2015

Hazard Mitigation Plan

❖ City of Poquoson, Virginia

REPORT DOCUMENTATION

TITLE	REPORT DATE
City of Poquoson, Virginia Hazard Mitigation Plan	January 2015

ABSTRACT

The *City of Poquoson Hazard Mitigation Plan* has been updated for 2015. The City is vulnerable to a wide range of hazards that threaten the safety of 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 hazards may never be fully eliminated, the *City of Poquoson Hazard Mitigation Plan* recommends specific actions designed to protect residents, business owners and the built environment.

GRANT/SPONSORING AGENCY	ACKNOWLEDGEMENTS
This report was funded by the Federal Emergency Management Agency through the Virginia Department of Emergency Management, via grant Agreement number FEMA HMGP DR-4024-735-014 for $31,000. The grant was administered by the Hampton Roads Planning District Commission.	The Hazard Mitigation Planning Committee (HMPC) would like to acknowledge the contributions of Salter's Creek Consulting, Inc., Hampton, Virginia, throughout the planning process, as well as the contributions of the members of HMPC that made the planning process work.

INTRODUCTION

2014 UPDATE

Each section of this plan has been updated as part of the Disaster Mitigation Act of 2000 process. At the beginning of each section, there is a brief description of the changes made to that section as part of the 2014 update. Also, the City of Poquoson's Hazard Mitigation Planning Committee (HMPC) concluded that the 2014 update would include formatting and other changes to align the plan with the *2011 Southside Hampton Roads Hazard Mitigation Plan* in anticipation of possibly joining future multi-jurisdictional planning processes.

Section 1 was updated to align the document with the *2011 Southside Hampton Roads Hazard Mitigation Plan*.

BACKGROUND

The City of Poquoson is vulnerable to a wide range of natural hazards that threaten the safety of residents, and have the potential to damage or destroy both public and private property, as well as infrastructure, and disrupt the local economy and overall quality of life.

While the threat from hazards may never be fully eliminated, much can be done to lessen their potential impact. The concept and practice of reducing risks associated with known hazards is referred to as *hazard mitigation*.

FEMA Definition of Hazard Mitigation

"Any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards."

Hazard mitigation techniques include both structural measures, such as strengthening or protecting buildings and infrastructure, and non-structural measures, such as the adoption of sound land use or floodplain management policies and the creation of public awareness programs. Effective mitigation measures are often implemented at the county or municipal level, where decisions that regulate and control development are made. A comprehensive mitigation approach addresses hazard vulnerabilities that exist today and in the foreseeable future. Therefore, projected patterns of future development must be evaluated and considered in terms of how that growth will increase or decrease a community's hazard vulnerability over time.

As a community formulates a comprehensive approach to reduce the impacts of hazards, a key means to accomplish this task is through the development, adoption, and regular update of a local hazard mitigation plan. A hazard mitigation plan establishes the community vision, guiding principles, and the specific actions designed to reduce current and future hazard vulnerabilities.

The City of Poquoson's Hazard Mitigation Plan (hereinafter referred to as "Hazard Mitigation Plan" or "Plan") is a logical part of incorporating hazard mitigation principles and practices into routine government activities and functions. The Plan recommends specific actions designed to protect residents, business owners, and the developed environment from those hazards that pose the greatest risk. Mitigation actions should go beyond recommending structural solutions to reduce existing vulnerability, such as elevation, retrofitting, and acquisition projects. Local policies that guide community growth and development, incentives tied to natural resource protection, and public awareness and outreach activities should be considered to reduce the City's future vulnerability to identified hazards.

In keeping with federal requirements and to present a review of Poquoson's risk and vulnerability, state and regional capabilities, and revised local capabilities, the HMPC prepared this updated Hazard Mitigation Plan in 2014. The committee worked throughout 2014 to update mitigation goals, objectives, and recommended actions, as outlined in detail in Section 2. As part of the ongoing mitigation planning process, this Plan is the result of the 2014 mitigation plan evaluation.

DISASTER MITIGATION ACT OF 2000

In an effort to reduce the Nation's mounting natural disaster losses, Congress passed the Disaster Mitigation Act of 2000 (DMA 2000). Section 322 of DMA 2000 requires that state and local governments develop a hazard mitigation plan in order to remain eligible for pre- and post-disaster mitigation funding. These funds include the Hazard Mitigation Grant Program (HMGP), Hazard Mitigation Assistance (HMA), Flood Mitigation Assistance (FMA) and the Pre-Disaster Mitigation (PDM) program, which are administered by the Federal Emergency Management Agency (FEMA). Communities with an adopted and federally approved hazard mitigation plan are eligible for available mitigation funds before and after the next disaster strikes.

This Plan was prepared and updated in coordination with FEMA and the Virginia Department of Emergency Management (VDEM) to make certain it meets all applicable state and federal mitigation planning requirements. In addition, guidance from the March 2013 FEMA manual, *Local Mitigation Planning Handbook* was used by the HMPC and professional consultants to guide the plan update process. The *Local Mitigation Plan Review Tool*, found in Appendix A, provides a summary of FEMA's current minimum standards of acceptability, and notes the location within the Plan where each planning requirement is met.

PURPOSE

The general purposes of this Hazard Mitigation Plan are to:

- protect life and property by reducing the potential for future damages and economic losses that result from natural hazards;
- qualify for additional grant funding, in both the pre-disaster and post-disaster environment;
- speed recovery and redevelopment following future disasters;
- integrate existing flood mitigation documents;
- demonstrate a firm local commitment to hazard mitigation principles; and
- comply with state and federal legislative requirements tied to local hazard mitigation planning.

SCOPE

This Hazard Mitigation Plan will be updated and maintained to continually address those natural hazards determined to be of high and moderate risk as defined by the results of the risk assessment (see "Conclusions on Hazard Risk" in Section 5: *Vulnerability Assessment*). This enables Poquoson's HMPC to prioritize mitigation actions based on those hazards which present the greatest risk to lives and property.

The planning area includes the incorporated, independent City of Poquoson, Virginia.

AUTHORITY

This updated Hazard Mitigation Plan has been adopted by the City of Poquoson in accordance with the authority and police powers granted to municipalities under §15.2-2223 through §15.2-2231 as defined by the Code of Virginia. A copy of the resolution adopting the Plan is included in Appendix B.

This Plan was developed and updated in accordance with current state and federal rules and regulations governing local hazard mitigation plans. The Plan will be monitored and updated on a routine basis 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
- Title 44 Code of Federal Regulations, Part 201, used as the basis for the October 1, 2011 update to FEMA's *Local Mitigation Plan Review Guide*.

PLANNING PROCESS

2014 UPDATE

Separate sections summarizing the meetings and procedures followed during the 2014 update process were appended to each subsection. The original planning process was edited for brevity, but the overall plan history is maintained herein.

Section 2 was updated to align the document with the *2011 Southside Hampton Roads Hazard Mitigation Plan*.

INTRODUCTION

This section describes the original mitigation planning process undertaken by the City of Poquoson in 2004, as well as the processes followed in the 2009 and 2014 updates. This section consists of the following five subsections:

- OVERVIEW OF HAZARD MITIGATION PLANNING
- PREPARING THE PLAN
- THE PLANNING TEAM
- COMMUNITY MEETINGS AND WORKSHOPS
- INVOLVING THE PUBLIC AND IDENTIFIED STAKEHOLDERS

OVERVIEW OF MITIGATION PLANNING

Local hazard mitigation planning involves the process of organizing community resources, identifying and assessing hazard risks, and determining how to minimize or manage those risks. This process results in a hazard mitigation plan that identifies specific actions designed to meet the goals established by those that participate in the planning process. To ensure the functionality of each mitigation action, responsibility is assigned to a specific individual, department or agency along with a budget and schedule for its implementation. Plan maintenance procedures are established to help ensure that the plan is implemented, as well as evaluated and enhanced as necessary. Developing clear plan maintenance procedures helps ensure that the Hazard Mitigation Plan remains a current, dynamic, and effective planning document over time.

Participating in a hazard mitigation planning process can help local officials and citizens achieve the following results:

- save lives and property;
- save money;
- speed recovery following disasters;
- reduce future vulnerability through wise development and post-disaster recovery and reconstruction;
- enhance coordination within and across participating jurisdictions;

- maintain community commitment to continued compliance with the National Flood Insurance Program (NFIP) minimum requirements for floodplain management;
- expedite the receipt of pre-disaster and post-disaster grant funding; and
- demonstrate a firm commitment to improving community health and safety.

Mitigation planning is an important tool to produce long-term 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 and its economy back on track sooner and with less interruption.

The benefits of mitigation planning go beyond reducing hazard vulnerability. Measures such as the regulation of flood-prone land in known hazard areas can help achieve multiple community goals, such as preserving open space, improving water quality, maintaining environmental health, and enhancing recreational opportunities. It is the intent of this document to help identify overlapping community objectives and facilitate the sharing of resources to achieve multiple aims.

PREPARING THE PLAN

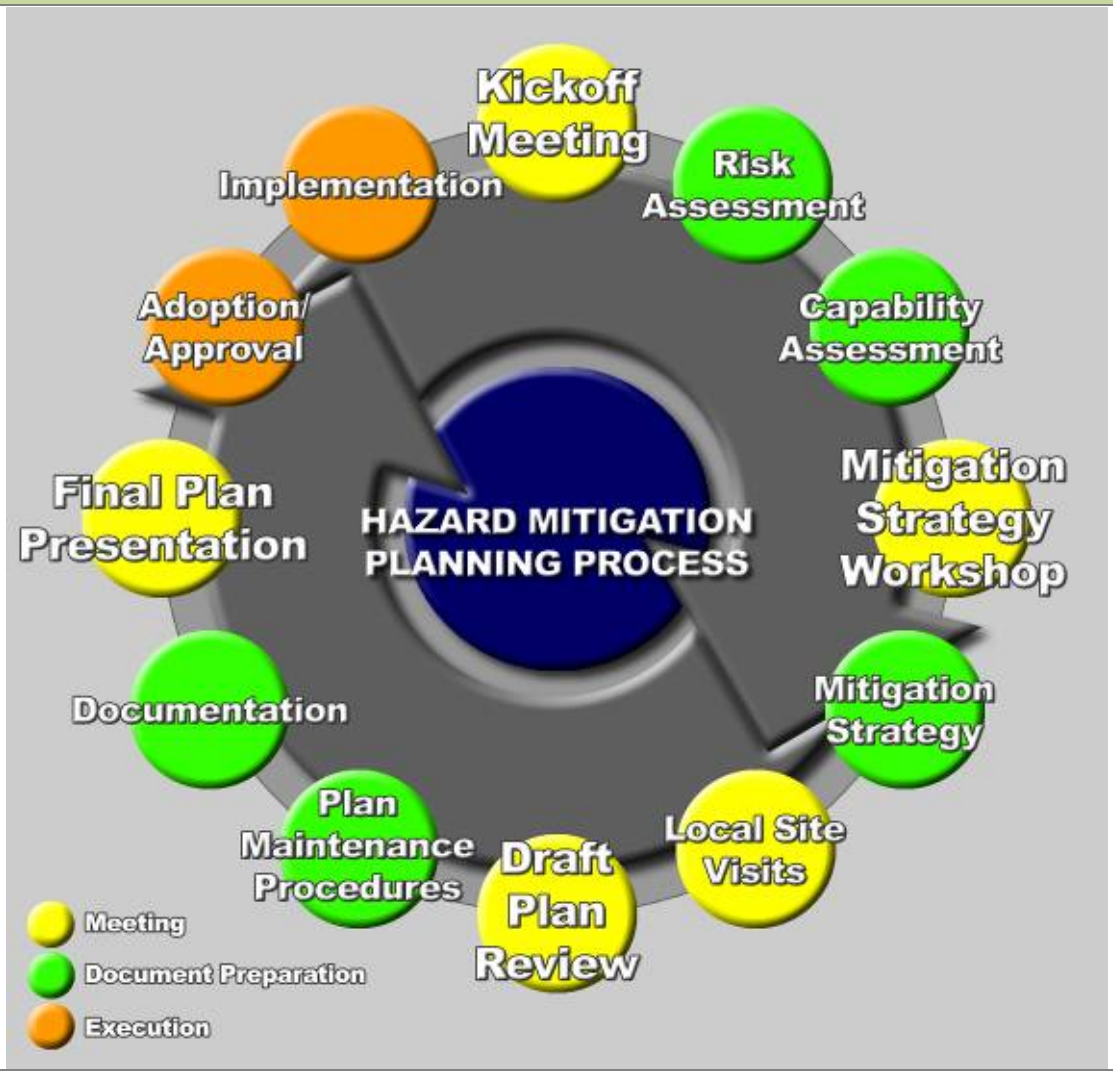
44 CFR Requirement

44 CFR Part 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.

Poquoson's HMPC used Federal Emergency Management Agency guidance (FEMA Publication Series 386) to develop and update this Hazard Mitigation Plan. A *Local Mitigation Plan Review Tool*, found in Appendix A, provides a detailed summary of FEMA's current minimum standards of acceptability for compliance with the Disaster Mitigation Act of 2000 and notes the location where each requirement is met within the Plan. These standards are based upon FEMA's Interim Final Rule as published in the Federal Register on February 26, 2002, and October 31, 2007, in Part 201 of the Code of Federal Regulations (CFR).

The planning process included 9 major steps that were completed in 2004 and 2009, and again during the update process beginning in February 2014. These steps are illustrated in **Figure 2.1**. Each of the planning steps illustrated in Figure 2.1 resulted in work products and outcomes that collectively make up the Hazard Mitigation Plan.

FIGURE 2.1: CITY OF POQUOSON HAZARD MITIGATION PLANNING PROCESS



THE PLANNING COMMITTEE

A community-based planning team made up of local government officials and key stakeholders, including citizens, helped guide the development of the Plan. The committee organized local meetings and planning workshops to discuss and complete tasks associated with preparing the Plan, including reviewing plan drafts and providing timely comments. The committee met quarterly between 2009 and 2014, but expects to move to twice-a-year meetings beginning in 2015. Additional participation and input from residents and other identified stakeholders was sought through the distribution of survey questionnaires and public meetings that described the planning process, the findings of the risk assessment, and the proposed mitigation actions. The committee reconvened in 2014 and used a similar process for this update.

POQUOSON HAZARD MITIGATION PLANNING COMMITTEE

The participants listed in **Table 2.1** are the members of the 2014 Poquoson Hazard Mitigation Planning Committee who participated in the planning process. Specifically, the tasks assigned to the committee members included:

- participate in mitigation planning meetings and workshops;
- provide best available data as required for the risk assessment portion of the Plan;
- provide copies of any mitigation or hazard-related documents for review and incorporation into the Plan;
- support the development of the Mitigation Strategy, including the design and adoption of community goals and objectives;
- help design and propose appropriate mitigation actions for incorporation into the Mitigation Action Plan;
- review and provide timely comments on all study findings and draft components of the plan; and
- support the adoption of the Hazard Mitigation Plan by community leaders.

Additional participation and input from other identified stakeholders and the general public was sought by the Committee during the planning process through e-mails, advertisements and public notices aimed at informing people about the status of the Plan. Public and stakeholder involvement is discussed in more detail later in this section.

TABLE 2.1: 2014 HAZARD MITIGATION PLANNING COMMITTEE MEMBERS

NAME	DEPARTMENT	CITIZEN OR OTHER STAKEHOLDERS NOT ATTACHED TO LOCAL GOVERNMENT?
Mike Bryant, Chairman	Fire/Emergency Management	No
Cliff Coffman	CERT	Yes
Greg Gecowets	CERT	Yes
Robert Sampe	CERT	Yes
Michelle Sheeler	CERT	Yes
Lester Pauls	Dominion Virginia Power	Yes
Amy Howard	Virginia Department of Emergency Management	Yes
Ben McFarlane	HRPDC	Yes
Robert Lawrence	HRPDC	Yes
Dawn Brantley	HRPDC	Yes
Curtis Brown	HRPDC	Yes
Les Nagel	Board of Zoning Appeals	Yes
Ellen Roberts	Engineering	No
Clifford Bowen	Police	No
John Young	Fire/Emergency Management	No
Robert Holloway	Fire	No
Robin Bellamy	Finance	No
Bob Speechley	Utilities	No
Kevin Wyne	Planning	No
Percy Ward	Police	No

TABLE 2.1: 2014 HAZARD MITIGATION PLANNING COMMITTEE MEMBERS		
NAME	DEPARTMENT	CITIZEN OR OTHER STAKEHOLDERS NOT ATTACHED TO LOCAL GOVERNMENT?
Kenneth Somerset	Floodplain Manager	No
Leigh Chapman	Salter's Creek Consulting, Inc.	No
Debbie Vest	Planning	No
Randy Wheeler	City Manager	No
Gretchen Gochenour	Community Recreation	No

2004 and 2009 COMMUNITY MEETINGS AND WORKSHOPS

The City of Poquoson contracted with professional planners to assist with the facilitation and development of the City's first Multi-Hazard Mitigation Plan in 2004, and again in 2008 to assist with the process of updating the plan for 2009. The consultants assisted the City with the following tasks for each planning process:

- Establishment of a planning organization for the City;
- Meeting all of the DMA requirements as established by federal regulations, following FEMA's planning guidance and Community Rating System planning guidance;
- Facilitation of the planning process;
- Identification of the data requirements and conduct of the research and documentation necessary to augment and, subsequently in 2009, to update that data;
- Development and facilitation of the public input process;
- Production of the draft and final plan documents;
- Submission for acceptance by FEMA Region III.

The consultants assisted the City with the establishment of the process for these planning efforts using the DMA 2000 planning requirements and FEMA's associated guidance. This guidance is structured around a generalized 4-phase approach. The consultants also integrated an older, more detailed 10-step planning process that was still required at the time the effort was initiated, for other FEMA mitigation programming such as the CRS and FMA programs. Thus, the City followed a single planning process and subsequent update process that combined these two sets of planning requirements together to meet the requirements of six other programs: CRS, DMA, FMA, HMGP, FEMA's Pre-Disaster Mitigation Program, and new flood control projects authorized by the U.S. Army Corps of Engineers (USACE).

The City of Poquoson's Hazard Mitigation Planning Committee was comprised of key City and stakeholder representatives. The Assistant City Manager chaired the team in 2004, and the Emergency Management Deputy Coordinator chaired the team for the 2009 update. With the Committee's commitment to participate, the first step was to establish both a framework and organization for the development of the plan. The original Hazard Mitigation Planning Committee met seven times over an eight-month period in 2004, and again convened and met five times in 2008/2009 to update the plan. Meeting dates and topics in 2008/2009 included:

December 4, 2008	Preliminary Project Coordination Meeting to review existing plan
February 17, 2009	Meeting #1 to review updated hazard data and existing mitigation strategy
February 18, 2009	Public Meeting #1/Stakeholder's Workshop to review updated hazard data
February 20, 2009	Meeting #2 to set mitigation goals and objectives
February 23, 2009	Meeting #3 to develop mitigation strategy through recommended actions
May 5, 2009	Meeting #4 to review public comments and final mitigation strategy
May 5, 2009	Public Meeting #2

Typical City representatives at each meeting included the police department, fire department, engineering, planning, public works, utilities, and finance departments, as well as the local school board.

2014 COMMUNITY MEETINGS AND WORKSHOPS

Below is a summary of the key meetings and community workshops during the 2014 update process. Routine discussions and additional meetings were held by local officials to accomplish planning tasks specific to their department or agency. A consultant (Salter's Creek, Inc., of Hampton, Virginia) was hired with grant funds to update the hazard identification and vulnerability analysis, to guide the committee through the planning process based on the revised information, and to begin the process of moving the

plan toward incorporation with the Southside Hampton Roads Hazard Mitigation Plan in future updates. Summary meeting minutes, attendance sheets and invitation emails are included in Appendix C.

NOVEMBER 25, 2013: PROJECT KICKOFF MEETING

Participants in the Kickoff Meeting discussed the overall approach to updating the Hazard Mitigation Plan, with emphasis placed on priorities for outreach and public participation, as well as the steps necessary to meet the requirements of the Disaster Mitigation Act of 2000, and the Community Rating System (CRS) of the NFIP. Salter's Creek Consulting initiated data collection efforts at the meeting and reviewed the existing list of hazards with the representatives present.

Manmade hazards were determined to be outside the committee's scope. The group reviewed the CRS Activity 510 planning requirements and discussed potential stakeholders and how they would be asked to participate, including tasks such as: reviewing drafts, participating on the committee, and/or attending public meetings.

FEBRUARY 10, 2014: FIRST PLANNING COMMITTEE MEETING (AND PUBLIC MEETING)

The consultant provided an overview of the proposed update approach to committee members and the public. Attendees discussed the hazards of most critical concern, and concurred with adjusting the names of several hazards. "Floods" became "Flooding", and "Wind Events" and "Nor'easters" were deleted and replaced by "Hurricanes". "Thunderstorms" was retitled "Severe Thunderstorms". The Committee reviewed the Hazard Identification and Vulnerability Assessment information updated by the consultant at this meeting.

APRIL 29, 2014: SECOND PLANNING COMMITTEE MEETING AND WORKSHOP

The second Planning Committee meeting was the beginning of the "Mitigation Strategy Workshop." The meeting began with a detailed presentation on the findings of the capability assessment and additional discussion to refine those findings. The assessment included local capabilities, as well as updated information regarding completed mitigation actions.

In addition to the hazard identification and vulnerability data provided in Sections 4 and 5, the consultant helped the Committee members review several documents in preparation for the goal setting exercise which was the focus of the meeting. Review notes from the documents were provided to committee members after they had divided into groups. This allowed discussion of relevant points in the other documents as facilitated by the contractor. This background information and discussion helped Committee members maintain continuity between various local, regional, and state planning efforts.

Data, documents, plans and procedures reviewed as part of the planning process included:

- Poquoson's Comprehensive Plan goal statements;
- *2013 Commonwealth of Virginia Hazard Mitigation Plan* goals and objectives;
- Virginia *Governor's Commission on Climate Change Final Report*, December 2008; and,
- *2011 Southside Hampton Roads Hazard Mitigation Plan* Goals and Objectives
- the City's:
    - floodplain management regulations,
    - site plan review process, and
    - permitting procedures.

The group was provided a list of potential, broad community goal key words in order to encourage brainstorming about revising the goal statements. The members also reviewed existing goal statements from the current plan and other plans pertinent to the region. Subgroups chose their top key phrases, and they were presented to the larger group. Using the group's chosen key phrases, the consulting

planner reworked, grouped together, and presented the revised goals and objectives so that the group could arrive at a consensus on the broader mitigation goals and objectives associated with the updated mitigation plan.

APRIL 30, 2014: THIRD MITIGATION PLANNING COMMITTEE MEETING AND WORKSHOP

The Committee reviewed the revised goals and objectives and approved the revisions with minor wording changes. The consultant shared additional review notes on floodplain management regulations, and suggested opportunities for mitigation actions based on capability gaps, status of existing mitigation actions and other observations. The consultant also shared identified opportunities for increasing credit points under Activity 510 of the CRS program that could also double as mitigation actions. The group reviewed a general list of potential mitigation actions categorized by type.

Committee members worked carefully through a review of the list of existing mitigation actions from the 2009 plan, deciding which actions to modify or delete based on their progress toward completion. The group then selected and discussed priorities for several new proposed actions. The consultant discussed a variety of mitigation categories for considering and evaluating possible mitigation action alternatives appropriate to Poquoson.

INVOLVING THE PUBLIC

44 CFR Requirement

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.

Individual citizen involvement provides the planning committee with a greater understanding of local concerns and increases mitigation success by developing community “buy-in” from those directly affected by public policy and planning decisions. As citizens become more involved in decisions that affect their health, life and safety, they are more likely to gain appreciation of the natural hazards present in their community and take personal steps to reduce hazard impacts. Public awareness is a key component of an overall mitigation strategy aimed at making a home, neighborhood, school, business or city safer from the effects of natural hazards.

Public input was sought using two primary methods: open public meetings; and the posting of the draft Hazard Mitigation Plan on Internet Web sites and at government offices. Public meetings were held at two stages of the planning process; early in the process to introduce the revised Hazard Identification and Vulnerability Assessment, and after the planning committee workshops, but well prior to adoption by City Council. A public survey was distributed and posted on the web but was unsuccessful at garnering any response.

2009 Public Meetings

There was continued public involvement in every step of the update process. Draft copies of the plan were on public display for review. Several opportunities were provided to the public for input and participation throughout the planning process. Two open public meetings were held February and May 2009, to allow the general public an opportunity to meet with HMPC members, ask questions, and provide comments and input on the draft mitigation plan.

2014 Public Meetings

Two open public meetings were held to present the findings of the risk and capability assessments and to review mitigation actions to be included in the Hazard Mitigation Plan. Summary meeting minutes, attendance sheets, invitation emails and public notices are included in Appendix C.

The first public meeting was held on February 10, 2014. The meeting was primarily advertised in *The Daily Press* and on the City's signboard outside City Hall. The newspaper publication has local and regional circulation which ensured local officials, residents, businesses, and other public and private interests in the region, including neighboring communities, were notified on how to be involved in the local mitigation planning process. Emergency Management officials also notified the City's Community Emergency Response Team (CERT) members.

Upon completion of a final draft Plan, the Committee held an open public meeting on the final Hazard Mitigation Plan on June 16, 2014. The meeting was advertised in the same manner, and provided further opportunities for the public and identified stakeholders to review and comment on all sections of the Plan prior to local approval and adoption. Advertisements and general notifications on the posting and availability of the draft Plan for public review were disseminated by the City through the web site: www.poquoson-va.gov. The meeting and subsequent 2-week review period provided citizens with a final opportunity to review the content of each of the Plan's sections, to ask questions and suggest possible revisions. All review comments are summarized and addressed in Appendix D.

Additionally, the plan was reviewed and presented to City Council at a public hearing on _____, 2015. Though the plan was in its final format, this did provide additional opportunity to answer questions and present findings to the public and elected officials.

2014 Public Participation Survey and FEMA Open House

A Public Participation Survey (Appendix E) was designed to capture data and information from residents and business owners that might not be able to attend public meetings or participate through other means in the mitigation planning process. A FEMA Open House, held July 8, 2014, for the purpose of sharing information on the City's revised Flood Insurance Rate Maps, provided an additional opportunity to distribute the survey and garner response. A table was set up to provide information and discussion on the mitigation actions in the draft mitigation plan. While many citizens visited the table and asked questions about the mitigation planning process, there was just one response to the Public Participation Survey as summarized in Appendix E.

Citizens get information from FEMA and others at the 2014 Open House.

INVOLVING STAKEHOLDERS

44 CFR Requirement

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.

A range of stakeholders, including neighboring communities, agencies, businesses, academia, nonprofits, hospitals, and other interested parties were invited and encouraged to participate in the development of the Hazard Mitigation Plan. Stakeholder involvement was encouraged through notifications and invitations to agencies or individuals to participate in meetings and the Mitigation Strategy Workshops.

In addition to the Planning Committee meetings, the committee encouraged open and widespread participation in the mitigation planning process through the design and publication of newspaper advertisements that promoted the open public meetings. These media advertisements and survey instruments provided opportunities for local officials, residents, and businesses to be involved and offer input throughout the local mitigation planning process.

During the 2014 update process, additional stakeholders were invited to participate in one of 3 ways: 1) attend and participate in HMPC meetings; 2) attend and participate in Public Meetings; and/or 3) review draft documents and provide comments and critique. The additional stakeholders invited included:

- State agency representatives;
- the Hampton Roads Planning District Commission;
- Neighboring jurisdictions;
- Representatives from colleges and universities in the region;
- the National Weather Service;
- Representatives from utilities servicing the region; and,
- Representatives from the medical community.

COMMUNITY PROFILE

2014 UPDATE

Section 3 was updated to align the document with the *2011 Southside Hampton Roads Hazard Mitigation Plan*. Tables and figures were updated to incorporate data from the 2010 U.S. Census, the Hampton Roads Planning District Commission (HRPDC) and other sources.

INTRODUCTION

This community profile provides a general overview of the geography, environment, and economic characteristics of the City of Poquoson. This section consists of the following five subsections:

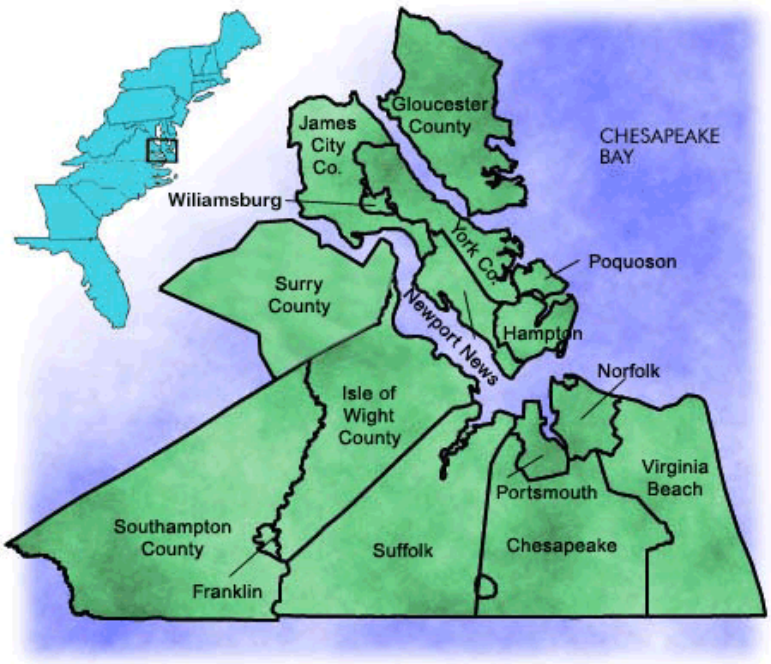
- GEOGRAPHY AND THE ENVIRONMENT
- POPULATION AND DEMOGRAPHICS
- HOUSING, INFRASTRUCTURE, AND LAND USE
- EMPLOYMENT AND INDUSTRY
- DEVELOPMENT TRENDS

GEOGRAPHY AND THE ENVIRONMENT

Poquoson, Virginia is located on the eastern tip of Virginia's Lower Peninsula bordered by the Poquoson River on the north, Back River and Wythe Creek on the south, and the Chesapeake Bay on the east. The City is greatly influenced by the surrounding bodies of water and has 116 miles of shoreline. Poquoson's immediate neighboring communities are York County to the west and the City of Hampton to the south (**Figure 3.1**).

The topography of Poquoson is typical of the lower Tidewater Virginia area bordering the Chesapeake Bay. The terrain is generally flat, and there are numerous inlets, marshes, and creeks forming many smaller peninsulas. Land elevations in many of these developed areas seldom exceed five feet National Geodetic Vertical Datum (NGVD); the majority of the City is less than seven feet NGVD.

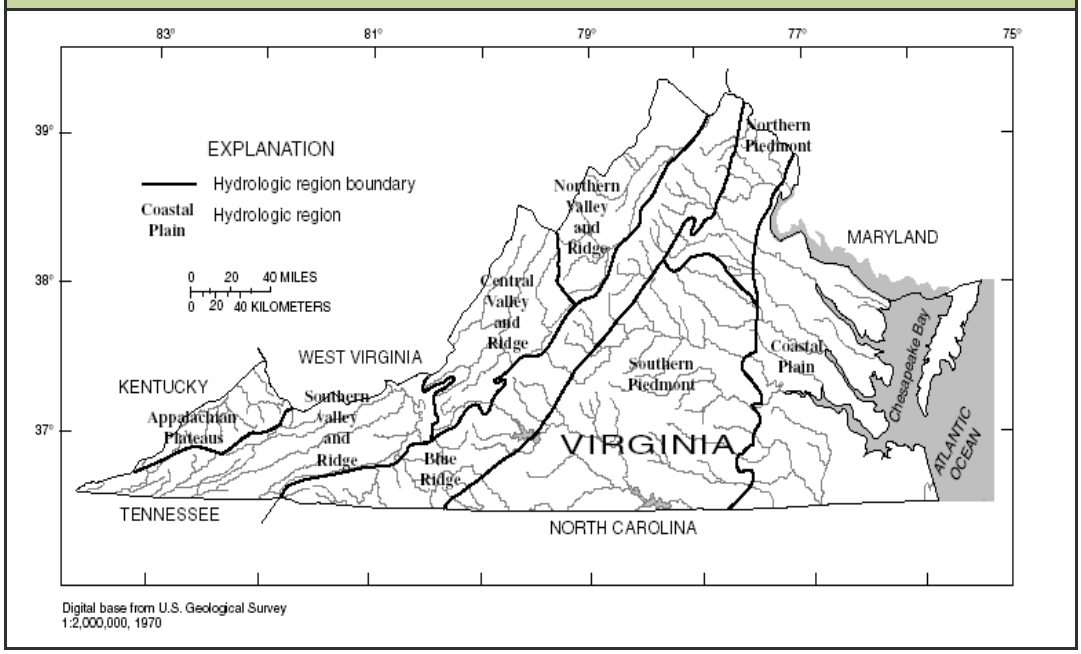
FIGURE 3.1: CITY OF POQUOSON WITHIN THE HAMPTON ROADS REGION OF VIRGINIA



The City of Poquoson is part of the Hampton Roads region, which includes the Cities of Virginia Beach, Hampton, Newport News, Williamsburg, Chesapeake, Norfolk, Portsmouth, and Suffolk, and the Counties of York, Matthews, James City, Isle of Wight, and Gloucester in Virginia, and Currituck County in North Carolina. Hampton Roads is located within the Atlantic Coastal Plains Province, which is characterized by its low, flat relief **(Figure 3.2)**.

The Atlantic Coastal Plain is the easternmost of Virginia's physiographic zones. The zone extends from New Jersey to Florida, and includes all of Virginia east of the Fall Line, which is the point at which east-flowing rivers cross from the hard, igneous, and metamorphic rocks of the Southern Piedmont to the relatively soft, unconsolidated strata of the Coastal Plain (USGS 2001).

FIGURE 3.2: HYDROLOGIC REGIONS OF VIRGINIA



The name "Poquoson" comes from a Native American term that has been translated as either "flat land" or "great marsh." The City encompasses a total area of 78.4 square miles (mi2); 15.5 mi2 of land and 62.9 mi2 of water. The total area is 80-percent water. Plum Tree Island National Wildlife Refuge covers approximately 5.5 mi2 and dominates the eastern portion of the City. Together with privately owned salt marsh lands, the area makes up the largest saline marsh in the lower Chesapeake Bay.

Poquoson was part of York County for over three centuries and incorporated as a town in 1952. It was later chartered as a city in 1975. It is the oldest continuously named city in Virginia (City of Poquoson website, undated). General agriculture and seafood related businesses remained the predominant activities of the City until the construction of Langley Field in 1917 prior to the United States' entry into World War I (Cook, 2000). The Field offered residents many employment opportunities either working directly for Langley Field, its many military contractors, or ancillary businesses. Since World War II, Poquoson has been a residential community for people working all over the peninsula.

Poquoson enjoys mild winters and warm, humid summers, influenced by proximity to the Atlantic Ocean and the Gulf Stream ocean current. The average annual temperature is 59 degrees Fahrenheit. January is the coldest month on average, while July is the hottest. The average annual rainfall is about 44 inches and is well distributed throughout the year, with the wettest months typically coming in the summer. Additional discussion of weather extremes, including winter storms and extreme heat, are included in Section 4.

POPULATION AND DEMOGRAPHICS

Poquoson is an independent City in the Commonwealth of Virginia. It is a mature city, having experienced its most significant population growth in the 1970s, when its population grew to 8,300 from 5,441, an increase of slightly more than 50-percent for the decade. Up until 2000, the rate of population growth declined rapidly. Since 2000, the City's population growth rate has increased slightly. According to the most recent data from the 2010 U.S. Census Bureau, Poquoson's population increased by 584 persons between 2000 and 2010. The 2010 estimate of the City's population is 12,150. The 2000 Census reported a population of 11,566. The change reflects migration into the City. **Table 3.1** provides a summary of the population, housing, and land area present within Poquoson and the adjacent communities in the Virginia Peninsula region, as well as population and housing densities per square mile.

TABLE 3.1: SUMMARY OF REGIONAL POPULATION, HOUSING, LAND AREA AND DENSITY

JURISDICTION	POPULATION	HOUSING UNITS	LAND AREA IN SQUARE MILES	DENSITY PER SQUARE MILE OF LAND AREA	
				POPULATION	HOUSING UNITS
Poquoson	12,150	4,726	15.32	793.2	308.5
Hampton	137,436	59,566	51.41	2,673.2	1,158.6
York County	65,464	26,849	104.78	624.8	256.2
Virginia	8,001,024	3,364,939	39,490.09	202.6	85.2

Source: U.S. Census Bureau, 2010

Table 3.2 shows total population breakdowns, including percent of children under the age of 18, percent of elderly population (age 65 and over), and percent of population living below the poverty level. Data in Table 3.2 are based on 2010 Census data and the *2008-2012 American Community Survey 5-Year Estimates*.

