: Incorporate sea level rise considerations into the Strategies for State Policies and Spending Land-use decisions in Delaware are made at the local level, but the bulk of infrastructure and service that support these decisions are funded by the state. The Strategies for State Policies and Spending set forth clear advisory policies (including maps) about where the state will allocate financial resources for conservation, infrastructure improvements, and social services and are updated every five years. Incorporation of sea level rise into the suite of issues considered when the strategies are updated would provide an opportunity for coordination between agencies and local governments regarding sea level rise and may help further ensure wise use of state funding.

Recommendation: Consider incorporation of sea level rise considerations into municipal and county comprehensive development plans - State law requires that every municipality in Delaware develop, and periodically update, a comprehensive development plan. These plans contain a municipal development strategy that includes expansion of boundaries, future plans for residential and commercial growth, and future infrastructure investments, among others. They also contain environmental and demographic information. Consideration of sea level rise impacts and potential adaptation actions would ensure that all municipalities in the state are proactively taking into account potential sea level rise impacts in their future plans for growth and development and may allow for increased communication about sea level rise between municipal, county and state governments.

Activity 7: Update the PLUS Checklist - Workshop participants suggested adding sea level rise as a component of the checklist that is filled out by developers for the state mandated Preliminary Land Use Service (PLUS) application. Adding a field for sea level rise would ensure that local governments were taking into account information about sea level rise prior to making land use decisions.

Partners: Office of State Planning Coordination, DNREC, DNREC Delaware Coastal Programs, Local Governments, Delaware Sea Grant, DEMA, Center of the Inland Bays, Partnership for the Delaware Estuary

Activity 8: Create model language for sea level rise in comprehensive development plans - Developing model language about sea level rise for comprehensive development plans would help local governments incorporate these concerns into their plans and would help keep language pertaining to sea level rise consistent between all plans.

Partners: Office of State Planning Coordination, DNREC, DNREC Delaware Coastal Programs, Local Governments, Delaware Sea Grant, DEMA, FEMA, Center of the Inland Bays, Partnership for the Delaware Estuary

Activity 9: Provide sea level rise educational opportunities during the comprehensive development plan process - Similar to above, language and content should be expanded to demonstrate the tangible benefits of planning for sea level rise.

Partners: Office of State Planning Coordination, DNREC, DNREC Delaware Coastal Programs, Local Governments, Delaware Sea Grant, DEMA, FEMA, Center of the Inland Bays, Partnership for the Delaware Estuary

Activity 10: Include incentives for inclusion of sea level rise into comprehensive development plans - Providing financial or other incentives to county and municipal governments could provide the impetus required for voluntary incorporation of sea level rise considerations into comprehensive development plans. Incentives could be grants or funding to help develop the comprehensive plan or it could be criteria to qualify for other programs or funding. Note, the DNREC Delaware Coastal Programs offers an annual grant program for this purpose; the intent of this activity would be to expand upon those efforts.

Partners: Office of State Planning Coordination, DNREC, DNREC Delaware Coastal Programs, Local Governments, Delaware Sea Grant, DEMA, FEMA, Center of the Inland Bays, Partnership for the Delaware Estuary

Activity 11: Develop specific community sea level rise adaptation plans - Comprehensive development plans must be updated by municipalities every ten years. There was a feeling among workshop participants that updating the plans more frequently (for example, every 5 years) would provide the community with an opportunity to utilize up to date and reliable information for adaptation decisions. Absent that, communities should be encouraged to develop specific sea level rise adaptation plans, which can be updated as new data becomes available. Funding and technical assistance should be provided for this purpose.

Partners: Office of State Planning Coordination, DNREC, DNREC Delaware Coastal Programs, Local Governments, Delaware Sea Grant, DEMA, FEMA, Center of the Inland Bays, Partnership for the Delaware Estuary

Recommendation: Provide education and outreach for impacted communities and citizens – Communities that may be the most impacted by sea level rise should be provided with up-to-date information on seal level rise scenarios and be informed of adaption measures that can reduce the impact to their homes and communities. Residents of these areas should be made aware of available information of short- and long-term adaptation measures, benefits and risks of various adaptation measures, combination of risk factors (e.g. drainage and stormwater, coastal storms and sea level rise) and changes occurring in the insurance industry that may impact insurance availability and cost.

Activity 12: Create a centralized web resource for coastal hazard and sea level rise information; link it to county and municipal websites. There should be a centralized Delaware specific website for coastal hazard and sea level rise information. It could be managed at one of the colleges or universities. The site should be linked from county and municipal websites so that the information is more accessible and available to all citizens. Communities should also be provided with links to interactive mapping sites.

Partners: Delaware Sea Grant, University of Delaware, DNREC, DEMA, Local Governments, DelDOT, FEMA, Local Politicians.

Activity 13: Create a brochure to better inform homebuyers
Delaware Sea Grant currently has a Homebuyer's Brochure but it is still in draft format and has not been released to the public. This document would need to be updated but could better inform home buyers if it explained the risks, flood insurance, and the state's current actions and stance on sea level rise.
Partners: Delaware Sea Grant, University of Delaware, DNREC, DEMA, and Realtors.

Activity 14: Provide outreach and education to realtors
Provide targeted outreach to realtors regarding flooding, sea level rise and insurance issues so that they can better answer questions about these subjects for their clients. This can be through presentations, training courses, brochures or websites.
Partners: Delaware Sea Grant College Program, DNREC, DEMA, Delaware Association of Realtors

Activity 15: Incorporate sea level rise information into Delaware State Housing Authority Housing Counseling Programs
The Delaware State Housing Authority and their partners offer housing education classes for potential homebuyers. Flooding, flood insurance and sea level rise could become a part of their curriculum. They could also provide sea level rise specific classes for homebuyers, homeowners, and realtors. The more information that is provided to new homebuyers the better informed and prepared they will be for any sea level rise based problems. The Homebuyers Fair that is held every year would also be a great event for this information to be shared and received by a large audience in a minimal amount of time and effort.
Partners: Delaware Sea Grant, University of Delaware, DNREC, DEMA, Realtors, DelDOT, Delaware State Housing Authority

Activity 16: Improve access to state agency data for use by local governments
Workshop participants identified issues obtaining information and data that would allow them to easily assess their vulnerability and plan resiliency projects. Road, culvert and outfall elevations held by DelDOT were specifically cited, but communities also have difficulty accessing basic geographic data, including sea level and floodplain data. Community participants emphasized that they are paying large amounts of money to have studies done to collect information that may have already been collected by a state agency, but cannot be found or shared.
Partners: DelDOT, DNREC, counties and municipalities, Delaware State Housing Authority

Activity 17: Create a team in each county to help develop projects for hazard mitigation and sea level rise
Participants wanted to create a team of knowledgeable professionals that could provide assistance in developing projects for hazard mitigation and sea level rise. This team could consist of county floodplain managers, infrastructure professionals, public works professionals, and environmental scientists. This group could assess projects, gather information, and help develop projects in a coordinated way.
Partners: County officials, Local Business owners, DNREC, DelDOT, DEMA

Activity 18: Include sea level rise and natural hazards in Comprehensive Land Use Planning Process
Including sea level rise and natural hazards in the Comprehensive Land Use Planning Process is a natural step to introduce sea level rise into future planning for communities. Communities should incorporate sea level rise into these plans so they can prepare and so that any future infrastructure will consider sea level rise before it is constructed.

Partners: Community Planning Boards, DNREC, DelDOT, Office of State Planning Coordination.

Activity 19: Provide model zoning code language for sea level rise
Model zoning code language reflecting best practices for sea level rise could be developed and provided to interested municipalities for adoption. Developing model language for zoning code improvements saves municipal governments from the expense of developing their own language while increasing the potential for consistency between local and county governments.
Partners: Delaware Office of State Planning Coordination, DNREC Delaware Coastal Programs, DNREC Delaware Division of Energy and Climate, Delaware Office of Management and Budget, Delaware Office of the Governor, Delaware Division of Facilities Management, League of Local Governments, University of Delaware Institute for Public Administration.

Activity 20: Educate Communities about sea level rise
Workshop participants felt it was necessary to work alongside DelDOT to educate communities about Sea Level Rise and how to plan for the future. In the same efforts, the participants wanted work with local governments to address Sea Level Rise. In order to reach the communities in a more consistent manner, the group suggested creating a guidance document that incorporates all agencies regarding flooding and sea level rise. This would be easier and cheaper than actually visiting the communities, until specific needs arise.
Cost: $100,000 – 1M
Partners: DelDOT, municipalities, counties

Activity 21: Assess construction material suitability for sea level rise and flooding
Some materials used in construction (concrete and compressed sand blocks) can be subject to erosion. Participants discussed the idea of conducting an analysis of materials used for construction and design to determine their suitability for use in flood prone areas. Results could be added to design manuals.
Cost: $10,000 – 100,000
Partners: No partners were discussed.

Activity 22: Update FEMA maps with sea level rise
Participants thought better maps and modeling were needed (instead of bathtub models) and that FEMA floodplain maps should be updated to incorporate sea level rise.
Cost: $100,000 – 1M
Partners: No partners were discussed.

Activity 23: Create disincentives for construction in sea level rise zones
Disincentives should be developed for new buildings that would be located in an area expected to be inundated by sea level rise. Designating these areas as vulnerable by classifying them as Level 4 would discourage state support for infrastructure and other services. Retreat strategies can, and should, be included for these projects. Local governments should be educated on the utility of flood management tools that can deter development in flood prone areas. These disincentive areas can capture projects that fall outside local flood ordinances and do not require flood insurance.
Partners: DNREC, local governments
Prerequisite: Develop new Delaware specific floodplain and sea level rise maps, as called for by EO 41.

Activity 24: Develop community-based vulnerability maps
Maps to identify the vulnerability of water infrastructure to both storm events and sea level rise should be developed. These maps should include facilities and associated pipelines. These maps would help to target areas for communities to focus their sea level rise adaptation efforts. Development of these maps will require additional

information about the heights of the facilities, the depths and locations of pipelines, along with potential sea level rise and flood levels. Maps that include this type of information can be included in Comprehensive Land Use Plans and other long-range planning documents as well.
Partners: Delaware Municipalities

Activity 25: Comprehensive Land Use Plans
Counties have information about county run wastewater systems. County and municipal land use plans can include information about sea level rise scenarios and areas where wastewater systems may need to accommodate for sea level rise.
Partners: Delaware Counties and Municipalities, Delaware Office of Management and Budget, DNREC

6.1 MITIGATION STRATEGY

6.1.1 Plan Update Summary

Based on the issues identified in the Hazard Identification and Risk Assessment, gaps identified in the mitigation capability analysis, input from the Steering Committee on goals in the 2009 Plan, the goals were revised for this Plan Update.

In order to improve the level of coordination between state and local governments within the State of Delaware, the State Plan discusses the linking of local and state planning goals as an important first step. The goals established through the State Plan and County Plan updates were developed independently but have been found to be similar due to the shared objectives of both the State of Delaware Mitigation Plan and the County Plan Update. In Kent County, this was aided by the attendance of State Officials from DEMA and FEMA Region III staff at the County Steering Committee meeting in December 2014. Goals were revised, added, and vetted by DEMA. Had the goals of state and county-level plans differed significantly, a resolution would have been reached during the meeting.

6.1.2 Introduction

The intent of the *Mitigation Strategy* is to provide Kent County and participating jurisdictions with the tools necessary to continue to reduce the impact of natural hazards. In order to achieve these aims, this section was separated into the following components:

- Mission Statement
- Mitigation Goals
- Identification and Analysis of Mitigation Measures and
- Mitigation Action Plan

The Kent County All Hazard Mitigation Plan Update provides a comprehensive review of hazards and identifies far-reaching policies and projects intended to not only reduce the future impacts of hazards, but also assist the county and municipalities achieve compatible economic, environmental and social goals. In addition, the Plan is strategic, in that all policies and projects are linked to departments or individuals responsible for their implementation. When possible, funding sources are identified that can be used to assist in project implementation.

The Mitigation Action Plan lists specific prioritized actions, agency(ies) responsible for their implementation, potential funding sources that may be used, and an estimated target date for completion. Each action was listed with the accompanying information. This approach provides those in charge of the Plan's implementation with a clear roadmap that serves as an important monitoring tool. The collection of actions also serves as an easily understood menu of policies and projects for those decision makers who want to quickly review the Plan.

6.1.3 Planning Approach

Goals are intended to meet the intent of the mission statement. Mitigation actions serve to provide clear, measurable tasks. Actions may include policies or projects designed to reduce the impacts of future hazard events. Each step is intended to provide a clearly defined set of policies and projects based on a rational framework for action. The components of the planning framework are explained in greater detail below.

Mission Statement:	Provides guiding principles of the Hazard Mitigation Plan.
Goals:	Goals represent broad statements that are achieved through the implementation of more specific, action-oriented objectives. Goals provide the framework for achieving the intent of the mission statement.
Hazard Mitigation Policies:	Policies are defined as a course of action agreed to by members of the Planning Team.
Hazard Mitigation Projects:	Projects are defined as specific actions taken to address defined vulnerabilities to existing buildings or systems. Potential funding sources are listed for each project.
Mitigation Action Plan:	Prioritized listing of actions (policies and projects), including a categorization of mitigation techniques, hazards addressed, individual or organization responsible for implementation, estimated timeline for completion, and a list of potential funding sources.

Mission Statement

Develop and maintain a comprehensive hazard mitigation program guided by the effective use of data, analyses and studies, enhanced communications, improved stormwater management, the implementation of special projects and the adoption of codes, leading to the creation of policies and projects designed to reduce the vulnerability of people and property within Kent County to the negative effects of natural hazards.

6.1.4 Mitigation Goals

Requirement §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.*

The following goals and mitigation actions of the Kent County Hazard Mitigation Plan were updated at the Committee meeting on 10 December 2014 and represent a comprehensive approach taken by the County and its municipalities. The goals have remained unchanged for the most part since the 2004 Plan. However, the goals have been reworded to focus on natural hazards rather than natural and human caused hazards. Three new goals (goal #s 7, 8 and 9) has been added to the list of existing goals.

Goal #1	Kent County and participating municipalities will maximize the use of data, analyses, and studies to develop sound mitigation policies and projects.
Goal #2	Kent County and participating municipalities will improve communication to better protect lives and property from the potential impacts of natural hazards.

Goal #3	Kent County and participating municipalities will improve stormwater management practices in order to reduce flood-related impacts in concert with DNREC and the Kent Conservation District.
Goal #4	Kent County and participating municipalities will identify various funding sources and will implement special projects designed to reduce the impact of natural hazards.
Goal #5	Kent County and participating municipalities will continue to adopt and implement local codes to reduce the impacts of natural hazards.
Goal #6	Kent County will continue to work with municipalities to provide education and assistance with the implementation of specific projects.
Goal #7	Kent County and its municipalities will support the implementation of cost-effective acquisition, elevation, floodproofing projects for residential and non-residential structures.
Goal #8	Kent County and its municipalities will support the implementation of cost-effective critical facilities and infrastructure projects.
Goal #9	Kent County and its municipalities will support the implementation of cost-effective emergency management/public safety related projects.

6.1.5 Identification and Analysis of Mitigation Measures

In reformulating the Kent County' Mitigation Strategy, a wide range of activities were considered in order to help achieve the goals of participating jurisdictions. All actions chosen by county and municipal government officials fell into one of the broad categories of mitigation techniques: preventive measures, natural resources and open space protection, outreach and coordination, and other (includes emergency services).