TABLE 3.2: DEMOGRAPHIC CHARACTERISTICS, CITY OF POQUOSON

TOTAL POPULATION	UNDER 18 YEARS OLD (%)	65 YEARS AND OVER (%)	MEDIAN AGE	BELOW POVERTY LEVEL (%)
Poquoson	2,969 (24.4)	1,891 (15.6)	44.4	4.1
Hampton	87,719 (63.4)	6972 (5.1)	37.4	14.7
York County	17,276 (26.4)	3525 (5.4)	38.1	5.4
Virginia	1,853,677 (23.2)	976,937 (12.2)	36.1	11.1

Source: U.S. Census Bureau, 2010 and 2008-2012 American Community Survey 5-Year Estimates

Table 3.3 lists the population change experienced by Poquoson between 1970 and 2010, as well as a population projection through 2040. While Poquoson and York County have experienced a continual increase in overall population that is expected to continue into 2040, Hampton saw a marked decline in population between 2000 and 2010. Much of this trend may be attributed to suburbanization as residents move outward from the denser city centers into more suburban settings such as Poquoson and York County. The population projection for 2040 in Poquoson, if realized, would represent a 44% population growth between 2000 and 2040.

TABLE 3.3: REGIONAL POPULATION CHANGE AND PROJECTED CHANGE, 1970 - 2040

JURISDICTION	1970	1980	1990	2000	2010	2040
Poquoson	5,441	8,726	11,005	11,566	12,150	16,604
Hampton	120,779	122,617	133,811	146,437	137,436	139,663
York County	33,203	35,463	42,434	56,297	65,464	97,627
Virginia	4,651,448	5,346,797	6,187,358	7,079,030	8,001,024	10,415,575

Source: Weldon Cooper Center for Public Service, 2014, U.S. Census Bureau, 2010

HOUSING, INFRASTRUCTURE AND LAND USE

According to the 2010 Census, there are 4,726 housing units in Poquoson with more than 95% of the units classified as occupied. The majority of structures were built between 1970 and 1989 (45%), and 82% of all housing units are owner-occupied. Slightly more than 67% of the housing units are mortgaged, which has declined markedly from the mortgaged rate of 80% reported in the 2009 plan. **Table 3.4** summarizes data on housing characteristics for Poquoson.

TABLE 3.4: HOUSING CHARACTERISTICS, CITY OF POQUOSON

TOTAL HOUSING UNITS	AVERAGE HOUSEHOLD SIZE (Persons)	MEDIAN VALUE	OCCUPIED UNITS (%)	STRUCTURES BUILT BEFORE 1970 (%)
4,726	2.67	$316,000	4,525 (95.7)	1,574(33.3)

Source: U.S. Census Bureau, 2010 and 2008-2012 American Community Survey 5-Year Estimates

The Peninsula's primary airport is the Newport News Williamsburg International Airport located in the City of Newport News, approximately eight miles from Poquoson. The Hampton Roads region's other major airport is Norfolk International Airport in Norfolk, approximately 25 miles from Poquoson.

Electrical service is supplied throughout the region by Dominion Virginia Power, and natural gas is provided by Virginia Natural Gas. Verizon, Verizon Wireless, FIOS and Cox Communications are primary service providers for cable television, phone, and internet service.

Poquoson serves as a bedroom community to the rest of the greater Peninsula area, with most residents commuting outside the community to work. According to the City's 2008 Comprehensive Plan, there are approximately 10,000 acres of land in Poquoson. Approximately 4,012 acres, or 40-percent, of this area is developed. Approximately 5,000 acres or 50-percent of the City's total land area is residential. This

includes property currently occupied by single-family and multi-family residences, as well as manufactured homes. It also includes woodland and open space areas designated for future residential use. The majority of the residential land, nearly 99-percent, is zoned for single-family detached dwellings. There are six multi-family complexes containing 530 multi-family units located within the City, and there are approximately 138 manufactured homes in the City, primarily in Shady Oaks Mobile Home Park.

Poquoson has 223 acres (2.2-percent) of commercial land, located primarily along Wythe Creek Road. Land for manufacturing and warehousing includes 99.5 acres or about 1-percent of the total. The City has 266 acres (2.6-percent of total) used for public and semi-public purposes, including parks, schools, City Hall, Masonic Hall, churches, cemeteries and the 40-acre landfill.

Undeveloped land in Poquoson accounts for 5,987 acres or approximately 60-percent of the City's total area. Included in the undeveloped acreage is approximately 4,537 acres of conservation land. The majority of the conservation land is the Plum Tree Island National Wildlife Refuge, which is owned by the Federal Government. The refuge, due to its isolation, was historically used for stock grazing, hunting, and fishing. The Federal Government acquired it for an Aviation Experimental Station in 1917, using it as a gunnery and bombing practice range until the latter part of the 1950's. In 1972, the area was transferred to the Department of the Interior for a wildlife refuge. As such, the flood-prone refuge provides immense natural and beneficial functions by serving as a protective barrier from wind and waves during coastal storms, and by providing habitat for rare species. The completely undeveloped refuge serves as a nursery for numerous crabs and fish, and provides shelter and hunting grounds for numerous mammals and furbearers. This distinctive ecosystem of floodplains, wetlands and water bodies, large and small, is marked by a diverse population of plants and animals that provide habitat and critical sources of energy and nutrients for organisms in adjacent terrestrial and aquatic ecosystems.

The City is divided into three Planning Districts, each of which has unique land use characteristics. The Eastern Planning District has extensive marshlands, including Plum Tree Island National Wildlife Refuge. Development is limited, and past development trends reflect only minor in-fill development and family subdivisions. The district is near full build-out. The district maintains a low population density overall, although development has tended to be compacted along roadways. The Central Planning District is more densely populated with multi-family housing units, commercial development, and more usable land area than the Eastern Planning District. The Western Planning District is predominantly development with low-density single-family homes. Large tracts of developable land still exist within this district.

Development patterns in all of the Planning Districts have been influenced by the City's geography and, particularly, the location of principal roads. The many necks of land and waterfront inlets created many desirable waterfront home sites. Development branched off of roadways that reach into these necks, and was limited only by the presence of extensive tidal wetlands. Additionally, public sewer extended into many new areas of the City in 1999, making more land area available to development. The 2008 Comprehensive Plan indicates that future land use is expected to be primarily single-family homes with medium to low densities, complimented by small, but well planned moderate density residential developments.

In 2013, the City created a new Planned Unit Development-Mixed Use overlay district within the Big Woods, a 260-acre swath of land lying north and south of Victory Boulevard. The underlying zoning districts remain intact; however, properties consisting of 5 or more acres may submit a master plan to City Council to activate the overlay district. The overlay allows for a mix of mixed-density residential and commercial uses. Density for residential dwellings shall not exceed 12 units per acre.

EMPLOYMENT AND INDUSTRY

Table 3.7 shows labor force data, unemployment rates and income and poverty information for the City of Poquoson, the region and the state. As shown in Table 3.7, the City's unemployment rate is consistent with the state's. Nearly 80-percent of the Poquoson workforce is employed in jobs outside the City limits and must use either Wythe Creek Road or Victory Boulevard to travel to and from work. Local and Federal government and large industrial companies are the largest employers in the region, including: Joint Base Langley-Eustis, NASA Langley Research Center, Yorktown Naval Weapons Station, Norfolk Naval Base, Joint Expeditionary Base Little Creek-Fort Story, and Huntington Ingalls Industries in Newport News. Canon Virginia, Inc., Measurement Specialties, Inc., Alcoa-Howmet Hampton, and Ferguson Enterprises, Inc., are also top non-government employers on the Peninsula. Virginia Employment Commission data from June 2014 indicate the following businesses are the top 10 employers in Poquoson: Poquoson City Schools; City of Poquoson; Farm Fresh; Food Lion; Ggnsc Poquoson, LLC; McDonald's Restaurant; Village Williamsburg; Poquoson Discount Pharmacy; Poquoson Veterinary Hospital; and Playtime Child Care.

TABLE 3.7: REGIONAL EMPLOYMENT

JURISDICTION	CIVILIAN LABOR FORCE (February 2014)	UNEMPLOYMENT RATE (%) (February 2014)
Poquoson	6,049	5.0
Hampton	58,920	7.1
York County	31,682	5.0
Virginia	4,328,420	4.9

Source: Hampton Roads Planning District Commission, Bureau of Labor Statistics

The primary market area for Poquoson lies within a three-mile radius from City Hall and is the fastest growing area in the City with the highest median income, highest educational level and the highest median age of residents on the Peninsula. Overall economic development objectives as outlined in the 2008 Comprehensive Plan including:

- Providing additional white collar and technical employment in order to provide employment opportunities within the City;
- Ensuring that all new business activity is environmentally sensitive;
- Ensuring business developments are consistent with the Comprehensive Plan;
- Providing increased shopping opportunities for residents;
- Enhancing Poquoson's commercial development image throughout the region;
- Fostering a business friendly environment; and
- Continuing to enhance the City's economic environment by ensuring that sufficient land and infrastructure exists, or can be provided, and that public actions support and promote desirable commercial and professional services development.

According to the 2008-2012 American Community Survey 5-Year Estimates, the top five industry classifications employing the greatest number of Poquoson residents include: educational, health and social services (20.3%), professional, scientific, and management (14.5%), manufacturing (13.3%), public administration (9.2%), and retail trade (8.9%).

The data presented reinforce the notion that Poquoson is a bedroom community to surrounding areas. This is partly due to the suburban landscape with low-density residential units and the environmentally sensitive land. However, the slow population increase may also be at least partially attributed to the lack of commercial businesses, mainly service and retail. While there are some businesses that provide basic goods and services for the area, there are not enough businesses to deter residents from going to adjacent larger cities to acquire specialized services and goods.

HAZARD IDENTIFICATION AND ANALYSIS

2014 UPDATE

Section 4 was updated to align the document with the 2011 Southside Hampton Roads Hazard Mitigation Plan.

Each of the hazards described in the 2009 Poquoson Multi-Hazard Mitigation Plan was reviewed and updated with current hazard history information from several sources, including the National Climatic Data Center (NCDC), National Oceanic and Atmospheric Administration (NOAA) Hurricane Tracks, National Weather Service (NWS), and the *Commonwealth of Virginia, Hazard Mitigation Plan 2013*. "Wind Events" has been removed as those impacts are addressed either through the new "Hurricanes" section or the "Tornado" section. Likewise, "Nor'easters" was deleted as the primary impact is flooding so it had been duplicative with "Flooding" and "Winter Storms". "Severe" was added to "Thunderstorms" as a qualifier.

INTRODUCTION

This section of the Plan describes the natural hazards that threaten the City of Poquoson and provides general background information, local data (e.g., the location and spatial extent), and historical occurences[1] for each hazard. This section also presents best available data regarding notable historical damages[2] within the City. The natural hazards discussed in this section are as follows:

- FLOODING
- HURRICANES
- TORNADO
- SEVERE THUNDERSTORMS
- SEA LEVEL RISE
- WINTER STORMS
- MOSQUITO BORNE DISEASES
- EARTHQUAKE
- DROUGHT
- WILDFIRE

44 CFR Requirement

Part 201.6(c)(2)(i): The risk assessment shall include a description of the type, 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.

Some of these hazards are interrelated (e.g., hurricane events can cause flooding and tornado activity); thus, hazard discussions overlap where necessary throughout the risk assessment.

[1] Significant historical events are based on information made available through NOAA unless otherwise cited. In most cases, NOAA information is obtained directly from NOAA's NCDC, the world's largest archive of weather data.
[2] Historical damage information is based on best available data and should only be considered approximate for general analysis and planning purposes.

To a large extent, historical records are used to identify the level of risk within the planning area—with the assumption that the data sources cited are reliable and accurate. Maps are provided to illustrate the location and spatial extent for those hazards within the region that have a recognizable geographic boundary (i.e., hazards that are known to occur in particular areas of the region such as the 100-year floodplain). For those hazards with potential risk not confined to a particular geographic area (such as winter storms, severe thunderstorms and tornadoes), historical event locations and/or general information on the applicable intensity of these events across the entire planning area is provided.

For most hazards analyzed in this section, some level of property damage was associated with any or all of the hazard events cataloged. However, for some historic events reports of property damage were not available. Therefore, totals of past property damages derived from historical records are best estimates and should not be used as a stand-alone indicator of hazard risk.

The *Vulnerability Assessment*, Section 5 of this plan, expands upon the foundation provided here and assesses the vulnerability of the City to these natural hazards.

SUMMARY OF PRESIDENTIAL DISASTER DECLARATIONS

A presidential disaster declaration is issued when a disaster event is determined to be beyond the response capabilities of state and local governments. Since 1953, the first year presidential disaster declarations were issued in the United States, the City has been named in eight such declarations (**Table 4.1**). Under a presidential disaster declaration, the state and affected local governments are eligible to apply for federal funding to pay 75% of the approved costs for debris removal, emergency services related to the storm, and the repair or replacement of damaged public facilities. The types of natural hazards that led to these disaster declarations in Poquoson include ice storms, winter storms, and hurricanes with associated flooding. The most recent declarations were for Tropical Depression Ida in 2009 and Hurricane Irene in 2011.

TABLE 4.1: PRESIDENTIAL DISASTER DECLARATIONS ISSUED FOR THE CITY OF POQUOSON

YEAR	DATE	DISASTER NUMBER	DISASTER TYPE
1972	September 8	339	Tropical Storm Agnes
1985	November 9	755	Severe Storms, Flooding
1996	February 16	1086	Blizzard of 1996
1996	September 6	1135	Hurricane Fran
1999	September 24	1293	Hurricane Floyd
2003	September 18	1491	Hurricane Isabel
2006	September 22	1661	Tropical Depression Ernesto
2009	December 9	1862	Tropical Depression Ida
2011	August 26	4024	Hurricane Irene

Source: FEMA, 2014

NATIONAL CLIMATIC DATA CENTER STORM EVENT DATABASE

Much of the data in the remaining tables in this section were taken from the NOAA NCDC database. NCDC receives storm data from the NWS which, in turn, receives their information from a variety of sources, including: county, state, and federal emergency management officials, local law enforcement officials, skywarn spotters, NWS damage surveys, newspaper clippings, the insurance industry, and the general public. Information on hazard events not recorded in this database is provided in narrative format for each hazard subsection. NCDC data are marginally useful because they are most accurate beginning in the early to mid 1990's, and data for Poquoson events is inconsistently grouped with the York County data. Small events may not even be reflected in the data at all. If available, local or anecdotal data were used to supplement the NCDC data and to provide a more accurate depiction of historic hazard events in the City.

FLOODING

BACKGROUND

Approximately 90% of presidentially declared disasters are associated with floods. However, the majority of damages across the United States are due to more frequent, localized flooding events that do not receive federal disaster declarations.

Elevated structure in flood-prone area of Poquoson. Photo courtesy of City of Poquoson.

The primary types of flooding include riverine, coastal, and urban flooding. Riverine flooding is a function of excessive precipitation levels and water runoff volumes within 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 when manmade development obstructs the natural flow of water or when impervious surfaces significantly decrease the ability of natural groundcover to absorb and retain surface water runoff. Poquoson is primarily subject to coastal flooding and storm surge associated with large amounts of tidally-influenced water being pushed inland from Hampton Roads. When coastal flooding is of longer duration and coupled with heavy precipitation, stormwater drainage can exacerbate existing flood conditions.

Similar to hurricanes, nor'easters are ocean storms capable of causing substantial damage to coastal areas in the Eastern United States due to their 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 surf that causes severe beach erosion and coastal flooding. There are two main components to a nor'easter: (1) a Gulf Stream low-pressure system (counter-clockwise winds) generated off the southeastern U.S. coast, gathering warm air and moisture from the Atlantic, and pulled up the East Coast by strong northeasterly winds at the leading edge of the storm; and (2) an Arctic high-pressure system (clockwise winds) which meets the low-pressure system with cold, arctic air blowing down from Canada. When the two systems collide, the moisture and cold air produce a mix of precipitation and have the potential for creating dangerously high winds and heavy seas. As the low-pressure system deepens the intensity of the winds and waves increase and can cause serious damage to coastal areas as the storm moves northeast.

The periodic inundation of floodplains adjacent to rivers, streams, and shorelines is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. FEMA has studied and mapped both the 100-year floodplain (with a 1% chance of being equaled or exceeded in any given year) and the 500-year floodplain (with a 0.2% chance of being equaled or exceeded in any given year) for the study area.

LOCATION AND SPATIAL EXTENT

Flooding can occur along all waterways in the City of Poquoson: Northwest Branch Back River, including the tidal tributaries of Wythe Creek, Cedar Creek, Topping Creek, Watts Creek, and Long Creek; and the Poquoson River, including the tidal tributaries of Moores Creek Lambs Creek, Roberts Creek, Lyons Creek, White House Creek, Floyds Bay, Bennett Creek, and Easton Cove.

Flood velocities are typically minimal because the primary sources are tidal, not riverine. Wave action can increase water velocity, especially if the fetch is large. Warning times for tropical storms are typically in the range of 1 to 3 days, although storms have been known to form and intensify over coastal North Carolina, leaving a shorter warning period once the storm begins to move. Similarly, warning times for flooding associated with nor'easters can range from 0 to 3 days, often catching forecasters by surprise as a low intensifies rapidly. Flooding associated with nor'easters is typically predicted in association with the astronomical tides, using a height above mean high tide as a warning tool. In addition to tidal flooding, the City of Poquoson is subject to flooding events induced by the rain associated with a hurricane or tropical storm and which can produce extreme amounts of rainfall in short periods.

Flooding of vacant land or land that does not have a direct effect on people or the economy is generally not considered a problem. In fact, the natural floodplains in Poquoson function quite well to provide some recreational open space throughout the eastern part of the City, and to protect flora and fauna associated with coastal tidewater and particularly tidal wetlands. Vast salt marshes and scrub/shrub areas, including Plum Tree Island, serve to protect the developed portions of the City from wave action associated with severe storms. Threats to these protective barriers, such as sea level rise and associated erosion, also constitute threats to the natural flood protection afforded the City.

Flood problems arise when floodwaters cover developed areas, locations of economic importance, infrastructure, and any other critical facility. Poquoson is highly susceptible to flooding, primarily from coastal storm surges, of the City's low-lying land areas, including marsh areas adjacent to many of its waterways, and the wide, flat outlets where its streams and rivers meet the Chesapeake Bay. Fluctuations in the surrounding water levels produce a mean tidal range of approximately 2.4 feet. The timing or coincidence of maximum surge-producing forces with the normal high tide is an important factor in consideration of flooding from tidal sources.

Strong east or northeast winds can push Chesapeake Bay water (storm surge) into the mouth of the York and James Rivers, flooding the Peninsula. This surge combined with the normal high tide can increase the mean water level 15 feet or more. The main impacts from severe floods are expected to be:

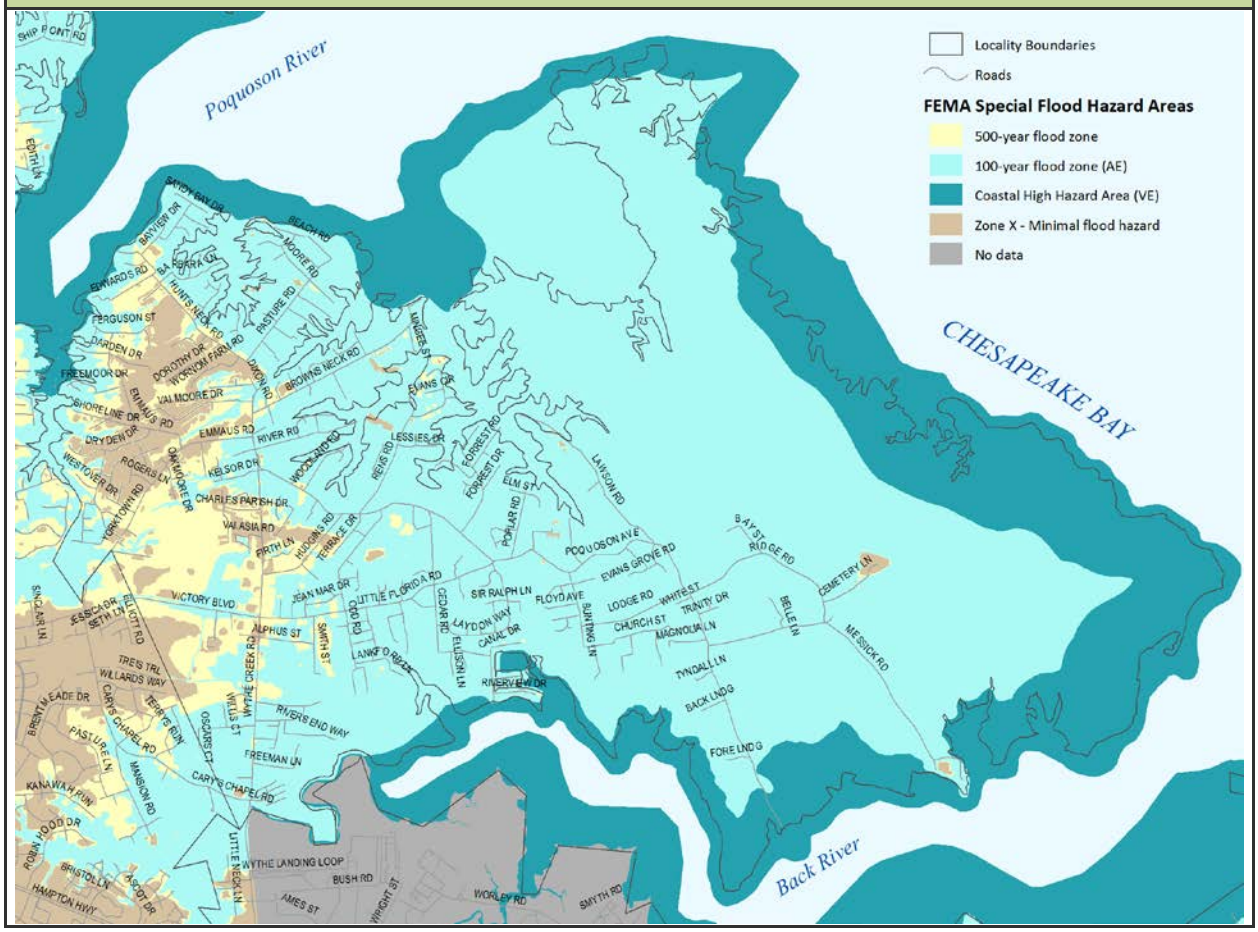
- Inundation of low-lying residential neighborhoods and, consequently, safety concerns for residents who do not evacuate;
- Impassable road crossings and consequential risk for people and cars attempting to traverse flooded crossings;
- Damage to public and private infrastructure, possibly including but not limited to water and sewer lines, bridge embankments, and both small and large drainageways;
- Wave action responsible for shoreline damage, and damage to boats and facilities; and
- Inundation of critical facilities, including some fire stations, police facilities, public shelters, and several city buildings.

Secondary impacts can include health and safety issues upon return to flooded areas and structures, including sewage or other pollutants in floodwaters or debris, and mold growth in structures that were inundated. Erosion of banks associated with tidal flooding is a secondary hazard of flooding for Poquoson, as well. With shoreline erosion, bank stability is threatened, contributing sediment to the waterways and possibly threatening shoreside structures and infrastructure.

Areas identified as vulnerable to flooding are depicted on FEMA's Flood Insurance Rate Maps (FIRMs), which were developed through the National Flood Insurance Program (NFIP), show the existing potential flood hazard areas throughout the City based on the estimated 100-year floodplain (**Figure 4.1).** The 100-year floodplain represents the areas susceptible to the 1% annual flood. The maps also show the 0.2%

annual flood, or 500-year flood. The 100-year flood, or base flood, has at least a 26% chance of occurring over the life of a typical 30-year mortgage.

FIGURE 4.1: FEMA-IDENTIFIED FLOOD HAZARD AREAS, CITY OF POQUOSON

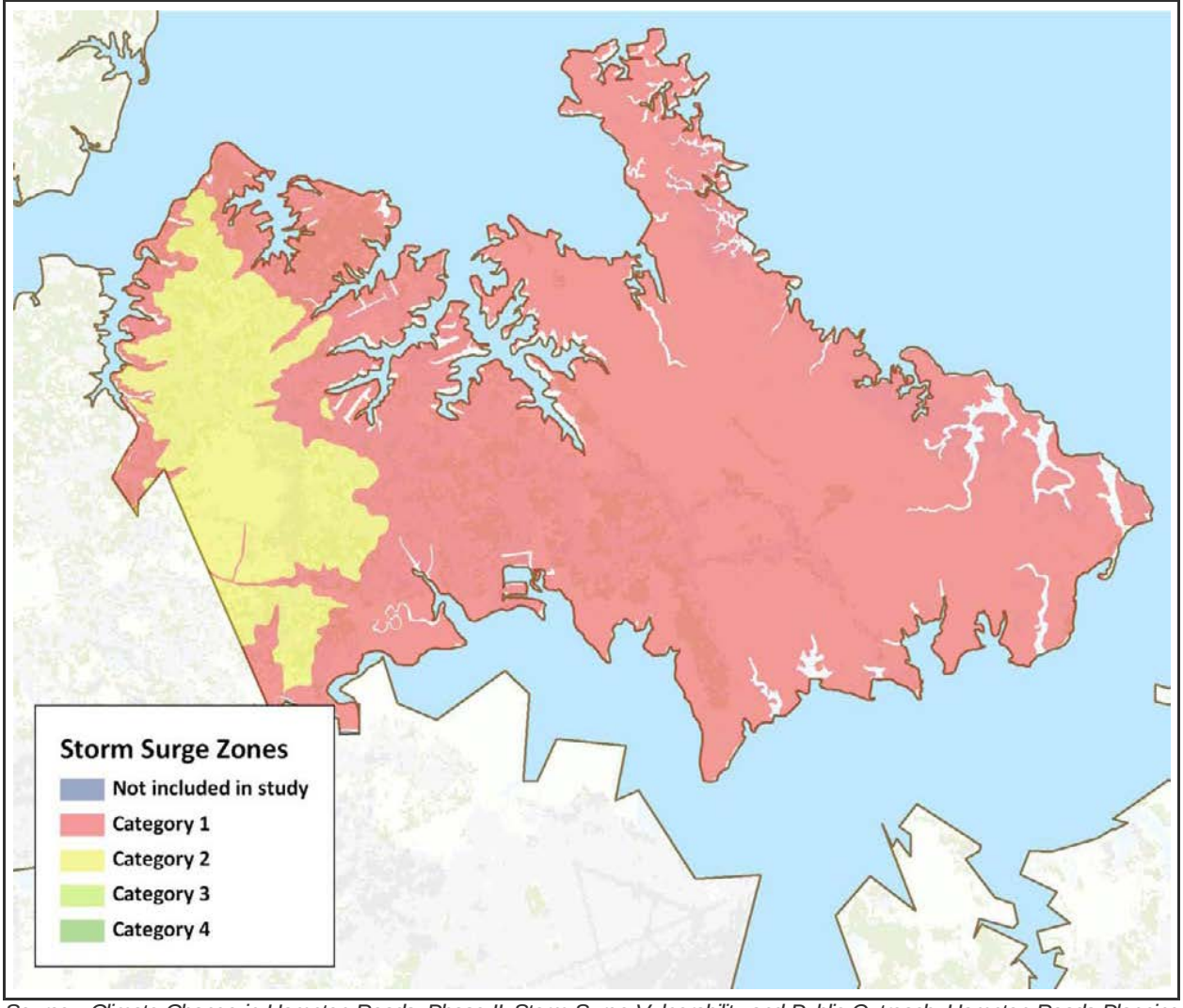


Source: Federal Emergency Management Agency, 2011

During the planning period for the 2014 update to this plan, the City had entered into the appeals process and was reviewing new preliminary FIRM data from FEMA. Those maps were still in draft format and not at a stage of completion that allowed analysis and mapping using the new data during the development of this section. The new maps will incorporate new detailed coastal flood hazard analyses and will become effective December 16, 2014.

Figure 4.2 shows the most recent storm surge hazard areas that can be expected as the result of Category 1, 2, 3, and 4 hurricanes, based on the Sea, Lake and Overland Surge from Hurricanes (SLOSH) model. SLOSH is a computerized model run by the NWS to estimate storm surge heights resulting from hypothetical hurricanes by taking into account the maximum of various category hurricanes as determined by pressure, size, forward speed, and sustained winds. The regional analysis represents the composite maximum water inundation levels for a series of parallel tracks making landfall at various points along the coast. The SLOSH model, therefore, is best used for defining the "worst case scenario" of potential maximum surge for particular locations as opposed to the regional impact of one singular storm surge event.

FIGURE 4.2: STORM SURGE INUNDATION AREAS, CITY OF POQUOSON



Source: Climate Change in Hampton Roads, Phase II: Storm Surge Vulnerability and Public Outreach, Hampton Roads Planning District Commission, June 2011

SIGNIFICANT HISTORICAL EVENTS

Many flood events that have occurred in the City have been the result of coastal storms, tropical storms or nor'easters. Other localized flooding occurs when heavy rains fall during high tide causing waters that would normally drain quickly to back up because of the tides. Based on historical and anecdotal evidence, it is clear that there is a relatively high frequency of flooding in the City. Recent, notable flood events to impact Poquoson are summarized in **Table 4.2** below. Since the 2009 update to this plan, there have been 3 noteworthy flood events impacting Poquoson:

The November **2009 Mid-Atlantic nor'easter** (or "Nor'Ida") was a powerful storm that caused widespread flooding throughout the region. The peak tide height at Yorktown was 6.86 feet above MLLW, which was 4.56 feet above the astronomical tide. That peak tide height was higher than 6.12 feet during a nor'easter in October 2006. Numerous streets, homes and businesses were flooded in low lying areas of the county close or directly exposed to the Chesapeake Bay. The NCDC reported $1,000,000 damage in the York Zone, which includes York County and Poquoson. The Poquoson Damage Assessment Team reported

major damage to 150 dwellings and minor damage to 401 dwellings totaling $6,970,000, minor damage to 7 businesses totaling $70,000, debris removal costs of $324,328, emergency protective measures of $14,500, and damage to public buildings, utilities and parks totaling $73,689. Total estimated damage in Poquoson was $7,452,517.

In **December 19, 2009,** a strong coastal low pressure area produced moderate to severe coastal flooding across much of eastern and southeast Virginia and the Virginia Eastern Shore. The peak tide height at Yorktown was 5.32 feet above MLLW. Several streets, homes and businesses were flooded in low lying areas close or directly exposed to the Chesapeake Bay. The NCDC reported $10,000 damage in the York Zone, which includes York County and Poquoson.

At the end of October 2012, **Tropical Cyclone Sandy** moved northward well off the Mid Atlantic Coast producing heavy rain and strong winds which caused flooding across much of eastern and southeastern Virginia. Water levels reached 2.5 feet to around 3.5 feet above normal adjacent to the Chesapeake Bay and York River. Yorktown experienced a tide height of 6.02 feet MLLW. The NCDC reported $300,000 damage in the York Zone, which includes York County and Poquoson.

Table 4.2 provides information on significant flood events documented by local officials and the NCDC between 1993 and 2013 in York County, the City of Poquoson and the Peninsula region, representing the most recent data available. These events resulted in at least 2 deaths. Property damages are misleading to total from Table 4.2 because the reports were not all for the same reporting area and may include wind damage as well as flood damage. Additional data on repetitive flood losses is provided in Chapter 5.

TABLE 4.2: SIGNIFICANT FLOOD EVENTS (1993 - 2013)

DATE OF OCCURRENCE	DEATHS/ INJURIES	PROPERTY DAMAGE	DETAILS
4/23/1997	0/0	$0	Moderate flooding occurred across portions of the area during high tide Wednesday, April 23rd and continued into Thursday, April 24th. The areas most seriously affected included the Willoughby Spit, Ghent, and downtown sections of Norfolk, the Old-Town section of Portsmouth, the Buckroe Beach and Grandview sections of Hampton and the Sandbridge section of Virginia Beach. Tides peaked at 5.8 feet above Mean Lower Low Water (MLLW) at Sewells Point in Norfolk. Based on reports received from downtown Norfolk and the Grandview section of Hampton, tides were somewhat higher in the estuaries (Lafayette River, the Hague, the Harris and Back Rivers) draining into the Elizabeth River and Hampton Roads. Minor coastal flooding was reported in portions of Newport News and York county.
10/19/1997	0/0	None reported	Minor to moderate flooding occurred across portions of the Hampton Roads area during the time of high tide Sunday afternoon, October 19th. Some minor flooding was reported in low-lying areas of Norfolk, with water in a few homes and a few streets closed. Tides peaked between 5.2 and 5.8 feet above Mean Lower Low Water (MLLW) at Sewells Point in Norfolk. Minor coastal flooding was reported in portions of Newport News and York county.
1/27/1998	0/0	None reported	A Nor'easter battered eastern Virginia on Tuesday, January 27th and Wednesday, January 28th. The slow movement of the storm combined with the highest astronomical tides of the month resulted in an extended period of gale to storm force onshore winds which drove tides to 6.44 feet above Mean Lower Low Water (MLLW) at Sewells Point. These tide levels resulted in moderate coastal flooding throughout the Hampton Roads area. Locally moderate coastal flooding was also reported across the middle peninsula and northern neck areas. The rainfall combined with the gale and storm force winds resulted in scattered tree limbs downed across much of eastern Virginia. In addition, there were widely scattered power outages.

TABLE 4.2: SIGNIFICANT FLOOD EVENTS (1993 - 2013)			
DATE OF OCCURRENCE	DEATHS/ INJURIES	PROPERTY DAMAGE	DETAILS
2/4/1998	0/0	$75,000,000	A Nor'easter battered eastern Virginia from Tuesday, February 3rd through Thursday, February 5th. The slow movement of the storm resulted in an extended period of gale to storm force onshore winds which drove tides to 7.0 feet above Mean Lower Low Water (MLLW) at Sewells Point in Norfolk. These tide levels resulted in moderate to severe coastal flooding throughout the Hampton Roads area and the Virginia Eastern Shore. The cities of Norfolk, Virginia Beach and Hampton reported some structural damage to buildings along the bay and coast, as well as significant beach erosion. The rainfall combined with the gale and storm force winds resulted in some trees downed across much of eastern Virginia. In addition, there were widely scattered power outages.
8/27/1998	None reported	None reported	Hurricane Bonnie. Tracked over the northern Outer Banks. Fastest 1 minute wind speed was northeast at 46 mph with gusts to 64 mph at Norfolk International Airport. Langley Air Base recorded a sustained wind of 53 mph with gusts to 67 mph. Cape Henry recorded a sustained wind (fastest 1 minute) of 81 mph (anemometer is at 90 feet) and a gust of 104 mph. The highest tide was 6.0 feet above Mean Low Low Water (3.5 feet above normal tide). The heavy rain and a two to four foot storm surge combined to produce street flooding in Norfolk, Virginia Beach and Portsmouth.
9/5/1999	None reported	None reported	Hurricane Dennis. A sustained wind of 52 mph was recorded at Langley Air Force Base with a peak gust of 76 mph. A F2 tornado (winds 113 to 157) touched down in the City of Hampton causing significant damage to a three block area and injuring six people. Tidal departures with the storm were about 3 feet above normal resulting in moderate coastal flooding at high tide.
9/16/1999	None reported	None reported	Hurricane Floyd made landfall near Cape Fear, North Carolina as a Category 2 hurricane with estimated maximum winds near 90 knots. Continuing to accelerate north-northeastward, Floyd's center passed over extreme eastern North Carolina on the morning of the 16th and over Hampton Roads later that day. Immense amounts of precipitation and storm surge flooding locally. Hampton received 7.5" rain, and Newport News received 16.57".
9/18/2003	2 deaths in Poquoson area	$506,000,000 in region	Hurricane Isabel was a Category 1 hurricane at landfall. The highest sustained wind speed recorded was 72 mph at Chesapeake Light (CHLV2). Storm surge varied significantly across the region. At Sewells Point in Norfolk, the maximum water level was 7.9 feet above MLLW. This represents a 5-foot storm surge, the biggest in the region since Hazel in 1954. In Virginia, 36 deaths were attributed to Isabel, including two in the Poquoson vicinity. Total damages in the Hampton Roads area amounted to $506 million.
9/1/2006	0/0	$1,900,000	Tropical Depression Ernesto. Storm tides of 4 to 5 feet above MLLW combined with 6 to 8 foot waves causing significant damage to homes, piers, bulkheads, boats, and marinas across portions of the Virginia Peninsula and Middle Peninsula near the Chesapeake Bay and adjacent tributaries.
10/6/2006	0/0	$200,000	A strong low pressure system off the North Carolina coast coupled with an upper level cutoff low to dump intense rainfall across portions of southeast Virginia. Rainfall amounts in excess of 10 inches resulted in numerous road closures and moderate to major river flooding from late Friday October 6th through Saturday October 7th. Up to 28,000 Dominion Virginia Power customers lost power during the event. Moderate to severe coastal flooding also resulted in western portions of the southern Chesapeake Bay. Strong onshore winds resulted in major coastal flooding during times of high tide. Tidal departures were 2.5 to 3.5 above normal during the event.