Mitigation Techniques

1. Prevention

   Preventative activities are intended to keep hazard problems from getting worse. They are particularly effective in reducing a community's future vulnerability, especially in areas where development has not occurred or capital improvements have not been substantial. Examples of preventative activities include:

   - Planning and zoning
   - Building codes
   - Hazard mapping
   - Floodplain regulations
   - Stormwater management
   - Capital improvements programming
   - Shoreline / riverine / fault zone setbacks

2. Natural Resources and Open Space Protection

   Natural resource protection activities reduce the impact of hazards by preserving or restoring the function of natural systems. Examples of natural systems that can be classified as high hazard areas include floodplains, wetlands and barrier islands. Thus, natural resource protection can serve the dual purpose of protecting lives and property while enhancing environmental goals such as improved water quality or recreational opportunities. Parks, recreation or conservation agencies and organizations often implement these measures. Examples include:

- Floodplain protection
- Beach and dune preservation
- Riparian buffers
- Fire resistant landscaping
- Erosion and sediment control
- Wetland restoration
- Habitat preservation
- Slope stabilization

3. Outreach and Coordination

   Outreach and coordination activities are used to advise residents, business owners, potential property buyers, and visitors about hazards and mitigation techniques they can use to protect themselves and their property. Examples of measures used to educate and inform the public include:

   - Outreach and education
   - Training
   - Speaker series, demonstration events
   - Real estate disclosure
   - Hazard expositions

4. Other (including property protection, emergency services and structural projects)

   Property protection measures enable structures to better withstand hazard events, remove structures from hazardous locations, or provide insurance to cover potential losses. Examples include:

   - Acquisition
   - Relocation
   - Building elevation
   - Critical facilities protection
   - Retrofitting (i.e., wind proofing, flood proofing, seismic design standards, etc.)
   - Insurance
   - Safe room construction

   Structural mitigation projects are intended to lessen the impact of hazards by modifying the environment or hardening structures. Structural projects are usually designed by engineers and managed or maintained by public works staff. Examples include:

   - Reservoirs
   - Levees, dikes, floodwalls, or seawalls
   - Detention and retention basins
   - Channel modification
   - Beach nourishment
   - Storm sewer construction

Emergency services minimize the impact of a hazard on people and property. Actions taken immediately prior to, during, or in response to a hazard event include:

- Warning systems
- Search and rescue
- Evacuation planning and management
- Flood fighting techniques

6.1.6 Mitigation Techniques in the Kent County Planning Area

Requirement: §201.6(c)(3)(ii): *[The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.*

County and municipal officials reviewed the findings of the *Capability Assessment* and *Risk Assessment* in order to determine feasible and effective mitigation techniques. The Mitigation Matrix (**Table 6.1**) assists local governments make sure they addressed, at a minimum, those hazards posing the greatest threat. Mitigation techniques, including prevention, property protection, natural resource protection, structural projects, emergency services and public information and awareness were noted in the matrix if adopted by a participating jurisdiction. It is important to note that local Mitigation Action Plans in the Kent County planning area include an array of actions, not just those addressing high and moderate risk hazards.

Participation in the NFIP is based on a voluntary agreement between a community and FEMA. Compliance with the NFIP, however, extends beyond mere participation in the program. The three basic components of the NFIP include 1) floodplain identification and mapping risk; 2) responsible floodplain management; and 3) flood insurance. The following minimum compliance actions and the manner in which the County handles them are included below, based on a list of questions developed by DEMA.

Table 1.1 – NFIP Continued Compliance

Floodplain Identification and Mapping		
Requirement	**Yes/No**	**County Action**
Does the County maintain a copy effective FIRM (flood insurance rate map) maps and FIS (flood insurance study) that is accessible to the public?	Yes	Maintained by the Department of Planning Services
Has the County adopted the most current DFIRM or FIRM and FIS?	Yes	2003
Does the County support request for map updates?	No	The municipalities are not involved in map changes.
Does the County share with FEMA any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	No	The County has not conducted any studies that have included new data for map revisions.
Does the County provide assistance with local floodplain determinations?	Yes	The County assists property owners identify their location relative to the FIRMs but does not assist with surveys or elevation certificates
Does the County maintain a record of approved Letters of Map Change?	Yes	Department of Planning Services maintains file
Floodplain Management		
Requirement	**Yes/No**	**County Action**
Has the municipality adopted a compliant floodplain management ordinance that at a minimum regulates the following:	Yes	
Does the County issue permits for all proposed development in the SFHA?	Yes	Permits are issued by the Department of Planning Services – Division of Inspection and Enforcement
Does the County obtain, review and utilize any Base Flood Elevation and floodway data, and require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	Yes	This is required by the Department of Planning Services
Does the County identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the Base Flood Elevation, including anchoring, using flood resistant materials, designing or locating utilities and service facilities to prevent water damage?	Yes	Identified by the Department of Planning Services
Does the County document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.	Yes	Maintained by the Department of Planning Services
If a compliant floodplain ordinance was adopted, does the County enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	Yes	The County coordinates with DNREC for community assessments; identifies properties in violation; and works with property owners to achieve compliance
Flood Insurance		
Requirement	**Yes/No**	**Municipality Action**
Does the County educate community members about the availability and value of flood insurance?	No	The County focuses primarily on construction requirements within the floodplain
Does the County inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	Yes	The public is notified when the maps are updated and prior to County adoption of the maps
Does the County provide general assistance to community members relating to insurance issues?	Yes	Outreach provide when the new maps were being considered. Other than that, outreach focuses mostly on construction requirements and does not include assistance on flood insurance.

DEMA has developed a Flood Smart brochure that addresses the availability of flood insurance and is distributed to every library in the State.

A few of the municipalities including Felton and Little Creek have adopted the County's floodplain regulations while other such as Leipsic has adopted their own floodplain regulations. However, all municipalities have their own zoning and subdivision ordinances.

Table 6.2 – Floodplain Regulations Matrix

	County	CRS	Freeboard (7)	Building Code	Flood study in Unmapped FP (1) = 3,4 A 5	Require EC & FP cert. (6) * = 3,4 A 2 & 3	Shallow fill doesn't exempt (9) = 4,4 F	Prohibit below grade crawls (11) = 5,2 B	Prohibit subdivision of Flood Plain (12)	Prohibit structures in FP in subd. (13) =	Prohibit encroachment that causes >0.1	Incorporate Tech. Bulletins (15)	Land below BFE considered SFHA = 1,4	Encourage Zone VE construction in Coa	
Bowers	Kent		1 ft.			x (2)						x	x		
Camden	Kent		18 in.			x (3)		x				x	x		
Cheswold	Kent		12 in.			x (2)		x				x	x		
Clayton	Kent		18 in.			x (3)		x				x			
Dover	Kent		18 in.	2009		x (2)						x	x		
Felton	Kent		18 /12 in.			x (3)	x 18 in.	x	??		x	x	x		
Frederica	Kent		18 in.		x	x (3)	x 18 in.	x		x	x	x	x		
Harrington	Kent		18 in.			x (2)		x				x	x		
Kent County	Kent		18 in.			x (3)		x	x			x		x	
Leipsic	Kent		18 in.			x (3)		x				x			
Little Creek	Kent		18 in.			x (3)		x				x			
Smyrna	Kent		18 in.		x	x (3)	x 18 in.	x		x	x	x	x		
Wyoming	Kent		18 in.			x (2)		x			x	x	x		

Source: DNREC

* = indicates # of Elevation Certificates required - Construction drawing EC, Building Under Cons. EC, Finished Construction EC

Table 6.2 demonstrates each community's minimum requirements from a floodplain regulation standpoint. The freeboard in all communities in the County is at least a foot and all municipalities require elevation certificates.

6.2 Locally-specific Mitigation Actions

6.2.1 Introduction

Requirement §201.6(c)(3): *The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

The mitigation strategy serves as the long-term road map to reduce the potential losses, vulnerabilities, and shortcomings identified in the Hazard Identification and Risk Assessment section. A typical mitigation strategy includes a list of goals and objectives, along with specific mitigation actions to address the goals and objectives. Actions are then prioritized, based on the community's requirements.

6.2.2 The Cost-Benefit Review and Benefit-Cost Analysis (BCA)

The Cost Benefit Review comprises an analysis that compares the project cost to both tangible and non-tangible benefits. Tangible benefits are those benefits that could be considered in a comprehensive Benefit-Cost Analysis (BCA). Non-tangible benefits include public support, political will, and life safety.

All mitigation projects that are considered for FEMA's Hazard Mitigation Assistance (HMA) program funding will have a comprehensive BCA completed using FEMA approved BCA software. Both the State Hazard Mitigation Officer (SHMO) and the Flood Mitigation Assistance program coordinator can provide assistance with the BCA. This analysis will be the basis by which the County, municipality, or University either pursues a FEMA grant or seeks funding elsewhere. Only cost-effective eligible projects will be submitted for funding under the HMA program.

The mitigation actions from the 2009 Plan were reviewed at the County and Municipal Steering Committee Meeting held on 10 December 2014 and edited as necessary. In addition to the meetings, the County, municipalities, and DEMA were contacted via phone and email and requested to review and update the actions from previous plan updates. Table 6.2.1 identifies actions that were either completed or cancelled since the last Plan Update while 6.2.2B lists the previous and newly developed actions that need to be implemented.

LOCALLY-SPECIFIC MITIGATION ACTIONS

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			X
	Moderate			
	Limited			

The mitigation actions from the 2004 Plan were reviewed at the Committee Meeting held on 10 December 2014 and edited as necessary. Tables 6.2A and 6.2B provide a listing of all mitigation actions, their adoption status, and timeline for completion, priority, and status. Table 6.2A contains all the actions that were either completed or cancelled while 6.2B lists the previous and newly developed actions that need to be implemented.

Requirement 201.6©(3)(ii): *[The mitigation strategy shall include a} section that identifies and analyzes a comprehensive range of mitigation action and projects being considered to reduce the effects of each hazards, with particular emphasis on new and existing buildings and infrastructure.*

LOCALLY-SPECIFIC MITIGATION ACTIONS

Table 6.2.1 – Completed and Cancelled Mitigation Actions

Action No.	Action	Action Completed or Cancelled
Bowers Beach		
1	Elevate three private buildings.	Cancelled - One property was determined not to be salvagable - the property was purchased by the Town through FEMA and DNREC grants, the building removed and the property is being converted to a park.
2	Conduct Bowers Beach Home Acquisition w/Park Improvements	
Camden		
1	Install generators and automatic transfer switches in two critical facilities.	Complete
2	Install portable emergency buttons for town hall employees with direct link to police department.	Complete
3	Implement photo identification system for town employees and key personnel.	Complete
4	Purchase four security cameras for town hall and police department.	Complete
5	Designate emergency shelters.	Complete
6	Install three entry bells for town buildings.	Complete
7	Develop post-disaster animal care plan.	Cancelled
Dover		
1	Conduct annual table top exercises for emergency response.	Complete. A general table top exercise was completed at the Fire School. example: Failure of a dam.
2	Identify mitigation measures for Puncheoron Run (between Governors Avenue and New Burton road).	Completed. URS study by KCD identified a number of options.
3	Correct identified Flood Insurance Rate Map inaccuracies in the vicinity of the Bay Tree Subdivision.	Complete
Frederica		
1	Work with Delaware DOT to identify areas of frequent roadway flooding on Market Street and develomitigation strategies.	Complete
2	Develop Emergency Operations Plan in coordination with fire and police.	Complete
Harrington		
1	Retrofit sewer lines to limit groundwater inflow into treatment plan.	The City has completed and Inflow and Infiltration Study for one quarter of the City and is currently half way complete for an Inflow and Infiltration Study for a second quadrant of the City. The City has authorized the City Engineer to apply for USDA and FAB grants and loans once the study is complete for the funding of the improvements as recommended in the studies.
Houston		
1	Purchase back-up generator for fire hall which would be used as an emergency shelter.	Complete
Little Creek		
1	Conduct regular inspections on the drainage ditches on the east side of Town.	Cancelled. This action is unable to be conducted due to access issues caused by the property owner just east of the ditch.
2	Conduct a study to determine why and how to alleviate flooding of Route 9 and nearby businesses.	Complete. This study was done as part of the Little River Dredging Project. Dredging is to start soon and this will alleviate some of the issues.
3	Place emergency prepared information in fire hall and post office.	Complete
4	Evaluate the feasibility of constructing a flood gate behind the state building east of Route 9.	Cancelled. This action is unable to be conducted due to access issues caused by the property owner just east of the ditch.
5	Work with the County to conduct a detailed flood vulnerability study for the entire Town.	Completed. This study was done as part of the Little River Dredging Project. Dredging is to start in Dec 2014 and we hope this will alleviate some of these issues.
Milford		
1	Update Local Flood Damage Prevention Ordinance.	Complete
2	Relocate commercial structures outside of floodplains and ensure that these sites remain open space in perpetuity.	Effort is cancelled since it would eliminate the historical downtown district.
Unincorporated Areas		
1	Conduct an inventory of critical facilities that are at high risks to various hazards.	Completed
2	Conduct DNREC Engineering Analysis (Kitts Hummock, Pickering Beach, South Bowers Beach)	Completed

LOCALLY-SPECIFIC MITIGATION ACTIONS

Requirement §201.6(c)(3)(ii): *[The mitigation strategy **shall** include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

Table 6.2.2 – Ongoing Mitigation Actions

Ongoing and New Actions		
Action	**Description**	**Status (Started, Not Started, In Progress)**
Bowers Beach		
1	Elevate Route 18 (Main Street) from the highway to town sign (approximately 1/4 mile).	Ongoing. Requires DelDot action-presently awaiting conclusion by the Delaware Bay Beach Communities drainage legislative committee.
2	Work with DNREC to develop a Coastal Resiliency Plan to reduce losses from coastal hazards and integrate the Action Plan with Kent County Hazard Mitigation Plan.	Under Resolution 2010-01-11-01, the Town adopted the revisions to the Kent County Plan dated September 2004 on February 11, 2010
3	Work with the County to conduct a detailed flood vulnerability study for the entire Town.	Ongoing. Through DNREC, the Town completed an engineering study and engineering has been done to mitigate the affects of tidal flooding. Awaiting funding
4	Elevate the southern portion of Hubbard Road (adjacent to the creek).	Ongoing. The engineering is complete and the Town is currently seeking funding.
Camden		
1	Purchase satellite cell phones for use by key personnel during emergencies.	
2	Conduct emergency response training exercises once every two years.	Not started. The Town simply needs to devote attention to and engage those who may assist in conducting an emergency response training exercise. Town will commit to initiating and conducting an exercise.
3	Designate emergency collection point at firehouses, churches, etc.	
4	Encourage residents who are dependant on electric power for essential medical devices (i.e., ventilators, and IV pumps) to register in the 911 system.	Not started. Staff will initiate and develop a roster of town residents relative to this action.
5	Request an annual presentation by a DEMA representative on local disaster planning.	Not started.
6	Investigate flooding and drainage related issues at the intersection of Main Street and South Street	New action
7	Replace the undersized stormwater drain on South Street	New action

LOCALLY-SPECIFIC MITIGATION ACTIONS

8	Address flooding issues due to the open pipe on Camden Wyoming Avenue and Southern Boulevard	New action
Cheswold		
1	Conduct natural vulnerability assessment of one asphalt plant in the Town.	To be completed
2	Investigate flooding related issues on US Route 13 south of 42.	New action
Clayton		
1	Inspect dam at Wheatley's Pond and identify strategies for repairing or retrofitting this dam based on the results of the inspection.	To be completed
2	Develop relocation plan for non-essential personnel (i.e., finance, law, public works, etc.) in the event that the City/County building is unusable.	
3	Purchase a generator for the Town Hall/PD	
Dover		
1	Consider relocating the electric distribution system to protect against long-term outages.	Ongoing
2	Re-enforce electric system in Emergency Operations Center so that it can sustain high winds.	Ongoing. Utility admin. Building controls the SCADA system, which runs electric, water [illegible] sewage utility. Concept only. Constrained by current economy.
3	Conduct a study to determine the feasibility of relocating the City of Dover Grounds Department outside of St. Jones river floodplain.	To be completed. The City must abandon this site regardless of cost at some point. Projects are in planning stage. Budget constraints are delaying this process.
4	Work with the County to conduct a detailed flood vulnerability study for the entire City.	Ongoing. Project is in concept phase.
5	Acquire grounds building	Not started.
Farmington		
1	Purchase and install outdoor surveillance security system at the town hall once retrofitted.	
2	Retrofit town hall to serve as an emergency shelter and evacuation point.	Not started. Action will be pursued if and when funding is identified secured.
3	Purchase and install outdoor surveillance security system at the firehouse to include monitoring the nearby town playground.	
Felton		
1	Develop generic informational guidelines for residents of Felton regarding how they should respond to various threats.	
2	Revise the Emergency Water Plan (updated in 1999 by the Delaware Rural Water Association).	
3	Develop an Emergency Operations Plan for the Town of Felton in conjunction with the local fire service and police.	
4	Develop and distribute material to the residents of Felton addressing preparedness and recovery.	
5	Conduct a survey of all historic sites that are located in hazard areas.	
6	Develop mitigation strategies to protect any at risk historic properties.	
Frederica		
1	Introduce back-up to the Town's pumping stations.	In progress