TABLE 4.2: SIGNIFICANT FLOOD EVENTS (1993 - 2013)			
DATE OF OCCURRENCE	DEATHS/ INJURIES	PROPERTY DAMAGE	DETAILS
11/22/2006	0/0	$80,000	An intense low pressure system off the North Carolina coast combined with an upper level cutoff low to provide very strong winds, heavy rains, and moderate coastal flooding across portions of eastern and southeast Virginia from late Tuesday November 21st into Thursday afternoon November 23rd. Strong onshore winds resulted in moderate coastal flooding during times of high tide. Tidal departures were about 3 feet above normal during the event. Many streets were closed due to high water.
9/6/2008	0/0	$10,000	Tropical Storm Hanna produced heavy rain and gusty winds. Few trees were downed. Storm total rainfall ranged from around one inch to just below five inches. The highest sustained wind of 48 knots (55 mph) with a peak gust of 59 knots (68 mph) was recorded at the 3rd Island Bay Bridge Tunnel. Minimum pressure of 991 MB was recorded at the 3rd Island Bay Bridge Tunnel. Coastal storm tides of 2 feet or less above astronomical tide levels were common, with only minor beach erosion reported. Near the coast, as well as inland, tropical storm winds knocked down numerous trees and power lines, as well as caused minor structural damage. No fatalities or injuries were attributed to the winds.
11/12/2009	0/0	$1,000,000	An intense Nor'easter produced moderate to severe coastal flooding across much of eastern and southeast Virginia and the Virginia Eastern Shore. The peak tide height at Yorktown was 6.86 feet above MLLW, which was 4.56 feet above the astronomical tide. That peak tide height was higher than 6.12 feet during a nor'easter in October 2006. Numerous streets, homes and businesses were flooded in low lying areas of the county close or directly exposed to the Chesapeake Bay.
12/19/2009	0/0	$10,000	A strong coastal low pressure area produced moderate to severe coastal flooding across much of eastern and southeast Virginia and the Virginia Eastern Shore. The peak tide height at Yorktown was 5.32 feet above MLLW. Several streets, homes and businesses were flooded in low lying areas of the county close or directly exposed to the Chesapeake Bay.
8/27/2011	0/0	$1,150,439 reported by the Poquoson Damage Assessment Team	Hurricane Irene moving northward over the outer banks of North Carolina and just off the Virginia and Maryland coasts produced heavy rains which caused widespread flooding across most of central and eastern Virginia Saturday afternoon, August 27th into early Sunday morning, August 28th. Storm total rainfall generally ranged from three to as much as eleven inches. Heavy rains associated with Hurricane Irene produced widespread low-land flooding across much of the county, including roadways which were washed out or closed. Storm total rainfall generally ranged from six to eleven inches. Yorktown reported 7.68 inches of rain. In Poquoson, 42 dwellings received major damage, 40 dwellings received minor damage, 1 business had major damage, and debris removal costs were over $150,000.
10/28/2012	0/0	$300,000	Tropical Cyclone Sandy moving northward well off the Mid Atlantic Coast then northwest into extreme southern New Jersey produced very strong northeast winds followed by very strong west or northwest winds. The very strong winds caused moderate to severe coastal flooding across portions of eastern and southeast Virginia. Water levels reached 2.5 feet to around 3.5 feet above normal adjacent to the Chesapeake Bay and York River resulting in moderate to severe coastal flooding. Yorktown reached a tide height of 6.02 feet MLLW.

Source: NCDC (1995 to 2013 data) and 2009 Poquoson Multi-Hazard Mitigation Plan

PROBABILITY OF FUTURE OCCURRENCES

Flooding remains a highly likely occurrence throughout the identified flood hazard and storm surge areas of the City. Smaller floods caused by heavy rains and limited drainage capacity will be frequent, but not

as costly as the large-scale floods which may occur at less frequent intervals, including extended torrential rainfall and storm surge events associated with hurricanes, tropical storms, and nor'easters.

HURRICANES

BACKGROUND

Hurricane Isabel approaches North Carolina and Virginia in September of 2003. (Photo courtesy of NASA)

Hurricanes and tropical storms are characterized by closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere and with a diameter averaging 10 to 30 miles across. A tropical cyclone refers to any such circulation that develops over tropical waters. Tropical cyclones act as a mechanism to transport built-up heat from the tropics toward the poles. In this way, they are critical to the earth's atmospheric heat and moisture balance. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation, and tornadoes. Coastal areas are particularly vulnerable to storm surge, wind-driven waves, and tidal flooding which can prove more destructive than cyclone wind[3].

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 September 10th. The Atlantic Ocean averages about 10 storms annually, of which 6 reach hurricane status. (NASA Earth Observatory online at: http://earthobservatory.nasa.gov)

As a hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour (MPH), the system is designated a tropical storm, given a name, and is monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 MPH the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Hurricane Wind Scale which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense. The wind scale, recently revised to remove storm surge ranges, flooding impact and central pressure statements, is shown in **Table 4.3**.

[3] For purposes of this risk assessment, coastal flood hazards associated with hurricanes and tropical storm events are included separately under the "flooding" hazard.

TABLE 4.3: SAFFIR-SIMPSON HURRICANE WIND SCALE		
CATEGORY	MAXIMUM SUSTAINED WIND SPEED (MPH)	DAMAGE SUMMARY
1	74–95	Very dangerous winds will produce some damage.
2	96–110	Extremely dangerous winds will cause extensive damage.
3	111–130	Devastating damage will occur
4	131–155	Catastrophic damage will occur.
5	155 +	Catastrophic damage will occur.

Source: National Hurricane Center

Categories 3, 4, and 5 are classified as "major" hurricanes, and while hurricanes within this range comprise only 20% of total tropical cyclones making landfall, they account for over 70 percent of the damage in the United States. **Table 4.4** describes the damage that could be expected for each hurricane category.

TABLE 4.4: HURRICANE DAMAGE CLASSIFICATIONS		
STORM CATEGORY	DAMAGE LEVEL	DESCRIPTION OF DAMAGES
1	**MINIMAL**	People, livestock, and pets struck by flying or falling debris could be injured or killed. Older (mainly pre-1994 construction) mobile homes could be destroyed, especially if they are not anchored properly as they tend to shift or roll off their foundations. Newer mobile homes that are anchored properly can sustain damage involving the removal of shingle or metal roof coverings, and loss of vinyl siding, as well as damage to carports, sunrooms, or lanais. Some poorly constructed frame homes can experience major damage, involving loss of the roof covering and damage to gable ends as well as the removal of porch coverings and awnings. Unprotected windows may break if struck by flying debris. Masonry chimneys can be toppled. Well-constructed frame homes could have damage to roof shingles, vinyl siding, soffit panels, and gutters. Failure of aluminum, screened-in, swimming pool enclosures can occur. Some apartment building and shopping center roof coverings could be partially removed. Industrial buildings can lose roofing and siding especially from windward corners, rakes, and eaves. Failures to overhead doors and unprotected windows will be common. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. There will be occasional damage to commercial signage, fences, and canopies. Large branches of trees will snap and shallow rooted trees can be toppled. Extensive damage to power lines and poles will likely result in power outages that could last a few to several days.
2	**MODERATE**	There is a substantial risk of injury or death to people, livestock, and pets due to flying and falling debris. Older (mainly pre-1994 construction) mobile homes have a very high chance of being destroyed and the flying debris generated can shred nearby mobile homes. Newer mobile homes can also be destroyed. Poorly constructed frame homes have a high chance of having their roof structures removed especially if they are not anchored properly. Unprotected windows will have a high probability of being broken by flying debris. Well-constructed frame homes could sustain major roof and siding damage. Failure of aluminum, screened-in, swimming pool enclosures will be common. There will be a substantial percentage of roof and siding damage to apartment buildings and industrial buildings. Unreinforced masonry walls can collapse. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. Commercial signage, fences, and canopies will be damaged and often destroyed. 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. Potable water could become scarce as

TABLE 4.4: HURRICANE DAMAGE CLASSIFICATIONS		
STORM CATEGORY	DAMAGE LEVEL	DESCRIPTION OF DAMAGES
		filtration systems begin to fail.
3	EXTENSIVE	There is a high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. Most newer mobile homes will sustain severe damage with potential for complete roof failure and wall collapse. Poorly constructed frame homes can be destroyed by the removal of the roof and exterior walls. Unprotected windows will be broken by flying debris. Well-built frame homes can experience major damage involving the removal of roof decking and gable ends. There will be a high percentage of roof covering and siding damage to apartment buildings and industrial buildings. Isolated structural damage to wood or steel framing can occur. Complete failure of older metal buildings is possible, and older unreinforced masonry buildings can collapse. Numerous windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Most commercial signage, fences, and canopies will be destroyed. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to a few weeks after the storm passes.
4	EXTREME	There is a very high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. A high percentage of newer mobile homes also will be destroyed. Poorly constructed homes can sustain complete collapse of all walls as well as the loss of the roof structure. Well-built homes also can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Extensive damage to roof coverings, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will break most unprotected windows and penetrate some protected windows. There will be a high percentage of structural damage to the top floors of apartment buildings. Steel frames in older industrial buildings can collapse. There will be a high percentage of collapse to older unreinforced masonry buildings. Most windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months.
5	CATASTROPHIC	People, livestock, and pets are at very high risk of injury or death from flying or falling debris, even if indoors in mobile homes or framed homes. Almost complete destruction of all mobile homes will occur, regardless of age or construction. A high percentage of frame homes will be destroyed, with total roof failure and wall collapse. Extensive damage to roof covers, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will occur to nearly all unprotected windows and many protected windows. Significant damage to wood roof commercial buildings will occur due to loss of roof sheathing. Complete collapse of many older metal buildings can occur. Most unreinforced masonry walls will fail which can lead to the collapse of the buildings. A high percentage of industrial buildings and low-rise apartment buildings will be destroyed. Nearly all windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Nearly all trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center

Storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from four to twenty feet. 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 north 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.

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.

LOCATION AND SPATIAL EXTENT

Poquoson is in an area that can expect to experience hurricane damage in any given year. Since the mid-1800s, numerous tropical cyclones have affected Virginia, causing the deaths of an estimated 228 people and costing the Commonwealth more than a billion dollars in damages.

In fact, 34 storms have passed within 100 miles of Poquoson since 1970 (**Figures 4.3 and 4.4**), none of which were Category 3 or stronger. Two storms were Category 2 hurricanes, 5 were Category 1 hurricanes and 27 were tropical storms or depressions.

SIGNIFICANT HISTORICAL EVENTS

The NWS began keeping weather records on January 1, 1871. Prior to that, information on past hurricanes and tropical storms to impact the Peninsula were taken from ships logs, accounts from local citizens, newspapers, and other sources. There are several historical references to major storms that affected coastal Virginia in the 1600's and 1700's. Some of these storms were strong enough to alter land masses, including the widening of the Lynnhaven River (September 6, 1667) and formation of Willoughby Spit (October 19, 1749). These reports also indicate severe flooding caused by these storms (12-15 feet of flooding in some cases).

Better records have been kept since 1871. One of the first storms to be well documented was a hurricane in October 1878 that resulted in Cobb and Smith Islands on the Eastern Shore being completely submerged.

One of the worst storms to impact the region occurred in August 1933 when a hurricane known as the Chesapeake-Potomac Hurricane of 1933 passed just west of the Hampton Roads area. The storm made landfall in northeastern North Carolina and moved northwest. This hurricane produced the record high tide for the area which exists today, at a level of 9.69 feet above MLLW. The highest sustained wind was 88 MPH at the Naval Air Station (NAS). Less than a month later, another hurricane struck the area with winds again clocked at 88 MPH at NAS, but tides only rose to 8.3 feet above MLLW.

Another unnamed storm occurred in September of 1944 creating the fastest 1 minute wind speed to ever be recorded in the area of 134 MPH at Cape Henry. Gusts were estimated to be 150 MPH. The local NWS office recorded 72 MPH winds with gusts to 90 MPH.

Although the center of circulation for Hurricane Hazel (1954) did not pass within 75 miles of the region, wind speeds of 78 MPH were recorded at Norfolk Airport with gusts up to 100 MPH and an unofficial reading of 130 MPH was also reported in Hampton.

In 1960 Hurricane Donna passed through the region with a fastest 1 minute wind speed of 73 MPH at Norfolk Airport, 80 MPH at Cape Henry and estimated 138 MPH at Chesapeake Light Ship. Lowest pressure of 28.65 inches holds the area record for a tropical storm. Three deaths were documented in association with this hurricane.

On August 27, 1998, Hurricane Bonnie tracked over the region after passing over the northern Outer Banks. Winds speeds were sustained at 46 MPH with gusts to 64 MPH at Norfolk International Airport. Four to seven inches of rain combined with near hurricane force winds knocked out power to 320,000 customers across Virginia. Highest tide was recorded at 6.0 feet above MLLW. This was the most significant storm to impact the region since Hurricane Donna in 1960.

On September 6, 1999, downgraded Hurricane Floyd passed directly over Virginia Beach on a track similar to Hurricane Donna in 1960. Wind speeds were recorded at 31 MPH with gusts to 46 MPH. Rainfall amounts of 12 to 18 inches were recorded in portions of eastern Virginia, causing extensive flooding in the region.

In the 1990s, several storms had a less direct path over Hampton Roads, but nonetheless impacted the weather severely. In 1996, Hurricanes Bertha and Fran impacted the region, followed by Hurricane Danny in 1997, Hurricane Bonnie in 1998, and Hurricanes Dennis, Floyd, and Irene in 1999. Although each of these storms was downgraded by the time they reached Hampton Roads, they each created problems for the region when they passed through. Tropical storms Helene in 2000 and Kyle occurred in 2002, and of course, Hurricane Isabel caused over $506 million damage in 2003, and claimed 36 lives, with at least 2 of those in the Poquoson area. During Isabel, wind speeds of 54 MPH with gusts to 75 MPH in Norfolk and significant beach erosion were reported.

Of the 2 storms that have passed through the region since the 2009 hazard mitigation plan was developed (Hanna and Irene), Hanna initially appeared to forecasters to have the worst characteristics. Tropical Storm Hanna tracked up the Mid-Atlantic coast on September 6, 2008, with maximum sustained winds around 50 MPH. Hanna originally made landfall near the border of North and South Carolina around 3:20 am on the 6th. The storm tracked across eastern North Carolina during the early afternoon hours before turning northeast across southeastern Virginia later in the afternoon. Hanna eventually tracked across the Chesapeake Bay and into Delaware during the evening hours. With the track of Hanna being to the east, the strongest winds were also confined to the east of Hampton Roads. The highest sustained wind of 55 MPH with a peak gust of 68 MPH was recorded at the 3rd Island Bay Bridge Tunnel. Minimum pressure of 991 MB was recorded at the 3rd Island Bay Bridge Tunnel. Coastal storm tides of 2 feet or less above astronomical tide levels were common, with only minor beach erosion reported. Near the coast, as well as inland, tropical storm winds knocked down numerous trees and power lines, as well as caused minor structural damage. No fatalities or injuries were attributed to the winds.

Contrary to expectations and forecasts, however, Ernesto in early September 2006 proved very damaging because of coastal flooding. State officials blamed Ernesto for six deaths across Virginia and an estimated $33 million in statewide damage (*The Virginian Pilot,* 9/4/06). Additional discussion of the regional flood-related impacts from Ernesto is shown in **Table 4.2**.

In late August 2011, Hurricane Irene devastated the Caribbean and eastern seaboard of the United States. Storm surge ranged between 3.3 to 4.5 feet along the coasts of Maryland, Delaware and New Jersey. Although the impacts were expected to be severe in coastal Virginia, the resulting damage was noteworthy, but hardly catastrophic as it was in parts of North Carolina and areas north of Chesapeake Bay.

Hurricane Sandy in October 2012 was again expected to bring extreme hurricane conditions to southeastern Virginia. Fortunately, the storm track veered away from the Virginia coast and spared the region much of the devastation wrought in the northeast. Some areas of Virginia were included in the Presidentially-Declared Disaster for the storm, but Poquoson and Hampton Roads saw little more than flooding in low-lying areas and limited wind damage, and therefore were not among declared communities.

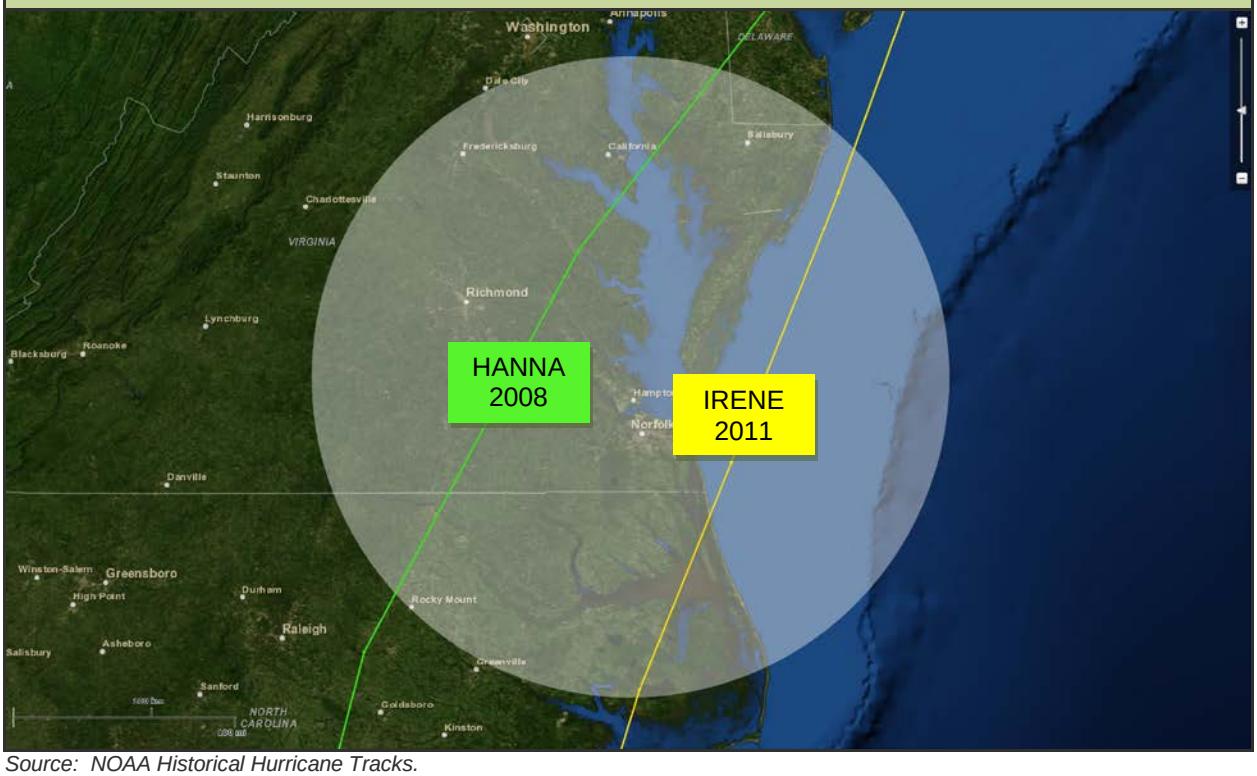
Table 4.5 shows the historical storm tracks within 100 miles of Poquoson since 1970 that are the basis for **Figures 4.3 and 4.4**.

TABLE 4.5: HISTORICAL STORM TRACKS WITHIN 100 MILES OF POQUOSON (SINCE 1970)

DATE OF OCCURRENCE	STORM NAME	WIND SPEED (MPH)	STORM CATEGORY AT LANDFALL
5/27/1970	ALMA	29	TROPICAL DEPRESSION
8/18/1970	UNNAMED	35	TROPICAL DEPRESSION
8/28/1971	DORIA	65	TROPICAL STORM
10/3/1971	GINGER	35	TROPICAL DEPRESSION
6/22/1972	AGNES	50	TROPICAL STORM
7/15/1979	BOB	23	TROPICAL DEPRESSION
7/1/1981	BRET	60	TROPICAL STORM
9/30/1983	DEAN	65	TROPICAL STORM
9/27/1985	GLORIA	105	CATEGORY 2 HURRICANE
9/19/1985	DANNY	29	TROPICAL DEPRESSION
8/18/1986	CHARLEY	80	CATEGORY 1 HURRICANE
9/25/1992	DANIELLE	65	TROPICAL STORM
10/8/1996	JOSEPHINE	52	TROPICAL STORM
7/13/1996	BERTHA	75	CATEGORY 1 HURRICANE
7/24/1997	DANNY	45	TROPICAL STORM
8/28/1998	BONNIE	85	CATEGORY 1 HURRICANE
9/4/1998	EARL	58	TROPICAL STORM
9/16/1999	FLOYD	80	CATEGORY 1 HURRICANE
9/24/2000	HELENE	40	TROPICAL STORM
9/19/2000	GORDON	23	TROPICAL DEPRESSION
6/16/2001	ALLISON	29	TROPICAL DEPRESSION
9/18/2003	ISABEL	100	CATEGORY 2 HURRICANE
8/31/2004	GASTON	40	TROPICAL STORM
8/14/2004	CHARLEY	46	TROPICAL STORM
9/29/2004	JEANNE	29	TROPICAL DEPRESSION
9/19/2004	IVAN	40	TROPICAL DEPRESSION
8/12/2004	BONNIE	63	TROPICAL DEPRESSION
7/8/2005	CINDY	29	TROPICAL DEPRESSION
6/16/2006	ALBERTO	60	EXTRATROPICAL STORM
9/2/2006	ERNESTO	45	EXTRATROPICAL STORM
6/4/2007	BARRY	46	TROPICAL STORM
9/10/2007	GABRIELLE	40	TROPICAL STORM
9/06/2008	HANNA	70	TROPICAL STORM
8/28/2011	IRENE	75	CATEGORY 1 HURRICANE

Source: National Hurricane Center, 2014

FIGURE 4.3: HISTORICAL STORM TRACKS WITHIN 100 MILES OF POQUOSON SINCE 2008



Source: NOAA Historical Hurricane Tracks.

FIGURE 4.4: HISTORICAL STORM TRACKS WITHIN 100 MILES OF POQUOSON, 1970-2008

Source: NOAA Historical Hurricane Tracks

PROBABILITY OF FUTURE OCCURRENCES

It is likely that the City will be impacted by hurricanes and tropical storms in the future. The City is less likely to experience the effects of a major (Category 3 or stronger) hurricane; however, it remains a possibility. The effects of smaller hurricanes (Categories 1 and 2 with wind speeds from 74-110 MPH) and tropical storms (sustained wind speeds of at least 39 MPH and torrential rains) will be more frequent, as storms making landfall along the North Carolina and Virginia coastlines could impact the region in any given year.

TORNADO

BACKGROUND

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 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 NWS, tornado wind speeds normally range from 40 to more than 300 MPH. The most violent tornadoes have rotating winds of 250 MPH or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles.

Each year, an average of over 1,200 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2002 and 2014). 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 devastating depending upon the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light or wood-framed construction such as residential homes (particularly mobile homes), and tend to remain localized in impact. The traditional Fujita Scale for tornadoes, introduced in 1971, was developed to measure tornado strength and associated damages. Starting in February of 2007, an “enhanced” Fujita (EF) Scale was implemented, with somewhat lower wind speeds at the higher F-numbers, and more thoroughly-refined structural damage indicator definitions. **Table 4.6** provides a summary of the EF Scale. Assigning an EF Scale rating to a tornado involves the following steps:

- Conduct an aerial and ground survey over the entire length of the damage path;
- Locate and identify damage indicators in the damage path;
- Consider the wind speeds of all damage indicators and assign an EF Scale category for the highest wind speed consistent with wind speeds from the other damage indicators;
- Record the basis for assigning an EF scale rating to a tornado event; and
- Record other pertinent data related to the tornado event.

TABLE 4.6: ENHANCED FUJITA (EF) SCALE FOR TORNADOES	
EF-SCALE NUMBER	3 SECOND GUSTS (MPH)
F0	65-85
F1	86-110
F2	11-135
F3	136-165
F4	166-200
F5	over 200

Source: NWS Storm Prediction Center

In Virginia, tornadoes primarily occur from April through September, although tornadoes have been observed in every month. Low-intensity tornadoes occur most frequently; tornadoes rated F2 or higher are very rare in Virginia, although F2, F3, and a few F4 storms have been observed. According to the *Commonwealth of Virginia, Mitigation Plan 2013*, Virginia ranks 28th in terms of the number of tornado touchdowns reported between 1950 and 2006.

LOCATION AND SPATIAL EXTENT

Tornadoes typically impact a relatively small area; however, it is impossible to predict where in the planning area a tornado may strike. Vulnerability of individual structures is based largely on building construction materials and standards, availability of safe rooms and advanced warning system capabilities. In cases involving intense tornadoes, the best defense against injury or death is a properly engineered safe room or tornado shelter, neither of which is standard practice in the region. Likewise, advanced warning system capabilities are limited to Reverse 911, Emergency Alert System warnings and National Weather Service weather radio broadcasts. Poquoson does not have tornado sirens.

Tornadoes are high-impact, low-probability hazards. The net impact of a tornado depends on the storm intensity and the vulnerability of development in its path. In Poquoson, a high intensity tornado, while unlikely, could be expected to impact almost everything within the storm's path: homes, especially those constructed prior to the use of building codes; infrastructure, especially above-ground power lines in the commercial zones and bridges throughout the City; cars and personal property; landscape elements such as trees, fences and shrubs; and even human lives. Downed trees can block roadways, impacting traffic and blocking access and egress if any of the City's limited thoroughfares are impacted. Manufactured homes are particularly vulnerable to damage in the event of tornadoes, as well, particularly if they were placed outside of flood zones and before building codes were in effect requiring foundation tie-downs.

Tornadoes associated with tropical cyclones are somewhat more predictable. These tornadoes occur frequently in September and October when the incidence of tropical storm systems is greatest. They usually form 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 4.12 illustrates the approximate location where confirmed tornadoes have touched down in the region.

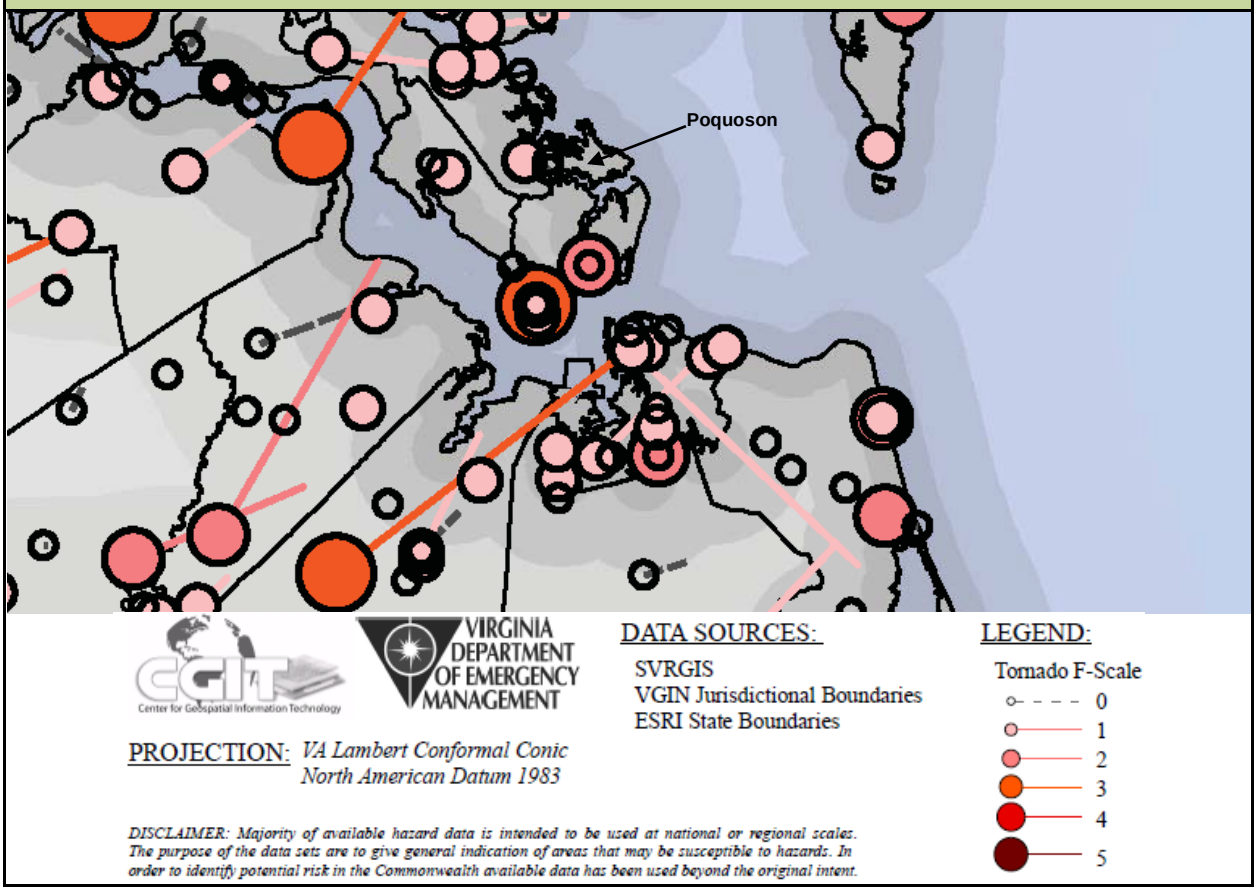
SIGNIFICANT HISTORICAL EVENTS

The City of Poquoson has experienced only 1 recorded tornado since 1950; however, there have been 7 tornadoes in nearby York County and 6 tornadoes recorded in Hampton. Damage estimates for these tornadoes exceed $9 million and there have been 15 reported injuries and no fatalities.

The single tornado event reported for Poquoson occurred on August 30, 2004. The event was an F0 on the Fujita Scale, indicating a weak or "gale" tornado that typically causes only minor damage to trees and signs. Maximum 3-second gust wind speeds for an F0 on the Enhanced Fujita Scale are estimated to be between 65 and 85 miles per hour. There were no injuries, and the event caused only $5,000 property damage. The path was approximately ½ mile and had a width of 50 yards. The tornado downed trees on River Road and Wythe Creek Road. Similar events occurred on the same date in Tabb and Seaford, each causing estimated $10,000 property damages and no injuries or fatalities.

Three noteworthy tornado events have occurred in nearby Hampton since 1950, including: 1) September 5, 1979 an F2 tornado associated with Hurricane David caused $250,000 property damage and 9 injuries; 2) September 4, 1999, an F2 tornado associated with Hurricane Dennis caused $7.7 million property damage and caused 6 injuries; and, 3) an EF1 tornado on the evening of June 1, 2012, caused $1 million in property damage near downtown Hampton.
The NCDC database includes mention of three other F1-level tornado events in York County since 1950, with no injuries and only minor property damage. Event dates were: November 1, 1951, July 12, 1996, and August 7, 2003. The strongest storm to strike the area was an EF3 tornado that tracked 5 miles from James City County into York County on April 16, 2011. Scattered severe thunderstorms in advance of a cold front produced damaging winds, large hail, and numerous tornadoes across portions of central and eastern Virginia. The tornado mainly affected the Yorktown Naval Weapons Station. Numerous trees were downed or sheared off, with only $15,000 building damage reported. Fortunately, the tornado caused no injuries. (NOAA, 2014)

FIGURE 4.5: HISTORIC TORNADO TOUCHDOWNS AND TRACKS: 1950-2011

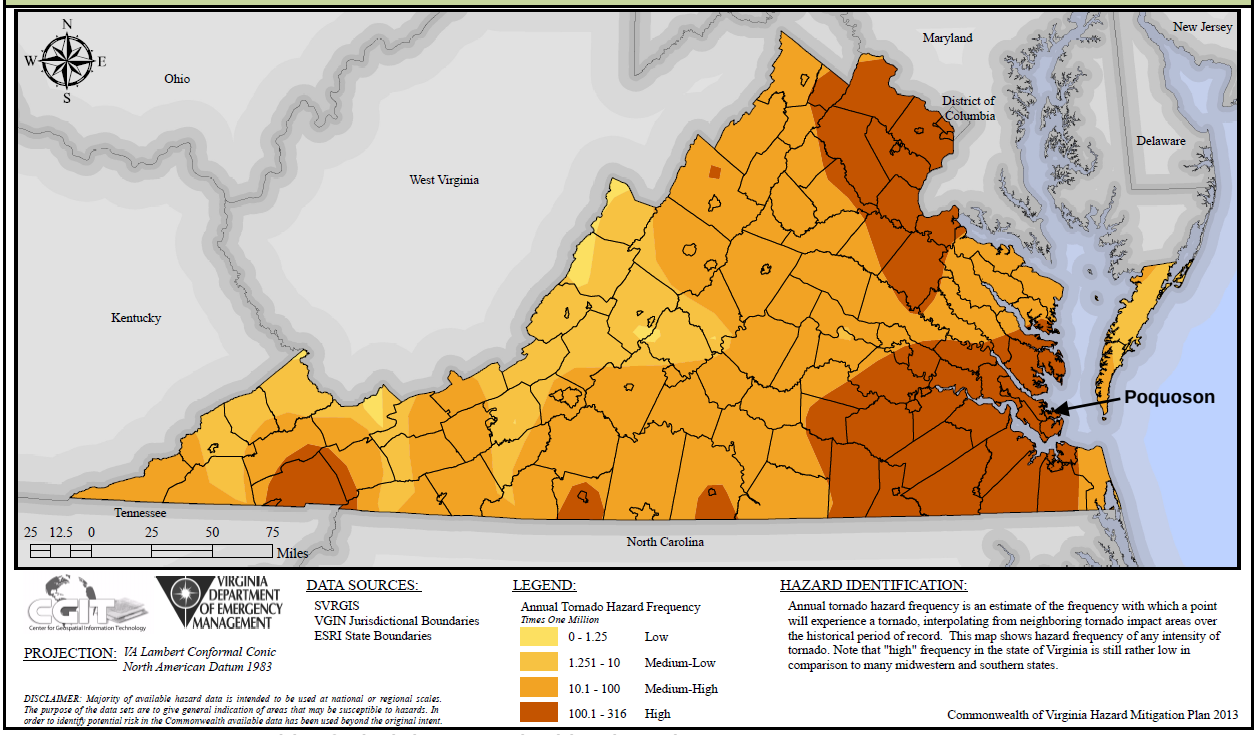


Source: *Commonwealth of Virginia Hazard Mitigation Plan 2013*

PROBABILITY OF FUTURE OCCURRENCES

For updates to the *Commonwealth of Virginia Mitigation Plan 2013*, the Virginia Department of Emergency Management documented statewide annual tornado frequency and annual significant tornado hazard frequency. The City of Poquoson, as shown in **Figure 4.6**, is located in an area of medium to high risk for tornado strikes of magnitude F2 or larger. Please note that this map is Virginia-specific and "high frequency" in the Commonwealth is still relatively low frequency in parts of the Midwest and southern United States. The probability of future occurrence is considered likely.

FIGURE 4.6: HISTORICAL TORNADO HAZARD FREQUENCY



Source: *Commonwealth of Virginia Hazard Mitigation Plan 2013*

A tornado wind event could occur in Poquoson at any time of the year, but is most likely to occur from April to August, with peak probability in June.

SEVERE THUNDERSTORMS

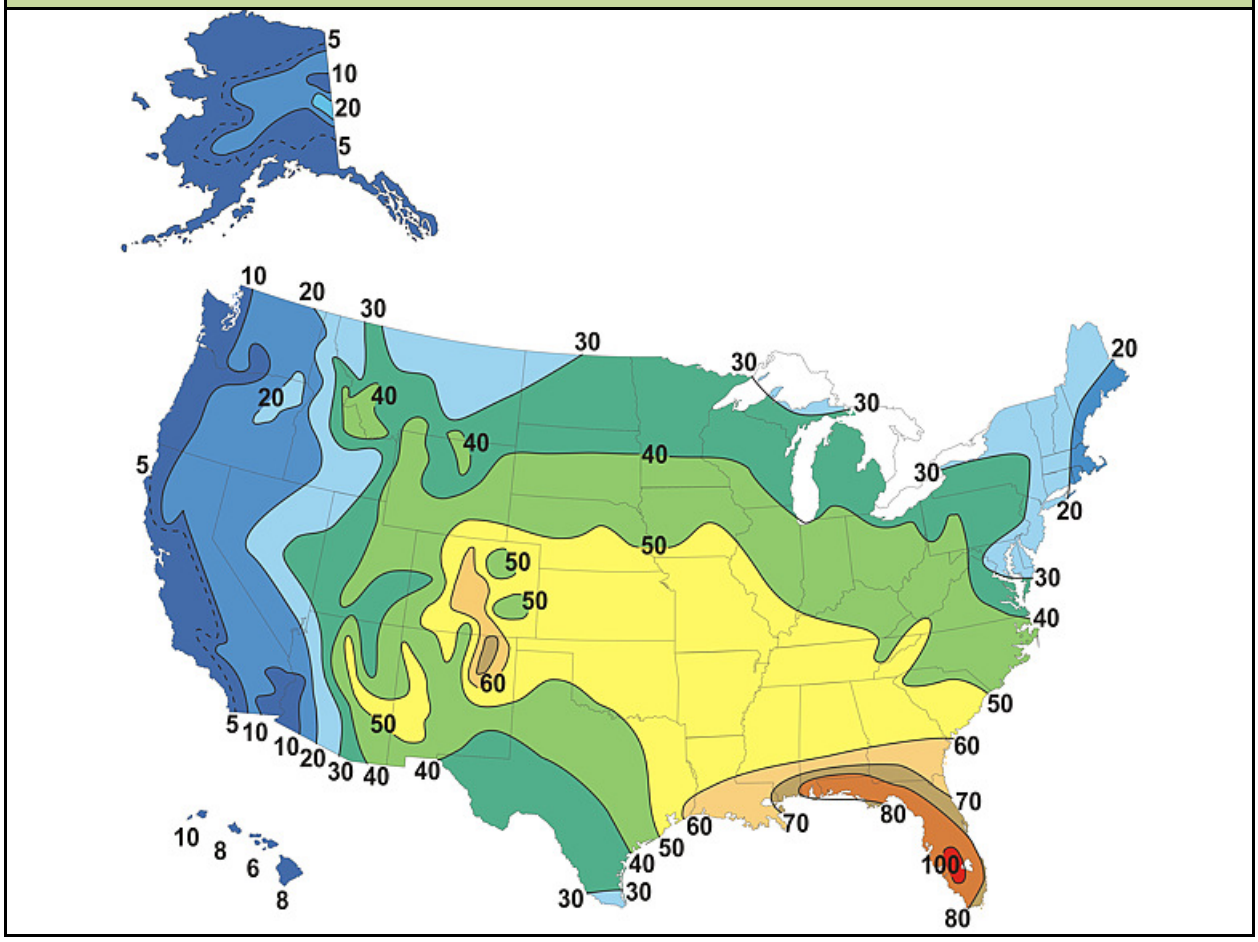
BACKGROUND

According to the NWS, more than 100,000 thunderstorms occur each year, though only 10% of these are classified as "severe." Although thunderstorms generally affect a small area when they occur, they are extremely dangerous because of their ability to generate tornadoes, large hail, 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.