LOCALLY-SPECIFIC MITIGATION ACTIONS

2	Provide property owners in Frederica with brochures and other material regarding potential flood hazards.	Current
3	Work with the County to conduct a detailed flood vulnerability study for the entire Town.	In progress
Harrington		
1	Purchase generator for wells.	
2	Retrofit sewer lines to limit groundwater inflow into treatment plant.	In progress Engineering Complete
3	Integrate 500,000 gallon and 250,000 gallon water towers.	Construction Phase – currently bidding work
4	Dig new well to increase redundancy of water supply system.	Ongoing. The City is evaluating their debt service to find a way to enact these improvements within the next two years.
Hartly		
1	Work with Kent County on public outreach programs designed to promote hazard education and awareness and identify a variety of techniques for residents and businesses.	Ongoing
Houston		
1	Develop an Emergency Operations Plan in cooperation with the Houston Fire Company.	"This is an on going project with the fire hall, funding is needed"
2	Provide residents with informational brochures regarding disaster preparedness.	"This is a continuing process for the Fire Hall and town. Funding is needed"
3	Create displays for use at public events (health fair, public awareness day, county fair and town events).	
Kenton		
1	Work with the LEPC to Develop hazardous materials site inventory.	
2	Identify strategies to mitigate risks associated with the transportation and storage of hazardous materials in and around the Town of Kenton.	
3	Evaluate storm water management system as it relates to tertiary roads.	
4	Coordinate with Towns of Cheswold, Hartly, Smyrna and Clayton conduct training exercises for emergency management activities.	
5	Retrofit the Kenton Municipal building (public shelter) to be more resilient to all hazards.	
Leipsic		
1	Develop an Emergency Operation Plan for the town of Leipsic in conjunction with the local fire service, county and state police.	
2	Continue to provide information about local, regional, state and Federal training opportunities to fire department, EMS, ambulance services and other emergency responders.	
3	Develop an emergency preparedness and response brochure specific to the Town of Leipsic for all residents that contains information on shelters, evacuation procedures and emergency contact information.	
4	Continue to increase the number of trained volunteer citizen emergency responders.	
5	Work with the County to conduct a detailed flood vulnerability study for the entire Town.	
6	Install a bulkhead at the Leipsic River.	New action
7	Rehab the Leipsic tax ditch to aid in flood control planning.	New action
Little Creek		

LOCALLY-SPECIFIC MITIGATION ACTIONS

1	Develop method to address mosquitoes and possible West Nile Virus outbreak.	Ongoing. The Fire House is used as temporary shelter during storms. The firehouse can't be a permanent shelter due to its proximity to the flood plain and the building not meeting ARC Requirements for a shelter.
2	Improve facilities at the Town's Fire Hall to support the use of the building as a Town shelter. Establish a decontamination facility within the Fire Hall to includea shower and wet room equipment.	New action
3	Relocate flood-prone structures when elevation is not a cost effective alternative.	New action
4	Elevate flood-prone structures.	New action
5	Reconstruct existing structure/building to reduce risk from (hazard).	New action
6	Dry Flood Proof structure/system to reduce risk from (hazard).	New action
7	Dry Flood Proof historic residential structures to reduce risk from (hazard) only when other techniques that would mitigate to the BFE would cause the structure to lose its status.	New action
8	Retrofit existing structure/buildings to reduce risk from (hazard). (i.e. foundation, load-bearing wall, beam, column, building envelope, structural floor and roof, connections between these)	New action
9	Retrofit non-structural elements) of buildings to reduce risk from (hazard). (i.e. bracing of building contents to prevent damage or elevation of heating and ventilation systems).	New action
10	Target hazard-prone properties, i.e., repetitive flood loss properties (FEMA repetitive loss and severe repetitive loss lists) through sponsorship of FEMA HMGP, FMA, PDM, RFC, and SRL grant programs.	New action
11	Pursue 5% initiative funding to procure warning systems that provide real time warning of impending hazards.	New action
12	Pursue 5% initiative funding to install generator "quick-connects" to critical facilities.	New action
13	Pursue 5% initiative funding to install generators to critical facilities	New action
14	Pursue 5% Initiative Funding to improve public outreach and communication efforts regarding hazard mitigation — utilizing websites, training, newsletters, brochures, etc.	New action
15	Pursue 5% initiative funding to evaluate building codes in support of future adoption and/or mitigation.	New action
16	Pursue 5% initiative funding to assist in mitigating damage from trees during high wind events such as hurricanes, snow load and ice accumulation.	New action
17	Pursue 5% initiative funding to assist in obtaining elevation certificates for all residences in town to determine which residences are most vulnerable to flooding.	New action
Magnolia		
1	Research the benefits and workload requirements for joining the National Flood Insurance Program.	Do not see any benefits of joining the NFIP; not in flood zone.
2	Coordinate with County and State officials to evaluate ways to eliminate or minimize flooding during heavy rain events along Barkers Landing Road just outside Town limits.	
3	Purchase generator for water system when power fails.	
Milford		
1	Relocate Milford Fertilizer out of floodplain.	
2	Develop a riparian buffer standard for building setbacks along the Mispillion River and other waterways.	In progress. Currently comparing ideas to both Sussex and Kent

LOCALLY-SPECIFIC MITIGATION ACTIONS

		Counties since the City is split.
3	Obtain back-up emergency radio system.	
4	Update Reverse notification system	
Smyrna		
1	Develop security badge system for use by all Town of Smyrna employees.	
2	Install security partitions at customer service counters in the lobby of Town hall.	
3	Install 12 "hold-up alarms."	
4	Purchase a generator for the Public Works Building for emergency power that is at least two 800 megahertz radios	
5	Purchase a flood alert monitor for Lake Como Spillway - well house #3	
Viola		
1	Educate the public regarding preparedness and protection measures including shelter-in-place.	Ongoing
2	Use GIS and existing location information reported under SARA Title III to identify hazardous materials handlers/waste sites in the mapped floodplain. Identify flood-prone properties and encourage the adoption of protective measures and the preparation of a flood response plan.	Ongoing. Town plans to communicate with County office to determine procedures regarding hazardous materials incidents and will educate citizens on an ongoing basis.
3	Educate the public concerning sheltering-in-place in the event of a hazardous material spill or release.	Ongoing
4	Educate the public regarding special needs populations in the event of winter storms.	
5	Educate the public concerning sheltering-in-place in the event of a hazardous material spill or release.	Ongoing
6	Identify shelters and notify the public about their location.	
Woodside		
1	Work with the County on outreach programs designed to promote hazard education and identify a variety of hazard mitigation techniques for residents and businesses.	Ongoing
Wyoming		
1	Install surveillance video equipment at the Wyoming police station/town hall interior and exterior and the railroad, which runs behind both northbound and southbound.	
2	Work with the Delaware Department of Transportation to identify areas of frequent roadway flooding and develop mitigation strategies to address known hazards.	
3	Develop specific mitigation strategies to protect any at-risk historic properties in town.	
4	Conduct a survey of all historic sites that are located in hazard areas.	
5	Develop a continuity of operations plan for the town of Wyoming to include the local fire company (shared between Camden and Wyoming) and police department (shared with Camden).	
6	Purchase back up generator for the police station/town hall.	
7	Install bulkhead from where the riprap ends at Wyoming park to Wyoming Mill Pond.	
8	Make improvements to South Layton Street Pump House	In progress
9	Address flooding issues due to the open pipe on Camden Wyoming Avenue and Southern Boulevard	New action
Unincorporated Areas		
1	Update Kent County Emergency Operations Plan.	New action
2	Review/revise drainage code.	In progress

LOCALLY-SPECIFIC MITIGATION ACTIONS

3	Repair sewer pump stations.	
4	Develop Emergency Evacuation Plan for public assembly events.	
5	Use GIS and existing location information reported under SARA Title III to identify hazardous materials handlers/waste sites in the mapped floodplain	Sara data is required and then Department of Planning will implement.
6	Continue to work closely with DELDOT to assess the flood vulnerability of state roads, support the upgrade of state roads, and incorporate findings into Delco safety upgrades.	Current
7	Continue to improve public outreach and communication efforts regarding actions in cases of an emergency-utilize website, training, newsletters, brochures, Reverse 9-1-1, etc.	In progress
8	Based on the Critical Facilities Inventory, offer retrofitting recommendations.	Current
9	Study and recommend solutions to alleviate the periodic flooding threat at six of the most vulnerable locations.	New action
10	Develop cost effective acquisition, elevation, and wet/dry floodproofing projects for all municipalities. Implement these projects when feasible.	New action
11	Implement the 25 specific recommendations by the Delaware Sea Level Rise Advisory Committee per the 2014 Report, for all municipalities.	New action
12	Encourage all relevant municipalities to the greatest extent possible, to use the LIMWA (Limited Wave Action) to adjust mitigation projects to a higher elevation level in A zones, for sea level rise and better protection.	New action
13	Identify areas where power lines can be buried underground in order to offer the security of uninterrupted power during and after winterstorms. However, consideration needs to be made for maintenance and repair, particularly in cold climates where soil freezes.	New action for 2015
14	Develop outreach programs to promote the importance of strengthening public and private structures against severe wind damage by encouraging wind engineering measures and construction techniques - structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced pedestrian and garage doors, window shutters, waterproof adhesive sealing strips, or interlocking roof shingles.	New Action for 2015. Some of this is already covered by 2012 IRC/IBC.
15	Identify areas where power lines can be buried underground in order to offer the security of uninterrupted power during and after storms. However, consideration needs to be made for maintenance and repair, particularly in cold climates where soil freezes.	New action for 2015
16	Ensure annual training in and compliance with all safety procedures and systems related to the manufacture, storage, transport, use, and disposal of hazardous materials.	New action for 2015
17	Meet with the municipalities to review their floodplain ordinances and make any updates as needed.	New action for 2015
18	Identify flood-prone properties and encourage the adoption of protective measures and the preparation of a flood response plan.	New action for 2015
19	Review future development trends information every five years and incorporate it to the Plan Update.	New action for 2015

Adoption status – 'Yes', if the action was included in the 2004 plan and 'No' if it is an action included after the 2004 Plan was adopted.
Timeline for completion – Not applicable for completed actions.
Priority – High, medium, or low. Not applicable for completed actions.
Status - Delayed, started, in progress, completed, ongoing, or cancelled.

6.2.3 Mitigation Action Plan

Requirement: §201.6(c)(3)(iii): *[The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

A detailed implementation plan for each mitigation action in Table 6.2.1 is included below. Mitigation actions in Table 6.2.2 (completed or cancelled actions) do not contain implementation plan. Each action identifies:

a. Community Name: Jurisdiction

b. Action Item: Specific actions that, if accomplished, will reduce vulnerability and risk in the impact area. Actions are linked to the mitigation goals and objectives.

c. Hazard(s): The hazard(s) the action attempts to mitigate.

d. Lead Agency/ Department Responsible: The local agency, department or organization that is best suited to accomplish this action.

e. Estimated Cost: The approximate cost to accomplish the mitigation action.

f. Funding Method: How the cost to complete the action will be funded. For example, funds may be provided from existing operating budgets (General Revenue), a previously established contingency fund (Contingency/Bonds), or a federal or state grant (External Sources).

g. Implementation Schedule: When the action will begin, and when the action is expected to be completed.

h. Priority: 1) High priority—short-term immediate—reducing overall risk to life and property; 2) Moderate priority—an action that should be implemented in the near future due to political or community support or ease of implementation; 3) Low priority—an action that should be implemented over the long term that may depend on the availability of fund

Requirement §201.6(c)(3)(iv): For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

LOCALLY-SPECIFIC MITIGATION ACTIONS

Local Mitigation Action Plans are organized alphabetically by individual jurisdiction. Mitigation actions are categorized by priority (high, moderate or low) within each jurisdiction. Mitigation actions listed within each prioritization category are not rank ordered. The following municipalities submitted local Mitigation Actions:

Table 6.3 - Kent County Mitigation Actions

Jurisdiction	Page Number	Status
Kent County	10	19 actions
Bowers Beach	18	4 actions
Camden	20	8 actions
Cheswold	23	2 actions
Clayton	24	3 actions
Dover	25	5 actions
Farmington	27	3 actions
Felton	29	6 actions
Frederica	31	3 actions
Harrington	33	4 actions
Hartly	35	1 action
Houston	36	3 actions
Kenton	38	5 actions
Leipsic	41	7 actions
Little Creek	44	17 actions
Magnolia	50	3 actions
Milford	52	4 actions
Smyrna	54	5 actions
Viola	56	6 actions
Woodside	59	1 action
Wyoming	60	9 actions

LOCALLY-SPECIFIC MITIGATION ACTIONS

Kent County

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			X
	Moderate			
	Limited			

Kent County Mitigation Action 1	Update Kent County Emergency Operations Plan.
Category:	Prevention
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$40,000
Potential Funding Sources:	State Grant, FEMA – Emergency Management Performance Grant, Department of Justice – State and Local Preparedness Technical Assistance, FEMA – All Hazards Emergency Operational Planning, Department of Justice – State Homeland Security Program
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	24 months

Kent County Mitigation Action 2	Review/revise the drainage code
Category:	Prevention
Hazard(s) Addressed:	Floods
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$40,000
Potential Funding Sources:	FEMA – Hazard Mitigation Grant Program, Pre-disaster Mitigation
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Kent County Mitigation Action 3	**Repair sewer pump stations.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Emergency Management Performance Grants, Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program
Lead Agency/Department Responsible:	Department of Public Works
Implementation Schedule:	24 months

Kent County Mitigation Action 4	**Develop an emergency evacuation plan for public assembly events.**
Category:	Prevention
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	$50,000
Potential Funding Sources:	State Grant, FEMA – Emergency Management Performance Grant
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	24 months

Kent County Mitigation Action 5	**Use GIS and existing location information reported under SARA Title III to identify hazardous materials handlers/waste sites in the mapped floodplain.**
Category:	Prevention, Other (Property Protection)
Hazard(s) Addressed:	Hazardous Materials,
Priority (High, Moderate, Low):	Low
Estimated Cost:	Minimal
Potential Funding Sources:	General Funds, LEPC Funds, Environmental Protection Administration – Water Protection Coordination Grants, FEMA – All Hazards Emergency Operational Planning, FEMA – Hazardous Materials Assistance Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Kent County Mitigation Action 6	**Continue to work closely with DelDOT to assess the flood vulnerability of state roads, support the updgrade of state roads, and incorporate findings into DelDOT safety upgrades.**
Category:	Prevention, Property Protection
Hazard(s) Addressed:	Flood, Hurricane
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Unknown
Potential Funding Sources:	General Fund, Flood Mitigation Assistance Program, Pre-Disaster Mitigation Grant Program, US Army Corp of Engineers – Floodplain Management Services, FEMA - Map Modernization Program, FEMA - Flood Hazard Mapping Program
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	36 months

Kent County Mitigation Action 7	**Continue to improve public outreach and communication efforts regarding actions in cases of an emergency—utilize website, training, newsletters, brochures, Reverse 9-1-1, etc.**
Category:	Public Information and Awareness
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$5,000
Potential Funding Sources:	General Fund, FEMA – Hurricane Local Grant Program, FEMA – Emergency Management Performance Grants, Hazard Mitigation Grant Program, Existing FEMA and Red Cross materials
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	Ongoing

LOCALLY-SPECIFIC MITIGATION ACTIONS

Kent County Mitigation Action 8	**Based on the Critical Facilities Inventory, offer retrofitting recommendations.**
Category:	Prevention
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Emergency Management Performance Grants, Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	36 months

Kent County Mitigation Action 9	**Study and recommend solutions to alleviate the periodic flooding threat at six the following most vulnerable locations.**
Category:	Other (Structural)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program
Lead Agency/Department Responsible:	Division of Emergency Management, Conservation District
Implementation Schedule:	48 months

Kent County Mitigation Action 10	**Develop cost effective acquisition, elevation, and wet/dry floodproofing projects for all municipalities. Implement these projects when feasible.**
Category:	Other (Structural Project)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program
Lead Agency/Department Responsible:	Division of Emergency Management, Conservation District
Implementation Schedule:	48 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Kent County Mitigation Action 11	**Implement the 25 specific recommendations by the Delaware Sea Level Rise Advisory Committee per the 2014 Report, for all municipalities.**
Category:	Prevention
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	To be determined
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	18 months

Kent County Mitigation Action 12	**Encourage all relevant municipalities to the greatest extent possible, to use the LIMWA (Limited Wave Action) to adjust mitigation projects to a higher elevation level in A zones, for sea level rise and better protection.**
Category:	Prevention
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	No funding needed
Potential Funding Sources:	Staff time
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	18 months

Kent County Mitigation Action 13*	**Identify areas where power lines can be buried underground in order to offer the security of uninterrupted power during and after winterstorms. However, consideration needs to be made for maintenance and repair, particularly in cold climates where soil freezes.**
Category:	Prevention
Hazard(s) Addressed:	Thunderstorms
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	Staff time
Lead Agency/Department Responsible:	Emergency Management, Public Works
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Kent County Mitigation Action 14*	**Develop outreach programs to promote the importance of strengthening public and private structures against severe wind damage by encouraging wind engineering measures and construction techniques - structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced pedestrian and garage doors, window shutters, waterproof adhesive sealing strips, or interlocking roof shingles.**
Category:	Outreach and Coordination
Hazard(s) Addressed:	Tornadoes
Priority (High, Moderate, Low):	High
Estimated Cost:	$10,000
Potential Funding Sources:	County funds
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	12 months

Kent County Mitigation Action 15*	**Identify areas where power lines can be buried underground in order to offer the security of uninterrupted power during and after winterstorms. However, consideration needs to be made for maintenance and repair, particularly in cold climates where soil freezes.**
Category:	Other (Structural Projects)
Hazard(s) Addressed:	Winterstorms
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$20,000
Potential Funding Sources:	County funds
Lead Agency/Department Responsible:	Emergency Management, Public Works
Implementation Schedule:	12 - 24 months

Kent County Mitigation Action 16*	**Ensure annual training in and compliance with all safety procedures and systems related to the manufacture, storage, transport, use, and disposal of hazardous materials.**
Category:	Outreach and Coordination
Hazard(s) Addressed:	Hazardous Materials
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	To be determined
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	24 – 48 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Kent County Mitigation Action 17*	**Meet with the municipalities to review their floodplain ordinances and make any updates as needed.**
Category:	Outreach and Coordination
Hazard(s) Addressed:	Flooding
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff time
Potential Funding Sources:	No funding required
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	12-24 months

Kent County Mitigation Action 18*	**Identify flood-prone properties and encourage the adoption of protective measures and the preparation of a flood response plan.**
Category:	Prevention, Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	Minimal
Potential Funding Sources:	General Funds, LEPC Funds, Environmental Protection Administration – Water Protection Coordination Grants, FEMA – All Hazards Emergency Operational Planning, FEMA – Hazardous Materials Assistance Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	24 months

Kent County Mitigation Action 19*	**Review future development trends information every five years and incorporate it to the Plan Update.**
Category:	Prevention
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time
Potential Funding Sources:	No funding needed
Lead Agency/Department Responsible:	Division of Planning
Implementation Schedule:	12-24 months

* Actions applicable to unincorporated areas of the County as well as municipalities.

LOCALLY-SPECIFIC MITIGATION ACTIONS

Bowers Beach

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited			X

Bowers Beach Mitigation Action 1	**Elevate Route 18 (Main Street) from the highway to the Town sign (approximately ¼ mile).**
Category:	Structural Projects
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Medium
Estimated Cost:	Unknown
Potential Funding Sources:	State funding, 406 Public Assistance (following federally declared disaster), Pre-Disaster Mitigation Grant Program)
Lead Agency/Department Responsible:	DelDOT
Implementation Schedule:	24 months

Bowers Beach Mitigation Action 2	**Work with DNREC to develop a Coastal Resiliency Plan to reduce losses from coastal hazards and integrate the Action Plan with the Kent County Hazard Mitigation Plan.**
Category:	Prevention
Hazard(s) Addressed:	Flood, Storm Surge
Priority (High, Moderate, Low):	Medium
Estimated Cost:	Unknown
Potential Funding Sources:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Small Business Administration - Pre-Disaster Mitigation Loans, Flood Mitigation Assistance Program, Corps of Engineers – Floodplain Management Services
Lead Agency/Department Responsible:	Town of Bowers Beach
Implementation Schedule:	24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Bowers Beach Mitigation Action 3	**Work with the County to conduct a detailed flood vulnerability study for Hubbard Avenue, South Falck Avenue, and North Bayshore Drive.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood, Storm Surge
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA - Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	Town of Bowers Beach
Implementation Schedule:	24 months

Bowers Beach Mitigation Action 4	**Reuse pipe size and improve outfall on Hubbard Avenue adjacent to the Creek.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Flood Mitigation Assistance
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	24 months

Bowers Beach Mitigation Action 5	**Fix jetty wall on Murderkill River prior to beach restoration.**
Category:	Other (Structural Projects)
Hazard(s) Addressed:	Flood, Hurricane
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	State funding, 406 Public Assistance (following federally declared disaster), Pre-Disaster Mitigation Grant Program
Lead Agency/Department Responsible:	DelDOT
Implementation Schedule:	24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Camden

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited		X	

Camden Mitigation Action 1	Purchase satellite cell phones for use by key personnel during emergencies.
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Medium
Estimated Cost:	$20,000
Potential Funding Sources:	FEMA - Emergency Management Performance Grants, FEMA – All Hazards Emergency Operational Planning, Hazard Mitigation Grant Program (generator quick-connects), Department of Justice – State Homeland Security Program
Lead Agency/Department Responsible:	Town Manager
Implementation Schedule:	24 months

Camden Mitigation Action 2	Conduct emergency response training exercises once every two years.
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Medium
Estimated Cost:	Unknown
Potential Funding Sources:	FEMA - All Hazards Emergency Operational Planning, FEMA – Assistance to Firefighters Grant, FEMA – First Responder Counter-Terrorism Training Assistance, Department of Justice – State and Local Domestic Preparedness Exercise Support, Department of Justice – State and Local Domestic Preparedness Technical Assistance
Lead Agency/Department Responsible:	Town administration, Police Department, Fire Department and EMTs
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Camden Mitigation Action 3	**Designate emergency collection points (firehouses, churches, etc.).**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	DEMA staff time and resources
Potential Funding Sources:	NA
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

Camden Mitigation Action 4	**Encourage residents who depend on electric power for essential medical devices (i.e., ventilators and IV pumps) to register in the 9-1-1 system.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time and resources
Potential Funding Sources:	FEMA - Emergency Management Performance Grant, Department of Health and Human Services (federal) – Public Health and Social Services Emergency Fund
Lead Agency/Department Responsible:	Town administration, Police Department
Implementation Schedule:	Within two months

Camden Mitigation Action 5	**Request an annual presentation by a DEMA representative on local disaster planning.**
Category:	Outreach and Coordination
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	DEMA staff time and resources
Potential Funding Sources:	NA
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Camden Mitigation Action 6	**Investigate flooding and drainage related issues at the intersection of Main Street and South Street.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA - Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

Camden Mitigation Action 7	**Replace the undersized stormwater drain on South Street.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA - Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Cheswold

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited	X		

Cheswold Mitigation Action 1	**Conduct a natural hazards vulnerability assessment of the asphalt plant in the Town.**
Category:	Prevention
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	Local funds, FEMA - Emergency Management Performance Grant, Department of Justice – State Homeland Security Program, Department of Justice – State and Local Domestic Preparedness Technical Assistance, Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	24 months

Cheswald Mitigation Action 2	**Investigate flooding related issues on US Route 13 south of 42.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA - Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Clayton

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited		X	

Clayton Mitigation Action 1	Inspect dam at Wheatley's Pond and identify strategies for repairing or retrofitting this dam based on the results of this inspection.
Category:	Prevention
Hazard(s) Addressed:	Flood, Dam Failure
Priority (High, Moderate, Low):	High
Estimated Cost:	$50,000 - $500,000
Potential Funding Sources:	FEMA – National Dam Safety Program, Natural Resource Conservation Service – Emergency Watershed Protection Program, Army Corps of Engineers – Floodplain Management Services, Army Corps of Engineers – Nonstructural Alternatives to Structural Rehabilitation of Damaged Flood Control Works
Lead Agency/Department Responsible:	Homeowners Association/Town of Clayton, DNREC Dam Safety Program
Implementation Schedule:	12 months

Clayton Mitigation Action 2	Develop relocation plan for non-essential personnel (i.e., finance, law, public works, etc.) in the event that the City/County building is unusable.
Category:	Prevention
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	$20,000
Potential Funding Sources:	Operating funds
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Dover

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited			X

Dover Mitigation Action 1	**Consider relocating the electric distribution system to protect against long-term outages.**
Category:	Other (Property Protection, Structural Project)
Hazard(s) Addressed:	Wind, Winter Storm, Hurricane, Tornado
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	City budget $200,000 per year - $1 million next 5 years
Potential Funding Sources:	City of Dover Electric Fund, Hazard Mitigation Grant Program, 406 Public Assistance (following federally declared disaster), Pre-Disaster Mitigation Grant Program. Additional Federal or state assistance.
Lead Agency/Department Responsible:	City of Dover Electric Department
Implementation Schedule:	On-going, city budgets $200,000 per year.

Dover Mitigation Action 2	**Re-enforce electric system in Emergency Operations Center so that it can sustain high winds.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Wind
Priority (High, Moderate, Low):	Low
Estimated Cost:	$500,000
Potential Funding Sources:	City operating funds, FEMA – Emergency Operations Center Funding, FEMA – Emergency Management Performance Grants, FEMA – All Hazards Emergency Operational Planning, Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program
Lead Agency/Department Responsible:	City of Dover
Implementation Schedule:	60 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Dover Mitigation Action 3	**Conduct a study to determine the feasibility of relocating the City of Dover Grounds Department outside of St. Jones River floodplain.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	$1,000,000
Potential Funding Sources:	Capital asset funds, US Army Corps of Engineers - Floodplain Management Services, US Army Corps of Engineers – Nonstructural Alternatives to Structural Rehabilitation of Damaged Flood Control Works, Flood Mitigation Assistance Program, 406 Public Assistance (following federally declared disaster), Community Development Block Grant
Lead Agency/Department Responsible:	City of Dover
Implementation Schedule:	24 months

Dover Mitigation Action 4	**Work with the County to conduct a detailed flood vulnerability study for the entire City.**
Category:	(Other) Property protection
Hazard(s) Addressed:	Flood, Storm Surge
Priority (High, Moderate, Low):	High
Estimated Cost:	$30,000
Potential Funding Sources:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	City of Dover
Implementation Schedule:	24 months

Dover Mitigation Action 5	**Acquire grounds building.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	City of Dover
Implementation Schedule:	24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Farmington

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited	X		

Farmington Mitigation Action 1	Purchase and install outdoor surveillance security system at the town hall once retrofitted.
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA - Emergency Management Performance Grants,
Lead Agency/Department Responsible:	Town of Farmington
Implementation Schedule:	24 months

Farmington Mitigation Action 2	Retrofit town hall to serve as an emergency shelter and evacuation point.
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$150,000
Potential Funding Sources:	FEMA - Emergency Management Performance Grants, FEMA – All Hazards Emergency Operations Planning Grants, FEMA – Emergency Operations Center Funding, Hazard Mitigation Grant Program, Pre-Disaster Mitigation, Red Cross provides emergency shelter information free of charge
Lead Agency/Department Responsible:	Farmington
Implementation Schedule:	2 years

LOCALLY-SPECIFIC MITIGATION ACTIONS

Farmington Mitigation Action 3	**Purchase and install outdoor surveillance security system at the firehouse to include monitoring the nearby town playground.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA - Emergency Management Performance Grants,
Lead Agency/Department Responsible:	Town of Farmington
Implementation Schedule:	24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Felton

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited		X	

Felton Mitigation Action 1	Work with Delaware DOT to identify areas of frequent roadway flooding on Market Street and develop mitigation strategies.
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Emergency Operations Center Funding, Hazard Mitigation Grant Program, Pre-Disaster Mitigation
Lead Agency/Department Responsible:	Town of Felton
Implementation Schedule:	12 months

Felton Mitigation Action 2	Revise the Emergency Water Plan (updated in 1999 by the Delaware Rural Water Association).
Category:	Emergency Services
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$20,000
Potential Funding Sources:	USDA - Emergency Community Water Assistance Grants, EPA-Vulnerability Assessments and Related Security Improvements at Large Privately-Owned Community Drinking Water Utilities, Water Security Training and Technical Assistance Grant Program
Lead Agency/Department Responsible:	Town of Felton
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Felton Mitigation Action 3	Develop an Emergency Operations Plan for the Town of Felton in conjunction with the local fire service and police.
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$40,000
Potential Funding Sources:	FEMA – Emergency Management Performance Grant, Emergency Operations Center funding
Lead Agency/Department Responsible:	Town of Felton, Police and Fire departments
Implementation Schedule:	24 months

Felton Mitigation Action 4	Provide property owners in Felton with brochures and other material regarding potential flood hazards.
Category:	Public Information and Awareness
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$20,000
Potential Funding Sources:	Local funds
Lead Agency/Department Responsible:	Town of Felton
Implementation Schedule:	12 months

Felton Mitigation Action 5	Work with the County to conduct a detailed flood vulnerability study for the entire Town.
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Hazard Mitigation Grant Program, Pre-Disaster Mitigation
Lead Agency/Department Responsible:	Town of Felton
Implementation Schedule:	24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Frederica

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited	X		

Frederica Mitigation Action 1	**Introduce back-up power to the Town's pumping stations.**
Category:	Structural Projects
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	FEMA - Hazard Mitigation Grant Program, Pre-Disaster Mitigation, Environmental Protection Agency – Water Quality Cooperative Agreements
Lead Agency/Department Responsible:	Town of Frederica
Implementation Schedule:	12 months

Frederica Mitigation Action 2	**Provide property owners in Frederica with brochures and other material regarding potential flood hazards.**
Category:	Public Outreach and Awareness
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff time and resources, $10,000
Potential Funding Sources:	Technical Assistance from FEMA and state NFIP, Hazard Mitigation Grant Program, Pre-Disaster Mitigation
Lead Agency/Department Responsible:	Town of Frederica
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Frederica Mitigation Action 3	**Work with the County to conduct a detailed flood vulnerability study for the entire Town.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood, Storm Surge
Priority (High, Moderate, Low):	High
Estimated Cost:	$20,000
Potential Funding Sources:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	Town of Frederica
Implementation Schedule:	24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Harrington

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited		X	

Harrington Mitigation Action 1	Purchase generator for wells.
Category:	Other (Emergency Services)
Hazard(s) Addressed:	Drought
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Emergency Management Performance Grant
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	18 months

Harrington Mitigation Action 2	Retrofit sewer lines to limit groundwater inflow into treatment plant.
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant
Lead Agency/Department Responsible:	Public Works, Town Administration
Implementation Schedule:	36 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Harrington Mitigation Action 3	**Integrate 500,000 gallon and 250,000 gallon water towers.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	Fire
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$300,000
Potential Funding Sources:	Environmental Protection Agency – Water Protection Coordination Grants, FEMA Assistance to Fire Fighters Grant
Lead Agency/Department Responsible:	Public Works, Town Administration
Implementation Schedule:	48 months