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.

The National Weather Service has generated a map showing the annual number of thunderstorm days each year, nationwide. **Figure 4.7** illustrates thunderstorm hazard severity based on the annual number of thunderstorm days and indicates between 30 and 40 such days for Poquoson.

FIGURE 4.7: ANNUAL NUMBER OF THUNDERSTORM DAYS EACH YEAR

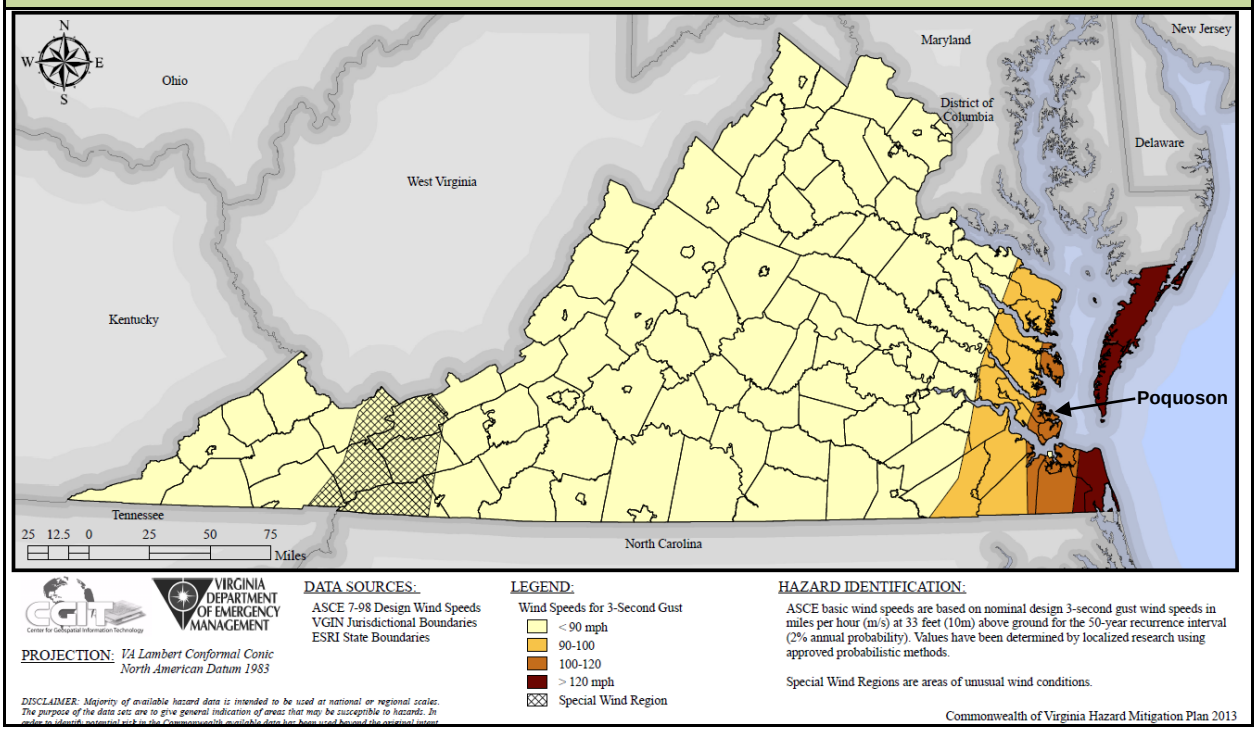


Source: National Weather Service

Straight-line winds, which in extreme cases have the potential to cause wind gusts that exceed 100 MPH, are responsible for most thunderstorm wind damage. One type of straight-line wind, the downburst, can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation. Poquoson is also vulnerable to *derechos*, widespread, long-lived, straight-line wind storms that are associated with a land-based, fast-moving band of severe thunderstorms. Squall lines will form in an area of wind divergence in upper levels of the troposphere, within a region of low-level warm air advection and rich low-level moisture. They travel quickly in the direction of movement of their associated storms, similar to a gust front, except that the wind is sustained and increases in strength behind the front, generally exceeding hurricane-force. Usually a warm-weather phenomenon, derechos occur mostly in summer, especially during June and July, within areas of moderately strong instability and moderately strong vertical wind shear. Derechos may occur at any time of the year and happen as frequently at night as during the daylight hours.

Figure 4.8 shows the basic design wind speed for the 50-year recurrence interval used for design and construction in Virginia, as defined by the American Society of Civil Engineers (ASCE). Poquoson is in an area with estimated wind speed between 100 and 120 MPH for a 3-second gust, with a 50-year recurrence interval.

FIGURE 4.8: ASCE DESIGN WIND SPEEDS



Source: Commonwealth of Virginia Hazard Mitigation Plan, 2013

LOCATION AND SPATIAL EXTENT

Thunderstorms are common throughout the Commonwealth of Virginia, and have been known to occur during all months of the year. In Poquoson, the high winds and dangerous lightning associated with these events can fell trees and cause fires, resulting in property damage, and possibly death or serious injury. Downed trees can block roadways, impacting traffic and blocking access and egress if any of the City's limited thoroughfares are impacted. Thunderstorms can also produce hail and large amounts of rain, which can cause varying degrees of property and crop damage, although agricultural lands are limited in the City. High winds can cause damage to infrastructure, particularly above-ground utility lines

in the commercial district, causing power outages and disrupting communications and citizen's normal routines. Power outages can be dangerous for certain vulnerable populations, as well. Structures built before 1973 when building codes went into effect in Virginia may be slightly more vulnerable to damage from high winds associated with severe thunderstorms, but since older structures are generally well-maintained in Poquoson, this is not a large distinguisher in structure vulnerability to severe thunderstorms.

According to the NCDC, Poquoson has experienced a recorded 57 *severe* thunderstorm events since 1996 resulting in 0 deaths and 2 injuries and approximately $207,000 in property damage.

SIGNIFICANT HISTORICAL EVENTS

Table 4.7 provides details of historical severe thunderstorm activity in Poquoson and the adjacent York County Zone, as recorded by the NCDC. The most significant report of damage was from a storm on June 13, 2013, when several structures were damaged, resulting in reported damages of $100,000. On June 29, 2012, a derecho produced a widespread path of damaging winds across much of central and eastern Virginia. Reported damage in the area was limited to downed trees. On March 21, 2011, a lightning strike caused damage to a structure in York County and injured a person.

The NCDC database indicates one recorded incident of a lightning strike in Poquoson in which a man was struck by lightning outside his home in the Roberts Creek subdivision on July 30, 2000. The man was rushed to the hospital, and remained under observation until the following day when he was released.

TABLE 4.7: SIGNIFICANT THUNDERSTORM EVENTS (1996 - 2013)

LOCATION	DATE OF OCCURRENCE	ESTIMATED WIND GUST (KNOTS) or HAIL SIZE	DEATHS/ INJURIES	PROPERTY DAMAGE	DETAILS
Grafton	6/12/1996	0.75 in.	0/0	$0	
Tabb	7/14/1996	1.00 in.	0/0	$0	
Grafton	5/1/1997	1.75 in.	0/0	$0	
Poquoson	5/1/1997	2.00 in.	0/0	$0	
Poquoson	6/13/1998	2.00 in.	0/0	$0	
Tabb	6/15/1998	0.75 in.	0/0	$0	
Poquoson	6/15/1998	0.75 in.	0/0	$0	
Poquoson	4/23/1999	1.75 in.	0/0	$0	
Seaford	4/23/1999	0.75 in.	0/0	$0	
Yorktown	6/18/2000	50 kts.	0/0	$2,000	
Grafton	7/15/2000	Lightning	0/1	$20,000	Lightning struck a house on Wolf Trap Road and started a fire. The occupant of the house was taken to the hospital as a precaution.
Yorktown	8/27/2001	59 kts.	0/0	$2,000	
Seaford	8/5/2003	50 kts.	0/0	$2,000	
Grafton	8/28/2003	50 kts.	0/0	$2,000	
Tabb	9/3/2003	50 kts.	0/0	$2,000	
Dare	5/22/2004	50 kts.	0/0	$2,000	
Poquoson	5/22/2004	50 kts.	0/0	$2,000	
Yorktown	6/26/2004	50 kts.	0/0	$5,000	Department of Defense Ammo Facility Supervisor reported partial roof damage. Flying debris broke windows in fire truck. Small limbs off trees and water damage inside building.
Tabb	7/14/2004	0.75 in.	0/0	$0	
Tabb	7/14/2004	50 kts.	0/0	$2,000	
Central Portion	4/22/2006	50 kts.	0/0	$2,000	
Lackey	8/4/2006	50 kts.	0/0	$3,000	
Magruder	4/27/2007	0.75 in.	0/0	$0	
Magruder	7/19/2007	50 kts.	0/0	$1,000	
Grafton	7/19/2007	50 kts.	0/0	$1,000	

TABLE 4.7: SIGNIFICANT THUNDERSTORM EVENTS (1996 - 2013)					
LOCATION	DATE OF OCCURRENCE	ESTIMATED WIND GUST (KNOTS) or HAIL SIZE	DEATHS/ INJURIES	PROPERTY DAMAGE	DETAILS
Harris Grove	7/28/2007	50 kts.	0/0	$1,000	
Magruder	7/8/2008	50 kts.	0/0	$1,000	
Harris Grove	7/30/2008	50 kts.	0/0	$1,000	
Grafton	1/7/2009	50 kts.	0/0	$1,000	
Dare	1/7/2009	50 kts.	0/0	$2,000	
Magruder	4/6/2009	0.75 in.	0/0	$1,000	
Grafton	4/20/2009	50 kts.	0/0	$3,000	Scattered severe thunderstorms in advance of a cold front produced large hail, damaging winds, and 1 tornado. Eight large trees and a telephone pole were snapped off just north of airport near Oriana Road and Elm Drive.
Grafton	4/20/2009	50 kts.	0/0	$2,000	
Dare	4/20/2009	0.88 in.	0/0	$0	
York Co.	5/9/2009	0.88 in.	0/0	$0	
York Co.	5/9/2009	1.00 in.	0/0	$0	
Tabb	6/22/2009	50 kts.	0/0	$1,000	
Lackey	7/26/2009	50 kts.	0/0	$2,000	
Magruder	7/26/2009	50 kts.	0/0	$1,000	
Yorktown	4/6/2010	Lightning	0/0	$5,000	Isolated thunderstorm produced a lightning strike which blew a hole in a roof of a house and caused a small fire in York County.
Magruder	5/14/2010	Lightning	0/0	$5,000	Scattered severe thunderstorms in advance of a cold front produced damaging winds and large hail across portions of central and eastern Virginia. Lightning struck a home on Schooner Boulevard causing a house fire.
Grafton	8/5/2010	50 kts.	0/0	$2,000	
Yorktown	8/5/2010	50 kts.	0/0	$2,000	
Magruder	9/30/2010	50 kts.	0/0	$1,000	
Magruder	11/17/2010	50 kts.	0/0	$2,000	
Magruder	11/17/2010	50 kts.	0/0	$1,000	
Magruder	3/21/2011	Lightning	0/1	$10,000	Isolated severe thunderstorms in advance of a cold front produced damaging winds and a lightning strike across portions of central and southeast Virginia. Lightning strike caused damage to a house. One person was injured.
Magruder	4/5/2011	50 kts.	0/0	$2,000	
York Co.	6/24/2011	50 kts.	0/0	$2,000	
York Co.	6/28/2011	50 kts.	0/0	$2,000	
York Co.	6/28/2011	1.00 in.	0/0	$0	
Magruder	7/3/2011	50 kts.	0/0	$2,000	
Magruder	7/3/2011	50 kts.	0/0	$1,000	
Hornsbyville	6/25/2012	50 kts.	0/0	$3,000	Scattered severe thunderstorms in advance of a cold front produced damaging winds, large hail and a tornado across portions of central and eastern Virginia. Numerous large trees were downed countywide.
Grafton	6/29/2012	50 kts. - Derecho	0/0	$2,000	

TABLE 4.7: SIGNIFICANT THUNDERSTORM EVENTS (1996 - 2013)					
LOCATION	DATE OF OCCURRENCE	ESTIMATED WIND GUST (KNOTS) or HAIL SIZE	DEATHS/ INJURIES	PROPERTY DAMAGE	DETAILS
Magruder	6/13/2013	52 kts.	0/0	$100,000	A squall line produced widespread wind damage and embedded large hail across much of central and eastern Virginia. A home was destroyed by a falling tree on Old Moore Town Road in Old Stage Manor. Wind gusts produced widespread damage across the county. The most significant damage occurred near Dare, where two mobile homes were destroyed by falling trees. A few additional structures sustained minor roof damage in Cheatham Annex due to tops of trees being sheared off. Several trees were also downed county wide, with several snapped and uprooted trees in Dalbytown.
Grafton	7/21/2013	Lightning	0/0	$1,000	
TOTAL			**0/2**	$207,000	

Source: NCDC

PROBABILITY OF FUTURE OCCURRENCES

Severe thunderstorms will remain a highly likely occurrence for Poquoson.

SEA LEVEL RISE

BACKGROUND

Global sea level is determined by the volume and mass of water in the world's oceans. Sea level rise occurs when the oceans warm or ice melts, bringing more water into the oceans. Sea level rise caused by warming water or thermal expansion is referred to as steric sea level rise, while sea level rise caused by melting snow and ice is called eustatic sea level rise. The combination of steric and eustatic sea level rise is referred to as absolute sea level rise. Absolute sea level rise does not include local land movements. Additionally, while it is often represented as a global average, absolute sea level rise varies from place to place as a result of differences in wind patterns, ocean currents, and gravitational forces.

The primary consequences of continuing sea level rise are interrelated and include:

Increased Coastal Erosion – Sea level rise influences the on-going processes that drive erosion, in turn making coastal areas ever more vulnerable to both chronic erosion and episodic storm events (Maryland Commission on Climate Change, 2008). Secondary effects of increased erosion include increased water depths and increased sediment loads which can drown seagrass and reduce habitat and food sources for fish and crabs.

Inundation of Normally Dry Lands – The loss of coastal upland and tidal wetlands through gradual submergence or inundation is likely over time. Wetlands can provide protection from erosion, subdue storm surges, and provide a nursery and spawning habitat for fish and crabs. Without impediments, such as hardened shorelines, and with a slow enough rate of sea level rise, wetlands can normally migrate upland. However, if barriers are present and sea level rise outpaces upland migration, wetlands can drown in place. (VA Governor's Commission on Climate Change, 2008) Many communities in the region have noted an influx of requests in recent years for bulkhead repair as a result of more frequent inundation behind failing bulkheads. Tidal wetlands are slowly migrating landward. The loss of wetlands means increased coastal and shoreline erosion, reduced storm surge protection, and reduction in nursery and spawning habitat for fish and crabs. This reduced habitat can be detrimental to the watermen of the lower Chesapeake Bay, including all of Hampton Roads.

Coastal Flooding – An increase in duration, quantity, and severity of coastal storms results in increased flood damages to infrastructure. Increased sea level and/or land subsidence increases the base storm tide, which is the storm surge plus astronomical tide (Boon, Wang, and Shen, undated). Ultimately, sea level rise increases the destructive power of every storm surge. Minor storms that may not have caused damage in the past will begin to affect infrastructure in the future (Boon, et al, undated). Higher wave energy from higher storm tides will translate each storm's destructive forces landward. The damage caused by major storms in the future is expected to be more costly. Sea level rise will threaten the longevity and effectiveness of stormwater drainage systems, especially during significant rain events that occur during high tides such as that which may be caused by a nor'easter.

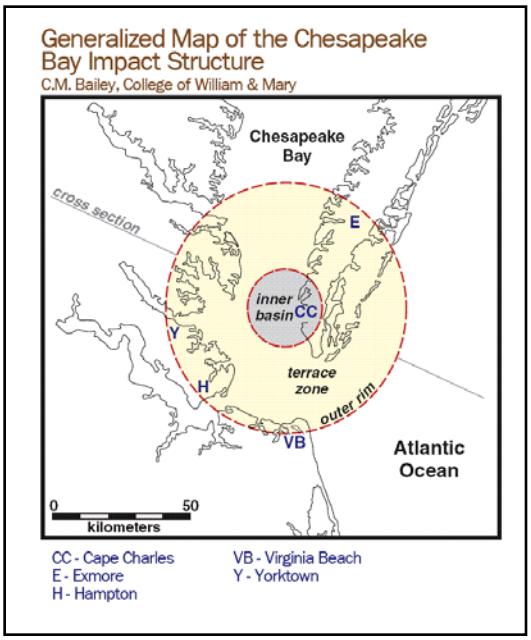
Saltwater Intrusion – As sea level rises, the groundwater table may also rise, and saltwater may intrude into freshwater aquifers. This impact may have secondary impacts related to drinking water and agriculture, even for home gardeners.

LOCATION AND SPATIAL EXTENT

Several factors are influencing the rates of sea level rise relative to land in Poquoson and the Hampton Roads region, including an increased volume of water in the oceans from melting ice. Some scientists believe that thermal expansion of a gradually warming ocean increases ocean volume. The rate of sea level rise is relative to the land adjacent to the sea; land subsidence is the downward movement of the

earth's crust. The Hampton Roads region is experiencing both regional subsidence (along the east coast of the United States) and local subsidence, exacerbating the effects of storms.

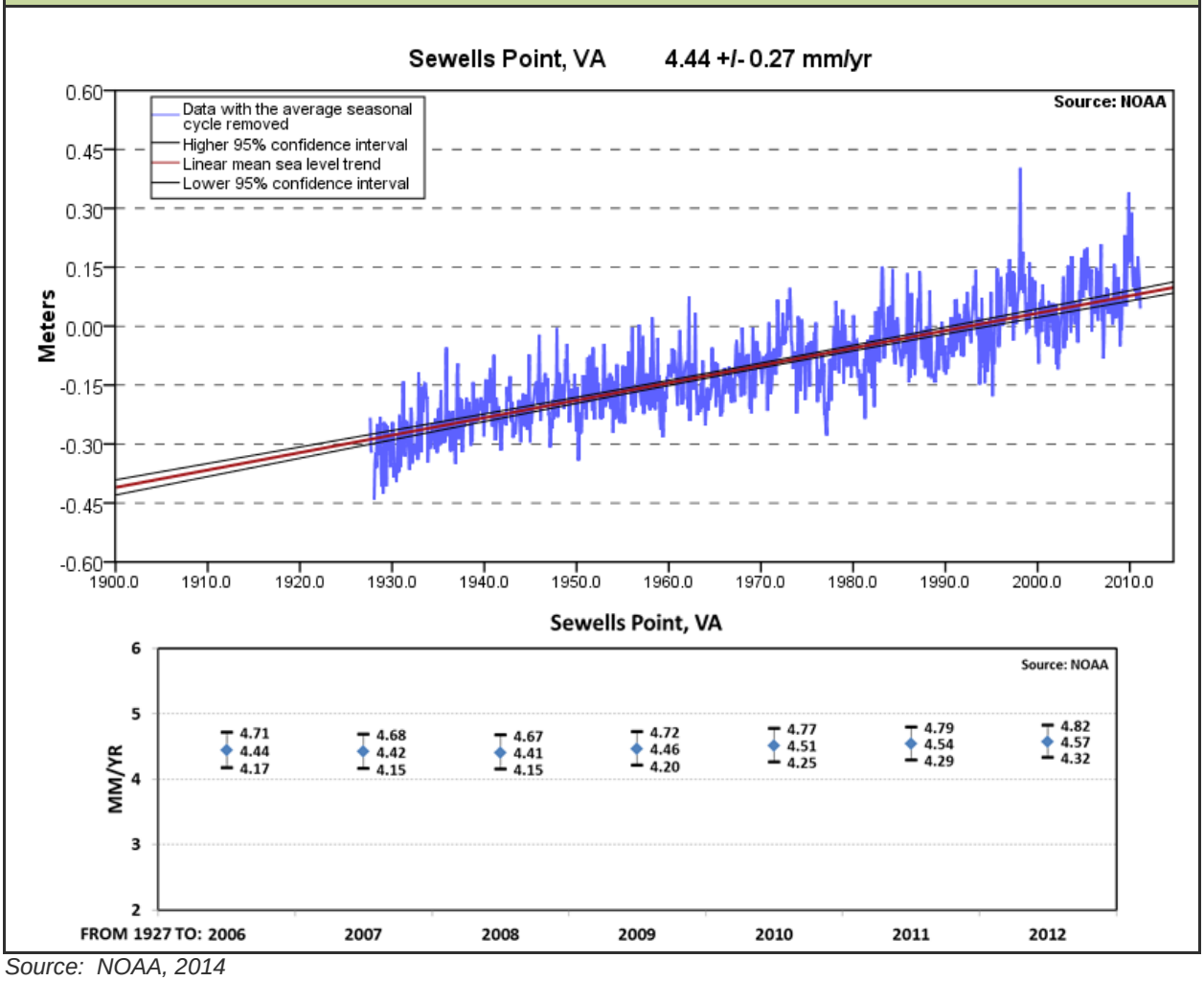
Local subsidence is believed to be the result of settlement or compaction of subsurface layers into the Chesapeake Bay Impact Crater (CBIC). A relatively recent discovery, the CBIC formed approximately 35 million years ago as the result of a comet or meteor strike (Boon, Wang, and Shen, *Planning for Sea Level Rise and Coastal Flooding,* October, 2008).



NOAA has compiled data from regional tide gauges to document the rates of sea level rise. There are 3 local stations with data pertinent to the City of Poquoson, and the rates of sea level rise range from 1.25 feet to 1.98 feet per 100 years.

At Sewell's Point, Naval Station Norfolk, the local NOAA tide station with the longest period of record, the mean sea level trend is 4.44 millimeters/year with a 95% confidence interval of +/- 0.27 mm per year, based on monthly mean sea level data from 1927 to 2006 (**Figure 4.9**). This rate is equivalent to an increase of 1.46 feet in 100 years. The first plot shows the monthly mean sea level without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. The long-term linear trend is also shown, including its 95 percent confidence interval. The second plot compares linear mean sea level trends and 95% confidence intervals calculated from the beginning of the station record to recent years (2006-2011). The values do not indicate the trend in each year, but the trend of the entire data period up to that year. Although the mean trend may change from year to year, there is no statistically significant difference between the calculated trends if their 95% confidence intervals overlap. Therefore, the most recent calculated trend is not necessarily more accurate than the previous trends; it is merely a little more precise. If several recent years have anomalously high or low water levels, the values may actually move slightly away from the true long-term linear trend.

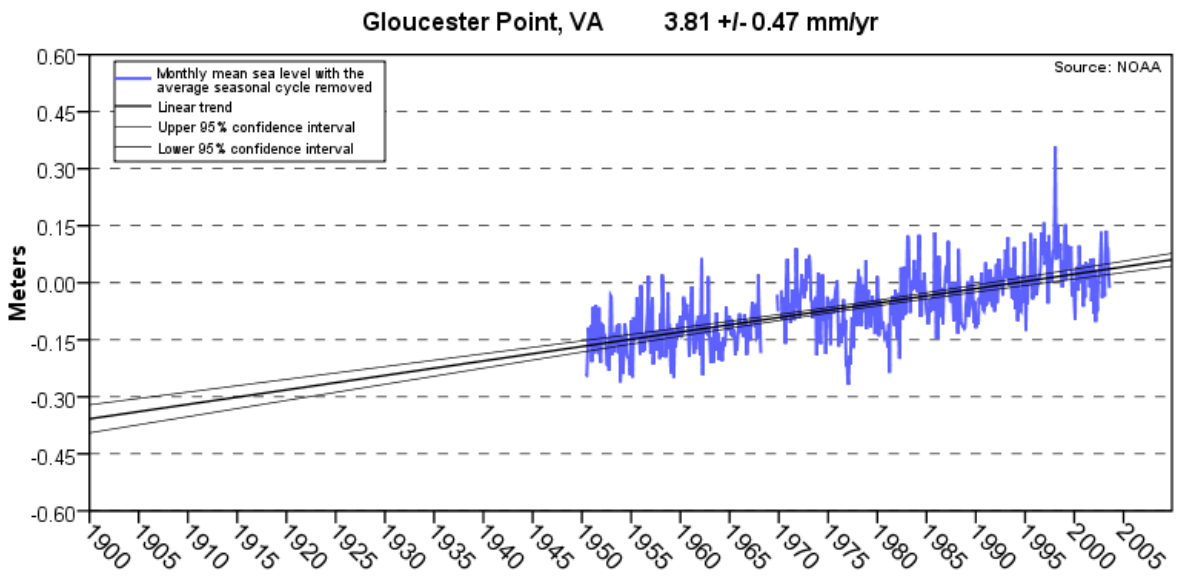
FIGURE 4.9: MEAN SEA LEVEL TREND, SEWELLS POINT, VIRGINIA



Source: NOAA, 2014

At Gloucester Point, the mean sea level trend is 3.81 millimeters/year with a 95-percent confidence interval of +/- 0.47 mm/yr based on monthly mean sea level data from 1950 to 2003, which is equivalent to an increase of 1.25 feet in 100 years. Additional data since 2003 have not been analyzed as part of NOAA's program.

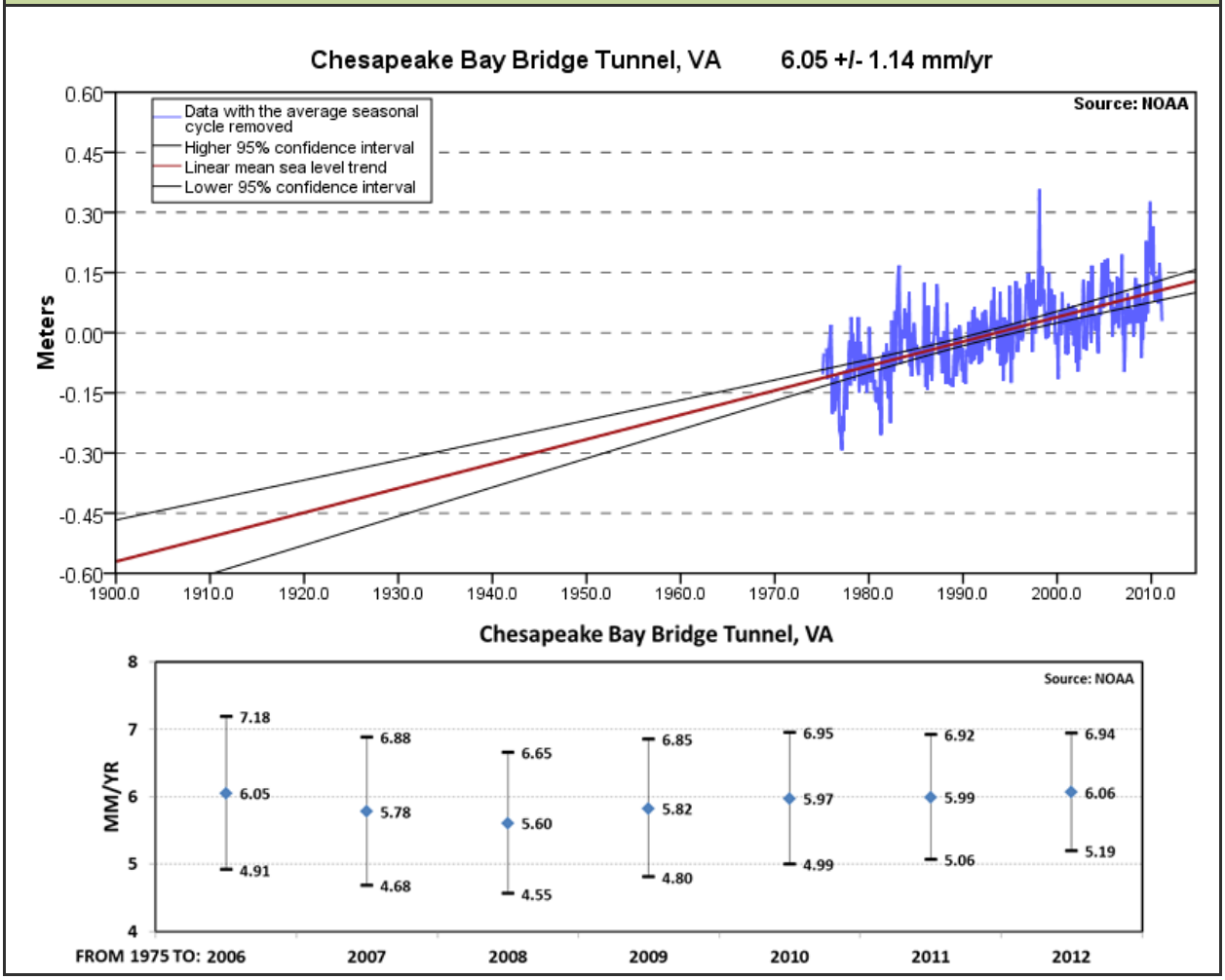
FIGURE 4.10: MEAN SEA LEVEL TREND, GLOUCESTER, VIRGINIA



Source: NOAA, 2014

At the First Island, Chesapeake Bay Bridge Tunnel, the mean sea level trend is 6.05 millimeters/year with a 95% confidence interval of +/- 1.14 mm per year based on monthly mean sea level data from 1975 to 2006, which is equivalent to an increase of 1.98 feet in 100 years (**Figure 4.11**). The second plot compares linear mean sea level trends and 95% confidence intervals calculated from the beginning of the station record to recent years (2006-2011). The values do not indicate the trend in each year, but the trend of the entire data period up to that year.

FIGURE 4.11: MEAN SEA LEVEL TREND, CHESAPEAKE BAY BRIDGE TUNNEL, VIRGINIA



Source: NOAA, 2014

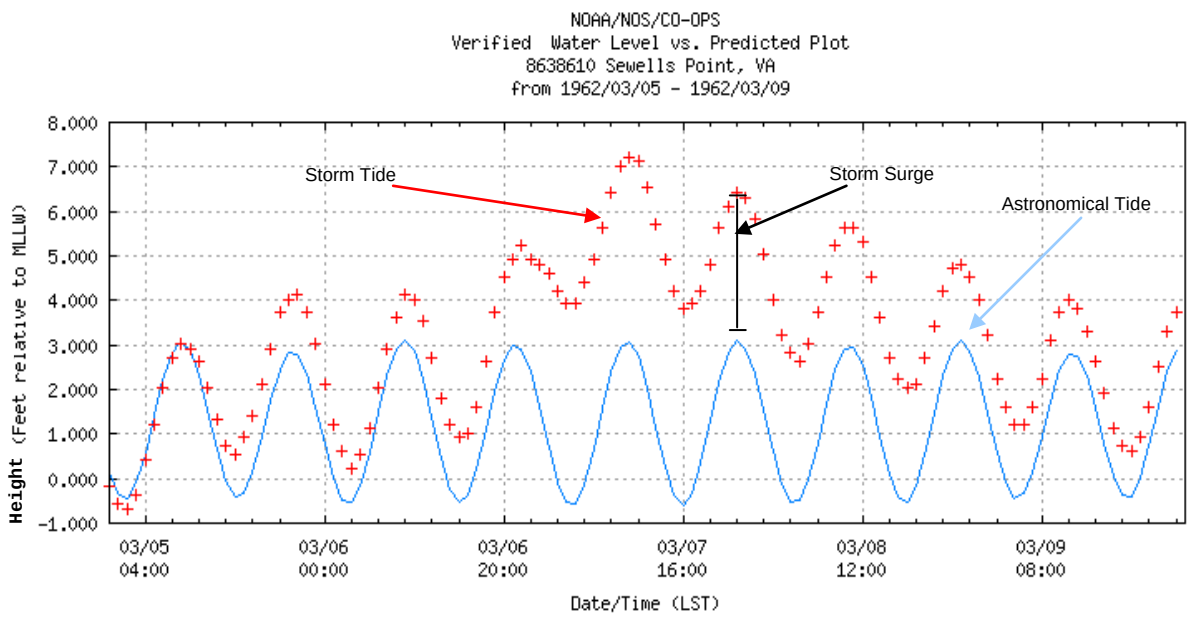
SIGNIFICANT HISTORICAL EVENTS

Unlike wildfires, earthquakes or coastal storms, the impacts of sea level rise are not felt or recorded in a matter of hours or days, but instead are slowly observed, recorded, and experienced over decades and centuries. However, scientists at VIMS have gathered data from several historical storms and made careful comparisons in an effort to highlight the historical impact of sea level rise locally.

The Ash Wednesday Storm of 1962 produced a peak storm tide of approximately 7.2 feet MLLW at Sewell's Point (see **Figure 4.12**). If that same storm were to occur at mean high tide in 2030, using the sea level rise rates calculated above for Sewell's Point, the astronomical tide would be approximately 1 foot higher. Since the storm tide is obtained by adding the storm surge to the astronomical tide, the same

storm could then produce a storm tide of over 8 feet MLLW. By comparison, Hurricane Isabel in 2003 produced a storm tide of 7.887 feet MLLW and caused an immense amount of damage.

FIGURE 4.12: ASTRONOMICAL AND STORM TIDES FOR 1962 STORM



Source: NOAA, 2008

Similarly, Dr. John Boon, Emeritus Professor at Virginia Institute of Marine Science, concluded that sea level rise contributed to the similarity of two storms, the August 1933 hurricane and Hurricane Isabel in 2003. The storms had comparable peak storm tides of 8.018 feet MLLW (1933) and 7.887 feet MLLW (2003), and both peaks occurred very shortly before or after astronomical high tide, yet the 1933 storm occurred during spring tides and Isabel during neap tides. As a result, the storm surge in the 1933 storm was much higher and, all things being equal, the data would not have shown the storm surge that it did for Isabel had it not been for the constant adjustment of MLLW to account for as much as 1.35 feet of sea level rise between August, 1933 and September, 2003 (**Table 4.8**).

TABLE 4.8: AUGUST 1933 HURRICANE AND HURRICANE ISABEL (BOON, UNDATED)

STORM	STORM TIDE (HEIGHT IN FEET ABOVE MLLW)	STORM SURGE (HEIGHT IN FEET ABOVE NORMAL)	MEAN WATER LEVEL (HEIGHT IN FEET ABOVE MLLW)
August 1933	8.018	5.84	0.95
Isabel – September 2003	7.887	4.76	2.30
1933 -2003	0.131	1.08	-1.35

A mere tropical depression, Ernesto struck Hampton Roads on September 1, 2006. At Sewells Point, the storm surge reached a peak of about 4 feet above monthly mean sea level for the lunar month, but occurred at low tide. Boon (*Ernesto: Anatomy of a Storm Tide,* undated) concludes that if the peak storm surge had occurred at high tide, the storm tide peak would have reached 7 feet MLLW, or just 0.9 feet below Isabel's peak storm tide.

PROBABILITY OF FUTURE OCCURRENCES

According to VIMS in a report to the U.S. Army Corps of Engineers, Norfolk District, “Land subsidence in Chesapeake Bay is likely to continue at or near present rates.” Future absolute sea level rise, measured relative to the center of the earth rather than fixed points on land, “remains uncertain owing to diverse and possibly changing trends world-wide” (Boon, John D., Brubaker, Forrest, *Chesapeake Bay Land Subsidence and Sea Level Change: An Evaluation of Past and Present Trends and Future Outlook*, November 2010). Therefore, for planning purposes, the rates experienced in the past and documented through tide gauge measurement are expected to continue, and this hazard is considered to have a highly likely probability of occurrence.

The remainder of this section provides a brief synopsis of the non-critical hazards as experienced by the City of Poquoson.

WINTER STORMS

Winter storms can combine different types of precipitation including snow, freezing rain, and ice, as well as high winds, and cold temperatures. These storms can be very disruptive in Poquoson, particularly in areas where they do not frequently occur. Severe winter storm events are relatively rare for the City; however, the impact can be potentially more severe for this coastal community than a community farther inland. Winter storms impact the entire City of Poquoson. Given its proximity to the ocean, the moderating effect of the ocean on air temperatures can cause snow to change to rain. If this rain falls on frozen ground or other surfaces, the resulting coating of ice can have dangerous consequences for the roads and bridges, which provide critical access and egress to the many peninsulas which comprise Poquoson. A simple blockage on one road can trap many residents before it is cleared, creating a challenge for road crews.