Harrington Mitigation Action 4	**Dig a new well to increase redundancy of water supply system.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	Flood, Drought
Priority (High, Moderate, Low):	Low
Estimated Cost:	$150,000
Potential Funding Sources:	Environmental Protection Agency – Water Protection Coordination Grants, Natural Resource Conservation Service – Emergency Watershed Protection Program, Natural Resource Conservation Service – Watershed Protection and Flood Prevention Program
Lead Agency/Department Responsible:	Public Works, Town Administration
Implementation Schedule:	24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Hartly

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited	X		

Hartly Mitigation Action 1	**Work with the Kent County on public outreach programs designed to promote hazard education and awareness and identify a variety of techniques for residents and businesses.**
Category:	Public Information and Awareness
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	Local government, business or non-profit organizations. Publications available free-of-charge from FEMA Distribution Center (1-800-480-2520) and DEMA.
Lead Agency/Department Responsible:	Town
Implementation Schedule:	Ongoing

LOCALLY-SPECIFIC MITIGATION ACTIONS

Houston

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited	X		

Houston Mitigation Action 1	**Develop an Emergency Operations Plan in cooperation with the Houston Fire Company.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	$20,000
Potential Funding Sources:	FEMA - Emergency Management Performance Grants, Community Emergency Response Team, DHS - State and Local All Hazards Emergency Operations Planning
Lead Agency/Department Responsible:	Town of Houston
Implementation Schedule:	24 months

Houston Mitigation Action 2	**Provide residents with informational brochures regarding disaster preparedness.**
Category:	Public Outreach and Awareness
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time and resources, $10,000
Potential Funding Sources:	FEMA – Citizen Corp, Community Emergency Response Team, Materials provided free of charge by FEMA and Red Cross
Lead Agency/Department Responsible:	Delaware Emergency Management Agency
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Houston Mitigation Action 3	**Create displays for use at public events (health fair, public awareness day, county fair and town events).**
Category:	Public Outreach and Awareness
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time and resources, $5,000
Potential Funding Sources:	General funds, FEMA - Citizen Corps, Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	Town of Houston
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Kenton

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited	X		

Kenton Mitigation Action 1	Work with the LEPC to develop a hazardous materials site inventory.
Category:	Prevention, Public Information and Awareness
Hazard(s) Addressed:	Hazardous Materials
Priority (High, Moderate, Low):	High
Estimated Cost:	$5,000
Potential Funding Sources:	FEMA – Hazardous Materials Assistance Program, FEMA – Emergency Management Performance Grant, FEMA – Emergency Management Institute and Delaware Emergency Management Agency provide materials free of charge, Department of Justice - State and Local Anti-Terrorism Training, Department of Transportation - Interagency Hazardous Materials Public Sector Training and Planning
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	24 - 48 months

Kenton Mitigation Action 2	Identify strategies to mitigate risks associated with the transportation and storage of hazardous materials in and around the Town of Kenton.
Category:	Prevention
Hazard(s) Addressed:	Hazardous Materials
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	FEMA – Hazardous Materials Assistance Program, FEMA – Emergency Management Performance Grant, Department of Justice - State and Local Anti-Terrorism Training, Department of Transportation - Interagency Hazardous Materials Public Sector Training and Planning
Lead Agency/Department Responsible:	Township administration
Implementation Schedule:	24 – 48 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Kenton Mitigation Action 3	**Evaluate stormwater management system as it relates to tertiary roads.**
Category:	Property Protection
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	US Army Corps of Engineers - Floodplain Management Services, US Army Corps of Engineers – Nonstructural Alternatives to Structural Rehabilitation of Damaged Flood Control Works, Flood Mitigation Assistance Program, 406 Public Assistance (following federally declared disaster), Community Development Block Grant, Delaware Department of Transportation – Grants in aid
Lead Agency/Department Responsible:	Township administration
Implementation Schedule:	12 24 months

Kenton Mitigation Action 4	**Coordinate with the Towns of Cheswold, Hartly, Smyrna and Clayton conduct training for emergency management activities.**
Category:	Emergency Services
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Unknown
Potential Funding Sources:	FEMA – Fire Management Assistance Grant, FEMA – Emergency Management Performance Grant, Department of Justice - State and Local Anti-Terrorism Training, Department of Transportation - Interagency Hazardous Materials Public Sector Training and Planning, FEMA – First Responder Counter-Terrorism Training Assistance, FEMA – Hazardous Materials Assistance Program
Lead Agency/Department Responsible:	Township
Implementation Schedule:	12 – 24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Kenton Mitigation Action 5	**Retrofit the Kenton Municipal Building (public shelter) to be more resilient to all hazards.**
Category:	Emergency Services, Other (Property Protection)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	FEMA – Emergency Operations Center Grant, FEMA – Emergency Management Performance Grant, Hazard Mitigation Grant Program, Pre-Disaster Mitigation, 406 Public Assistance (following federal disaster declaration), Information regarding shelter requirements available from Red Cross free of charge
Lead Agency/Department Responsible:	Township administration
Implementation Schedule:	24 – 48 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Leipsic

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited	X		

Leipsic Mitigation Action 1	Develop an Emergency Operation Plan for the Town of Leipsic in conjunction with the local fire service, county, and state police.
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Low
Estimated Cost:	$20,000
Potential Funding Sources:	FEMA - Emergency Management Performance Grants, Community Emergency Response Team, DHS - State and Local All Hazards Emergency Operations Planning
Lead Agency/Department Responsible:	Town of Leipsic/local Fire Service/State Police
Implementation Schedule:	12 months

Leipsic Mitigation Action 2	Continue to provide information about local, regional, state and federal training opportunities to fire department, EMS, ambulance services and other emergency responders.
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Medium
Estimated Cost:	Staff time and resources
Potential Funding Sources:	FEMA – Emergency Management Institute and Delaware Emergency Management Agency, Department of Justice - State and Local Anti-Terrorism Training, Department of Transportation - Interagency Hazardous Materials Public Sector Training and Planning Grants
Lead Agency/Department Responsible:	Town of Leipsic/local Fire Service
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Leipsic Mitigation Action 3	**Develop an emergency preparedness and response brochure specific to the Town of Leipsic for all residents that contains information on shelters, evacuation procedures and emergency contact information.**
Category:	Public Awareness and Outreach
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Medium
Estimated Cost:	$10,000, staff time and resources
Potential Funding Sources:	American Red Cross, FEMA – Citizen Corp, FEMA – Emergency Management Performance Grant, Community Emergency Response Team, Materials available from FEMA and Red Cross free of charge
Lead Agency/Department Responsible:	Town of Leipsic
Implementation Schedule:	12 months

Leipsic Mitigation Action 4	**Continue to increase the number of trained volunteer citizen emergency responders.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Medium
Estimated Cost:	Unknown
Potential Funding Sources:	American Red Cross, FEMA – Citizen Corp, FEMA – Emergency Management Performance Grant, Community Emergency Response Team, State and Local Domestic Preparedness Training Program
Lead Agency/Department Responsible:	Town of Leipsic
Implementation Schedule:	18 months

Leipsic Mitigation Action 5	**Work with the County to conduct a detailed flood vulnerability study for the entire Town.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood, Storm Surge
Priority (High, Moderate, Low):	Low
Estimated Cost:	$20,000
Potential Funding Sources:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	Town of Leipsic
Implementation Schedule:	24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Leipsic Mitigation Action 6	**Install a bulkhead at the Leipsic River.**
Category:	Other (Structural Projects)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	Town of Leipsic
Implementation Schedule:	24 months

Leipsic Mitigation Action 7	**Rehab the Leipsic tax ditch to aid in flood control plans.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	Town of Leipsic
Implementation Schedule:	24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Little Creek

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate		X	
	Limited			

Little Creek Mitigation Action 1	**Develop method to address mosquitoes and possible West Nile Virus outbreak.**
Category:	Other
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff Time
Potential Funding Sources:	No funding required.
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	6 months

Little Creek Mitigation Action 2	**Improve facilities at the Town's Fire Hall to support the use of the building as a Town shelter. Establish a decontamination facility within the Fire Hall to include shower and wet room equipment.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – All Hazard Operational Planning, FEMA – Assistance to Firefighters Grants
Lead Agency/Department Responsible:	Little Creek
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Little Creek Mitigation Action 3	Relocate flood-prone structures when elevation is not a cost effective alternative.
Category:	Property Protection
Hazard(s) Addressed:	Flood, Coastal Erosion
Priority (High, Moderate, Low):	Low
Estimated Cost:	Costs based on the number and type of buildings
Potential Funding Sources:	Federal Pre-disaster Mitigation and Hazard Mitigation Grant Program and Private Residence and Business Owners
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

Little Creek Mitigation Action 4	Elevate flood-prone structures.
Category:	Property Protection
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	Costs based on the number and type of buildings
Potential Funding Sources:	Federal Pre-disaster Mitigation and Hazard Mitigation Grant Program and Private Residence and Business Owners
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

Little Creek Mitigation Action 5	Reconstruct existing structure/building to reduce risk from (hazard).
Category:	Property Protection
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	Costs based on the number and type of buildings
Potential Funding Sources:	Federal Pre-disaster Mitigation and Hazard Mitigation Grant Program and Private Residence and Business Owners
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

LOCALLY-SPECIFIC MITIGATION ACTIONS

Little Creek Mitigation Action 6	**Dry floodproof structure/system to reduce risk from (hazard).**
Category:	Property Protection
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Costs based on the number and type of buildings
Potential Funding Sources:	Federal Pre-disaster Mitigation and Hazard Mitigation Grant Program and Private Residence and Business Owners
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

Little Creek Mitigation Action 7	**Dry floodproof historic residential structure to reduce risk from (hazard) only when other techniques that would mitigate to the BFE would cause the structure to lose its status.**
Category:	Property Protection
Hazard(s) Addressed:	Flood, High Wind, Snow Load
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Costs based on the number and type of buildings
Potential Funding Sources:	Federal Pre-disaster Mitigation and Hazard Mitigation Grant Program and Private Residence and Business Owners
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

Little Creek Mitigation Action 8	**Retrofit existing structure/building to reduce risk from (hazard). (i.e. foundation, load-bearing wall, beam, column, building envelope, structural floor and roof, connections between these).**
Category:	Property Protection
Hazard(s) Addressed:	Flood, High Wind, Snow Load
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Costs based on the number and type of buildings
Potential Funding Sources:	Federal Pre-disaster Mitigation and Hazard Mitigation Grant Program and Private Residence and Business Owners
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

LOCALLY-SPECIFIC MITIGATION ACTIONS

Little Creek Mitigation Action 9	**Retrofit non-structural elements of buildings to reduce risk from (hazard) (i.e. bracing of building contents to prevent damage or elevation of heating and ventilation systems).**
Category:	Property Protection
Hazard(s) Addressed:	Flood, High Wind, Snow Load
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Costs based on the number and type of buildings
Potential Funding Sources:	Federal Pre-disaster Mitigation and Hazard Mitigation Grant Program and Private Residence and Business Owners
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

Little Creek Mitigation Action 10	**Target hazard-prone properties, i.e., repetitive flood loss properties (FEMA repetitive loss and severe repetitive loss lists) through sponsorship of FEMA HMGP, FMA, PDM, RFC, and SRL grant programs.**
Category:	Prevention, Property Protection
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	Costs based on the number and type of buildings
Potential Funding Sources:	Federal Pre-disaster Mitigation and Hazard Mitigation Grant Program and Private Residence and Business Owners
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

Little Creek Mitigation Action 11	**Pursue 5 percent initiative funding to procure warning systems that provide real time warning of impending hazards.**
Category:	Prevention, Public Outreach and Coordination
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Costs based on the number and type of buildings
Potential Funding Sources:	Federal Pre-disaster Mitigation and Hazard Mitigation Grant Program and Private Residence and Business Owners
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

LOCALLY-SPECIFIC MITIGATION ACTIONS

Little Creek Mitigation Action 12	**Pursue 5 percent initiative funding to install generator "quick-connects" to critical facilities.**
Category:	Prevention
Hazard(s) Addressed:	All Hazards, with emphasis on Tropical Event, Nor'easter, and Winter Storm
Priority (High, Moderate, Low):	Low
Estimated Cost:	Costs based on the number and type of buildings
Potential Funding Sources:	Federal Pre-disaster Mitigation and Hazard Mitigation Grant Program and Facility Owners' funds.
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

Little Creek Mitigation Action 13	**Pursue 5 percent initiative funding to install generators to critical facilities.**
Category:	Prevention
Hazard(s) Addressed:	All Hazards, with emphasis on Tropical Event, Nor'easter, and Winter Storm
Priority (High, Moderate, Low):	Low
Estimated Cost:	Costs based on the number and type of buildings
Potential Funding Sources:	Federal Pre-disaster Mitigation and Hazard Mitigation Grant Program and Facility Owners' funds.
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

Little Creek Mitigation Action 14	**Pursue 5 percent Initiative Funding to improve public outreach and communication efforts regarding hazard mitigation — utilizing websites, training, newsletters, brochures, etc.**
Category:	Public Outreach and Coordination
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	Federal Grants and Town Funds
Lead Agency/Department Responsible:	Kent County, Town of Little Creek
Implementation Schedule:	As needed

LOCALLY-SPECIFIC MITIGATION ACTIONS

Little Creek Mitigation Action 15	**Pursue 5 percent initiative funding to evaluate building codes in support of future adoption and/or mitigation.**
Category:	Prevention
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	Federal Grants and Town Funds
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

Little Creek Mitigation Action 16	**Pursue 5 percent initiative funding to assist in mitigating damage from trees during high wind events such as hurricanes, snow load and ice accumulation.**
Category:	Prevention
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	Federal Grants, Private Residence and Business Owners and Town Funds
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

Little Creek Mitigation Action 17	**Pursue 5 percent initiative funding to assist in obtaining elevation certificates for all residences in town to determine which residences are most vulnerable to flooding.**
Category:	Prevention
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	Federal Grants, Private Residence and Business Owners and Town Funds
Lead Agency/Department Responsible:	Kent County and Town of Little Creek
Implementation Schedule:	As needed

LOCALLY-SPECIFIC MITIGATION ACTIONS

Magnolia

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited		X	

Magnolia Mitigation Action 1	**Research the benefits and workload requirements for joining the National Flood Insurance Program.**
Category:	Prevention
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Pre-disaster Mitigation, Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

Magnolia Mitigation Action 2	**Coordinate with County and State officials to evaluate ways to eliminate or minimize flooding during heavy rain events along Barkers Landing Road just outside Town limits.**
Category:	Prevention, Property Protection
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Unknown
Potential Funding Sources:	Delaware Open Space Program, Delaware Coastal Management, NRCS - Watershed Protection and Flood Prevention, Soil and Water Conservation, Watershed Surveys and Planning, FEMA – Pre-Disaster Mitigation, Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Magnolia Mitigation Action 3	**Purchase generator for water system when power fails.**
Category:	Other (Emergency Management)
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Emergency Management Performance Grant
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Milford

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited		X	

Milford Mitigation Action 1	**Relocate Milford Fertilizer out of floodplain.**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Pre-disaster Mitigation, Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

Milford Mitigation Action 2	**Develop a riparian buffer standard for building setbacks along the Mispillion River and other waterways.**
Category:	Prevention, Natural Resource Protection
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Unknown
Potential Funding Sources:	Delaware Open Space Program, Delaware Coastal Management, NRCS - Watershed Protection and Flood Prevention, Soil and Water Conservation, Watershed Surveys and Planning, FEMA - Flood Mitigation Assistance, Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Milford Mitigation Action 3	**Obtain back-up emergency radio system.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	FEMA – Emergency Management Performance Grant
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

Milford Mitigation Action 4	**Update reverse notification system.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	FEMA – Emergency Management Performance Grant
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Smyrna

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate		X	
	Limited			

Smyrna Mitigation Action 1	**Develop security badge system for use by all Town of Smyrna employees.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	$5,000
Potential Funding Sources:	Local fees, FEMA Emergency Management Performance Grant
Lead Agency/Department Responsible:	Town of Smyrna Administrative Office
Implementation Schedule:	12 months

Smyrna Mitigation Action 2	**Install security partitions at customer service counters in the lobby of Town hall.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	$5,000-$10,000
Potential Funding Sources:	FEMA – Emergency Management Performance Grants
Lead Agency/Department Responsible:	Town of Smyrna Administrative Office
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Smyrna Mitigation Action 3	**Install 12 "hold-up alarms."**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	$5,000-$10,000
Potential Funding Sources:	FEMA – Emergency Management Performance Grants
Lead Agency/Department Responsible:	Town of Smyrna Administrative Office
Implementation Schedule:	12 months

Smyrna Mitigation Action 4	**Purchase a generator for the Public Works Building for emergency power that is at least two 800 megahertz radios.**
Category:	Emergency Services
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	$5,000
Potential Funding Sources:	Local fees, FEMA Emergency Management Performance Grant
Lead Agency/Department Responsible:	Town of Smyrna Administrative Office
Implementation Schedule:	12 months

Smyrna Mitigation Action 5	**Purchase a flood alert monitor for Lake Como Spillway – wellhouse #3**
Category:	Emergency Services
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	$5,000-$10,000
Potential Funding Sources:	FEMA – Emergency Management Performance Grants
Lead Agency/Department Responsible:	Town of Smyrna Administrative Office
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Viola

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited	X		

Viola Mitigation Action 1	**Educate the public regarding preparedness and protection measures including sheltering-in-place.**
Category:	Public Information and Awareness
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time and resources
Potential Funding Sources:	Materials about preparedness and protective measures are available free of charge from FEMA and the Red Cross, Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	Town of Viola
Implementation Schedule:	12-24 months

Viola Mitigation Action 2	**Review County Office of Emergency Services plans regarding protective measures and evacuation procedures for hazardous materials incidents and share information with citizens on ways to elevate and / or harden oil and gas storage tanks to avoid spills and contamination of surrounding areas.**
Category:	Public Information and Awareness, Emergency Services
Hazard(s) Addressed:	Hazardous Materials
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time and resources
Potential Funding Sources:	Partnership with Sussex County Health Department and Sussex County OES, FEMA – Hazardous Materials Assistance Program, FEMA - Emergency Management Performance Grant
Lead Agency/Department Responsible:	Town of Viola
Implementation Schedule:	12-24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Viola Mitigation Action 3	**Educate the public concerning sheltering-in-place in the event of a hazardous material spill or release.**
Category:	Public Information and Awareness
Hazard(s) Addressed:	Terrorism (chemical agents), Hazardous Material Release
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time and resources, $5,000
Potential Funding Sources:	Partnership with Sussex County Health Department and Sussex County OES, Materials regarding shelter-in-place available from FEMA free of charge, Department of Justice – State Homeland Security Program
Lead Agency/Department Responsible:	Town of Viola
Implementation Schedule:	–12-24 months

Viola Mitigation Action 4	**Educate the public regarding special needs populations in the event of winter storms.**
Category:	Public Information and Awareness
Hazard(s) Addressed:	Winter Storms
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time and resources
Potential Funding Sources:	Materials about special needs populations are available free of charge from FEMA and the Red Cross, FEMA – Emergency Management Performance Grant
Lead Agency/Department Responsible:	Town of Viola
Implementation Schedule:	12 months

Viola Mitigation Action 5	**Educate the public on the necessity of periodic well testing, especially during periods of drought.**
Category:	Public Information and Awareness
Hazard(s) Addressed:	Terrorism (chemical agents), Hazardous Material Release
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time and resources, $5,000
Potential Funding Sources:	Partnership with Sussex County Health Department and Sussex County OES, Materials regarding shelter-in-place available from FEMA free of charge, Department of Justice – State Homeland Security Program
Lead Agency/Department Responsible:	Town of Viola
Implementation Schedule:	12-24 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Viola Mitigation Action 6	**Identify shelters and notify the public about their location.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time and resources
Potential Funding Sources:	Materials about special needs populations are available free of charge from FEMA and the Red Cross, FEMA – Emergency Management Performance Grant
Lead Agency/Department Responsible:	Town of Viola
Implementation Schedule:	12 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Woodside

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited		X	

Woodside Mitigation Action 1	**Work with the County on outreach programs designed to promote hazard awareness and identify a variety of hazard mitigation techniques for residents and businesses.**
Category:	Public Information and Awareness
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	No cost
Potential Funding Sources:	Local government, business or non-profit organizations. Publications available free-of-charge from FEMA Distribution Center (1-800-480-2520) and DEMA.
Lead Agency/Department Responsible:	Woodside Town
Implementation Schedule:	Ongoing

LOCALLY-SPECIFIC MITIGATION ACTIONS

Wyoming

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Limited		X	

Wyoming Mitigation Action 1	**Install surveillance video equipment at the Wyoming police station/town hall interior and exterior and the railroad, which runs behind both northbound and southbound.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	FEMA – Emergency Management Performance Grant
Lead Agency/Department Responsible:	Township / DNREC
Implementation Schedule:	24 – 48 months

Wyoming Mitigation Action 2	**Work with the Delaware Department of Transportation to identify areas of frequent roadway flooding and develop mitigation strategies to address known hazards.**
Category:	Other (Structural Projects)
Hazard(s) Addressed:	Flooding
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	US Army Corps of Engineers – Small Flood Control Projects, USDA Natural Conservation Service – Watershed Protection and Flood Prevention Program, DelDOT
Lead Agency/Department Responsible:	Township / DelDOT
Implementation Schedule:	48 -60 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Wyoming Mitigation Action 3	**Develop specific mitigation strategies to protect any at-risk historic properties in town.**
Category:	Prevention
Hazard(s) Addressed:	All hazard
Priority (High, Moderate, Low):	High
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Pre-disaster Mitigation, Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	Township
Implementation Schedule:	12 – 24 months

Wyoming Mitigation Action 4	**Conduct a survey of all historic sites that are located in hazard areas.**
Category:	Prevention
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA – Pre-disaster Mitigation, Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	Township
Implementation Schedule:	12 – 24 months

Wyoming Mitigation Action 5	**Develop a continuity of operations plan for the town of Wyoming to include the local fire company (shared between Camden and Wyoming) and police department (shared with Camden).**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	$50,000
Potential Funding Sources:	FEMA – Emergency Management Performance Grant
Lead Agency/Department Responsible:	Township
Implementation Schedule:	24 – 48 months

LOCALLY-SPECIFIC MITIGATION ACTIONS

Wyoming Mitigation Action 6	**Purchase back-up generator for the police station/town hall.**
Category:	Other (Emergency Services)
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	FEMA – Emergency Management Performance Grant
Lead Agency/Department Responsible:	Township
Implementation Schedule:	12 – 24 months

Wyoming Mitigation Action 7	**Install bulk head from where the rip rap ends at Wyoming park to Wyoming Mill Pond.**
Category:	Structural Projects
Hazard(s) Addressed:	Flooding
Priority (High, Moderate, Low):	High
Estimated Cost:	Unknown
Potential Funding Sources:	US Army Corps of Engineers – Small Flood Control Projects, USDA Natural Conservation Service – Watershed Protection and Flood Prevention Program
Lead Agency/Department Responsible:	Township / DNREC
Implementation Schedule:	24 – 48 months

Wyoming Mitigation Action 8	**Make improvements to South Layton Street Pump House**
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$55,000
Potential Funding Sources:	FEMA – Disaster 4037 Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	Division of Emergency Management
Implementation Schedule:	18 months

Wyoming Mitigation Action 9	Address flooding issues due to the open pipe on Camden Wyoming Avenue and Southern Boulevard.
Category:	Other (Property Protection)
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA - Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program, Flood Mitigation Assistance Program
Lead Agency/Department Responsible:	Town administration
Implementation Schedule:	12 months

6.2.4 Prioritization

Once the mitigation actions and implementation plan were finalized, the Steering Committee developed a set of criteria: Social Considerations, Administrative Considerations, and Economic Considerations. The following questions were asked to evaluate criteria for project prioritization.

Social Considerations – Life/Safety Impact

- Will the project have minimal/direct/or significant impact on the safety of businesses, residents, and properties?
- Will the proposed action adversely affect one segment of the population?
- Will the project be a proactive measure to reducing flood risk?

Administrative Considerations – Administrative/Technical Assistance

- Is there sufficient staff currently to implement the project?
- Is training required for the staff to implement this project?

Economic Considerations – Project Cost

- What is the approximate cost of the project?

For each criterion, the level of importance (high, medium, or low) was determined based on the total number of points.

Prioritization Categories

- High priority – Total score of 14+
- Medium priority – Total score between 10 and 13
- Low priority – Total score >10

Table 6.4 – Prioritized Mitigation Actions

Prioritization Criteria						
Criteria	**Points (High Score)**	**High Score (H)**	**Points (Medium Score)**	**Medium Score (M)**	**Points (Low Score)**	**Low Score (L)**
Life/ Safety Impact	**10**	Significant impact on public safety for businesses, residents, properties	6	Direct impact on businesses, residents, properties	2	Minimal/negligible impact on businesses, residents, properties
Administrative/ Tech Assistance	**5**	No additional staff or technical support needed to implement action	3	and technical support needed to implement action	1	Significant administrative and technical support needed to implement action
Project Cost	**5**	(<$25,000)	3	implement ($25,000-	1	implement (>$100,000)

Table 6.5 – Prioritized Mitigation Actions

Kent County Hazard Mitigation Action Prioritization						
Action No.	**Description**	**Life Safety**	**Administrative/Technical**	**Cost**	**Total Score**	**Priority**
	Bowers Beach					
1	Elevate Route 18 (Main Street) from the highway to town sign (approximately 1/4 mile).	10	1	1	12	Medium
2	Work with DNREC to develop a Coastal Resiliency Plan to reduce losses from coastal hazards and integrate the Action Plan with Kent County Hazard Mitigation Plan.	2	5	5	12	Medium
3	Work with County to conduct a detailed flood vulnerability study on Hubbard Avenue, South Flack Avenue, and North Bayshore Drive.	6	1	1	8	Low
4	Review pipesize and improve outfall on Hubbard Avenue to Creek.	2	1	1	4	Low
5	Fix jetty wall on Murderkill River prior to beach restoration.	6	1	1	8	Low
	Camden					
Action No.	**Description**					
1	Purchase satellite cell phones for use by key personnel during emergencies.	2	5	5	12	Medium
2	Conduct emergency response training exercises every two years.	2	5	5	12	Medium
3	Designate emergency collection point at firehouses, churches, etc.	6	5	5	16	High
4	Encourage residents who are dependant on electric power for essential medical devices (i.e., ventilators, and IV pumps) to register in the 911 system.	6	5	5	16	High
5	Request an annual presentation by a DEMA representative on local disaster planning.	2	5	5	12	Medium
6	Investigate flooding and drainage related issues at the intersection of Main Street and South Street	6	1	1	8	Low

7	Replace the undersized stormwater drain on South Street.	6	1	1	8	Low
Cheswold						
Action No.	**Description**					
1	Conduct natural vulnerability assessment of the asphalt plant (in the Town.	**2**	3	3	8	Low
2	Investigate flooding related issues on US Route 13 south of 42.	**2**	3	3	8	Low
Clayton						
Action No.	**Description**					
1	Inspect dam at Wheatley's Pond and identify strategies for repairing or retrofitting this dam based on the results of the inspection.	**6**	3	3	12	Medium
2	Develop relocation plan for non-essential personnel (i.e., finance, law, public works, etc.) in the event that the City/County building is unusable.	2	3	5	10	Medium
3	Purchase a generator for the Town Hall/PD	**2**	5	5	12	Medium
Dover						
Action No.	**Description**					
1	Consider relocating the electric distribution system to protect against long-term outages.	6	3	3	12	Medium
2	Re-enforce electric system in Emergency Operations Center so that it can sustain high winds.	2	3	3	8	Low
3	Conduct a study to determine the feasibility of relocating the City of Dover Grounds Department outside of St. Jones river floodplain.	**2**	3	5	10	Medium
4	Work with the County to conduct a detailed flood vulnerability study for the entire City.	6	1	3	10	Medium
5	Acquire grounds building.	2	3	1	6	Low
Farmington						
Action No.	**Description**					
1	Purchase and install outdoor surveillance security system at the town hall once retrofitted.	2	3	5	10	Medium
2	Retrofit town hall to serve as an emergency shelter and evacuation point.	**6**	3	3	12	Medium
3	Purchase and install outdoor surveillance security system at the firehouse to include monitoring the nearby town playground.	2	3	5	10	Medium
Felton						
Action No.	**Description**					
1	Develop generic informational guidelines for residents of Felton regarding how they should respond to various threats.	6	3	5	14	High
2	Revise the Emergency Water Plan (updated in 1999 by the Delaware Rural Water Association).	2	3	5	10	Medium
3	Develop an Emergency Operations Plan for the town of Felton in conjunction with the local fire service and police.	6	3	5	14	High
4	Develop and distribute material to the residents of Felton addressing preparedness and recovery.	2	3	5	10	Medium

5	Conduct a survey of all historic sites that are located in hazard areas.	**2**	3	5	10	Medium
6	Develop mitigation strategies to protect any at risk historic properties.	2	3	5	10	Medium
Frederica						
Action No.	**Description**					
1	Introduce back-up to the Town's pumping stations.	6	1	1	8	Low
2	Provide property owners in Frederica with brochures and other material regarding potential flood hazards.	2	3	5	10	Medium
3	Work with the County to conduct a detailed flood vulnerability study for the entire Town.	6	3	3	12	Medium
Harrington						
Action No.	**Description**					
1	Purchase generator for wells.	6	3	3	12	Medium
2	Retrofit sewer lines to limit groundwater inflow into treatment plant.	2	3	3	8	Low
3	Integrate 500,000 gallon and 250,000 gallon water towers.	**2**	3	1	6	Low
4	Dig new well to increase redundancy of water supply system.	2	3	3	8	Low
Hartly						
Action No.	**Description**					
1	Work with Kent County on public outreach programs designed to promote hazard education and awareness and identify a variety of techniques for residents and businesses.	2	5	5	12	Medium
Houston						
Action No.	**Description**					
1	Develop an Emergency Operations Plan in cooperation with the Houston Fire Company.	6	3	5	14	High
2	Provide residents with informational brochures regarding disaster preparedness.	**2**	3	5	10	Medium
3	Create displays for use at public events (health fair, public awareness day, county fair and town events).	2	5	5	12	Medium
Kenton						
Action No.	**Description**					
1	Work with the LEPC to Develop hazardous materials site inventory.	6	3	5	14	High
2	Identify strategies to mitigate risks associated with the transportation and storage of hazardous materials in/around the Town of Kenton.	6	3	5	14	High
3	Evaluate storm water management system as it relates to tertiary roads.	2	3	5	10	Medium
4	Coordinate with Towns of Cheswold, Hartly, Smyrna and Clayton conduct training exercises for emergency management activities.	2	5	5	12	Medium
5	Retrofit the Kenton Municipal building (public shelter) to be more resilient to all hazards.	6	3	3	12	Medium
Leipsic						
Action No.	**Description**					