A VDOT snowplow plows I-64 East. (Photo by Tom Saunders, VDOT)

Even small accumulations of ice on roads and sidewalks can be extremely hazardous to motorists and pedestrians and can lead to vehicle and pedestrian accidents. Other, less frequent, impacts can include collapsed roofs from fallen trees and limbs and heavy ice, and snow loads along with felled trees, telephone poles and lines, electrical wires, and communications towers. As a result of ice storms, telecommunications and power can be disrupted. In addition, icy roads, icy sidewalks and power outages can increase the hazard to vulnerable populations, cause an increase in car accidents, an increase in slip and fall accidents, and reduce the reliability of life-support systems that depend on electricity.

Detailed historical information on winter weather events in or about the City is limited. Listed below (**Table 4.9**) are several significant winter events, with impacts described in the Tidewater area.

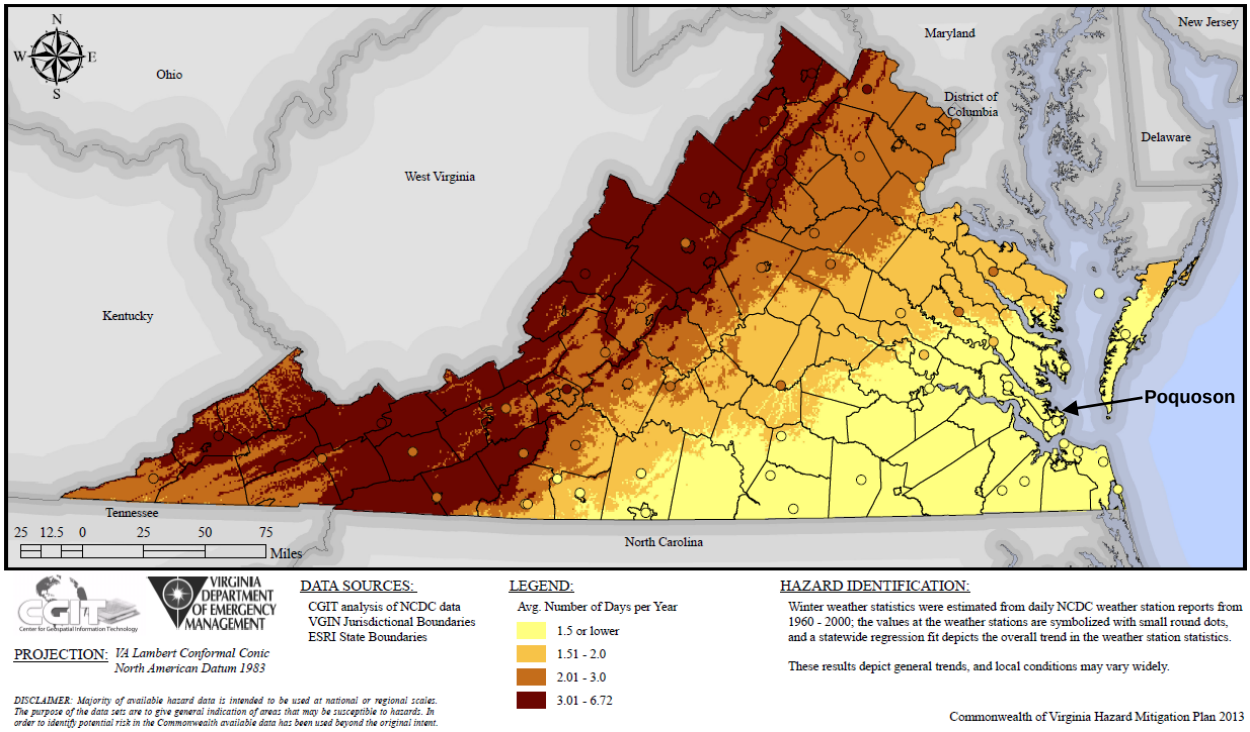
TABLE 4.9: RECENT SIGNIFICANT WINTER STORM EVENTS	
DATE	**DESCRIPTION**
Winter of 1960-1961	Stormy pattern of previous winters continued with three more significant storms. The first was December 10-12, 1960 with heavy snow and high winds from Virginia to New York. In Virginia, snow fall ranged from 4 -13 inches in the north and west, with 7 fatalities. The next snowstorm struck on January 19-20 from North Carolina to New York. Virginia saw up to 12 inches. Two deaths were blamed on the storm in Virginia, due to overexertion and accidents. The third storm struck February 3-5 and hit like a blizzard with severe cold and gale force winds. Two to 13 inches of snow across Virginia, and 4 fatalities.
Winter of 1980	On January 4 and 5, a heavy wet snow fell over eastern Virginia with 18 inches reported at Williamsburg. A second storm hit on February 6 that dumped 6 inches in Williamsburg and as much as 20 inches at Virginia Beach. Over a foot of snow fell in Norfolk. This was topped on March 1. Once again, arctic air had settled over Virginia and temperatures were in the teens. More than a foot (13.7 inches) of snow fell at Norfolk. The heavy snow combined with strong winds to create blizzard conditions. Norfolk's total for the season came to a record 41.9 inches making this the snowiest winter ever for eastern Virginia.
December 23-25, 1998	A major ice storm affected central and eastern Virginia from Wednesday, December 23rd into Friday, December 25th. A prolonged period of freezing rain and some sleet resulted in ice accumulations of 0.5 – 1.0 inches in many locations. The heavy ice accumulations on trees and power lines caused widespread power outages across the region. Approximately 400,000 customers were without power during the maximum outage period, Christmas Eve day. Some customers were without power for about ten days. Many accidents occurred due to slippery road conditions, especially bridges and overpasses. Many secondary roads were impassable due to fallen tree limbs and in a few cases, whole trees. The ice storm caused downed trees and power-related issues for Poquoson.
January 19-20, 2000	Back to back snow storms causing traffic mobility problems for Poquoson. Two to three inches of snow fell overnight as an area of low pressure passed south of the region. The highest amounts were measured along a line from Caroline County in the north, through the City of Richmond, then along the southern shore of the James River to near the Newport News area. Snow briefly fell heavily after midnight, creating hazardous driving conditions.
February 15-16, 2004	On February 15 and 16, a winter storm hit the Tidewater area of Virginia dumping wind driven rain, freezing rain, and snow on a significant portion of Hampton Roads. Snow accumulation totals in some areas reached three to six inches and winds were reported at up to 30 mph. Sleet also fell across much of the region causing roads to become icy and treacherous.
January 19-20, 2008	Coastal low pressure produced one half inch to three inches of snow across portions of central and eastern Virginia. One half inch to three inches of snow occurred across York County.
January 30, 2010	Low pressure moving off the coastal Carolinas produced between five and fifteen inches of snow across central and eastern Virginia from Friday night, January 29th, into Saturday night January 30th. Poquoson reported 8.5 inches of snow.
December 25, 2010	Low pressure moving north just off the Mid Atlantic Coast produced between eight and fourteen inches across York County. Yorktown reported 14.0 inches of snow. Seaford reported 13.0 inches of snow. Storm created havoc on the roadways. Between midnight and 10 pm December 26, State Police recorded 421 traffic crashes, 296 disabled vehicles and 1,159 total calls for service in Hampton Roads, Eastern Shore, Williamsburg, Franklin and Emporia.
January 21, 2014	Coastal low pressure intensifying off the Mid Atlantic Coast produced a widespread two to five inches of snowfall from the Virginia Piedmont to the Virginia Eastern Shore. Snowfall amounts were generally between two inches and four inches across the area. Newport News recorded 4.0 inches of snowfall. Lakeside recorded 3.0 inches of snowfall.
January 28, 2014	Coastal low pressure intensifying off the Mid Atlantic Coast produced widespread snowfall ranging from two to ten inches of snowfall from the Virginia Piedmont to the Virginia Eastern Shore. Highest snowfall amounts were over southeast Virginia. Snowfall amounts were generally between four inches and six inches across York County. Tabb recorded 6.7 inches of snowfall.

Winter storms remain a likely occurrence for the region. While storms will be more likely to produce small amounts of snow, sleet or freezing rain, larger storms, though less frequent in occurrence, could also impact the region.

Figure 4.13 indicates the average number of days the region will experience 3 or more days with at least 3 inches of snow. Data produced for the *Commonwealth of Virginia Hazard Mitigation Plan 2013* indicate the following frequency characteristics about winter storm characteristics for Poquoson:

- 1.5 or fewer days per year with at least 3 inches of snow;
- 0.5 or fewer days per year with at least 6 inches of snow; and,
- 3 or fewer days per year entirely at or below 32°F.

FIGURE 4.13: AVERAGE NUMBER OF DAYS WITH AT LEAST 3 INCHES OF SNOW



Source: Commonwealth of Virginia Hazard Mitigation Plan 2013

Although emergency management and snow removal needs are costly, property damages are typically minimal; therefore, the HMPC felt that this hazard did not warrant categorization as a high risk, critical hazard.

MOSQUITO BORNE DISEASES

Two arthropod-borne viruses (also known as arboviruses) that are currently of concern in the eastern United States are West Nile virus (WNV) and eastern equine encephalitis (EEE). Bird-feeding mosquitoes are the primary source vector for the diseases, which are then transmitted to humans or horses via a bridge mosquito species that bites both infected birds, and subsequently, humans or horses.

An estimated 80% of people infected with the WNV show no symptoms (Virginia Department of Health, 2013). Approximately 20% of infections cause a clinical presentation known as West Nile Virus fever, which is characterized by an acute onset of fever, and can be accompanied by, but not limited to, headache, muscle aches, fatigue, and joint pain.

In 1999, WNV was first documented in the United States during an outbreak of meningitis and encephalitis in New York City. Since its introduction, it became established throughout much of the United States, and has spread into Canada and Mexico.

One in 150 people infected with WNV will go on to develop severe symptoms, which can include fever, headache, stiff neck, disorientation or confusion, vision loss, seizures, and paralysis (Virginia Department of Health, 2013). In some cases, the neurological effects of WNV infection can be permanent. There is no treatment available for WNV. Treatment for severe cases consists of supportive care. The best defense against WNV is to protect humans from biting mosquitoes and to eliminate mosquito breeding areas.

Because of the rate of death among infected persons with EEE, the virus is regarded as one of the more serious mosquito-borne diseases in the United States. EEE occurs in the eastern half of the country and is most commonly detected around swamps in Virginia's coastal plain. Symptoms of EEE range from mild flu-like illness to encephalitis (inflammation of the brain), coma and death. About 35 percent of people who develop the disease die. It is estimated that 35 percent of people who survive EEE will have mild to severe neurologic after effects from this disease (Virginia Department of Health, 2013). Human cases of EEE are somewhat rare.

The proximity of developed areas to standing water (i.e., potential breeding pools) may affect the probability of a bite from an infected mosquito that leads to transmission of WNV or EEE. Such areas may include:

- wetlands;
- containers where rainwater collects, such as potted plant trays, buckets, or toys;
- bird baths;
- old tires;
- roof gutters and downspout screens;
- flat roofs, boats, and tarps;
- obstructed ditches; and
- puddles with soil, or a mixture of sand and gravel.

Certain species of mosquitoes are associated with human activity, and developed areas tend to contain suitable manmade breeding habitats. The habitat of "container species" (a.k.a., tree-hole species) mosquitoes that breed in areas of standing water, is difficult to map, but these represent several common species that transmit disease because of their proximity to areas with high human populations.

Because infected birds must be present before the diseases can spread to humans, and because birds like chickens are stationary and easily tested for the presence of the viruses, birds can serve as sentinels or provide warning of outbreak through testing. According to the Virginia Department of Health, the City of Poquoson and York County had its first documented positive case in 2002, six birds tested positive for West Nile Virus. In 2003, the number of birds testing positive increased to nine. No human cases of West

Nile virus in Poquoson have been recorded to date, but nearby Hampton had 1 case of West Nile Virus confirmed in October 2012, the latest year for which the Department of Health has online data.

When a serious mosquito infestation is imminent and impacting Langley Air Force Base, arrangements may be made for an aerial spray flight over the lower, eastern Peninsula. There are generally three flights available per year and only if the mosquito situation warrants such treatment. The application focuses on the salt marsh mosquito breeding environment East of Route 17. The spray treatment is done at 1/2 ounce per acre, and is only conducted if weather conditions are optimum for an effective application.

The probability of future occurrences of mosquito borne disease in birds and horses is considered likely. The likelihood of human incidence is possible based on the history of occurrence in the region.

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.

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 10 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. Earthquakes occurring in the mid-Atlantic trench usually pose little danger to humans.

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 Richter scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude (see **Table 4.10**). Each unit increase in magnitude on the Richter scale corresponds to a 10-fold increase in wave amplitude, or a 32-fold increase in energy. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using Roman numerals, with a I corresponding to imperceptible (instrumental) events, IV corresponding to moderate (felt by people awake), to XII for catastrophic (total destruction). A detailed description of the Modified Mercalli Intensity Scale of earthquake intensity and its correspondence to the Richter scale is given in **Table 4.11**.

TABLE 4.10: RICHTER SCALE	
RICHTER MAGNITUDES	**EARTHQUAKE EFFECTS**
Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0-7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

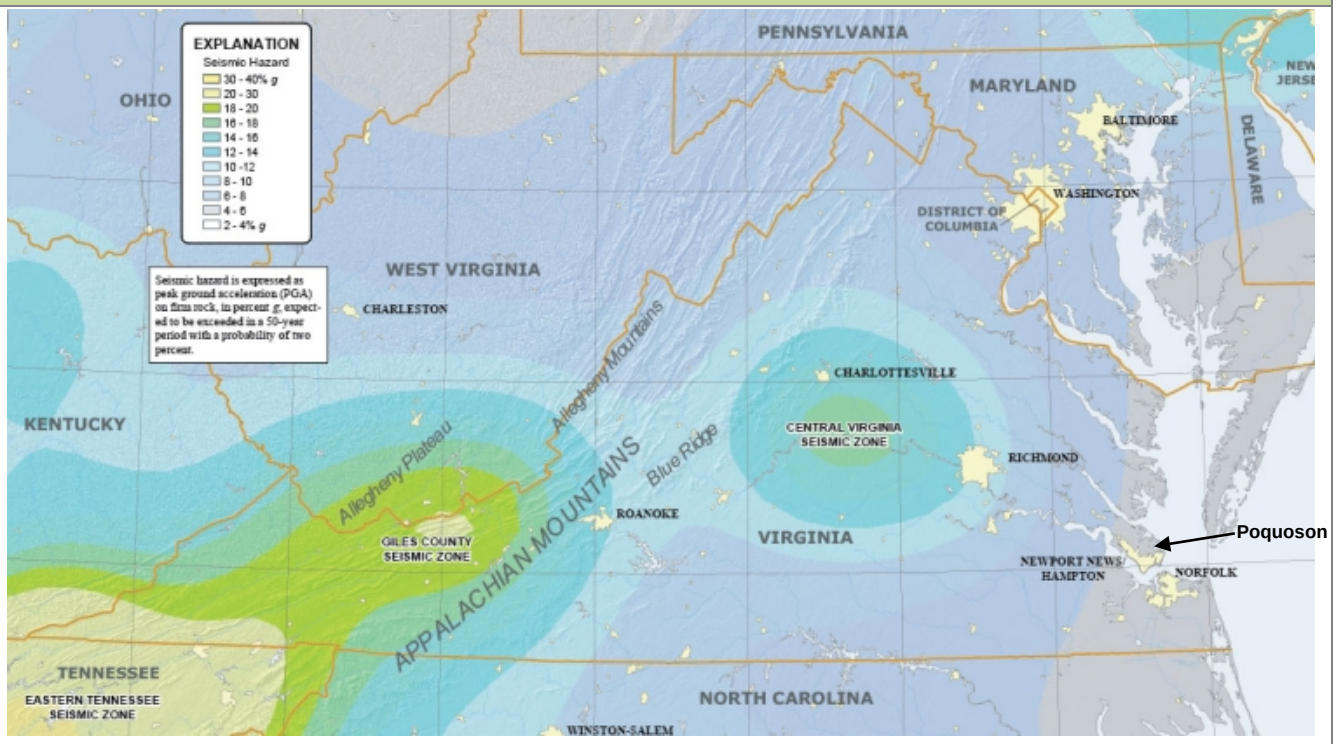
Source: United States Geological Survey

TABLE 4.11: MODIFIED MERCALLI INTENSITY SCALE FOR EARTHQUAKES			
SCALE	**INTENSITY**	**DESCRIPTION OF EFFECTS**	**CORRESPONDING RICHTER SCALE MAGNITUDE**
I	Instrumental	Detected only on seismographs	
II	Feeble	Some people feel it	<4.2
III	Slight	Felt by people resting; like a truck rumbling by	
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	<4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves	<5.4
VII	Very Strong	Mild Alarm; walls crack; plaster falls	<6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	<6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	<7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	<8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	>8.1

Source: United States Geological Survey

Poquoson is in an area that could feel the effects of earthquakes in the Central Virginia Seismic Zone (see **Figure 4.14**), an area of frequent, yet very weak, earthquake activity located to the southwest of Charlottesville, at the New Madrid Fault in Missouri and at the Charleston Fault in South Carolina. During the last 200 years, both the New Madrid Fault and the Charleston Fault have generated earthquakes measuring greater than 8 on the Richter scale.

FIGURE 4.14: CENTRAL VIRGINIA SEISMIC ZONE



Source: Virginia Department of Mines Minerals and Energy, web site, 2014

Earthquakes in the central and eastern U.S., although less frequent than in the western U.S., are typically felt over a much broader region. East of the Rockies, an earthquake can be felt over an area as much as ten times larger than a similar magnitude earthquake on the west coast. A magnitude 4.0 eastern U.S. earthquake typically can be felt at many places as far as 60 miles from where it occurred, and it infrequently causes damage near its source. A magnitude 5.5 eastern U.S. earthquake usually can be felt as far as 300 miles from where it occurred, and sometimes causes damage out to 25 miles.

Earthquakes everywhere occur on faults within bedrock, usually several miles deep. Most bedrock beneath central Virginia was assembled as continents collided to form a supercontinent about 500-300 million years ago, raising the Appalachian Mountains. Most of the rest of the bedrock formed when the supercontinent rifted apart about 200 million years ago to form what are now the northeastern U.S., the Atlantic Ocean, and Europe.

At well-studied plate boundaries like the San Andreas fault system in California, often scientists can determine the name of the specific fault that is responsible for an earthquake. In contrast, east of the Rocky Mountains this is rarely the case. The Central Virginia seismic zone is far from the nearest plate boundaries, which are in the center of the Atlantic Ocean and in the Caribbean Sea. The seismic zone is laced with known faults but numerous smaller or deeply buried faults remain undetected. Even the known faults are poorly located at earthquake depths. Accordingly, few, if any, earthquakes in the seismic zone can be linked to named faults. It is difficult to determine if a known fault is still active and could slip and cause an earthquake. As in most other areas east of the Rockies, the best guide to earthquake hazards in the seismic zone is the earthquakes themselves.

Historical data is supportive of the low risk assessment. Since 1774, there have been only three earthquake epicenters within 65 miles of Poquoson, one on the Delmarva Peninsula and two in the Hampton Roads area. No local damages have been recorded.

On Tuesday afternoon, August 23, 2011, an earthquake with a moment magnitude of 5.8 occurred about 7 miles southwest of Mineral, Virginia, which is near Lake Anna in Louisa County. The earthquake was widely felt, with felt reports received from people as far away as Detroit, Atlanta, Boston, Toronto, and Montreal. Dozens of aftershocks up to magnitude 4.5 have been recorded, including a magnitude 4.2 aftershock approximately six hours after the mainshock and a magnitude 4.5 aftershock about a day and a half later. The *Washington Post* reported that the two Dominion Virginia Power nuclear plants in North Anna, Va., 10 miles from the epicenter, shut down automatically when the quake hit. They lost power from the grid and switched to four diesel generators. Damage was greatest in Louisa County and several minor injuries occurred. Structural damage to buildings was significant in cities throughout central and eastern Virginia and Washington D.C., including damage to the Washington Monument and the Washington National Cathedral.

The *Daily Press* and *Virginian-Pilot* newspapers reported a minor, but relatively rare, earthquake with its epicenter on the Peninsula August 3, 1995. According to the *Virginian-Pilot*, the quake measured 2.6 on the Richter scale. The Virginia Tech Seismological Observatory detected the quake with instrumentation in Goochland County west of Richmond, and in Blacksburg. The quake was centered under the York River near York River State Park. According to the *Daily Press*, people at Camp Peary in York County reported feeling the quake.

The Virginia Tech Seismological Observatory provides additional information on more recent events in Virginia, including a magnitude 4.0 shock that occurred on August 17, 1984. The epicenter was approximately 15 miles to the southeast of Charlottesville. The quake was felt from Washington, DC to the North Carolina border and from Staunton to Norfolk.

A magnitude 3.2 earthquake occurred Saturday, September 22, 2001, with the epicenter near Shadwell, just east of Charlottesville. The focal depth was within a few kilometers of the surface, and this produced a strong acoustic signal that local officials attributed to an aircraft in transonic flight. In fact, such explosive sounds are frequently associated with shallow earthquakes in eastern North America. Unlike the situation in California, the rocks in the upper few kilometers of the Earth's crust in the east are extremely efficient transmitters of high frequency seismic energy, and a proportion of this energy is converted to ordinary sound waves when the seismic waves reach the Earth's surface.

Earthquakes of significant magnitude are unlikely occurrences for Poquoson, though the proximity of the region to the Charleston Fault could increase the possibility of feeling some impact of a large earthquake if it were to occur along that fault line.

DROUGHT

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 make areas more susceptible to wildfire. Human demands and actions can also hasten drought-related impacts.

All areas of Virginia are susceptible to drought; however, drought has not been an extreme condition for Poquoson. A drought response plan was prepared by Newport News Waterworks (NNW) in March of 2004, which contains a review and analysis of the City's response to the significant regional drought that occurred during 2001 and 2002. While this drought did not significantly impact Poquoson, the NNW imposed mandatory use restrictions in 2002. During this period, the NNW had its first opportunity to apply the drought monitoring tools, practices, and policies provided by the Water Conservation Management Plan and ordinance. The Water Conservation Management Plan and ordinance were developed in 1995 to provide specific tools needed to respond to water emergencies and to meet requirements by the Virginia Department of Environmental Quality (VDEQ). The NNW serves as the regional water utility for the cities of Newport News, Hampton, Poquoson, and portions of York and James City Counties.

Another drought in 2007 and 2008 affected much of the Commonwealth. Governor Timothy M. Kaine declared a Statewide Emergency on October 18, 2007 and imposed a statewide ban on all open burning. The burn ban was lifted on November 15, 2007. According to the Drought Monitoring Task Force Report dated February 25, 2008, the City of Poquoson experienced severe drought conditions. From January 1, 2007 through February 21, 2008, the York-James region recorded rainfall that was 21.38 inches below normal. The final VDEM situation report dated October 31, 2008, indicated that the Statewide Emergency remained in effect at that time (VDEM, 2008). The western part of the state appears to have been hit hardest, especially with regard to agriculture. Impacts in Poquoson were limited, according to City officials, and may have included some shallow wells going dry. Council took action encouraging citizens to conserve water.

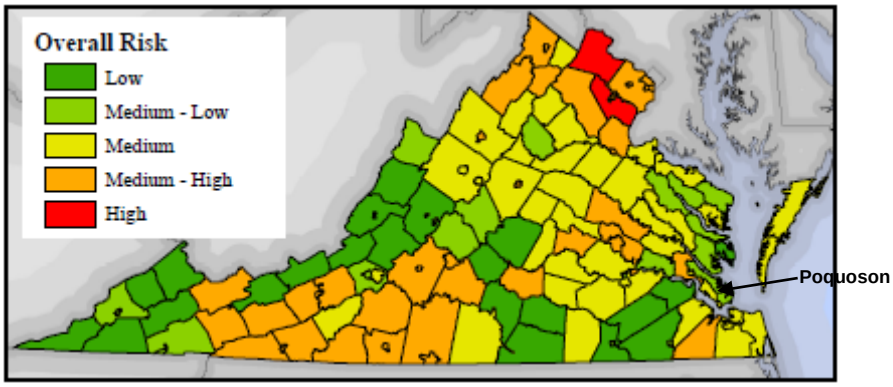
The drought of record for Virginia occurred in 1931 when the statewide average rainfall amount was 7.64 inches compared to an average mean rainfall amount of 17.89. This was during this period that also saw the Great Dust Bowl that helped lead to the Great Depression.

In early November, 2010 the U.S. Department of Agriculture designated 59 counties and the independent city of Suffolk in Virginia as natural disaster areas due to losses caused by drought and excessive heat that began April 1, 2010. Poquoson was not in the original declaration, but because it was contiguous with declared communities, the City was eligible for disaster assistance. Poquoson did not receive any disaster assistance.

Since 1950, the NCDC has recorded zero reports of drought to impact Poquoson, Hampton or York Zones. Overall, droughts have had very limited historical impacts on the City of Poquoson, and occurrences or impacts of severe drought have not been documented. Therefore, the extent or severity of the hazard is considered low, with only minimal potential impacts to the water supply possible. Impacts of water shortages could include: wells drying up, implementation of restrictions on watering and recreational use of water, vegetation becomes stressed, diseased or dies, increased wildfire vulnerability, and stressed or diseased wildlife.

In the 2013 *Commonwealth of Virginia Hazard Mitigation Plan*, the overall risk of drought is determined to be low for Poquoson (**Figure 4.15**). Given the low number of historical occurrences, the Committee determined drought to be a non-critical hazard.

FIGURE 4.15: VIRGINIA OVERALL DROUGHT RISK



Source: Commonwealth of Virginia Hazard Mitigation Plan 2013

WILDFIRE

A wildfire is any fire occurring in a wildland area (i.e., grassland, forest, brush land) except for fire under prescription.[4] Wildfires are part of the natural management of the Earth's ecosystems, but may also be caused by natural or human factors. Over 80% 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. They often start unnoticed and spread quickly; a common characteristic is dense smoke that fills the area for miles around. Naturally occurring and non-native species of grasses, brush, and trees fuel wildfires. (FEMA, How-to Guide, 2-29) Generally, there are three major factors to consider in assessing the threat of wildfires to a community: topography, vegetation, and weather.

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 (such as hurricanes or tornadoes) 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.

A 2008 fire sparked by logging equipment in the Great Dismal Swamp National Wildlife Refuge lasted 121 days and cost more than $10 million. It was the longest and most expensive wildfire in Virginia history. (Credit: U.S. Fish and Wildlife Service)

The City of Poquoson Fire Department reported 425 wildfires between 1984 and February 2014. Poquoson's biggest concern about wildfire centers on vegetation known as *Phragmites australis*. Phragmites, also known as common reed, is a perennial grass that grows in dense stands up to 12 feet in height. It is an aggressive invader of wetland areas particularly where the soil has been disturbed or exposed. Phragmites will also crowd out native wetland plants. Because the stands contain a lot of standing dead material, they will carry fire readily even in summer when the year's growth is still green. The greatest danger comes in late fall early and winter when the previous year's growth dies, creating large amounts of combustible material that carries fire well. There are also numerous undeveloped forested areas and grasslands that during dry conditions, can be susceptible to wildfires.

Weather is another factor for consideration in the case of wildfires. High temperatures combined with low humidity offer the most conducive environment for wildfires. The City of Poquoson's climate is considered subtropical humid. While the City may experience high temperatures during the summer months, this is usually combined with high levels of humidity that are not conducive to the ignition and spread of wildfires. However, during periods of drought, the threat of wildfire increases. As a result of the large number of variables that contribute to wildfires, the probability cannot be accurately determined.

In the period between 1984 and 2003, when the first mitigation plan was prepared, Poquoson reported that 158 of the wildfires they dealt with were Phragmites-related fires. Since 2003, there have not been any reported Phragmites-related fires, a positive result of the City Fire Department's increased focus on

[4] Prescription burning, or "controlled burn," undertaken by land management agencies is the process of igniting fires under selected conditions, in accordance with strict parameters.

wildfire mitigation, which has included increased property owner education and public information campaigns.

Wildfires remain a likely occurrence for the City, though the Fire Department expects that fewer Phragmites-related fires will occur. They feel they have had success in relating the fire hazard to the public and mitigating the hazards associated with open burning. For this reason, the hazard is considered noncritical and low risk.

DATA SOURCES

The following primary data sources were among those used to collect the information presented in this section.

- *American Society of Civil Engineers (ASCE), "Facts About Windstorms"* (www.windhazards.org/facts.cfm)
- *Climate Change in Hampton Roads, Phase II: Storm Surge Vulnerability and Public Outreach, Hampton Roads Planning District Commission (HRPDC), June 2011*
- *Federal Emergency Management Agency (FEMA)* (www.fema.gov)
- *National Climatic Data Center (NCDC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration* (http://lwf.ncdc.noaa.gov/oa/ncdc.html)
- *National Drought Mitigation Center, University of Nebraska-Lincoln* (www.drought.unl.edu/index.htm)
- *National Hurricane Center, National Oceanic & Atmospheric Administration (NOAA)* (www.nhc.noaa.gov)
- *National Severe Storms Laboratory (NSSL), U.S. Department of Commerce, National Oceanic and Atmospheric Administration* (www.nssl.noaa.gov)
- *National Weather Service (NWS), U.S. Department of Commerce, National Oceanic and Atmospheric Administration* (www.nws.noaa.gov)
- *National Severe Storms Laboratory, U.S. Department of Commerce, National Oceanic and Atmospheric Administration (http://www.nssl.noaa.gov/education/svrwx101/tornadoes/)*
- *Sea Level Rise and Coastal Infrastructure: Prediction, Risks and Solutions,* Bilal M. Ayyub and Michael S. Kearney *(American Society of Civil Engineers Council on Disaster Risk Management, Monograph No. 6, January 2012)*
- *Storm Prediction Center (SPC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service* (www.spc.noaa.gov)
- *The Tornado Project, St. Johnsbury, Vermont* (www.tornadoproject.com)
- *Virginia Department of Health (http://www.vdh.state.va.us/epidemiology/DEE/Vectorborne/factsheets/westnilevirus.htm)*

VULNERABILITY ASSESSMENT

2014 UPDATE

Section 5 was updated to align the document with the *2011 Southside Hampton Roads Hazard Mitigation Plan*.

Each of the hazards in this section was reviewed and updated to reflect the revised information obtained for the updated *Hazard Identification and Analysis* section. All tables and figures were updated to reflect the most current information available.

INTRODUCTION

The *Vulnerability Assessment* section builds on information provided in the *Hazard Identification and Analysis* by identifying community assets and development trends in the region, then assessing the potential impact and amount of damage (loss of life and/or property) that could be caused by each hazard event addressed in this risk assessment. The primary objective of this level of vulnerability assessment is to prioritize hazards of concern to Poquoson, adding to the foundation for mitigation strategy and policy development. Consistent with the preceding sections, the following hazards are addressed in this assessment:

- FLOODING
- HURRICANES
- TORNADO
- SEVERE THUNDERSTORMS
- SEA LEVEL RISE
- WINTER STORMS
- MOSQUITO BORNE DISEASES
- EARTHQUAKE
- DROUGHT
- WILDFIRE

To complete the vulnerability assessment, best available data were collected from a variety of sources, including local, state and federal agencies, and multiple analyses were applied through qualitative means. Additional work will be done on an ongoing basis to enhance, expand, and further improve the accuracy of the baseline results, and it is expected that this vulnerability assessment will continue to be refined through future plan updates as new data and loss estimation methods become available.

The findings presented in this section with regard to vulnerability were developed using best available data, and the methods applied have resulted in an approximation of risk. These estimates should be used to understand relative hazard risk and the potential losses that may be incurred; however, uncertainties are inherent in any loss estimation methodology, arising from incomplete knowledge concerning specific hazards and their effect on the built environment, as well as incomplete data sets and from approximations and simplifications that are necessary in order to provide a meaningful analysis. Further, most data sets contain relatively short periods of record which increases the uncertainty of any statistically-based analysis.

METHODOLOGIES USED

Two distinct risk assessment methodologies were used in the formation of this vulnerability assessment. The first consists of a ***quantitative*** analysis that relies upon best available data and technology, while the second approach consists of a ***qualitative*** analysis that relies on local knowledge and rational decision making. Upon completion, the methods are combined to create a "hybrid" approach for assessing hazard vulnerability for the region that allows for some degree of quality control and assurance. The methodologies are briefly described and introduced here and are further illustrated throughout this section. For each hazard the HMPC considers "critical" addressed in this section, an effort was made to summarize vulnerability in part by an annualized loss estimate specific to that hazard.

QUANTITATIVE METHODOLOGY

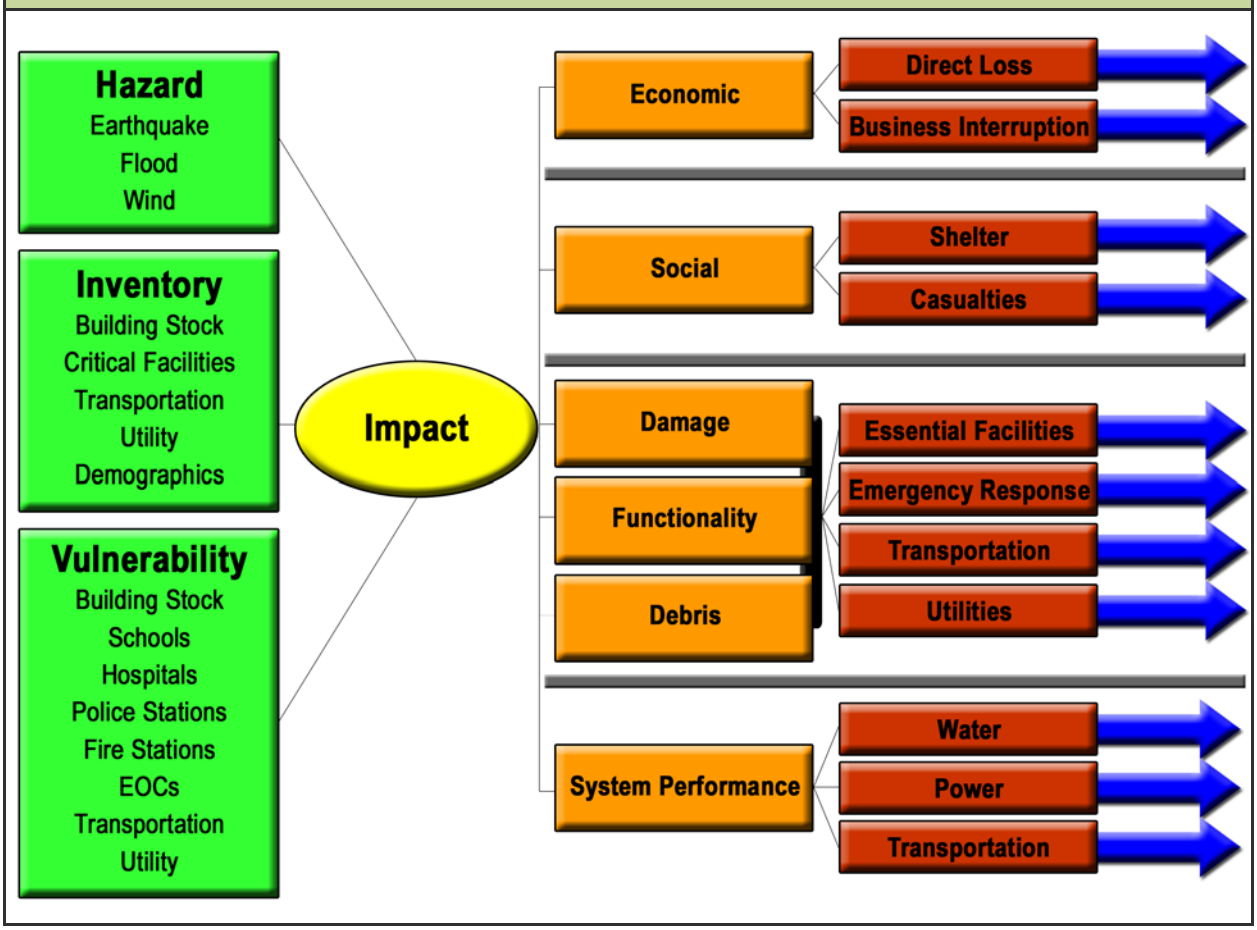
The quantitative assessment involved the use of Hazards U.S. Multi-Hazard (HAZUS-MH) software, a geographic information system (GIS)-based loss estimation tool available from the FEMA, along with a statistical risk assessment methodology for hazards outside the scope of HAZUS-MH. For the flood hazard, the quantitative assessment incorporates a detailed GIS-based approach using best available data. While an effort was made to include local assessor and structure elevation data in the HAZUS analysis, the software did not accommodate these inputs. When the plan is subsequently updated, a revised HAZUS Level 2 analysis will be conducted using the community's new flood hazard data (effective in 2015), which was not available as a HAZUS input during this plan update. When combined, the results of these vulnerability studies are used to form an assessment of potential hazard losses (in dollars) along with the identification of specific community assets that are deemed at-risk.

Explanation of HAZUS-MH and Statistical Risk Assessment Methodology

HAZUS-MH is FEMA's standardized loss estimation software package, built on an integrated GIS platform using a national inventory of baseline geographic data (including information on the region's general building stock and dollar exposure). Originally designed for the analysis of earthquake risks, FEMA expanded the program in 2003 to allow for the analysis of multiple hazards: namely the flood and wind (hurricane wind) hazards. By providing estimates on potential losses, HAZUS-MH facilitates quantitative comparisons between hazards and assists in the prioritization of hazard mitigation activities.

HAZUS-MH uses a statistical approach and mathematical modeling of risk to predict a hazard's frequency of occurrence and estimated impacts based on recorded or historic damage information. The HAZUS-MH risk assessment methodology is parametric, in that distinct hazard and inventory parameters—such as wind speed and building type—were modeled using the HAZUS-MH software to determine the impact on the built environment. **Figure 5.1** shows a conceptual model of HAZUS-MH methodology. More information on HAZUS-MH loss estimation methodology is available through FEMA at www.fema.gov/hazus.

FIGURE 5.1: CONCEPTUAL MODEL OF HAZUS^{MH} METHODOLOGY



Sources: FEMA

This risk assessment used HAZUS-MH to produce regional profiles and estimated losses for two of the hazards addressed in this section: flooding and hurricanes (wind damage only). For each of these hazards, HAZUS-MH was used to generate probabilistic "worst case scenario" events to show the extent of potential damages.

Explanation of GIS-based (Non-HAZUS^{MH}) Risk Assessment Methodology

For hazards outside the scope of HAZUS-MH, a statistical risk assessment methodology was designed and applied to generate potential loss estimates. The approach is based on the same principles as HAZUS-MH, but does not rely on readily available automated software. First, historical data are compiled for each hazard to relate occurrence patterns with existing hazard models. Statistical evaluations are then applied to develop damage functions that generate annualized losses.

The use of the statistical risk assessment methodology provides a determination of estimated annualized loss for tornadoes and severe thunderstorms. When possible, quantitative hazard loss estimates are compared with historical damage data as recorded through the National Climatic Data Center (NCDC) and other reliable data sources.

QUALITATIVE METHODOLOGY

The qualitative assessment relies less on technology and more on historical and anecdotal data, community input, and professional judgment regarding expected hazard impacts. The qualitative assessment completed for Poquoson is based on committee member dot voting to indicate their priorities for mitigation spending. The members present at the second planning meeting on April 29, 2014, were provided "dot mitigation grants" in the following amounts: 1 - $1,000,000 grant (yellow dot); 2 - $250,000 grants (blue dots); and 4 - $25,000 grants (red dots).

Each person was then tasked with determining how they would spend their mitigation dollars. The groups were reminded that projects must be cost-beneficial and that FEMA urges communities to "Prioritize mitigation actions based on level of risk a hazard poses to lives and property." Each person then placed their dot grants next to the hazards they considered a priority for spending. Results are shown in **Table 5.14** at the end of this section.

While the quantitative assessment focuses on using best available data, computer models and GIS technology, this qualitative ranking system relies more on historical data, local knowledge, and the general consensus of the HMPC. The results allow identified hazards to be ranked against one another.

SUMMARY

Using both the qualitative and quantitative analyses to evaluate the hazards that impact the City provided members of the HMPC with a dual-faceted review of the hazards. This allowed officials to recognize those hazards that may potentially be costly, but also to plan and prepare for hazards that may not cause much monetary damage, but could put a strain on the local resources needed to respond and recover.

All conclusions of the vulnerability assessment completed for the City are presented in "Conclusions on Hazard Risk" at the end of this section. Qualitative findings for each hazard are detailed in the hazard-by-hazard vulnerability assessment that follows, beginning with an overview of general asset inventory and exposure data for Poquoson.

OVERVIEW OF POQUOSON VULNERABILITY

GENERAL ASSET INVENTORY

The total dollar exposure of buildings within Poquoson is estimated to be $734,010,000. This figure is based on an estimated 4,327 residential, commercial, industrial and other buildings located throughout the City, derived from HAZUS-MH data (**Table 5.1**). The data provide an estimate of the aggregated replacement value for the City's assets.

TABLE 5.1: BUILDING INVENTORY IN POQUOSON

BUILDING TYPE	NUMBER OF BUILDINGS	BUILDING EXPOSURE (2006 dollars)
Residential	4,077	$641,974,000
Commercial	152	$54,832,000
Others	98	$37,204,000
Total	4,327	$734,010,000

Source: HAZUS-MH

ESSENTIAL FACILITIES

There is no universally accepted definition of what constitutes essential facilities and infrastructure, nor is one associated with FEMA and DMA 2000 planning requirements. However, for purposes of this Plan, essential facilities and infrastructure are identified as "*those facilities or systems whose incapacity or destruction would present an immediate threat to life, public health, and safety or have a debilitating effect on the economic security of the region*." This includes the following facilities and systems based on their high relative importance for the delivery of vital services, the protection of special populations, and other important functions in Poquoson:

- Emergency Operations Center (EOC)
- Police stations
- Fire stations
- Public schools designated as shelters
- Hazardous materials facilities
- Water (and wastewater) facilities
- Energy facilities (electric, oil and natural gas)
- Communication facilities

Essential facility data were acquired from the City's database of essential facilities. **Table 5.2** shows the results of a simple overlay analysis of the essential facilities that are located in the 100-year floodplain, 500-year floodplain and the Storm Surge Zone for a Category 3 hurricane. There are no essential facilities in the Coastal High Hazard Area (V Zone) in Poquoson.

TABLE 5.2: ESSENTIAL FACILITIES AND INFRASTRUCTURE LOCATED IN HAZARD AREAS			
FACILITY TYPE	100-YEAR FLOODPLAIN	500-YEAR FLOODPLAIN	STORM SURGE CATEGORY 3
Poquoson Fire and Rescue (Station #1)	✓ - elevated	✓	✓
Poquoson Fire and Rescue (Station #2)		✓ - elevated	✓
City of Poquoson Fire Department	✓	✓	✓
Poquoson Police Department	✓	✓	✓
City Hall		✓	✓
Poquoson Middle School	✓	✓	✓
Poquoson Primary School		✓	✓
Poquoson High School			✓
Poquoson Elementary School	✓ - elevated	✓	✓
Pump Stations (29)	✓ - elevated	✓	✓
Grinder Stations (18)	✓	✓	✓
Communication Towers (3)	✓	✓	✓
Parks Building (no longer City Archives)	✓	✓	✓
Public Works Department	✓	✓	✓

FLOODING

Annualized Loss Estimate: $17,027,000

The vulnerability assessment for the flood hazard includes the findings of the qualitative assessment conducted, an overview of NFIP statistics, repetitive flood loss properties (as defined and identified by the NFIP), estimates of potential losses, and future vulnerability and land use.

As described in detail in the *Hazard Identification and Analysis* section, the NCDC has records for 16 significant flood events in the past 21 years (1993 to 2013) for the City of Poquoson, but the total reported property damages are not available. Also discussed in the *Hazard Identification and Analysis* are historic storms such as Hurricanes Isabel, Floyd and the 1933 hurricane that each caused notable flooding in the City. Historically, the low-lying areas of Poquoson are vulnerable to the flood hazard and flood events occur on a frequent basis.

NFIP STATISTICS AND REPETITIVE LOSS PROPERTIES

As of February 2014, there were 3,266 flood insurance policies in place in Poquoson, providing a total of $858 million in coverage. Over 84% (or 2,755 policies) insure structures located within the 100-year floodplain. HRPDC estimates that there are 3,309 improved residential and commercial properties within the 100-year floodplain, meaning that an estimated 83% of structures subject to flooding by the 100-year flood have NFIP coverage.

Reducing the number of repetitive loss (RL) properties insured by the NFIP is a nationwide emphasis of FEMA. An RL property is an NFIP-insured property that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978. As of November 5, 2014, a total of 971 RL properties as defined by the NFIP have been identified within the City of Poquoson, but the City estimates that at least 274 of these properties have been mitigated and/or elevated to protect against flood damage. These 971 properties have experienced a total of $43 million individual insured losses for the structure and contents combined since 1985. The average total in payments per structure was $44,190. There are 966 residential properties and 5 non-residential properties on FEMA's RL list.

The NFIP also designates severe repetitive losses (SRL) in a community, meaning insurable structures with four or more claims payments of over $5,000 or two claims that exceed the value of the property. SRL for single family residences is defined as 4 or more claims, each for more than $5,000 and cumulatively more than $20,000. An analysis by VDEM in 2013 indicates that there are 35 SRLs, and 31 properties that, according to a FEMA formula, would provide the greatest savings to the National Flood Insurance Fund were they to be mitigated. **Table 5.3** provides summary details for Poquoson with regard to the community's NFIP policies, repetitive losses, and severe repetitive losses.

TABLE 5.3: NFIP STATISTICS AND REPETITIVE LOSS PROPERTIES			
		REPETITIVE FLOOD LOSSES	
NUMBER OF NFIP POLICIES	TOTAL COVERAGE	NUMBER OF PROPERTIES	VALUE OF LOSSES
2,567 (Jul 2003)			
2,596 (Jan 2004)			
3,110 (Dec 2008)			
3,266 (Feb 2014)	$858,722,700	971	$42,908,857
		SEVERE REPETITIVE FLOOD LOSSES	
		35	$3,586,963

Sources: NFIP, VDEM (2014)

An analysis by the City of repetitive loss 'areas' or groups of repetitive loss properties, combined with knowledge of repetitively flooded uninsured properties, did not reveal geographic concentrations but a consistent distribution across the City's 100-year floodplain. Thus the entire 100-year floodplain, as indicated on the FIRM (Figure 4.1), is considered a repetitive loss area for the purposes of this plan and for the community's CRS outreach. According to the HRPDC, there are 3,280 structures in the AE Zone, and 29 structures located in the V Zone and subject to coastal high hazards.

In Poquoson, residential structures in the repetitive loss area are primarily located on either side of the main roads that reach into the main peninsulas: Little Florida Road, Poquoson Avenue, Messick Road, Ren's Road, Brown's Neck Road, and Pasture Road. Poquoson Avenue and Messick Road were the first areas of the City to be developed. The City and property owners have worked together to elevate many of the repetitive losses in this area since Hurricane Isabel. Most of the structures west of Trinity Methodist Church are one-story brick ranchers on crawl space foundations. East of the church, many of the structures are older two-story structures built around the turn of the century (1900s). Further down Messick Road, there is some infill and a large recreational park. Residential structures toward the end of Messick Point tend to be recently elevated structures with two stories constructed after World War II. Many have newer additions. At the very end of the point, several water-dependent structures are situated near the water, including a marina. Ren's Road contains many large, elevated, newer, two-story brick homes. Along northern Wythe Creek Road and Pasture Road, the flooding during Hurricane Isabel was not as deep or damaging, flooding mostly garages and yards. Many of the homes are two-story structures, built in the mid- to late 20th century. Bayview Drive, which fronts the York River, has a collection of homes on higher ground. Sandy Bay, also on the York River, has several large homes which were elevated after Hurricane Isabel, and several newer elevated homes on the water.

ESTIMATES OF POTENTIAL LOSSES

HAZUS-MH was used to model the damage expected in association with the 100-year flood in the City; custom data from the City's databases was incorporated to the extent that the HRPDC was confident in the results. **Table 5.4** provides a detailed listing of the number of structures expected to be damaged, and the dollar losses expected.

TABLE 5.4: HAZUS-MH LOSS ESTIMATES FOR 100-YEAR FLOOD EVENT

Occupancy Type	Building Loss	Business Interruption or Relocation Costs	Total
Residential	$409,080,000	$920,000	$410,000,000
Commercial	$50,480,000	$490,000	$50,960,000
Industrial	$15,610,000	$0	$15,610,000
Other	$25,520,000	$360,000	$25,880,000
Total	$500,690,000 (81.6% of total)	$1,760,000	$502,450,000

Sources: HAZUS-MH

Using the 2009 plan's detailed analysis of damages avoided as a result of mitigated or elevated structures, and subtracting that total from the HAZUS estimate of damages, an updated analysis indicates that an estimated $100 million in damages are avoided in a 100-year flood scenario as a result of structures that are known to be elevated. The revised estimate for damages during a 100-year flood in Poquoson is $402,426,500. FEMA's HAZUS average annualized loss viewer at http://fema.maps.arcgis.com/home/ provides an average annualized flood loss estimate of $17,027,000, and an average annualized loss per capita in Poquoson of $1,401.

FUTURE VULNERABILITY AND LAND USE

Future vulnerability will be determined, in part, by local action. Flood hazard and SLOSH maps have been developed to indicate what areas of the City are most vulnerable to these hazards. All of the SLOSH maps and flood hazard maps for Poquoson have been updated since the initial hazard mitigation plan was developed and can be used to help guide development away from hazardous areas and the City has begun to make land available for development outside of flood hazard areas. Local officials are responsible for enforcing local floodplain management regulations, flood damage prevention ordinances, and other forms of development policies that restrict new development in flood hazard areas.

HURRICANES

Annualized Loss Estimate: $1,262,013

Historical evidence shows that Poquoson is vulnerable to damaging hurricane and tropical storm-force winds. As discussed in detail in the *Hazard Identification and Analysis* section, 34 hurricanes and tropical storms have passed within 100 miles of the City since 1970. This equates to a 79 percent annual chance that a storm will impact the region.

ESTIMATES OF POTENTIAL LOSSES

Detailed loss estimates for the wind damage associated with the hurricane and tropical storm hazard were developed based on probabilistic scenarios using HAZUS-MH (Level 1 analysis). **Table 5.5** shows estimates of potential building damage for the 100- and 500-year return periods, as well as annualized losses. In summary, Poquoson may be susceptible to an estimated total of approximately $4.7 million in building damages from a 100-year wind event, increasing up to $25.2 million for a 500-year event. Annualized losses are estimated to be approximately $1.3 million. These figures are based on "worst-case" scenarios.

TABLE 5.5: ESTIMATES OF POTENTIAL BUILDING DAMAGE – WIND ONLY

OCCUPANCY	DAMAGE TYPE	100-YEAR EVENT 2006 dollars	500-YEAR EVENT 2006 dollars
Residential	Property	$4,260,950	$20,499,810
	Business Interruption	$195,900	$2,445,110
Commercial	Property	$78,250	$829,940
	Business Interruption	$49,970	$446,480
Industrial	Property	$25,060	$377,420
	Business Interruption	$1,500	$31,370
Other	Property	$34,150	$356,760
	Business Interruption	$17,830	$206,600
TOTAL		**$4,663,610**	**$25,193,490**
ANNUALIZED LOSSES		**$1,262,013**	

Source: HAZUS-MH

HAZUS-MH was also used to produce building damage estimates based on percentage of damage (by damage state) for the 100- and 500-year return periods (**Table 5.6**). For the 100-year event, 258 buildings are expected to experience minor or moderate damage, while no structures are expected to be severely damaged or destroyed. For the 500-year event, 1,290 buildings are expected to suffer minor damage or moderate damage, while 38 buildings are expected to be severely damaged or destroyed.

TABLE 5.6: ESTIMATE OF POTENTIAL NUMBER OF BUILDINGS DAMAGED, BY DAMAGE STATE[1]

OCCUPANCY TYPE	MINOR		MODERATE		SEVERE		DESTRUCTION	
	100-YR	500-YR	100-YR	500-YR	100-YR	500-YR	100-YR	500-YR
Residential	233	1,013	14	207	0	17	0	18
Commercial	6	29	1	13	0	2	0	0
Industrial	2	10	0	5	0	1	0	0
Other	2	10	0	3	0	0	0	0
TOTAL	**243**	**1,062**	**15**	**228**	**0**	**20**	**0**	**18**

Source: HAZUS-MH

FUTURE VULNERABILITY AND LAND USE

All future structures built in Poquoson will likely be exposed to hurricane and tropical storm-force winds and may also experience damage not accounted for in the loss estimates presented in this section. Wind retrofitting is especially important for publicly owned structures for maintaining continuity of operations.

[1] For detailed definitions of the four damage states, please refer to the *HAZUS-MH User Manual* for the Hurricane Model.

TORNADO

Annualized Loss Estimate: $142,857

Historical evidence shows that the City of Poquoson is vulnerable to tornado activity, which is often associated with other severe weather events such as thunderstorm or tropical cyclone activity.

ESTIMATES OF POTENTIAL LOSSES

Because it cannot be predicted where a tornado may strike, it is not possible to map geographic boundaries for this hazard or produce detailed loss estimates. Therefore, the total dollar exposure figure of $734,010,000 for all buildings and contents within Poquoson is considered to be exposed and could potentially be impacted on some level by the tornado hazard.

Low-intensity tornadoes may not completely destroy a well-constructed building, although even the most well-constructed buildings are vulnerable to the effects of a more intense (F2 or higher) tornado. The statewide building code provides a reasonable level of protection for newly constructed buildings, while structures built before the code went into effect are most vulnerable to damage. Poquoson has 1,491 structures, assessed at more than $1,000, and built before 1973 when Virginia adopted the Uniform Statewide Building Code. Total improvement value for those structures is $177,122,000, and only 31 of those structures have half or full basements, according to the City's tax records. According to the City's most recent Comprehensive Plan, there were 232 mobile home units in the City in 2000, representing 5.4% of the housing stock, and there was a steady increase in the number of mobiles homes developed between 1970 and 2000.

Based on historic property damages (including York County and Hampton) for the 63 year period between 1950 and 2013, an annualized loss estimate of $142,857 and annual probability of 4.5% percent were generated for the tornado hazard.

FUTURE VULNERABILITY AND LAND USE

All future structures built in the City of Poquoson are likely to be exposed to the tornado hazard and may experience damage not accounted for in the estimated losses presented in this section.

SEVERE THUNDERSTORMS

Annualized Loss Estimate: $12,176

Historical evidence shows that the City of Poquoson is vulnerable to severe thunderstorm activity.

ESTIMATES OF POTENTIAL LOSSES

Because it cannot be predicted where severe thunderstorms and hail may occur, it is not possible to map geographic boundaries for this hazard or produce detailed loss estimates. Therefore, the total dollar exposure figure of $734,010,000 for all buildings and contents within the planning area is considered to be exposed and could potentially be impacted on some level by this hazard. Based on historic property damages for the past 17 years in Poquoson and York County (1996 to 2013), an annualized loss estimate of $12,176 was generated for severe thunderstorm. The area is likely to experience an average of 3 severe thunderstorms annually.

FUTURE VULNERABILITY AND LAND USE

All future structures built in the City of Poquoson will likely be exposed to severe thunderstorms and may experience damage not accounted for in the estimated losses presented in this section.

SEA LEVEL RISE

Annualized Loss Estimate: **$23 million to $27 million (1 foot rise by 2100)**
$34 million to $51 million (3 foot rise by 2100)

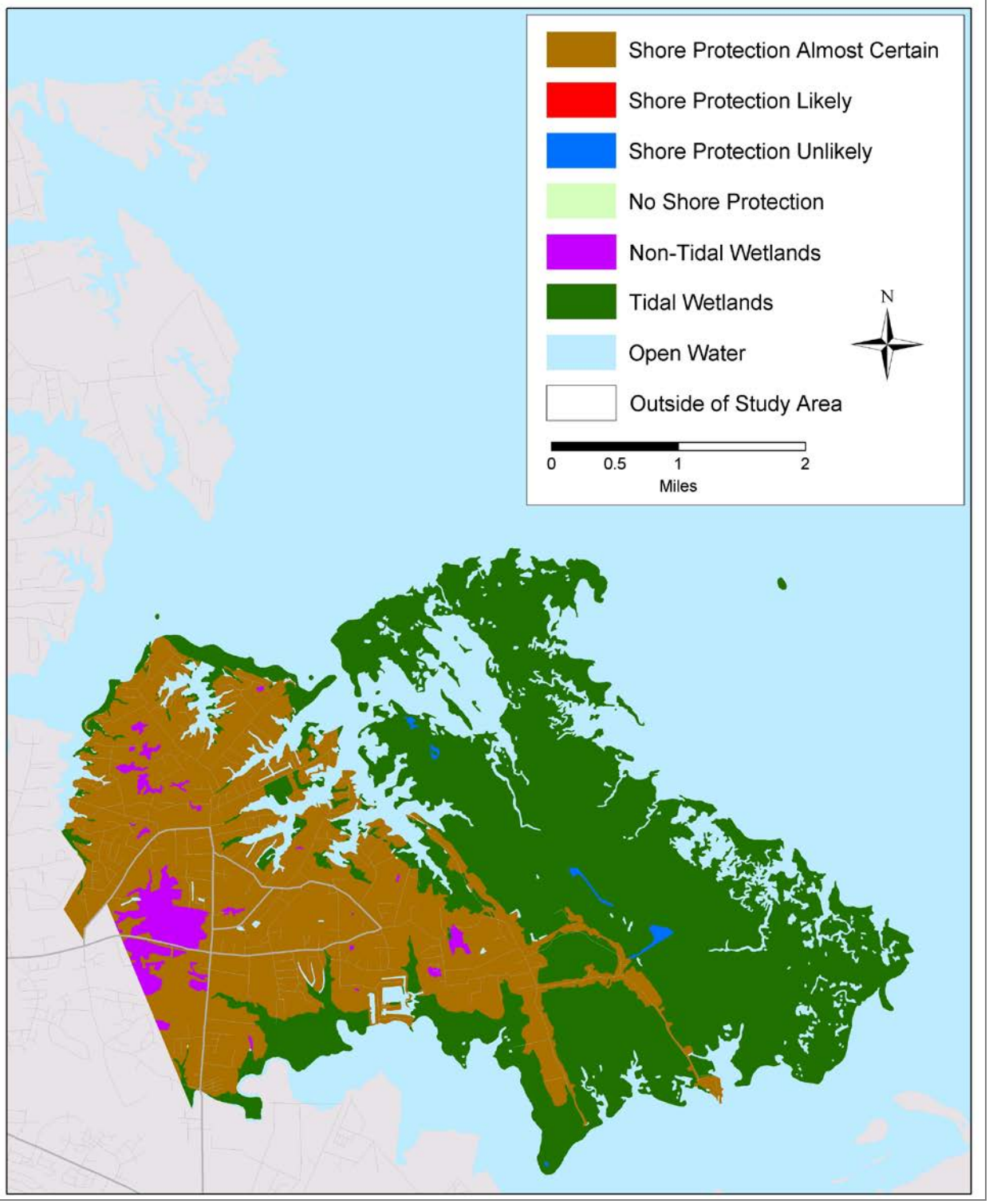
Historical evidence shows that the Hampton Roads region, including Poquoson, is already experiencing some degree of sea level rise. As discussed in detail in the *Hazard Identification and Analysis* section, data from Sewells Point at the Norfolk Naval Base indicate that sea level in the past 70 years has risen at a rate of approximately 4.44 millimeters per year. Although there is no guarantee that this rate will remain constant in the future, the rate of land subsidence is expected to remain somewhat steady, and that rate is a major component of the relative sea level rise experienced in Hampton Roads.

ESTIMATES OF POTENTIAL LOSSES

Detailed economic loss estimates for sea level rise and land subsidence are extremely difficult to develop because the response of individual property owners to sea level rise is inherently unpredictable and variable over both time and space. The lack of detailed elevation information for the entire building inventory in Poquoson hinders efforts to calculate detailed future average annual flood damages using increasing 100-year flood elevations. For example, calculations of sea level rise losses may be supported by the argument that areas below a certain elevation will be permanently inundated and evacuated; however, regional experience over the past 50 years alone indicates that shoreline protection measures will be reinforced to protect threatened structures and structures and land will be elevated. These measures will protect infrastructure and private property but hinder the ability of wetlands and shorelines to adjust naturally as the water level rises. So models based on permanent inundation dramatically overstate losses.

A recent project conducted by VIMS created maps depicting the likelihood of shore protection along the Virginia coast as part of a nationwide study reporting on the development of coastal land most vulnerable to rising sea level (*Environmental Research Letters*, 2009). The purpose of the project was to motivate dialogues about the appropriate measures to rising sea level by creating maps that depict the likely response given current practices and policies. The maps divide coastal low lands in Poquoson into four categories: developed (shore protection almost certain), intermediate (shore protection likely), undeveloped (shore protection unlikely), and conservation (no shore protection) (**Figure 5.2**).

FIGURE 5.2: SEA LEVEL RISE PLANNING MAP



Source: Environmental Research Letters, 2009

One methodology for estimating average annual losses expected from sea level rise is supported by FEMA. In 1991, FEMA issued a report to Congress documenting the estimated impact of relative sea level rise on the Flood Insurance Rate Maps. The agency estimates that existing development in the coastal zone would experience a 36% to 58% increase in annual flood damages for a 1-foot rise in sea level by 2100, and a 102% to 200% increase resulting from a 3-foot rise by 2100. Based on this estimate, average annual flood damages from storm surge could be expected to increase to between $23 million and $27 million under a 1-foot rise scenario, and to between $34 million to $51 million under the 3-foot rise scenario.

However, the FEMA study assumes that the current elevation distribution of post-FIRM construction relative to the 100-year flood elevation holds steady for future construction, when in fact many communities in the region are implementing freeboard requirements, such as the one foot of freeboard now required in Poquoson. The obsolescence of buildings is not accounted for in the FEMA predictions; realistically, the number of pre-FIRM and post-FIRM buildings built to outmoded floodplain management standards should decline with time. Replacement structures must be in compliance with NFIP regulations in effect at the time of their construction. Thus, loss expectations based on the FEMA formula are likely overestimated, but provide some basis for decision making in this planning environment.

FUTURE VULNERABILITY AND LAND USE

In *Vulnerability of Hampton Roads, Virginia to Storm-Surge Flooding and Sea-Level Rise*, Kleinosky, Yarnal and Fisher (*Natural Hazards,* 2006) compare data on the location of socially and economically vulnerable populations with storm surge flood risk exposure in order to map areas with the highest social vulnerability to storm surge in the future. The study premise is that sea level rise will cause an increase in the land area susceptible to storm surge flooding. Results indicate uniform social vulnerability throughout Poquoson. The article and maps are copyright-protected and cannot be provided herein, but are available online at: http://www.cara.psu.edu/about/publications/2006-Kleinosky%20et%20al.pdf.

Figure 5.3 contains the results of the same case study regarding physical vulnerability of the Hampton Roads region to sea level rise. The map used SLOSH output data and a digital elevation model to create a visual representation of vulnerability as it changes over the region.

The Hampton Roads Planning District Commission, in a 2012 report entitled *Climate Change in Hampton Roads, Phase III: Sea Level Rise in Hampton Roads, Virginia,* compiled maps and data to document those areas of the City that are exposed to one meter of sea level rise above spring high tide **(Figure 5.4)**. **Table 5.7** summarizes the report's findings, which highlight over $518 million of vulnerability or exposure in the built environment. However, there are several important caveats that must be considered when reviewing Figure 5.4 and Table 5.7:

1. The elevation data used in the analysis, while available for the whole region, are relatively imprecise (30-meter pixels) and uncertain, which limits usefulness at a small scale. The arbitrary zero elevation (spring high tide) and the low degree of vertical accuracy may lead to analysis that likely overstates the actual exposure.
2. The analysis is based solely on elevation using a static shoreline, and does not account for any anticipated adaptation measures such as flood protection measures or shoreline stabilization measures, or shoreline changes such as erosion.
3. Exposure calculations include all properties that may be exposed to flooding, even if improvements and inhabitants are elsewhere on the parcel, and even if the inundation is not permanent. This is important in Poquoson where many waterfront lots stretch from road to river, with improvements situated near the road.
4. The decennial Census data used for the population impacts are amalgamated and are not provided for specific locations (points).
5. All of the roads are assumed to be at grade and the analysis does not account for the widths of roads.

6. The Poquoson analysis includes protected lands at Plum Tree Island despite the fact that the land is Federally-owned and operated. The Plum Tree Island Wildlife Refuge encompasses approximately 5.1 square miles.

Because of these limitations, the results of the HRPDC analysis should be used as estimates only for general planning purposes and not as predictions of actual population, property, and resources vulnerable to sea level rise. The goal in this analysis is to provide a general idea of which areas are vulnerable to sea level rise, not a specific value for property or population that would be useful for a project-specific cost-benefit analysis or property-specific planning decision (such as a rezoning of a particular property).

TABLE 5.7: EXPOSURE TO ONE METER SEA LEVEL RISE ABOVE SPRING HIGH TIDE (MIDDLE ESTIMATE)

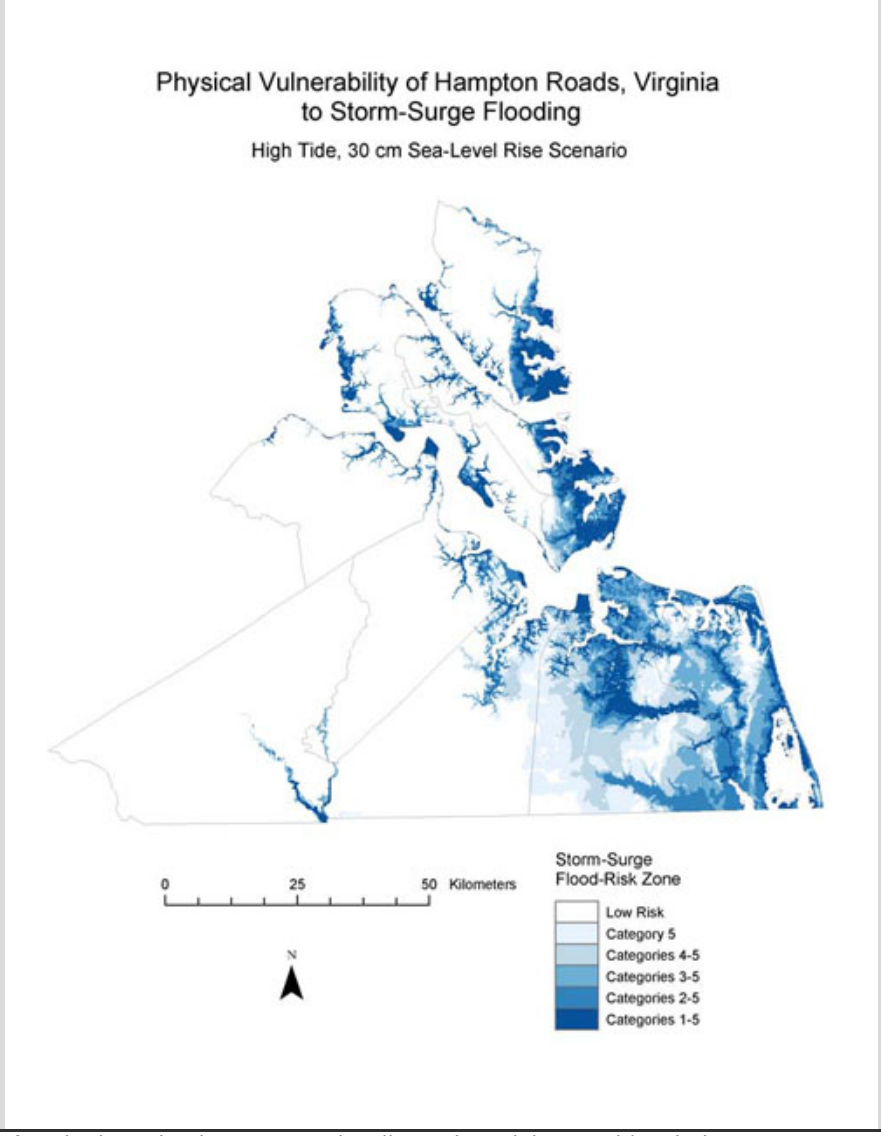
Land Area*	11.8 square miles**
Population*	6,770
Housing Units*	2,597
Number of Parcels*	3,330
Improvement Value of Parcels* (residential)	$517 million
Roads (total miles)	38.7 miles
Businesses*	115
Total Value of Parcels* (commercial)	$1.03 million
Protected Lands	2,213 acres (includes Federal land at Plum Tree Island)

* Includes elements lost to sea level rise, and properties that would abut or be partially inundated during seasonal high tide.
** City staff estimate that approximately 70% of this land area is wetlands or otherwise uninhabited land.

Source: *Climate Change in Hampton Roads, Phase III: Sea Level Rise in Hampton Roads, Virginia.* HRPDC, July 2012.

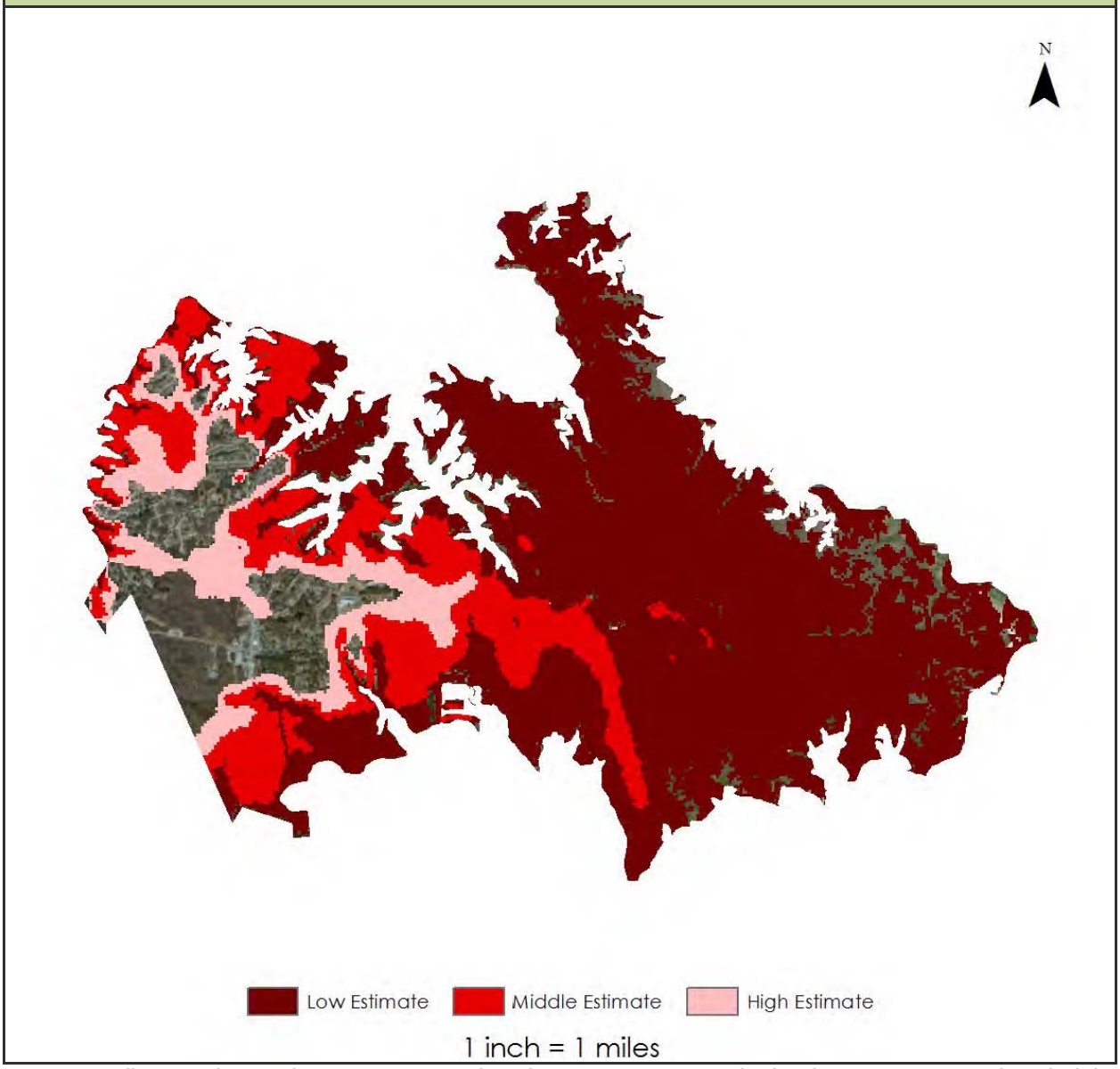
In an effort to address the deficiencies of existing studies of the future impacts of sea level rise, Poquoson has recently partnered with NASA to develop and implement the NASA Storm Surge Prediction Tool, which is a real-time mapping GIS program. City-wide maps of predicted storm surge elevations can be generated at the click of a button, which is especially useful in pre- and post-flood damage assessment. Sea level rise or flood water surface elevations for various scenarios can be readily mapped to study future conditions. Additional work is needed to analyze the results in conjunction with assessor's data, structure elevation data, predicted shoreline and flood protection responses and detailed demographic data to create a more realistic picture of exposure to sea level rise. **Figures 5.5 through 5.9** are maps of the areas predicted to be exposed to 0.5 meter sea level rise above five different starting, or zero, elevations for Poquoson generated by the NASA Storm Surge Prediction Tool.

FIGURE 5.3: PHYSICAL VULNERABILITY OF HAMPTON ROADS TO 30 CM SEA LEVEL RISE



Source: Consortium for Atlantic Regional Assessment, http://ccrm.vims.edu/cara_web/results.htm.