1	Develop an Emergency Operation Plan for the town of Leipsic in conjunction with the local fire service, county and state police.	2	3	1	6	Low
2	Continue to provide information about local, regional, state and federal training opportunities to fire department, EMS, ambulance services and other emergency responders.	2	5	5	12	Medium
3	Develop an emergency preparedness and response brochure specific to the Town of Leipsic for all residents, that contains information on shelters, evacuation procedures and emergency contact information.	2	5	5	12	Medium
4	Continue to increase the number of trained volunteer citizen emergency responders.	**2**	5	5	12	Medium
5	Work with the County to conduct a detailed flood vulnerability study for the entire Town.	2	1	1	4	Low
6	Install a bulkhead at the Leipsic River.	6	1	1	8	Low
7	Rehab the Leipsic tax ditch to aid in flood control planning.	6	1	1	8	Low
Little Creek						
Action No.	**Description**					
1	Develop method to address mosquitoes and possible West Nile Virus outbreak.	10	1	3	12	Medium
2	Improve facilities at the Town's Fire Hall to support the use of the building as a Town shelter. Establish a decontamination facility within the Fire Hall to include a shower and wet room equipment.	6	3	3	12	Medium
3	Relocate flood-prone structures when elevation is not a cost effective alternative.	6	1	1	8	Low
4	Elevate flood-prone structures.	6	1	1	8	Low
5	Reconstruct existing structure/building to reduce risk from (hazard).	6	1	1	8	Low
6	Dry Flood Proof structure/system to reduce risk from (hazard).	6	1	3	10	Medium
7	Dry Flood Proof historic residential structures to reduce risk from (hazard) only when other techniques that would mitigate to the BFE would cause the structure to lose its status.	6	1	3	10	Medium
8	Retrofit existing structure/buildings to reduce risk from (hazard). (i.e. foundation, load-bearing wall, beam, column, building envelope, structural floor and roof, connections between these).	6	1	5	12	Medium
9	Retrofit non-structural elements) of buildings to reduce risk from (hazard). (i.e. bracing of building contents to prevent damage or elevation of heating and ventilation systems).	6	1	5	12	Medium
10	Target hazard-prone properties, i.e., repetitive flood loss properties (FEMA repetitive loss and severe repetitive loss lists) through sponsorship of FEMA HMGP, FMA, PDM, RFC, and SRL grant programs.	6	1	1	8	Low
11	Pursue 5% initiative funding to procure warning systems that provide real time warning of impending hazards.	10	1	5	16	High
12	Pursue 5% initiative funding to install generator “quick-connects” to critical facilities.	2	1	5	8	Low
13	Pursue 5% initiative funding to install generators to critical facilities	2	1	3	6	Low
14	Pursue 5% Initiative Funding to improve public outreach and communication efforts regarding hazard mitigation — utilizing websites, training, newsletters, brochures, etc.	2	1	5	8	Low

15	Pursue 5% initiative funding to evaluate building codes in support of future adoption and/or mitigation.	2	1	5	8	Low
16	Pursue 5% initiative funding to assist in mitigating damage from trees during high wind events such as hurricanes, snow load and ice accumulation.	6	1	5	12	Medium
17	Pursue 5% initiative funding to assist in obtaining elevation certificates for all residences in town to determine which residences are most vulnerable to flooding.	2	1	3	6	Low
Magnolia						
Action No.	**Description**					
1	Research the benefits and workload requirements for joining the National Flood Insurance Program.	2	1	5	8	Low
2	Coordinate with County and State officials to evaluate ways to eliminate or minimize flooding during heavy rain events along Barkers Landing Road just outside Town limits.	2	1	3	6	Low
3	Purchase generator for water system when power fails (potential).	10	3	3	16	High
Milford						
Action No.	**Description**					
1	Relocate Milford Fertilizer out of floodplain.	6	1	1	8	Low
2	Develop a riparian buffer standard for building setbacks along the Mispillion River and other waterways.	6	3	3	12	Medium
3	Obtain back-up emergency radio system.	6	3	3	12	Medium
4	Update Reverse notification system	2	3	3	8	Low
Smyrna						
Action No.	**Description**					
1	Develop security badge system for use by all Town of Smyrna employees.	10	3	5	18	High
2	Install security partitions at customer service counters in the lobby of Town hall.	10	5	3	18	High
3	Install 12 "hold-up alarms."	10	3	5	18	High
4	Purchase a generator for the Public Works Building for emergency power that is at least two 800 megahertz radios	6	5	3	14	High
5	Purchase a flood alert monitor for Lake Como Spillway - well house #3.	6	5	3	14	High
Viola						
Action No.	**Description**					
1	Educate the public regarding preparedness and protection measures including shelter-in-place.	2	3	5	10	Medium
2	Review County Office of Emergency Services plans regarding protective measures and evacuation procedures for hazardous materials incidents and share information with citizens on ways to elevate and/or harden oil and gas storage tanks to avoid spills and contamination of surrounding areas.	6	1	5	12	Medium

3	Educate the public on the necessity of periodic well testing, especially during periods of drought.	2	3	5	10	Medium
4	Identify shelters and notify the public about their location.	2	5	5	12	Medium
5	Educate the public concerning sheltering-in-place in the event of a hazardous material spill or release.	2	5	5	12	Medium
6	Educate the public regarding special needs populations in the event of winter storms.	2	5	5	12	Medium
Woodside						
Action No.	**Description**					
1	Work with the County on outreach programs designed to promote hazard education and identify a variety of hazard mitigation techniques for residents and businesses.	2	3	5	10	Medium
Wyoming						
Action No.	**Description**					
1	Install surveillance video equipment at the Wyoming police station/town hall interior and exterior and the railroad which runs behind both northbound and southbound.	2	3	3	8	Low
2	Work with the Delaware Department of Transportation to identify areas of frequent roadway flooding and develop mitigation strategies to address known hazards.	6	3	3	12	Medium
3	Develop specific mitigation strategies to protect any at risk historic properties in town.	2	3	3	8	Low
4	Conduct a survey of all historic sites that are located in hazard areas.	2	3	3	8	Low
5	Develop a continuity of operations plan for the town of Wyoming to include the local fire company (shared between Camden and Wyoming) and police department (shared with Camden).	6	3	3	12	Medium
6	Purchase back up generator for the police station/town hall.	**2**	3	3	8	Low
7	Install bulk head from where the rip rap ends at Wyoming park to Wyoming Mill Pond.	2	3	3	8	Low
8	Make improvements to South Layton Street Pump House	6	3	3	12	Medium
9	Address flooding issues due to the open pipe on Camden Wyoming Avenue and Southern Boulevard.	6	1	1	8	Low
Unincorporated Areas						
Action No.	**Description**					
1	Update Kent County Emergency Operations Plan.	2	3	5	10	Medium
2	Review/revise drainage code.	2	3	5	10	Medium
3	Repair sewer pump stations.	2	5	5	12	Medium
4	Develop Emergency Evacuation Plan for public assembly events.	10	3	5	18	High
5	Use GIS and existing location information reported under SARA Title III to identify hazardous materials handlers/waste sites in the mapped floodplain.	2	3	3	8	Low
6	Continue to work closely with DELDOT to assess the flood vulnerability of state roads, support the upgrade of state roads, and incorporate findings into DelDOT safety upgrades.	2	5	5	12	Medium

LOCALLY-SPECIFIC MITIGATION ACTIONS

7	Continue to improve public outreach and communication efforts regarding actions in cases of an emergency-utilize website, training, newsletters, brochures, Reverse 9-1-1, etc.	**2**	5	5	12	Medium
8	Based on the Critical Facilities Inventory, offer retrofitting recommendations.	2	3	5	10	Medium
9	Study and recommend solutions to alleviate the periodic flooding threat at six of the most vulnerable locations.	6	1	1	8	Low
10	Develop cost effective acquisition, elevation, and wet/dry floodproofing projects for all municipalities. Implement these projects when feasible.	2	1	1	4	Low
11	Implement the 25 specific recommendations by the Delaware Sea Level Rise Advisory Committee per the 2014 Report, for all municipalities.	6	3	3	12	Medium
12	Encourage all relevant municipalities to use the LIMWA (Limited Wave Action) to adjust mitigation projects to a higher elevation level in A zones, for sea level rise and better protection.	6	3	3	12	Medium
13	Identify areas where power lines can be buried underground in order to offer the security of uninterrupted power during and after winterstorms. However, consideration needs to be made for maintenance and repair, particularly in cold climates where soil freezes.	6	3	3	12	Medium
14	Develop outreach programs to promote the importance of strengthening public and private structures against severe wind damage by encouraging wind engineering measures and construction techniques - structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced pedestrian and garage doors, window shutters, waterproof adhesive sealing strips, or interlocking roof shingles.	6	3	3	12	Medium
15	Identify areas where power lines can be buried underground in order to offer the security of uninterrupted power during and after storms. However, consideration needs to be made for maintenance and repair, particularly in cold climates where soil freezes.	6	3	3	12	Medium
16	Ensure annual training in and compliance with all safety procedures and systems related to the manufacture, storage, transport, use, and disposal of hazardous materials.	2	5	5	12	Medium
17	Meet with the municipalities to review their floodplain ordinances and make any updates as needed.	2	5	5	12	Medium
18	Identify flood-prone properties and encourage the adoption of protective measures and the preparation of a flood response plan.	2	3	3	8	Low

7. PLAN MAINTENANCE PROCEDURES

7.1 Introduction

Requirement §201.6(c)(4)(i): *[The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*

This Chapter discusses how the Mitigation Strategy will be implemented by participating jurisdictions and how the overall All Hazard Mitigation Plan will be evaluated and enhanced over time. This Chapter also discusses how the public will continue to be involved in the hazard mitigation planning process.

The long-term success of the Kent County all hazard mitigation plan depends in large part on routine monitoring, evaluating and updating of the plan so that it will remain a valid tool for the community to use. The plan activities will be implemented by the Kent Office of Emergency Management and Steering Committee.

The Steering Committee will monitor the efficiency and effectiveness of various mitigation strategies and will make recommendation for additional improvements. The Kent Office of Emergency Management and the Steering Committee will review the year's local hazard events and impacts, community actions that may help or hinder mitigation capabilities, and the progress of mitigation activities. Any changes will be noted in the planning document accordingly, along with a summary of their findings and associated changes in a memorandum to the Kent County Levy Court and the Delaware Emergency Management Agency.

An annual report will be made available to the governing body (Kent County Levy Court, Municipal /Mayors and Councils) in order to report progress on the actions identified in the Plan and to provide information on the latest legislative requirements and/or changes. The Steering Committee will be responsible for working with the Kent County Levy Court to determine the best schedule for these updates. A potential timeframe for these annual updates is just before the annual hurricane season begins on June 1. Reviewing the plan at a time when media coverage and community awareness tends to be high may help serve as a reminder to local officials that the community needs to be prepared for hurricanes and other disasters.

Annual updates will be collected from the County and municipalities at the annual Mitigation Grant Workshop held in July/August, and updates will be included in the Plan's Appendix. The Kent County Office of Emergency Management will manage the process.

7.2 Implementation

Each jurisdiction participating in this Plan is responsible for implementing specific mitigation actions as prescribed in their locally adopted Mitigation Action Plan. In the Mitigation Action Plan, each proposed action is assigned to a specific local department or agency in order to increase accountability and the likelihood of implementation. This approach enables individual jurisdictions to update their unique mitigation strategy as needed without altering the broader focus of the countywide plan elements. The separate adoption of locally specific actions also ensures that each jurisdiction is not held responsible for the actions of every other jurisdiction involved in the planning process.

In addition the specific local department or agency, an implementation time period or a specific implementation date has been assigned in order to assess whether actions are being implemented in a timely fashion. Kent County and its jurisdictions will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. Whenever possible, a funding source has been identified for proposed actions listed in the Mitigation Action Plan.

It will be up to each participating jurisdiction to determine additional implementation procedures beyond their Mitigation Action Plan. This includes integrating the requirements of the Hazard Mitigation Plan into other planning documents, processes or mechanisms such as comprehensive or capital improvement plans, when appropriate.

7.3 Evaluation and Enhancement

Periodic revisions and updates of the All Hazard Mitigation Plan are required to ensure that the goals and objectives of the Plan are kept current, taking into account potential changes in hazard vulnerability and mitigation priorities. In addition, revisions may be necessary to ensure that the Plan is in full compliance with applicable Federal regulations or State statutes. Periodic evaluation of the Plan will also ensure that specific mitigation actions are being reviewed and carried out according to each jurisdiction's individual Mitigation Action Plan.

Five (5) Year Plan Review

The Plan will undergo a comprehensive review and evaluation process every five years by the Kent Steering Committee under the authority of the Kent County Levy Court. The Update will serve as an opportunity to determine whether there have been any significant changes in the County, which may necessitate changes in the mitigation actions proposed. New development in identified hazard areas, an increased exposure to hazards, the increase or decrease in capability to address hazards, and changes to Federal or State legislation are factors that drive and affect the content of the Plan. The next Plan Update will be required to be completed and submitted to the State and FEMA for review by February 2020. This update process will also provide community officials with an opportunity to evaluate those actions that have been successfully completed and to possibly document potential losses avoided due to the implementation of specific mitigation measures.

In addition to the FEMA-required 5-year review, the Steering Committee will continue to meet annually and after major events occur. This will ensure that the Plan is kept current and reflects changing conditions within the County and its jurisdictions.

Disaster Declaration

Following a disaster declaration, the Plan may need to be revised to reflect lessons learned, or to address specific circumstances arising from the event.

Reporting Procedures

The results of the five-year review will be summarized by the Mitigation Advisory Committee in a report that will include an evaluation of the effectiveness of the Plan and any required or recommended changes or amendments. The report will also include an evaluation of implementation progress for each of the proposed mitigation actions, identifying reasons for delays or obstacles to their completion along with recommended strategies to overcome them.

Changes to the Plan will be assigned to appropriate local officials with pre-determined timelines for completion. If changes are required of individual Mitigation Action Plans, the appropriate local designee will assign responsibility for the completion of the task.[1]

Plan Amendment Process

Upon the initiation of the amendment process, Kent County and its municipalities will forward information on the proposed change to all interested parties including, but not limited to, all affected county and municipal departments, residents, and businesses. Information will also be forwarded to DEMA. This information will be disseminated in order to seek input on the proposed amendment for not less than a 5-day review and comment period. If no comments are received from the reviewing parties within the specified review period, such will be noted accordingly.

At the end of the 5-day review and comment period, the proposed amendment and all comments will be forwarded to Hazard Mitigation Advisory Committee for consideration. The Committee will review the proposed amendment along with the comments received from other parties, and submit a recommendation to the appropriate governing body within 60 days.

In determining whether to recommend approval or denial of a Plan amendment request, the following factors will be considered:

- There are errors or omissions made in the identification of issues or needs during the preparation of the Plan;
- New issues or needs have been identified which were not adequately addressed in the Plan;
- There has been a change in information, data, or assumptions from those on which the Plan was based.

Upon receiving the recommendation of the designee, the governing body will hold a public hearing. The governing body will review the recommendation (including the factors listed above) and any oral or written comments received at the public hearing. Following that review, the governing body will take one of the following actions:

- Adopt the proposed amendment as presented;
- Adopt the proposed amendment with modifications;
- Refer the amendments request back to the designee for further consideration; or
- Defer the amendment request for further consideration and/or hearing.

A public hearing needs to be conducted for the original adoption of the Plan. Each municipality will need to adopt the Plan as well.

[1] Local jurisdictions do have the authority to approve/adopt changes to their own Mitigation Action Plans without approval from the County; however, the County should be advised of all changes as a courtesy and for consideration for changes or modifications to the countywide Plan. Changes to either the multi-jurisdictional plan or local Mitigation Action Plans will necessitate the adoption of these changes by the appropriate governing body. Ultimately, the updated Plan or plan component(s) will be submitted to DEMA.

7.4 Continued Public Involvement

Public input was an integral part of the completion of this Plan and will continue to be essential as this Plan changes over time. As is the case with any officially adopted plan or ordinance, significant changes to this Plan shall require a public hearing.

Other efforts to involve the public in the maintenance, evaluation and revision process will be made as necessary. These efforts may include:

- Advertising meetings of the Steering Committee in the local newspaper, public bulletin boards and/or City and County office buildings;
- Utilizing local media to update the public of any maintenance and/or periodic review activities taking place;
- Utilizing the County's website to advertise any maintenance and/or periodic review activities taking place; and
- Keeping copies of the Plan in public libraries.