FIGURE 5.4: AREAS EXPOSED TO ONE METER OF SEA LEVEL RISE ABOVE SPRING HIGH TIDE, POQUOSON, VIRGINIA

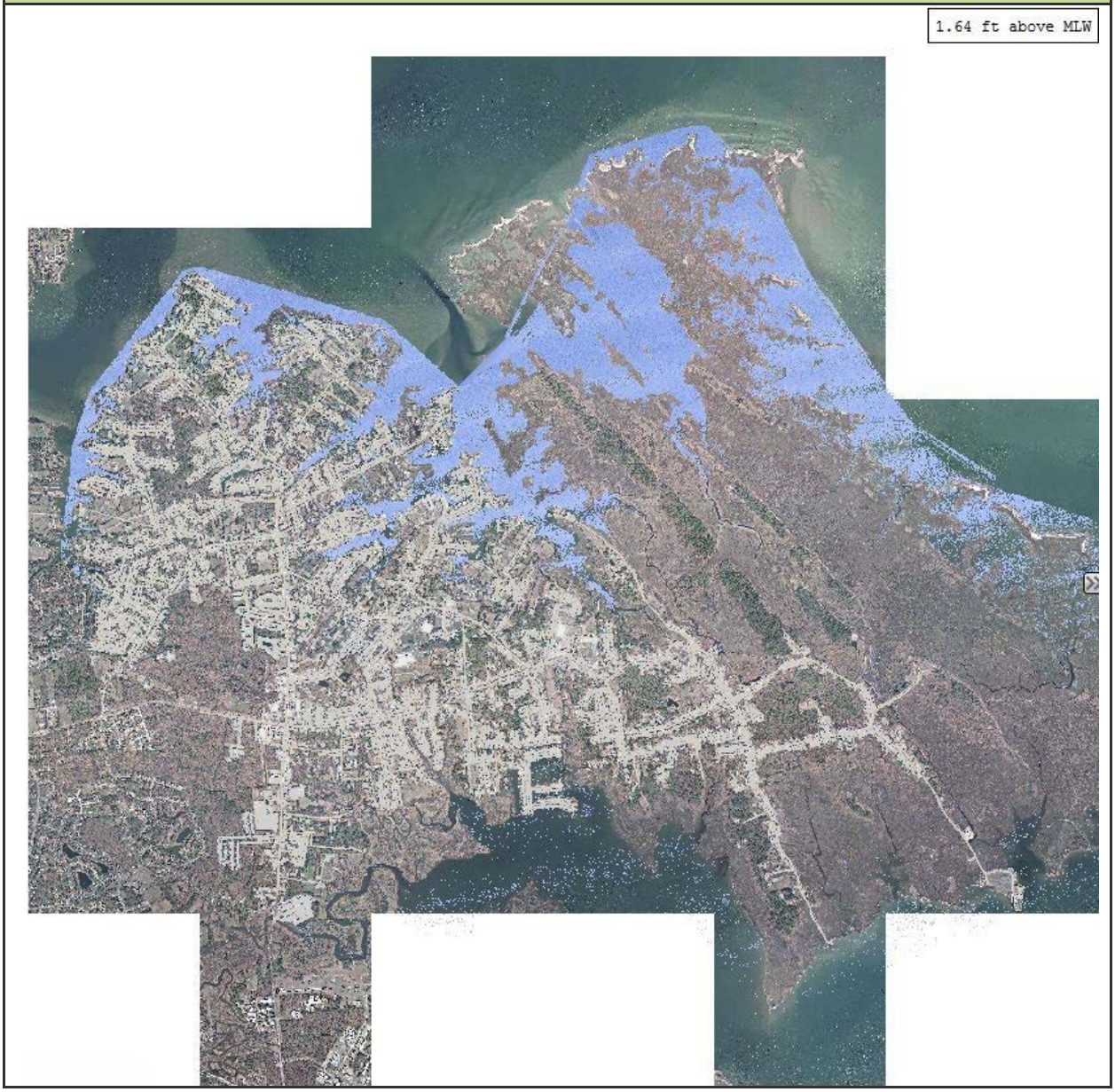


Source: *Climate Change in Hampton Roads, Phase III: Sea Level Rise in Hampton Roads, Virginia.* HRPDC, July 2012.

FIGURE 5.5: ESTIMATED IMPACTS OF 0.5 METERS SEA LEVEL RISE AT MEAN LOWER LOW WATER (MLLW)

Source: NASA/GIS Storm Surge Prediction Tool, 2014

FIGURE 5.6: ESTIMATED IMPACTS OF 0.5 METERS SEA LEVEL RISE AT MEAN LOW WATER (MLW)

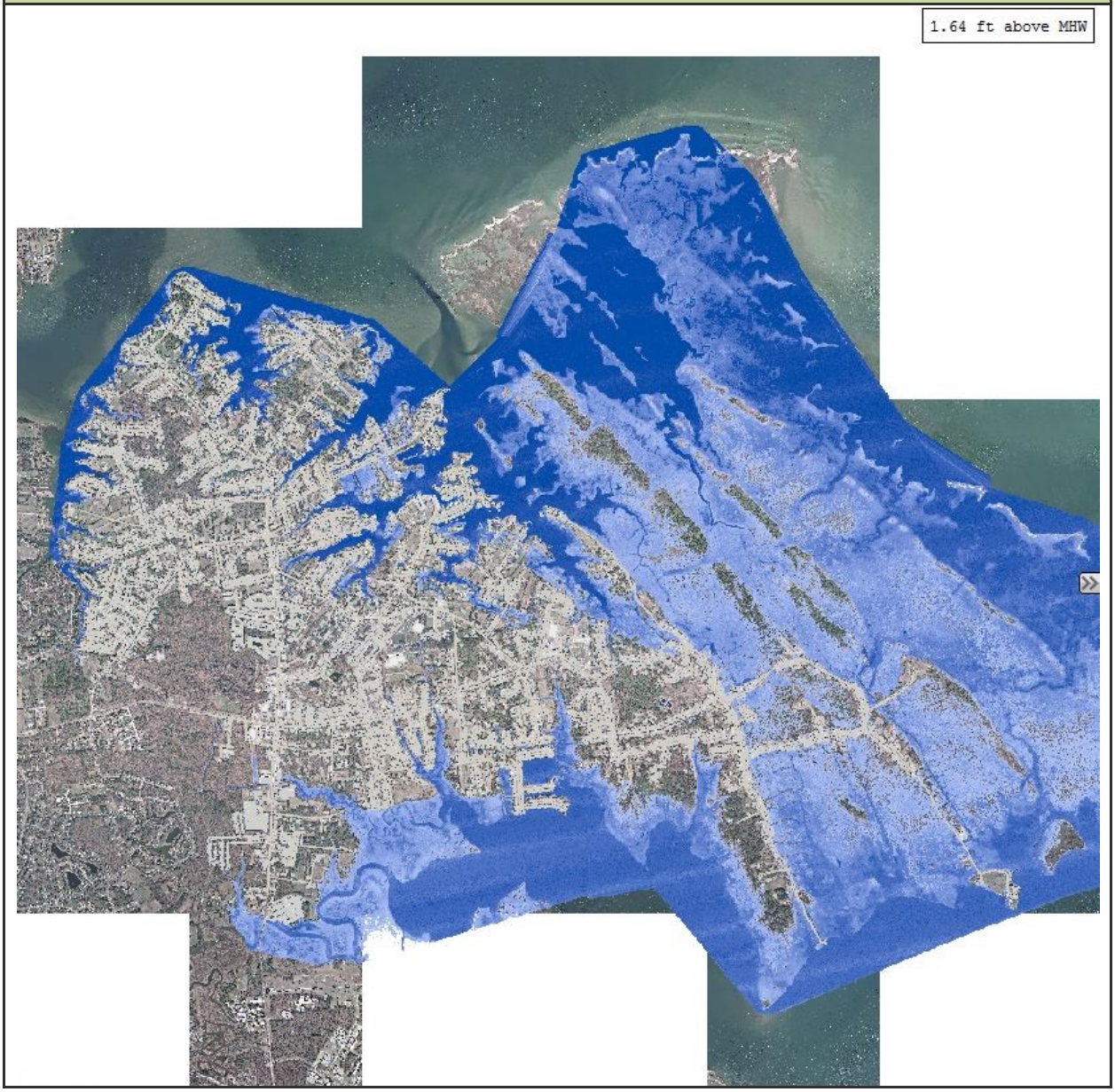


Source: NASA/GIS Storm Surge Prediction Tool, 2014

FIGURE 5.7: ESTIMATED IMPACTS OF 0.5 METERS SEA LEVEL RISE AT MEAN SEA LEVEL (MSL)

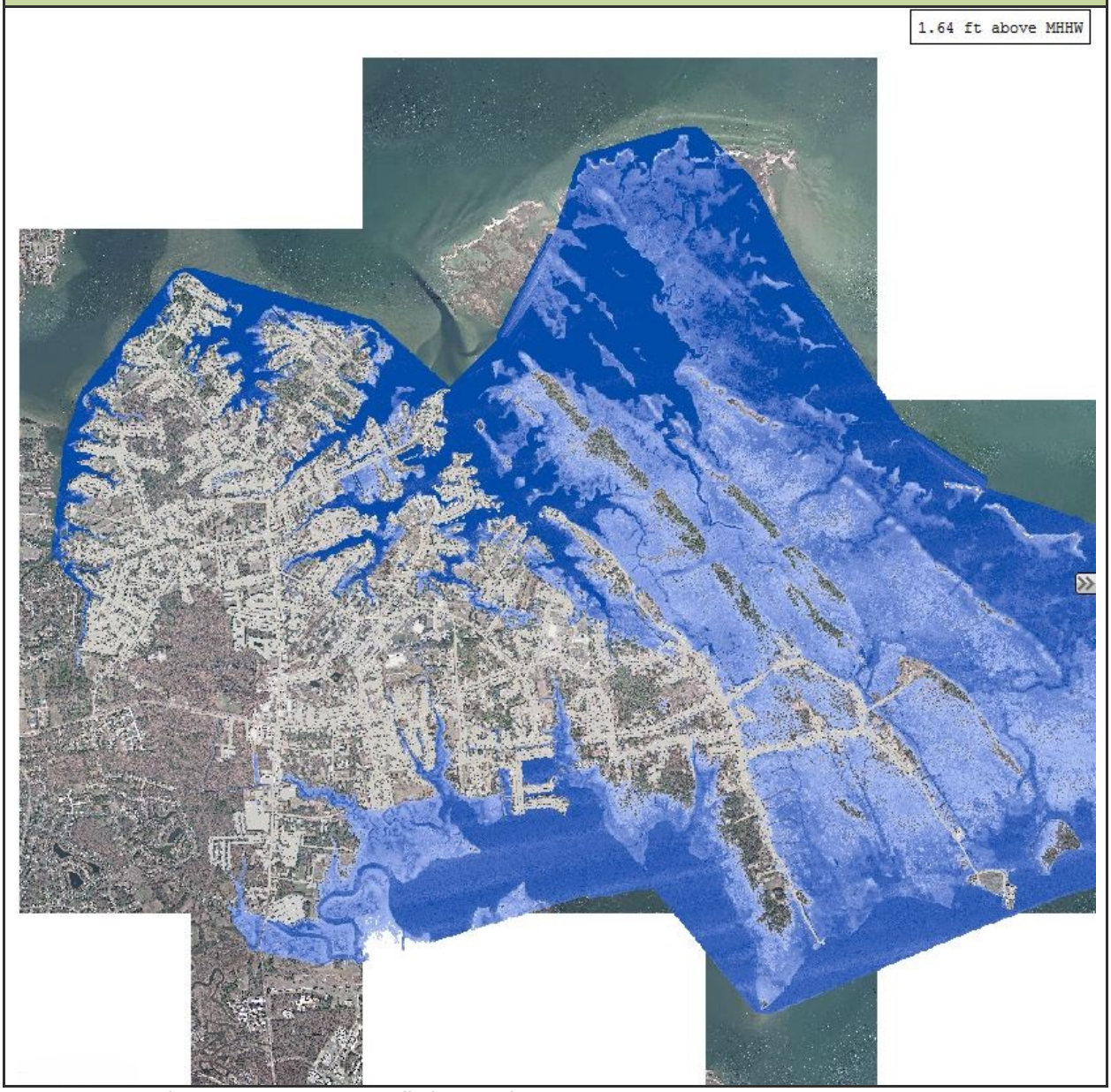
Source: NASA/GIS Storm Surge Prediction Tool, 2014

FIGURE 5.8: ESTIMATED IMPACTS OF 0.5 METERS SEA LEVEL RISE AT MEAN HIGH WATER (MHW)



Source: NASA/GIS Storm Surge Prediction Tool, 2014

FIGURE 5.9: ESTIMATED IMPACTS OF 0.5 METERS SEA LEVEL RISE AT MEAN HIGHER HIGH WATER (MHHW)



Source: NASA/GIS Storm Surge Prediction Tool, 2014

WINTER STORMS

Annualized Loss Estimate: Undetermined

Historical evidence shows that the City of Poquoson is vulnerable to winter storm activity and the wind-related impacts of nor'easters, including heavy snow, ice, extreme cold, freezing rain, and sleet.

ESTIMATES OF POTENTIAL LOSSES

Because winter storms typically affect large areas beyond county and municipal boundaries, it is not possible to map geographic locations at specific risk from this hazard or produce detailed loss estimates. Therefore, the total dollar exposure figure of $734,010,000 for all buildings and contents within the City is considered to be exposed and could potentially be impacted by the winter storm hazard. There have been approximately 10 severe winter storms since 1960, which equates to a 19% annual chance of a *severe* winter storm.

Potential losses may be inflated by factors such as the costs associated with the removal of snow from roadways, debris clean-up, indirect losses from power outages, and the tendency of the NCDC data to lump metropolitan regional damages together.

Because winter weather impacts the City uniformly, no winter storm and nor'easter vulnerability maps have been created. Structures built prior to Virginia's statewide building code are somewhat more vulnerable to damage from severe winter storms where snow and ice may accumulate on rooftops, especially if snow loads were not accounted for in the original structure design. Manufactured or mobile homes are also very susceptible to damage of roof collapse or additional damage due to their design features. Poquoson has 1,491 structures, assessed at more than $1,000, and built before 1973 when Virginia adopted the Uniform Statewide Building Code. Total improvement value for those structures is $177,122,000. According to the City's most recent Comprehensive Plan, there were 232 mobile home units in the City in 2000, representing 5.4% of the housing stock, and there was a steady increase in the number of mobiles homes developed between 1970 and 2000.For additional information on flooding vulnerability associated with nor'easters, refer to the Flooding subsection above.

FUTURE VULNERABILITY AND LAND USE

Because of the geographic location, all future structures built in the City of Poquoson are likely to be exposed to winter storms and nor'easters and may experience damage.

MOSQUITO BORNE DISEASES

Annualized Loss Estimate: Negligible (Less than $1,000)

ESTIMATES OF POTENTIAL LOSSES

An outbreak of a Mosquito Borne Disease may burden regional medical facilities in terms of capacity for treatment, and may burden the City personnel charged with mosquito abatement and control responsibilities, but would not be expected to impact the built environment or community infrastructure in any way.

SOCIAL VULNERABILITY

Eastern Equine Encephalitis: Residents of and visitors to areas with an established presence of the virus and people who engage in outdoor work and recreational activities are at increased risk of getting the diseases. Persons over age 50 and younger than age 15 seem to be at greatest risk for developing severe disease after outbreaks begin. (Virginia Department of Health, 2011)

West Nile Virus: Anyone can get WNV infection if bitten by an infected mosquito; however, even in areas where transmission of WNV is active, less than 1% of mosquitoes are likely to be infected. Additionally, less than 1 percent of people bitten by an infected mosquito will become seriously ill. People who are over age 50 are at greater risk of severe illness. (Virginia Department of Health, 2011)

FUTURE VULNERABILITY AND LAND USE

Future land use is expected to have less impact on future vulnerability than the protection of public health through dissemination of proper individual protection measures and emergency notification with regard to mosquito borne disease outbreaks.

EARTHQUAKE

Annualized Loss Estimate: $2,860

The annual probability of an earthquake epicenter within 65 miles of Poquoson is estimated at less than 1% based on historical data. While the probability of an earthquake occurrence is relatively low, moderate losses, should a significant earthquake event occur, are possible.

ESTIMATES OF POTENTIAL LOSSES

Table 5.8 provides generalized building damage estimates by jurisdiction for the 100-, 500- and 1,000-year return periods as well as annualized losses based on probabilistic scenarios using HAZUS-MH. The annualized building damage estimate for the earthquake hazard is $2,860, and in that estimate residential properties suffer more than 79 percent of the total damage.

TABLE 5.8: ESTIMATES OF POTENTIAL BUILDING DAMAGE

BUILDING OCCUPANCY TYPE	100-YEAR EVENT	500-YEAR EVENT	1,000-YEAR EVENT	ANNUALIZED
Residential	$0	$184,520	$613,940	$2,280
Commercial	$0	$33,010	$107,510	$410
Industrial	$0	$2,930	$11,800	$50
Other	$0	$9,120	$30,270	$120
TOTAL	**$0**	**$229,580**	**$763,520**	**$2,860**

Source: HAZUS-MH

HAZUS-MH (Level 1 analysis) was also used to produce building damage estimates based on percentage of damage (by damage state) for the 500-, and 1,000-year return periods (**Table 5.9**). According to the HAZUS-MH model assumptions, there should be no building damage from 100-year earthquake event.

TABLE 5.9: ESTIMATES OF POTENTIAL BUILDINGS DAMAGED BY DAMAGE STATE[2]							
SLIGHT		MODERATE		EXTENSIVE		COMPLETE	
500-YR	1,000-YR	500-YR	1,000-YR	500-YR	1,000-YR	500-YR	1,000-YR
29	83	7	20	1	2	0	0

Source: HAZUS-MH

FUTURE VULNERABILITY AND LAND USE

All future structures built in Poquoson will be vulnerable to seismic events to a limited degree, and may also experience damage not accounted for in the estimated losses presented in this section.

[2] For more detailed description of the four damage states, please refer to the HAZUS-MH User Manual for the Earthquake Model.

DROUGHT

Annualized Loss Estimate: Undetermined

Droughts can impact natural systems and the ability of cities, towns and neighborhoods to function effectively. Specific effects may include a reduction in the production of food grains and other crops, the size and quality of livestock and fish, available forage for livestock and wildlife, and the availability of water supplies needed by communities and industry. As evidenced by previous occurrences, the City of Poquoson is vulnerable to the drought hazard, with the primary damage a result of limited water supplies for recreation and related activities.

ESTIMATES OF POTENTIAL LOSSES

While drought impacts agricultural, recreational, and manufacturing industries, estimating losses to the built environment is difficult because drought causes little documented physical damage to the built environment. Annualized damages based on changes in total harvested cropland may not accurately represent drought impacts because losses in harvested cropland or the market value of crops cannot be attributed entirely to drought or other weather-related conditions, especially in rural areas that are being developed. Cropland is not a prevailing land use in the City. Data on drought damages from the NCDC are incomplete and, when available, apply to a very large area including jurisdictions outside of the planning region. As a result, the estimation of annualized damages due to drought is undetermined.

FUTURE VULNERABILITY AND LAND USE

Future land use changes may require additional water supply capacity, but otherwise are not expected to influence the City's vulnerability to drought.

WILDFIRE

Annualized Loss Estimate: Undetermined

As stated in Section 4, The City of Poquoson Fire Department reported 425 wildfires between 1984 and February 2014. Poquoson's biggest concern about wildfire centers on vegetation known as *Phragmites australis.* Phragmites is an invasive plant species because it moves into areas that are inhabited by other types of vegetation and eventually takes over as the dominant species. The high productivity and the tendency for the previous year's growth to remain interspersed among the current year's growth make it a wildfire danger. The combustibility of this plant and its tendency to thrive near houses and community infrastructure is a formidable fire risk.

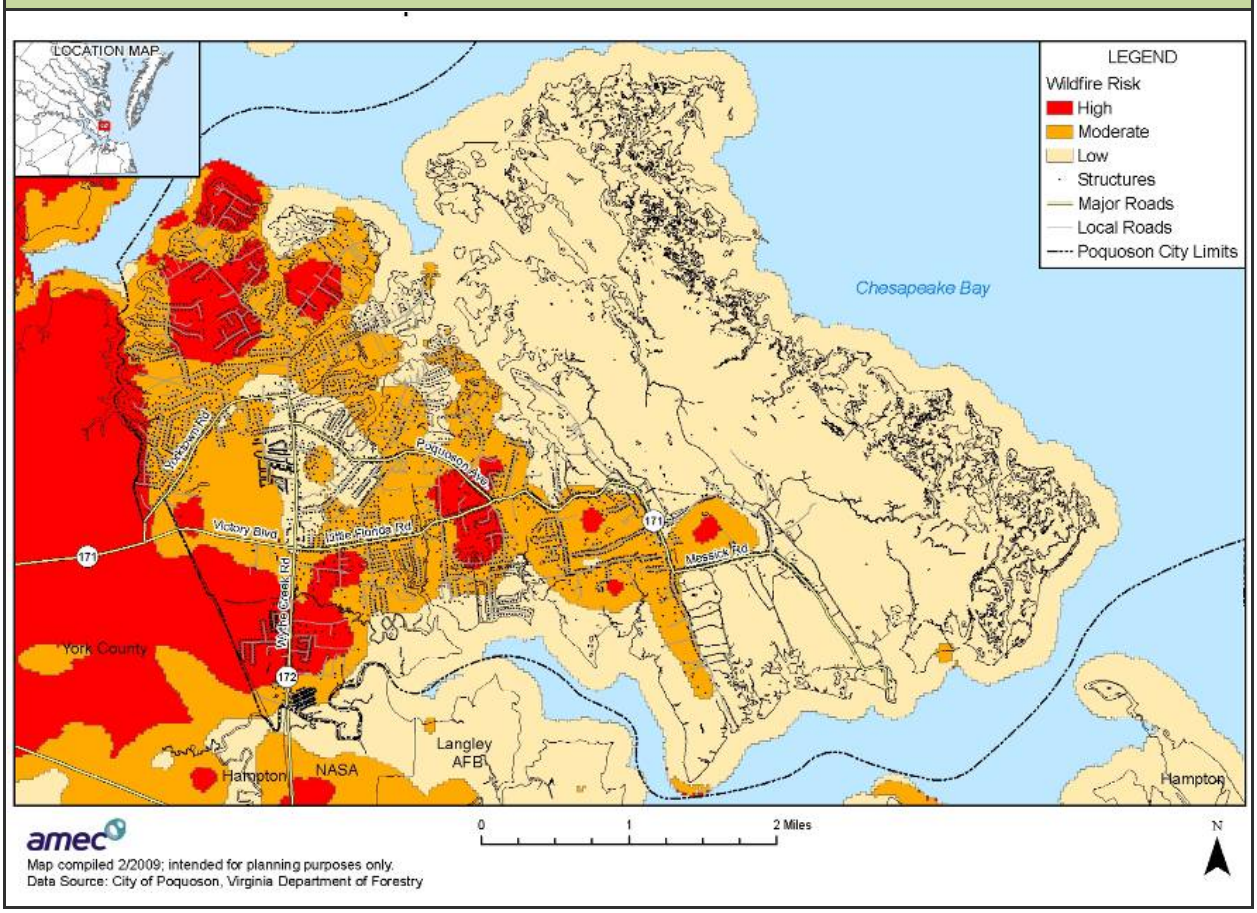
The Virginia Department of Forestry (VDOF) has provided information on identifying high-risk wildfire areas. Their Fire Risk Assessment Map was designed to help communities determine areas with the greatest vulnerability to wildfire. This map was used in a GIS environment during the 2009 update to refine the 2004 vulnerability assessment.

The Fire Risk Assessment Map, **Figure 5.10**, delineates the aerial extent of wildfire vulnerability within the City of Poquoson, based on VDOF fire risk assessment data. The risk area boundaries are based on a model of fire risk that incorporated metrics for land use, population density, slope, land cover and proximity to roads. Given the City's low flat topography, slope does not contribute significantly to the City's fire risk. Land use, land cover and proximity to City roads are the main influences on the fire risk.

Land Cover data reveals the type of wildfire fuels that are likely to be found in different areas. Fuel types, such as grasslands, ignite easily and burn with great intensity, facilitating greater rates of wildfire advancement. Thus, recognition of these land cover types and size are essential in determining wildfire risk. However, both woody wetlands and emergent wetlands were rated as low-risk fuels in the VDOF model used to map the wildfire risk, so Figure 5.10 does not adequately account for wildfire risk due specifically to Phragmites. The resolution of the data and the scale of the modeling have limitations for determining risk to a small area such as Poquoson. The lack of detailed fuel models is commonly recognized as the most prominent limitation of wildfire risk modeling (VDOF, 2009).

Distance of tree line or brush to roads is also included in the wildfire risk analysis to capture the human/wildfire causal relationship. Travel corridors increase the probability of human presence across a landscape, thereby increasing the probability of wildfire ignition. As such, areas closer to roads have a higher ignition probability.

FIGURE 5.10: WILDFIRE RISK ASSESSMENT MAP



An example of urbanization lowering the risk of wildfire can be seen in the central portion of the City, near the intersection of Little Florida Road and Wythe Creek Road. This is an anomalous low risk area compared to the medium and high risk areas surrounding it, but it's justifiable because of the commercial land use in this section of the City of Poquoson. Like many commercial urban areas, this section of the City has many large hard surfaces such as parking lots and large buildings, which lowers available wildfire fuel, thereby lowering the wild fire vulnerability. In addition, the risk of fire increases in areas of the City accessible by roads. Almost all areas bisected by a road have at least a moderate risk for wildfire. Large areas with available wildfire fuel that are accessible by road will have the greatest risk levels. Risk levels are high in these areas for two reasons. First, larger, open areas of land are much more likely to contain significant amounts of wildfire fuel, including undergrowth, dead plant material, deadfalls, and other combustible ground cover. In addition, when these open stands are accessible to human contact, the risk of accidental fire increases. Examples of high-risk large open areas are in the northwestern and southwestern parts of the City.

ESTIMATES OF POTENTIAL LOSSES

During the 2009 plan update, GIS was used to overlay the fire risk zones on existing structures to assess the number and value of structures in the high risk areas. This updated analysis assumes that all affected properties are completely destroyed, which is often the case in wildland-urban interface fires. It is not likely that a wildfire would consume all of these structures in one occurrence, so this representation should be considered a worst-case scenario. Approximately 1,160 acres of the City fall within a high-

risk zone and account for 9-percent of the aerial extent of the City (see **Table 5.10**). The results of the property analysis within the high fire risk zone are presented in **Table 5.11**.

TABLE 5.10: FIRE RISK AREA

ZONE	LAND AREA (ACRES)	% OF TOTAL
1 (Low)	8,763	68
2 (Moderate)	3,015	23
3 (High)	1,160	9
Totals	**12,938**	**100**

TABLE 5.11: SUMMARY OF STRUCTURES AND VALUE IN HIGH WILDFIRE RISK ZONE

PROPERTY TYPE	STRUCTURE COUNT	IMPROVED VALUE	ESTIMATED CONTENT VALUE
Single Family	784	$197,698,600	$98,849,300
Multi-Family	82	$22,586,800	$11,293,400
Commercial	8	$3,316,800	$1,658,400
Research & Development	1	$1,531,200	$765,600
Total	**875**	**$225,133,400**	**$112,566,700**

FUTURE VULNERABILITY AND LAND USE

The City of Poquoson's future fire risk will be dependent on the type of development, including building construction and design, as well as firebreak buffer space and landscaping requirements. Based on the parameters discussed above, the City of Poquoson could see a decrease in fire risk as the City continues to develop and replace open space, and its inherent wildfire fuel supplies, with impervious cover. In addition, maintenance of City and Virginia Department of Forestry policies for controlled burning and proper public education on wildfire causes and risks will help the City continue to avoid wildfire damage.

CONCLUSIONS ON HAZARD RISK

The vulnerability assessment performed for the City of Poquoson provides significant findings that allow the HMPC to prioritize hazard risks and proposed hazard mitigation strategies and actions. Prior to assigning conclusive risk levels for each hazard, the HMPC reviewed the results of quantitative and qualitative assessments shown in the following tables.

Table 5.12 summarizes the degree of risk assigned to each category for all identified hazards in the City based on the application of the voting tool fully introduced in "Methodologies Used." Assigned risk levels were based on historical and anecdotal data, as well as input from the HMPC.

TABLE 5.12: SUMMARY OF QUALITATIVE ASSESSMENT

HAZARD	MITIGATION PRIORITY RANKING
Flooding	$10 million
Hurricanes	$5 million
Tornado	$1.5 million
Severe Thunderstorms	$750,000
Winter Storms	$600,000
Sea Level Rise	$450,000
Mosquito Borne Diseases	$375,000
Earthquake	$50,000
Drought	$25,000
Wildfire	$25,000

Source: HMPC

Table 5.13 summarizes the annualized loss estimates that were generated for the applicable hazards based on the quantitative assessment and compares them with the rankings determined for each hazard based on the qualitative assessment. The results and comparisons of both assessments aided the HMPC in determining the final conclusions on overall hazard risk for the City.

TABLE 5.13: COMPARISON OF ANNUALIZED LOSS ESTIMATES			
QUANTITATIVE ASSESSMENT FINDINGS		QUALITATIVE ASSESSMENT RANKING	
HAZARD	ANNUALIZED LOSS ESTIMATES	HAZARD	RANK BASED ON RELATIVE SPENDING OF MITIGATION DOLLARS
Sea Level Rise	$23 million to $51 million	Flooding	$10 million
Flooding	$17,027,000	Hurricanes	$5 million
Hurricanes	$1,262,013	Tornado	$1.5 million
Tornado	$142,857	Severe Thunderstorms	$750,000
Severe Thunderstorms	$12,176	Winter Storms	$600,000
Earthquake	$2,860	Sea Level Rise	$450,000
Mosquito Borne Diseases	Negligible	Mosquito Borne Diseases	$375,000
Winter Storms	Undetermined	Earthquake	$50,000
Drought	Undetermined	Drought	$25,000
Wildfire	Undetermined	Wildfire	$25,000

The conclusions drawn from the qualitative and quantitative assessments, combined with final determinations from the HMPC, were inserted into three categories for a final summary of hazard risk for the City based on High, Moderate or Low designations (**Table 5.14**). It should be noted that although some hazards are classified as posing Low risk, their occurrence is still possible.

TABLE 5.14: CONCLUSIONS ON HAZARD RISK FOR THE CITY OF POQUOSON	
CRITICAL HAZARD - HIGH RISK	Flooding Hurricanes
CRITICAL HAZARD - MODERATE RISK	Tornado Severe Thunderstorms Sea Level Rise
NONCRITICAL HAZARD - LOW RISK	Winter Storms Mosquito Borne Diseases Earthquake Drought Wildfire

CAPABILITY ASSESSMENT

2014 UPDATE

Section 6 was updated to align the document with the *2011 Southside Hampton Roads Hazard Mitigation Plan*. The following major changes were incorporated:

1) All tables were updated to reflect new information;
2) Mitigation actions completed since 2009 were included as part of the "Previously Implemented Mitigation Measures" table; and,
3) A brief section detailing regional capabilities in conjunction with the Hampton Roads Planning District Commission, and state coastal zone management capabilities was added.

INTRODUCTION

This section of the Plan discusses the capability of Poquoson with regard to hazard mitigation activities, and consists of the following four subsections:

- WHAT IS A CAPABILITY ASSESSMENT?
- CONDUCTING THE CAPABILITY ASSESSMENT
- CAPABILITY ASSESSMENT FINDINGS
- PREVIOUSLY IMPLEMENTED MITIGATION MEASURES

WHAT IS A CAPABILITY ASSESSMENT?

The purpose of conducting a capability assessment is to confirm that the community's resulting mitigation strategy is based on the principles found in (or missing from) existing authorities, policies, programs, and resources, and based on the community's ability to expand and improve these existing tools. This planning process strives to establish goals, objectives, and actions that are feasible, based on an understanding of the organizational capacity of the departments tasked with their implementation. A capability assessment helps to determine which mitigation actions are practical and likely to be implemented over time given a local government's planning and regulatory framework, level of administrative and technical support, level of fiscal resources, and current political climate.

Careful examination of local capabilities helps detect existing gaps, shortfalls, or weaknesses within ongoing government activities that could hinder proposed mitigation activities or exacerbate hazard vulnerability. A capability assessment highlights positive mitigation measures already in place or being implemented at the local and regional levels, which should continue to be supported and enhanced through future mitigation efforts.

CONDUCTING THE CAPABILITY ASSESSMENT

In order to inventory and analyze Poquoson's capabilities, the consultant requested information on a variety of "capability indicators" such as existing local plans, policies, programs, or ordinances that may reduce, or in some circumstances, increase the community's hazard vulnerability. Other indicators included information related to each jurisdiction's fiscal, administrative and technical capabilities such as access to local budgetary and personnel resources necessary to implement mitigation measures. Identified gaps, weaknesses, or conflicts can be recast as opportunities to implement specific mitigation actions.

CAPABILITY ASSESSMENT FINDINGS

PLANNING AND REGULATORY CAPABILITY

Planning and regulatory capability is based on the implementation of plans, ordinances and programs that demonstrate a local jurisdiction's commitment to guiding and managing growth, including reconstruction following a disaster. Examples include emergency response, mitigation and recovery planning, comprehensive land use planning, transportation planning, and capital improvements planning. Additional examples include the enforcement of zoning or subdivision ordinances and building codes. These planning initiatives present significant opportunities to integrate hazard mitigation principles and practices into the local decision making process.

This assessment is designed to provide a general overview of the key planning and regulatory tools in place or under development in Poquoson, along with their potential effect on hazard loss reduction. This information will help identify opportunities to address existing gaps, weaknesses or conflicts in the hazard mitigation strategy.

Table 6.1 provides a summary of the relevant local plans, ordinances, and programs already in place or under development. A checkmark (✓) indicates that the item is currently in place and being implemented, or that it is currently under development.

TABLE 6.1: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Hazard Mitigation Plan	Comprehensive Land Use Plan	Floodplain Management Plan	Open Space Management Plan	Stormwater Management Program	Emergency Operations Plan	SARA Title III Plan	Radiological Emergency Plan	Continuity of Operations Plan	Evacuation Plan	Disaster Recovery Plan	Capital Improvements Plan	Economic Development Program	Historic Preservation Plan	Flood Damage Prevention Ordinance	Zoning Ordinance	Subdivision Ordinance	Unified Development Ordinance	Post-disaster Redevelopment Ordinance	Building and Fire Code	NFIP	NFIP Community Rating System
✓	✓			✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓			✓	✓	✓

Emergency Management

Hazard mitigation is one of 4 primary phases of emergency management. The three other phases include preparedness, response, and recovery. Each phase is interconnected with hazard mitigation as **Figure 6.1** suggests. Opportunities to reduce potential losses through mitigation practices are ideally implemented before a disaster strikes. Examples include the acquisition or elevation of flood-prone structures or the enforcement of regulatory policies that limit or prevent construction in known hazard areas. In reality, the post-disaster environment provides an important “window of opportunity” to implement hazard mitigation projects and policies. During this time period, federal disaster assistance, including the Hazard Mitigation Grant Program (HMGP), may be available. In addition, elected officials and disaster victims may be more willing to implement mitigation measures in order to avoid similar events in the future.

FIGURE 6.1: FOUR PHASES OF EMERGENCY MANAGEMENT

Source: Federal Emergency Management Agency

Planning for each phase is a critical part of a comprehensive emergency management program and key to the successful implementation of hazard mitigation actions.

Hazard Mitigation Plan: A hazard mitigation plan represents a community's blueprint for how it intends to reduce 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.

- Poquoson initially adopted a hazard mitigation plan in 2004. The Plan was updated in 2009 and again in 2014.

Disaster Recovery Plan: A disaster recovery plan guides 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. Disaster recovery plans can also lead to the preparation of disaster redevelopment policies and ordinances to be enacted following a hazard event.

- Poquoson is a part of the regional disaster recovery plan.

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

- Poquoson has an Emergency Operations Plan (EOP) in place that is updated every 4 years. City staff who compiled and are knowledgeable about the EOP participated in the update process described in Section 2 of this plan.

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

- Poquoson has a Continuity of Operations Plan. City staff who compiled and are knowledgeable about the Continuity of Operations Plan participated in the update process described in Section 2 of this plan.

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.

- Poquoson is covered by a Radiological Emergency Plan, as an element of the Emergency Operations Plan. The State plan for radiological emergencies is available online at: http://www.vaemergency.gov/webfm_send/522/COVEOP_2012_HSA_1_Radiological_Emergency_Respsonse.pdf. City staff who compiled and are knowledgeable about the Radiological Emergency Plan participated in the update process described in Section 2 of this plan.

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), and the Emergency Planning and Community Right-to-Know Act (EPCRA).

- Poquoson has a Local Emergency Planning Committee with a Strategic Plan and Goals in response to the requirements of SARA Title III. City staff members who are on the Local Emergency Planning Committee participated in the update process described in Section 2 of this plan.

General Planning

The implementation of hazard mitigation activities involves departments and individuals in a broad range of professions. Stakeholders may include local planners, public works officials, economic development specialists, and others. Concurrent local planning efforts can complement hazard mitigation goals even though they are not designed as such.

Comprehensive Land Use Plan: A comprehensive land use plan establishes the overall vision for what a community wants to be and serves as a guide to future governmental decision making. Typically, a comprehensive plan is comprised of demographic conditions, land use patterns, transportation elements and proposed 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 serve as a far reaching, long-term risk reduction tool.