APPENDIX A

Steering Committee Meeting December 10, 2014

Kent County
ALL HAZARDS MITIGATION PLAN UPDATE
10 December 2014
AGENDA

Steering Committee Meeting #1
1:30pm-4pm

Introductions – Colin Faulkner, Kent County Emergency Management

- **County Staff**
- **Steering Committee Members**
- **Consultants**
  - **Deepa Srinivasan, President, Vision Planning and Consulting, LLC**
  - **Mike Scott, ESRGC, Salisbury University**

PowerPoint Presentation – Deepa Srinivasan and Mike Scott

- **Overview of the Hazard Mitigation Planning Process**
- **Schedule**
- **Deliverables**

Discussion of Hazards, Risks, and Vulnerability – Mike Scott

Summary of Capabilities – Deepa Srinivasan

Discussion of 2009 Plan Goals and Objectives

Discussion of 2009 Mitigation Actions

Wrap-up

- **Next steps**
- **Steering Committee Meeting 2 and Public Meeting February 2014**
- **Questions**

Municipal Workshop
4pm to 6pm

Review of Municipal Capabilities

Review of Municipal Problem Areas, Hazards, and Vulnerabilities

Review of Mitigation Actions

2014 All-Hazards Mitigation Plan Update
Kent County, DE

Steering Committee Meeting #1 and Municipal Workshop
10 December 2014

Presented by:
Deepa Srinivasan, Vision Planning and Consulting, LLC

Project Purpose

To update the all-hazards mitigation plan to improve Kent County's resistance to natural hazards by identifying actions to reduce the impact of various hazards to people and property.

Key Players

- Kent County Staff – Emergency Management, Planning Department
- Hazard Mitigation Plan Steering Committee
- Municipalities
- Consultants
  - Deepa Srinivasan, President, Vision Planning & Consulting
  - Dr. Mike Scott, ESRGC- Salisbury University
- Public
- Delaware Emergency Management Agency (DEMA)
- Federal Emergency Management Agency (FEMA)

Project Organization

Steps in the Planning Process

1. Reconvene 2009 Steering Committee and develop planning process (meetings)
2. Assess hazards, risks, vulnerability
3. Assess municipal capabilities
   - Existing Plans, Programs, Policies
   - Plan Integration – Document Reviews
   - Local Codes and Zoning Ordinances
   - Current and Proposed Projects
4. Develop goals and objectives and mitigation actions
   - Preventative Measures
   - Projects
   - Natural Resource Protection
   - Outreach and Communication
   - Other Mitigation Actions

Steps in the Planning Process (cont'd)

5. Write mitigation plan and prioritize projects (using Evaluation Criteria)
   - Social
   - Technical
   - Administrative
   - Political
   - Legal
   - Economic
   - Environmental
6. Develop implementation plan
   - Priorities for Mitigation Actions
     - Short-, Medium-, or Long-Range
     - Potential Funding Sources
     - Responsible Entities
     - Target Completion Dates
   - Five-Year Plan Maintenance Cycle

Sample of slides presented

SIGN-IN SHEET FOR Hazard Mitigation Meeting **DATE** 12/10/14

NAME	ORGANIZATION	PHONE	FAX	E-MAIL
Brandon Olenik	KC EMA			
Nicole Vautard	KC EMA			
~~Sarah Kafer~~	KC Planning			
Tess Grubb	fema	215-931-5528	215-931-5501	therese.grubb@fema.dhs.gov
David Carlson	DEMH	302 659-2313	302-659 6855	david.carlson@state.de.us
Michael Scott	SU/ESRGC	410-543-6456		MSScott@salisbury.edu
Colin Faulkner				
Deepa Srinivasan				

SIGN-IN SHEET FOR Hazard Mitigation Municipality Meeting **DATE** 12/10/14

NAME	ORGANIZATION	PHONE	FAX	E-MAIL
Aaron Chatfield	Camden	697-2299		aaron.chatfield@townofcamden.com
HAROLD SCOTT JR	CAMDEN	697-7313	697-0184	HAROLD.SCOTT@TOWNOFCAMDEN.COM
SAM CALLENDER	CHESWOLD	734-6991	734-1355	callenderte@verizon.net
ANDREW JAKUBOWITCH	KENT COUNTY	302 229-4493		andrew.jakubowitch@co.kent.de.us
Brandon Olenik	Kent County			
Colin Faulkner	Kent County			
Nicole Vautard	Kent County			
Tim Gulick	FEMA R3			
Mike Scott	DEMEC			
Dept	VPC			

APPENDIX B

Steering Committee Meeting March 10, 2015

Kent County

ALL HAZARDS MITIGATION PLAN UPDATE

Steering Committee Meeting #2
10 March 2015
3-5pm
AGENDA

County Mitigation Actions
- **Discussion and finalization**
- **Review/comments by Committee**
- **Review of prioritization criteria**
- **Project prioritization**

Municipal Mitigation Actions
- **Summary**

Hazard Identification and Vulnerability Assessment

Plan Maintenance

Overview of Draft Plan

Wrap-up
- **Draft Plan for Review**
- **Draft Plan for Upload**
- **Questions**

Adjournment

Prioritization Criteria

Social Considerations – Life/Safety Impact

- Will the project have minimal/direct/or significant impact on the safety of businesses, residents, and properties?
- Will the proposed action adversely affect one segment of the population?
- Will the project be a proactive measure to reducing flood risk?

Administrative Considerations – Administrative/Technical Assistance

- Is there sufficient staff currently to implement the project?
- Is training required for the staff to implement this project?

Economic Considerations – Project Cost

- What is the approximate cost of the project?

Evaluation Criteria for Project Prioritization

Criteria	Points (High Score)	High Score (H)	Points	Medium Score (M)	Points (Low Score)	Low Score (L)
Life/ Safety Impact	**10**	Significant impact on public safety for businesses, residents, properties	6	Direct impact on businesses, residents, properties	2	Minimal/negligible impact on businesses, residents, properties
Administrative/ Tech Assistance	**5**	No additional staff or technical support needed to implement action	**3**	Some administrative and technical support needed to implement action	**1**	Significant administrative and technical support needed to implement action
Project Cost	**5**	Low cost (<$25,000)	**3**	Moderate cost ($25,000-$100,000)	**1**	High cost to implement (>$100,000)

Timeline

- Short range projects – implemented within first 2 years;
- Medium range projects - 3 to 5 years; and
- Long range projects – over 5 years.

Prioritization Categories

- High priority 14+ points
- Medium priority 10-13 points
- Low priority < 10 points

2015 All-Hazards Mitigation Plan Update
Kent County, DE

Steering Committee Meeting #2 and Public Meeting
10 March 2015

Presented by:
Deepa Srinivasan, Vision Planning and Consulting, LLC

Project Purpose

To update the all-hazards mitigation plan to improve Kent County's resistance to natural hazards by identifying actions to reduce the impact of various hazards to people and property.

Key Players

- Kent County Staff – Emergency Management, Planning Department
- Hazard Mitigation Plan Steering Committee
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- Consultants
  - Deepa Srinivasan, President, Vision Planning & Consulting
  - Dr. Mike Scott, ESRGC- Salisbury University
- Public
- Delaware Emergency Management Agency (DEMA)
- Federal Emergency Management Agency (FEMA)

Project Organization

Steps in the Planning Process

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2. Assess hazards, risks, vulnerability
3. Assess municipal capabilities
   - Existing Plans, Programs, Policies
   - Plan Integration – Document Reviews
   - Local Codes and Zoning Ordinances
   - Current and Proposed Projects
4. Develop goals and objectives and mitigation actions
   - Preventative Measures
   - Projects
   - Natural Resource Protection
   - Outreach and Communication
   - Other Mitigation Actions

Steps in the Planning Process (cont'd)

5. Write mitigation plan and prioritize projects (using Evaluation Criteria)
   - Social
   - Administrative/Technical
   - Economic/Cost
6. Develop implementation plan
   - Priorities for Mitigation Actions
     - Short-, Medium-, or Long-Range
     - Potential Funding Sources
     - Responsible Entities
     - Target Completion Dates
   - Five-Year Plan Maintenance Cycle

Sample of slides presented

Hazard Identification and Vulnerability Assessment of Environmental Hazards in Kent County, DE

Michael S. Scott, PhD, GISP
Eastern Shore Regional GIS Cooperative
at Salisbury University

Outline

- Definitions
- Review of process
- Hazard Identification
- Vulnerability Assessment
- What happens next?

Definitions

- Asset – an object of value to a community
- Hazard – a threat to an asset
- Risk – probability that a hazard event may occur
- Vulnerability – potential for loss, also known as exposure
- Annualized loss – total predicted loss, divided by the recurrence interval
- Annualized loss ratio – total loss/total exposure

Hazard Identification & Profiling

- Data Sources
  - Federal Emergency Management Agency
  - National Climatic Data Center
  - US Army Corps of Engineers (Philadelphia)
  - US Geological Survey
  - US Department of Agriculture
  - Delaware Geospatial Data Exchange
  - Kent County Department of Planning Services

Hazards to be Updated

- Floods
  - Riverine and Coastal
- Coastal Storm Wind
  - Tropical or Nor'easter
- Tornadoes
- Thunderstorm Wind
- Droughts
- Hail
- Winter Storms
- Extreme Heat/Cold
- Earthquakes

Other Hazards Reviewed

- Low Level of Vulnerability
  - Wildfires
  - Erosion
  - Sinkholes
  - Landslides
  - Volcanoes
  - Tsunamis
- Other Non-Ranked Hazards
  - Dam/Levee Failures
  - Weapons of Mass Destruction
  - Pipelines
  - Hazardous materials

Sample of slides presented

dy Petition

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Custody Petition

Petitioner, **John F. Casey III,** has filed a Petition for an Order of Protection From Abuse against you in the Family Court of the State of Delaware for KENT County.

Petition No. 15-00519

A court hearing has been scheduled for 2/24/2015 at 11:30 AM.
The Family Court is located at 400 Court Street, Dover, DE 19901. If you fail to appear, the hearing may proceed without you.
If you wish to obtain the information on this filing prior to the hearing, please respond to the Family Court location noted above.
43370 DSN 2/12/2015

Divorce

NOTICE OF DIVORCE ACTION

TO: **Amy E. Wright,** Respondent

FROM: Clerk of Court Divorce

David M. Wright, Petitioner has brought suit against you for a Divorce in the Family Court of State of Delaware for Kent County in Petition No.: 15-17754, 2015. If you do not serve a response to the petition upon the Petitioner's Attorney:

David M. Wright
3199 Seven Hickories Road
Dover, DE 19904

Or to the petitioner if unrepresented, and the Court within 20 days after publication of this notice exclusive of the date of publication, as required by statute, this action will be heard without further notice at Family Court.
43337 DSN 2/12/2015

Liquor License

NOTICE TO PROPERTY OWNERS

Liquor License

speakers, amplifiers, live entertainment, and a wet bar.

Persons who are against this application should provide written notice of their objections to the Commissioner. For the Commissioner to be required to hold a hearing to consider additional input from persons against the application, the Commissioner must receive one or more documents containing a total of at lease 10 signatures of residents or property owners located within 1 mile of the premises or in any incorporated areas located within 1 mile of the premises. The protest(s) must be filed with the Alcoholic Beverage Control Commissioner at the 3rd Floor, Carvel State Office Building, 820 North French Street, Wilmington, DE 19801. The protest(s) must be received by the Commissioner's office on or before Thursday, March 12, 2015. Failure to file such a protest may result in the Commissioner considering the application without further notice, input or hearing. If you have questions regarding this matter please contact the Commissioner's Office.
42861 DSN 2/12,16,19
SCP 2/11,18,25/2015

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Press Release for Open House/ Public Meeting

2015 Kent County Hazard Mitigation Plan Update

Become educated and better prepared to deal with your community's hazards.

Date: 26 February 2015
Time: 5-7pm
Location:
Kent County Department of Public Safety
911 Public Safety Boulevard
Dover, DE 19901

The Kent County Department of Public Safety is holding a public meeting on 26 February 2015 to present the update of the Kent County Hazards Mitigation Plan and to solicit public input. The meeting will be held at the Kent County Department of Public Safety. Residents throughout the County are invited to attend. At this meeting, the updated hazards, risks, and mitigation actions will be presented. Residents who have an interest in properties located in hazard-prone areas, or those who would be affected by potential regulatory changes are encouraged to attend.

Lead Organization for the All Hazards Mitigation Plan Update:
Kent County Department of Public Safety

Point of Contact:
Brandon Olenik, Administrative Officer
Kent County Department of Public Safety
Emergency Management Division
911 Public Safety Boulevard
Dover, DE 19901
P: (302)-735-2201
F: (302)-735-3473
brandon.olenik@co.kent.de.us
43194 DSN 2/12/2015

NOTICE of BOARD of ADJUSTMENT HEARING

NOTICE: Land Use Administrator Theon Callender hereby gives notice that a BOARD of ADJUSTMENT HEARING will be held at **3:00 p.m.,** on **Wednesday, February 25, 2015, in the Cheswold Town Hall, 691 Main Street, Cheswold, Delaware 19936.**

PURPOSE: For the Board of Adjustment to review the validity of the Administrative Decision to deny a Building Permit to Mr. Robert J. Coleman to construct manufactured homes in the R-1 Zone of the Town of Cheswold.

HEARING: Will be conducted in accordance with the Town of Cheswold Land Use Ordinance, Article 3, Section 3-3D; Article 4 – Section 4-8 Item C-3 and Title 22, Section 323 of the State of Delaware Code.

COMMENTS: Are being solicited from any person with an interest in this hearing and may be in writing or presented orally at the Hearing. Written comments and requests to intervene or participate as a party must be received no later than Thursday, February 19, 2015 and should be addressed to the attention of Town Clerk – Shadina Jones, Town of Cheswold, P.O. Box 220, Cheswold, Delaware 19936. Those intending to provide oral comments must notify Ms. Jones at 302-734-6991, or cheswoldoffice@comcast.net, no later than 4:30 p.m., February 24, 2015.
43343 DSN 2/12/2015

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ANNOUNCEMENT OF PUBLIC HEARING

The Department of Health and Social Services, Division of Public Heath, will conduct a hearing to receive public comment on the Ryan White funds to be used for services to persons with HIV infection.

The Public hearing will be held on Thursday February 26, 2015 starting at 10AM at the Dover Public Library, 35 Loockerman Plaza, Dover, DE 19901, Ground Floor Conference Room. For more information, please call Stanley Waite at the Division of Public Health (302) 744- 1050.
42778 DSN 2/12,15/2015

LEGAL NOTICE

Pursuant to 24 **Del.C.** § 2006(a)(1), the Delaware Board of Occupational Therapy Practice has proposed revisions to its rules and regulations. The rules pertaining to continuing education are amended to clarify their application. Additionally rules of an administrative nature are changed to reflect current practices.

A public hearing will be held on March 4, 2015 at 4:30 p.m. in the Second Floor Conference Room A of the Cannon Building, 861 Silver Lake Boulevard, Dover, Delaware, 19904 where members of the public can offer comments on the amendments to the rules and regulations. Anyone wishing to receive a copy of the proposed rules and regulations may obtain a copy from the Delaware Board of Occupational Therapy Practice, 861 Silver Lake Boulevard, Dover, Delaware 19904. Persons wishing to submit written comments may forward these to the Board at the above address in accordance with 29 **Del. C.** § 10118(a).
42645 DSN 2/12/2015

SIGN-IN SHEET FOR Public Meeting **DATE** 3/10/15
All Hazards Mitigation Plan Update 5-7pm

NAME	ORGANIZATION	PHONE	FAX	E-MAIL
Harold Scott	TOWN OF CAMDEN	302-697-2299		HAROLD.SCOTT@TOWNOFCAMDEN.COM
Aaron Chaffinch	Camden	(302) 697-2299		aaron.chaffinch@townofcamden.com
Bob McDevitt	Town of Bowers	302-335-1039		bobatbowersbeach@gmail.com
Martha Wilkinson	LEPC	302-734-2625		[redacted]
Ed Strouse	Town of Little Creek	302-222-5014		Fire541707@yahoo.com
Ed Strouse	DEMA	302-659-3314		edward.strouse@state.de.us