- Virginia law requires that all communities have a comprehensive land use plan and that it be updated every 5 years. Poquoson is in the process of updating their 2009 Comprehensive Plan. This document presents policies and strategies for growth management and recognizes the value in preserving wetlands for flood control measures. Plan goals and strategies are dedicated to preserving the natural environment, open space and areas deserving special attention including coastal areas, tidal/non-tidal wetlands, prime forest, agricultural lands, mature trees, highly permeable soils, erodible soils and ground water.
- Shoreline restoration and stabilization, water quality, and groundwater are given special attention in the plan at the urging of citizens. Strategies such as “no wake zones” for boats, and pump-out

facilities at marinas are recommended. The plan encourages conservation of existing vegetation and landscape features for new development and includes recommendations to the zoning and subdivision ordinances to help ensure this happens. The plan generally recommends that future development be focused on existing areas of impervious surface. Additional information and data on groundwater and recharging aquifers, water conservation, and wave velocity at waterfront sites is provided. The plan also includes strategies for regulating open burning, and urges consideration of banning open burning for land clearing.

- The Comprehensive Plan recommends continued participation by the City in the National Flood Insurance Program (NFIP) and the Community Rating System (CRS). Since the previous hazard mitigation plan, the City has moved up from a Class 9 to achieve a Class 8 in the CRS, resulting in a 10-percent reduction in flood insurance premiums for most policyholders. The premium reduction is an incentive to urge communities to exceed the minimum requirements of the NFIP with regard to outreach, design guidelines, and public information.
- The Comprehensive Plan recognizes the role of the City of Poquoson Wetlands Board in regulating riparian development. The Board reviews proposals and issues permits in accordance with State and local requirements for tidal wetland avoidance and wetland impact minimization for all new development and renovation projects. Mitigation is required when impacts are unavoidable.
- Regarding climate change, the Comprehensive Plan indicates that the City is awaiting further direction from the Virginia Governor's Council on Climate Change before making specific recommendations for changes to City practices. A primary focus of the climate change council and report is reducing greenhouse gas emissions; however, specific recommendations for sea level rise are included. The report and recommendations may be found online at: http://www.deq.state.va.us/export/sites/default/info/documents/climate/CCC_Final_Report-Final_12152008.pdf.
- As a result of recommended mitigation actions made in the 2004 edition of the hazard mitigation plan, Poquoson's 2009 Comprehensive Plan included the 2009 Multi-Hazard Mitigation Plan by reference. City staff who are currently working on the next update to the Comprehensive Plan participated in the update process described in Section 2 of this plan.

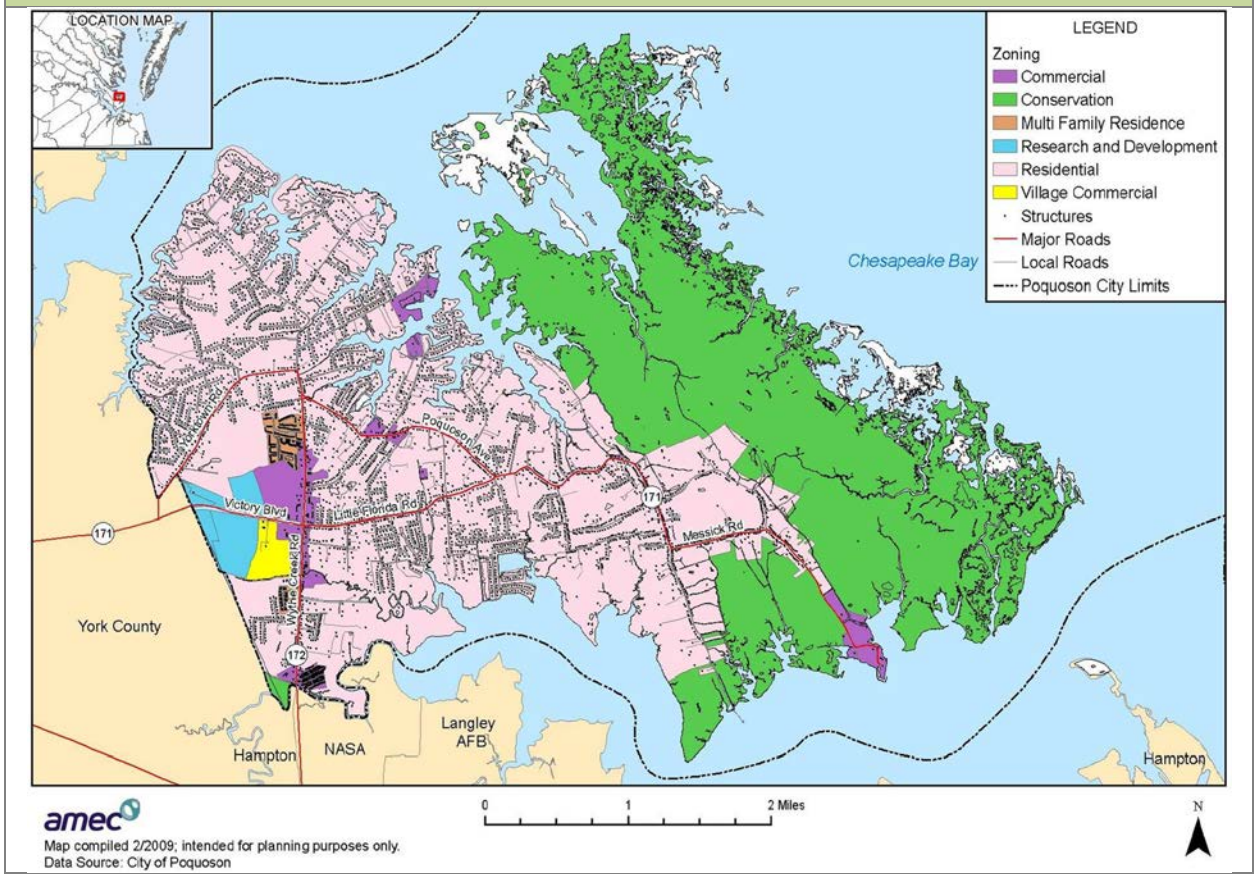
Capital Improvements Plan: A capital improvements plan guides the scheduling of spending on public improvements. A capital improvements plan can serve as an important mechanism to guide future development away from identified hazard areas and to fund drainage improvements in hazardous areas. Limiting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

- Poquoson has a Capital Improvements Plan in place. City staff who compiled and are knowledgeable about the Capital Improvements Plan, including the City Manager's Office, participated in the update process described in Section 2 of this plan.

Zoning Ordinances: Zoning represents the primary means by which land use is controlled by local governments. As part of a community's police power, zoning is used to protect the public health, safety and welfare. 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.

- The Poquoson Development Review Committee (DRC) reviews proposed development as a group to ensure compliance with development standards. The DRC consists of representatives from Engineering, Planning, Community Development, Building Inspection, Fire Department, Environmental Compliance, Public Works, Assessor's Office, and Utilities. A map showing Poquoson's Zoning areas is provided in **Figure 6.2**. City staff and citizens knowledgeable about the DRC participated in the update process described in Section 2 of this plan.
- As seen in Figure 6.2, a large portion of the eastern part of the City, including wetlands and coastal barrier uplands, has conservation zoning. These areas are not likely to be developed, and instead are protected so that the natural and beneficial functions of these lands are not diminished.

FIGURE 6.2: CITY OF POQUOSON UNOFFICIAL ZONING MAP



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

- Poquoson has a Subdivision Ordinance. Each proposed subdivision plan is reviewed for conformity with the ordinance and with other relevant ordinances, regulations, and policies applicable to the site. City staff who are knowledgeable about the Subdivision Ordinance participated in the update process described in Section 2 of this plan.

Building Codes, Permitting and Inspections: Building codes regulate design and construction standards. Permits are issued and work is inspected on new construction and building alterations. Permitting and inspection processes both before and after a disaster can affect the level of hazard risk faced by a community.

- The Virginia Uniform Statewide Building Code (USBC) is administered by the Virginia Board of Housing and Community Development and regulates construction and maintenance of buildings and structures throughout the Commonwealth. The 2012 version of the International Building Code and International Fire Code were adopted by the Commonwealth of Virginia and are in effect in Poquoson as of July 14, 2014. The City Inspections Department is principally responsible for enforcing the building code through plan review, permit issuance, and building inspections. Virginia's building code is based on the International Construction Code series, and provides building standards to protect against hazards such as wind, flood, and fire. Although

Poquoson is divided into two wind zones according to code, the building official requires all construction to be built to withstand 110 mile per hour wind with 3 second gusts, and ½-inch ice load. Also, all footings require rebar, and roof attachments always require extra brackets at the ends. This conservative approach to new construction, additions, and changes to roof structures is in recognition of the City's vulnerability to coastal wind events.

- The City's Building Inspector participated in the update process described in Section 2 of this plan.

The adoption and enforcement of building codes by local jurisdictions is routinely assessed through the Building Code Effectiveness Grading Schedule (BCEGS) program developed by the Insurance Services Office, Inc. (ISO). 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 ISO's member private insurance companies, which in turn may offer ratings credits for new buildings constructed in communities with strong BCEGS classifications.

In conducting the assessment, ISO collects information related to personnel qualifications and continuing education as well as the 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 an exemplary commitment to building code enforcement, and a grade of 10 indicates less than a minimum level of recognized protection. Poquoson has a BCEGS rating of 4.

Floodplain Management

The 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, but is promoted by FEMA as a crucial means to implement and sustain an effective hazard mitigation program.

In order to join the NFIP, a community must adopt flood damage prevention ordinance development standards in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings be protected from damage by the 100-year flood, and that new floodplain development will not aggravate existing flood problems or increase damage to other properties.

Another key service provided by the NFIP is the identification of flood hazard areas. 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 6.2 summarizes NFIP participation for Poquoson, along with general NFIP policy data.

TABLE 6.2: NFIP PARTICIPATION, CITY OF POQUOSON

NFIP ENTRY DATE	CURRENT EFFECTIVE MAP	NUMBER OF POLICIES	INSURANCE IN FORCE	WRITTEN PREMIUM IN FORCE
May 16, 1977	November 2, 2011*	3,278	$864,541,600	$2,970,225

** Poquoson received Preliminary Flood Insurance Rate Maps and was in the appeals period as of the date of this update. FEMA had not yet issued a Letter of Final Determination for the new study.*
Source: Federal Emergency Management Agency (as of March 31, 2014)

The City of Poquoson Municipal Code, Zoning, includes the Floodplain Management Overlay District which regulates new and substantially improved development in the Special Flood Hazard Area (SFHA) shown on the FIRM. The ordinance exceeds NFIP standards by:

- prohibiting new manufactured homes in the SFHA;

- prohibiting outdoor storage of buoyant, flammable, or explosive items;
- strictly regulating the area, compaction and content of fill;
- prohibiting use of fill to create a buildable lot in the SFHA; and,
- requiring three feet freeboard for all new and substantially improved structures, and specifically requiring that all duct work and related equipment needs to be at BFE or higher. The City had previously adopted one foot of freeboard in 2006 as a result of a 2004 Hazard Mitigation Plan recommendation.

In addition to these standards in the ordinance, some permitting procedures help Poquoson building officials protect new construction from flood damage. Replacement manufactured homes must be placed with the lowest horizontal structural element above the base flood elevation. Engineering details are required to indicate that replacement manufactured homes are anchored to resist flood and wind uplift forces. Permit applicants must sign a statement acknowledging that FEMA Elevation Certificates are required to be submitted at two stages of construction: one during construction (prior to the Floor Joist Inspection), and another before final inspection. The elevation data is maintained in a computer database. The Building Official affixes a sticker explaining the hydrostatic venting requirement to each of the three sets of plans for structures in the SFHA. The Building Official then requires that the permit applicant sign and date the sticker to indicate recognition of the requirement. In March 2009, the Building Official received nationwide certification as a Certified Floodplain Manager (CFM) through the Association of State Floodplain Managers.

An additional indicator of floodplain management capability is participation in the Community Rating System (CRS). The CRS is an incentive program that encourages communities to undertake defined flood mitigation activities that go beyond the minimum requirements of the NFIP, adding extra local measures to provide protection from flooding. The creditable CRS mitigation activities are assigned a range of point values. As points are accumulated and identified thresholds are reached, communities can apply for an improved CRS class rating. Class ratings, which run from 10 to 1, are tied to flood insurance premium reductions as shown in **Table 6.3**. As class ratings improve (decrease), the percent reduction in flood insurance premiums for NFIP policy holders in that community increases.

TABLE 6.3: CRS PREMIUM DISCOUNTS, BY CLASS

CRS CLASS	PREMIUM REDUCTION
1	45 percent
2	40 percent
3	35 percent
4	30 percent
5	25 percent
6	20 percent
7	15 percent
8	10 percent
9	5 percent
10	0 percent

Source: Federal Emergency Management Agency

Community participation in the CRS is voluntary. Any community that is in full compliance with the minimum rules and regulations of the NFIP may apply to FEMA for a CRS classification better than class 10.

- The City of Poquoson is participating in the CRS and has a class rating of 8.
- Poquoson plans to continue participating in both the NFIP and the CRS during the 5-year planning period encompassed by this plan.

- The City's CRS Coordinator, also a Certified Floodplain Manager, participated in the update process described in Section 2 of this plan.

Floodplain Management Plan: A floodplain management plan (or a flood mitigation plan) provides a framework for the identification and implementation of corrective and preventative measures specifically designed to reduce the impacts of floods.

- The City of Poquoson does not have a separate floodplain management plan in place, but uses this hazard mitigation planning document to develop and enact flood mitigation activities.

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 frequent urban nuisance flooding.

- Poquoson has a Stormwater Management Plan, ordinance and program in place, all administered by the City Engineer and the Public Works Department who participated in the update process described in Section 2 of this plan.
- The City is particularly concerned with stormwater and diligently regulates land disturbance projects to ensure they meet state requirements for flood control, water quality, and erosion and sediment control. Infiltration is not an option in much of Poquoson because of the City's high groundwater table and silt/clay soils. These factors prevent stormwater from infiltrating into the soil and can lead to increased flooding. Shallow ponds and created wetlands are discouraged because they attract mosquitoes and are unpopular with residents. The City requires that drainage systems be designed for tidal conditions; that they meet state requirements; and that impoundments safely pass the 100-year storm whenever possible.
- Since most flooding occurs on roads at or below 4.5 feet mean sea level, development standards require all new roads to be built at least 4.5 above mean sea level to avoid nuisance flooding. New utilities built below the 100-year flood elevation must have watertight manhole lids. The City's pump stations are either elevated above the 100-year flood elevation, or have key components and electrical utilities above the 100-year flood elevation. All of the pump stations have alerts which notify the main office when any of sixteen events occur, including: water level rises, power is interrupted, the stations are broken into, or the pump fails. All of the City's 29 pumping stations have generators, either permanently installed or portable. The City is operating under a Consent Order from the State Water Control Board. The order requires evaluation and planning to ensure effective capacity management and proper maintenance in order to preclude overflows, particularly in storm scenarios. Rain gages are also required by the Consent Order to closely monitor precipitation and to correlate precipitation with flow analysis.

Administrative and Technical Capability

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. Administrative capability is evaluated by determining how mitigation-related activities are assigned to local departments and if there are adequate personnel resources to complete these activities. The degree of intergovernmental coordination among departments will also affect administrative capability associated with the implementation and success of proposed mitigation activities. Technical capability is evaluated by assessing the level of knowledge and technical expertise of local government employees, such as personnel skilled in using GIS to assess community hazard vulnerability.

Staff interviews were used to capture information on administrative and technical capability through the identification of available staff and personnel resources. **Table 6.4** provides a summary of the results. A checkmark (✓) indicates that local staff members are tasked with the services listed.

TABLE 6.4: RELEVANT STAFF / PERSONNEL RESOURCES, CITY OF POQUOSON

Planners with knowledge of land development and land management practices	Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Planners or engineers with an understanding of natural and/or human-caused hazards	Emergency manager	Floodplain manager	Land surveyors	Planner familiar with the hazards of the community	Staff with education or expertise to assess the community's vulnerability to hazards	Personnel skilled in Geographic Information Systems and/or HAZUS	Resource development staff or grant writers
✓	✓	✓	✓	✓		✓			✓

Fiscal Capability

The ability of a local government to take action is often closely associated with the amount of money available to implement policies and projects. This may take the form of grant funding or locally-based revenue and financing. The costs associated with mitigation policy and project implementation vary widely. In some cases, policies are tied to staff time or administrative costs associated with the creation and monitoring of a given program. In other cases, direct expenses are linked to an actual project such as the acquisition of flood-prone homes, which can require a substantial commitment from local, state and federal funding sources.

Staff interviews were used to capture information on fiscal capability through the identification of locally available financial resources. **Table 6.5** provides a summary of the results. A checkmark (✓) indicates that the listed fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds).

TABLE 6.5: FISCAL CAPABILITY, CITY OF POQUOSON

Capital Improvement Programming	Community Development Block Grants	Special Purpose Taxes	Gas / Electric Utility Fees	Water / Sewer Fees	Stormwater Utility Fees	Development Impact Fees	General Obligation Bonds	Partnering Arrangements or Intergovernmental Agreements
✓	✓				✓		✓	✓

The City of Poquoson places a great reliance on locally generated revenues; however, officials have effectively leveraged a great deal of grant funding to elevate flood-prone structures throughout the City following Hurricane Isabel. Through the use of the NFIP's Increased Cost of Compliance coverage, over 200 homes were elevated by the property owners after Hurricane Isabel flooding in 2003. City officials obtained four grants (Community Development Block Grants and Hazard Mitigation Grant Program grants) between 2004 and 2007 to elevate approximately 70 homes. As of November 2014, FEMA

recently approved two grants to elevate a total of 19 flood-prone homes and the City expects to have the project completed within 3 years.

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 hazards. The adoption of hazard mitigation measures may be seen as an impediment to growth and economic development, which may adversely impact other hazard-related initiatives. Mitigation may not generate the same level of interest among local officials when compared with competing priorities.

The City Council is Poquoson's legislative body, setting policy, approving budgets, and setting tax rates. Members also hire the City Manager, who is responsible for the day-to-day administration of the city, and serves as the Council's chief advisor. The City Manager prepares a recommended budget, recruits and hires most of the government's staff, and carries out the council's policies. While the City Manager may recommend policy decisions, he is ultimately bound by the actions of the Council.

Jurisdictional Self-Assessments of Capabilities

In addition to the inventory and analysis of specific local capabilities, communities should self-assess their capability to implement hazard mitigation activities. Officials were encouraged to consider the barriers to implementing proposed mitigation strategies in addition to the mechanisms that could enhance or further such strategies. HMPC classified each of the capabilities as either “limited,” “moderate” or “high.”

Table 6.6 summarizes the results of the self-assessment process. An “**L**” indicates limited capability; an “**M**” indicates moderate capability; and an “**H**” indicates high capability.

TABLE 6.6: SELF ASSESSMENT OF LOCAL CAPABILITY, CITY OF POQUOSON

Planning and Regulatory Capability	Administrative and Technical Capability	Fiscal Capability	Political Capability	Overall Capability
H	H	M	M	H

PREVIOUSLY IMPLEMENTED MITIGATION MEASURES

The success of future mitigation efforts in a community can be gauged to some extent by its past efforts. Previously implemented mitigation measures indicate that there is, or has been, a desire to reduce the effects of natural hazards, and the success of these projects can be influential in building local government support for new mitigation efforts. Additional capability toward realizing mitigation goals is built through the integration of mitigation strategies into other local planning and administrative tasks. **Table 6.7** lists some of the recent mitigation measures undertaken by Poquoson and describes how the City integrated their mitigation strategy into other planning mechanisms.

TABLE 6.7: MITIGATION MEASURES IN PLACE

MITIGATION ACTIVITIES COMPLETED	INTEGRATION OF MITIGATION GOALS
• The City has received additional benefits through the CRS program and reduced risk to future development by increasing the required minimum height of the lowest floor of any new or substantially improved buildings built in the floodplain at least one foot above Base Flood Elevation (BFE + 1). • A household chemical collection program helps minimize the scattering of containers and chemicals during flood events. Currently there is a Household Chemical Collection for the residents of Hampton, James City County, Poquoson, Williamsburg, and York County offered through the Virginia Peninsulas Public Service Authority. • The City's local warning system has been improved by developing procedures for decision making, dissemination of warnings, public education regarding emergency procedures. Training exercises for citizens and emergency responders are still critical. • The local CERT has increased capability with regard to dissemination of information, particularly after a disaster. • Disaster re-entry efforts in the City have been eased by a popular decal program for residents. • After a decades-long rash of approximately 159 wildfires which involved Phragmites australis, Poquoson's public education efforts appear to have ameliorated the problem to a large extent. • The community is vigilant about protecting natural resources and refers to the Chesapeake Bay and wetland regulations for guidance. • The City has prepared detailed infrastructure mapping and continues to collect elevation data that will help better identify hazard vulnerabilities in the future. • The latest Comprehensive Plan focuses on erosion control, stormwater management, and other environmental management issues. • The City has helped numerous homeowners mitigate against flood damage, primarily through elevation of structures. • The City has elevated or reconstructed numerous publicly-owned structures and critical facilities to provide storm protection. • Code Red system in place to notify residents of impending events. • City and VIMS prepared a Shoreline Management Plan with and inventory and recommendations for managing the City's fragile shorelines. • Portable radios provided to numerous City staff for coordination and response. • Pre-Disaster Debris Management Plan in place. • Tree trimming for utility management.	• Mitigation goals were integrated into the updated Comprehensive Plan and the Comprehensive Plan more thoroughly addresses hazard issues. • City planners and many of the same City staff served on both the HMPC and the team to update the Comprehensive Plan. • The mitigation plan is included in the Comprehensive Plan by reference.

Poquoson uses a multi-media approach to public education regarding natural hazards. The City maintains a website at http:// www.poquoson-va.gov that provides links to important guiding documents, both during and after final adoption. The site provides Flood Information, including a history of flooding in the City, property protection measures, flood insurance information, Federal disaster relief information, drainage system maintenance guidelines, and building design and permitting guidelines. The site includes links to an online property mapping tool, the Municipal Code, City Council minutes, departmental contacts and items like proposed capital budgets.

The City maintains a manually-changed out sign board that grabs citizens' attention as they leave the area via Victory Boulevard (**Figure 6.3**). City events, such as planning meetings, are advertised prominently on the sign board. The Hazard Mitigation Planning Committee used the sign board to advertise meetings related to the planning process in 2009 and 2014. At City Hall, a table near the Building Permits office maintains various informational pamphlets on flood hazards and flood insurance, providing vital information in such a flood-prone community.

FIGURE 6.3: POQUOSON SIGN BOARD, VICTORY BOULEVARD

The CodeRed Emergency Notification system allows the City to send out simultaneous emergency messages to the public. There are numerous options for message distribution. For example, a message could be sent to all citizens living in a particular storm surge zone advising evacuation due to a hurricane warning. The weather warning system is an option that citizens may sign up for to have weather alerts directly sent to their phone in case of a thunderstorm, flash flood, or tornado warning. Having both of these systems in place better prepares citizens and their families in the event of a disaster.

As a result of recommended mitigation actions made in the 2004 edition of this Hazard Mitigation Plan, the City's Emergency Management Office has established a Community Emergency Response Team (CERT). The CERT program educates interested citizens about disaster preparedness for hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. Using the training learned in the classroom and during exercises, CERT members can assist others in their neighborhood or workplace following an event when professional responders are not immediately available to help. CERT members also are encouraged to support emergency response agencies by taking a more active role in emergency preparedness projects in their community. Poquoson CERT members were invited to participate in the 2009 hazard mitigation planning process.

Regional Capabilities

The communities of Hampton Roads are part of the Hampton Roads Planning District Commission (HRPDC), one of 21 Planning District Commissions in the Commonwealth of Virginia. The HRPDC is a regional organization representing the area's sixteen local governments. Planning District Commissions are voluntary associations and were created in 1969 pursuant to the Virginia Area Development Act and a regionally executed Charter Agreement. The HRPDC was formed in 1990 by the merger of the Southeastern Virginia Planning District Commission and the Peninsula Planning District Commission.

The purpose of planning district commissions, as set out in the Code of Virginia, Section 15.2-4207, is "…to encourage and facilitate local government cooperation and state-local cooperation in addressing on a regional basis problems of greater than local significance." The HRPDC mission is to:

- Serve as a forum for local and elected officials and chief administrators to deliberate and decide issues of regional importance;
- Provide the local governments and citizens of Hampton Roads credible and timely planning, research and analysis on matters of mutual concern; and
- Provide leadership and offer strategies and support services to other public and private, local and regional agencies, in their efforts to improve the region's quality of life.

The HRPDC serves as a resource of technical expertise to its member local governments. It provides assistance on local and regional issues pertaining to Economics, Physical and Environmental Planning, Emergency Management, and Transportation. For example, the commission staff is currently working on cataloging GIS data for the region and improving compatibility of the data on a regional basis.

Additional regional capabilities exist with regard to the management of coastal zone resources in the Commonwealth. A permit must be obtained from the Virginia Marine Resources Commission (VMRC) to build, dump or otherwise trespass upon or over, encroach upon, take or use any material from the beds of the bays, ocean, rivers, streams or creeks within the jurisdiction of Virginia. The permitting process is designed to reduce the unnecessary filling of submerged land, to minimize obstructions or hazards to navigation and to avoid conflicts with other uses of state-owned submerged lands or state waters.

In addition, the VMRC is responsible for managing and regulating the use of Virginia's tidal wetlands in conjunction with Virginia's local wetlands boards. Under Virginia law, tidal wetlands include both vegetated and non-vegetated intertidal areas. Vegetated wetlands include all the land lying between and contiguous to mean low water and an elevation above mean low water equal to a factor 1.5 times the mean tidal range at the site and upon which is growing at least one of the botanical species specified in the Virginia Wetlands Act. Non-vegetated wetlands include all the land lying contiguous to mean low water and between mean low water and mean high water at the site.

Technical assistance and advice on dredging and filling operations that involve subaqueous bottoms and wetlands, all aspects of the marine environment, marine science and marine affairs is available from the Virginia Institute of Marine Science. The institute provides technical assistance, often at no cost, to businesses whose development plans have impacts on marine resources.

The Virginia Coastal Zone Management Program (CZM Program) was established in 1986 to protect and manage Virginia's "coastal zone." The CZM Program is part of a national coastal zone management program, a voluntary partnership between the National Oceanic and Atmospheric Administration, National Ocean Service Office of Ocean and Coastal Resource Management, and U.S. coastal states and territories authorized by the federal Coastal Zone Management Act. The Virginia program was established through an Executive Order, which is renewed by each new governor. The program is not a single centralized agency or entity, but a network of state agencies and local governments, including

Poquoson, which administer the following enforceable laws, regulations and policies that protect our coastal resources:

•Tidal and Nontidal Wetlands;
•Fisheries;
•Subaqueous Lands;
•Dunes and Beaches;
•Point Source Air Pollution;
•Point Source Water Pollution;
•Nonpoint Source Water Pollution;
•Shoreline Sanitation; and
•Coastal Lands.

The geographic areas of particular concern for the CZM Program include:
•spawning/nursery/feeding grounds;
•coastal primary sand dunes;
•barrier islands;
•significant wildlife habitat areas;
•significant public recreation areas;
•significant sand and gravel resource deposits;
•underwater historic resources;
•highly erodible/high hazard areas; and
•waterfront development areas.

Currently, some of the projects that the CZM Program is pursuing that have applications with regard to hazard capabilities include: adapting to climate change, special area management planning, coastal land conservation, shoreline management, and public access.

MITIGATION STRATEGY

2014 UPDATE

Section 7 was updated to align the document with the *2011 Southside Hampton Roads Hazard Mitigation Plan*. The following major changes were incorporated:

1) All tables were added or updated to reflect new information, including the new goals and objectives; and,
2) Mitigation actions were reconfigured into the new format, completed actions were deleted; and, new mitigation actions were revised and added as directed by the HMPC.

INTRODUCTION

This section of the Plan provides the "blueprint" for the City of Poquoson to become less vulnerable to natural hazards. It is based on the general consensus of the HMPC along with the findings and conclusions of the *Capability Assessment* and *Risk Assessment*. The *Mitigation Strategy* section consists of the following four subsections:

- MITIGATION GOALS
- IDENTIFICATION AND ANALYSIS OF MITIGATION TECHNIQUES
- SELECTION OF MITIGATION TECHNIQUES
- MITIGATION ACTION PLAN

The intent of the *Mitigation Strategy* is to provide participants with the goals that will serve as the guiding principles for future mitigation policy and project administration, along with a list of proposed actions available to meet those goals and reduce the impact of natural hazards. It is designed to be comprehensive and strategic in nature.

The development of the strategy included a thorough review of all natural hazards and identified policies and projects intended to not only reduce the future impacts of hazards, but also to assist the city in achieving compatible economic, environmental, and social goals. The development of this section is also intended to be strategic, in that all policies and projects are linked to established priorities assigned to specific departments responsible for their implementation and assigned target completion deadlines. Funding sources are identified that can be used to assist in project implementation.

The first step in designing the *Mitigation Strategy* includes the identification of mitigation goals. Mitigation goals represent broad statements that are achieved through the implementation of more specific, action-oriented tasks listed in the *Mitigation Action Plan*. These actions include both hazard mitigation policies (such as the regulation of land in known hazard areas), and hazard mitigation projects that seek to address specifically targeted at-risk properties (such as the acquisition and relocation of flood-prone structures). Additional mitigation measures are then considered over time as new mitigation opportunities are identified, new data become available, technology improves, and mitigation funding becomes available.

The last step in designing the *Mitigation Strategy* is the creation of a *Mitigation Action Plan* (MAP). The MAP represents the key outcome of the mitigation planning process, and includes a prioritized list of proposed hazard mitigation actions (policies and projects), including accompanying information such as those agencies or individuals assigned responsibility for their implementation, potential funding sources,

and an estimated target date for completion. The MAP provides those individuals or agencies responsible for implementing mitigation actions with a clear roadmap that also serves as an important tool for monitoring progress over time. The collection of actions listed in the MAP also serves as a synopsis of activities for local decision makers.

In preparing the *Mitigation Action Plan*, the HMPC considered their overall hazard risk and capability to mitigate natural hazards, in addition to the mitigation goals. Prioritizing mitigation actions was based on the following 5 factors: (1) effect on overall risk to life and property; (2) ease of implementation; (3) political and community support; (4) a general economic cost/benefit review; and (5) funding availability.

MITIGATION GOALS

The goals of the Poquoson Hazard Mitigation Plan were crafted as part of a facilitated discussion and brainstorming session with the HMPC (see Section 2: *Planning Process*). Each of the following goal statements represent a broad target to achieve through implementation of the Mitigation Action Plan. As part of the 2014 update, the HMPC reassessed each goal word for word, reprioritized the list, and edited overall for clarity. The original (2009) and updated (2014) goals are provided in **Table 7.1** below, with notes about the discussion leading to the changes. HMPC also reviewed and considered the regional mitigation goals expressed in the *2011 Southside Hampton Roads, Virginia Hazard Mitigation Plan.*

TABLE 7.1: UPDATED GOALS AND OBJECTIVES

2009 GOALS	2014 GOALS AND OBJECTIVES
Goal 1: Reduce Future Hazard Related Losses	**Goal 1: Reduce Future Hazard Related Losses**
Objective 1.1: ~~Provide~~ Protect~~ion for~~ Existing Buildings ~~to the extent possible~~ ~~Objective 1.1.1:~~ Reduce ~~the Number of Repetitive~~ Flood Losses ~~Objective 1.1.2:~~ ~~Support~~ implement~~ation of~~ structural and non-structural mitigation ~~activities to reduce exposure to natural and man-made hazards~~ projects.	**Objective 1.1:** Protect Existing Buildings by implementing structural and non-structural mitigation projects and reducing flood losses. **Why the Change?** More concise and avoids sub-objectives. Mitigation funding from various sources is no longer geared toward only *repetitive* flood losses.
Objective 1.2: ~~Provide~~ Protect~~ion for~~ Future Development ~~to the extent possible~~ ~~Objective 1.2.1: Support incorporation of multi-hazard best management practices into State and local development regulations and projects~~	**Objective 1.2:** Protect Future Development **Why the Change?** There are many ways to protect future development. Rather than single any out as an objective, the HMPC determined appropriate actions for the MAP and simplified this into a single objective.
Objective 1.3: Provide Protection and Access for Critical Public Facilities and Services	**Objective 1.3:** Provide Protection and Access for Critical Public Facilities and Services
GOAL 2: Increase Public Awareness of Vulnerability to Hazards and the Benefits of Timely Mitigation	**GOAL 2:** Increase Public Awareness of Vulnerability to Hazards and the Benefits of Timely Mitigation
Objective 2.1: Provide information to residents, schoolchildren	**Objective 2.1:** Provide information to residents,

TABLE 7.1: UPDATED GOALS AND OBJECTIVES	
2009 GOALS	**2014 GOALS AND OBJECTIVES**
and businesses about the types of hazards they are exposed to, where they occur, and what they can do to ~~be better prepared better~~ protect themselves and their property	schoolchildren and businesses about the types of hazards they are exposed to, where they occur, and what they can do to protect themselves and their property. **Why the Change?** The HMPC indicated Poquoson's pride in education of children. "Be better prepared" is vague, so this was changed to reflect a more precise objective.
Objective 2.2: Couple hazard information with environmental protection programs and planning initiatives~~, as appropriate~~.	**Objective 2.2:** Couple hazard information with environmental protection programs and planning initiatives. **Why the Change?** The HMPC indicated the importance of incorporating hazard information into future planning initiatives.
Objective 2.3: Highlight mitigation successes	**Objective 2.3:** Highlight mitigation successes.
GOAL 3: Weather catastrophic events with reduced impacts to residents' life and safety through added capability in ~~Enhance Community~~ Emergency and Floodplain Management ~~Capability~~	**GOAL 3: Weather catastrophic events with reduced impacts to residents' life and safety through added capability in Emergency and Floodplain Management** **Why the Change?** The word "enhance" was vague and the new goal conveys more precisely what the intent of these improved City services should be as it affects citizens.
~~Objective 3.1: Develop/Improve Comprehensive Plan / Emergency Response Plan~~	**Why the Change?** The previous objective 3.1 is more appropriately categorized as a mitigation action rather than an objective.
~~Objective 3.2: Educate general public regarding disaster preparedness, evacuation and warning system.~~	**Why the Change?** The education indicated in previous objective 3.2 is captured in the new Objective 2.1 and the new Objective 3.1. Objective was eliminated to reduce redundancy.
Objective 3.~~3~~1: Increase training and event-exercise opportunities for citizens and staff.	Objective 3.1: Increase training and event-exercise opportunities for citizens and staff.
GOAL 4: ~~Gather Hazard-Related Data to Refine Risk Assessment and Target~~ Maximize Use of Available Mitigation Funds	**GOAL 4: Maximize Use of Available Mitigation Funds** **Why the Change?** Gathering hazard related data is an action, not a goal. Maximizing funds is a better statement of the committee's intent.
~~GOAL 5: Continue Participating in the National Flood Insurance Program~~	**Why the Change?** This is more appropriate as an action that fulfills Goal 1. See Mitigation Action #2.

TABLE 7.1: UPDATED GOALS AND OBJECTIVES	
2009 GOALS	**2014 GOALS AND OBJECTIVES**
~~Objective 5.1: Reduce the Cost of Flood Insurance~~	**Why the Change?** The previous objective 5.1 was a *result* of participation in the CRS, not a way to continue participating in the NFIP.
~~Objective 5.2: Provide floodplain management training for staff~~	**Why the Change?** Because Goal 3 now pertains to both Emergency Management and Floodplain Management and new Objective 3.1 aims to increase training, this previous objective 5.1 was deleted.

IDENTIFICATION AND ANALYSIS OF MITIGATION TECHNIQUES

44 CFR Requirement

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

In formulating Poquoson's *Mitigation Strategy*, a wide range of activities was considered in order to help achieve the regional goals and address specific hazard concerns. At the third planning meeting, HMPC and subcommittee members considered 6 broad categories of mitigation techniques. Committee discussions regarding each possible mitigation measure are summarized beneath each category, including notes on the appropriateness and applicability of each specifically for the City of Poquoson.

1. Prevention

Preventative activities are intended to reduce the impact of future hazard events, and are typically administered through government programs or regulatory actions that influence the way land is developed and buildings are constructed. 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
- Open space preservation
- Floodplain regulations
- Stormwater management regulations
- Drainage system maintenance
- Capital improvements programming
- Shoreline/riverine setbacks

2014 Committee Discussion: Prevention activities related to planning and zoning activities have been implemented in the past in Poquoson, are ongoing, and will continue to be included in this and future mitigation action plans because the committee believes in their effectiveness. The statewide building code will continue to be enforced as it is required by State law. Open space preservation will be pursued as opportunities arise, particularly in hazardous areas. The City's current capabilities with regard

to floodplain regulations, as well as drainage system maintenance and stormwater management, mitigate several of the highest risk hazards and are consistent with the Comprehensive Plan goals and the goals of this plan. Additional floodplain management regulations are possible to reflect newly designated Coastal A zones on the City's new FEMA maps, which will become effective in 2015. In light of ongoing and expected future sea level rise, additional floodplain regulations such as cumulative substantial improvement and additional freeboard, will be studied by committee members as part of the actions recommended by this plan. Stormwater management regulations mandated by the State are considered sufficient. Drainage system maintenance is an important City responsibility that is considered a hazard reduction activity and will continue to be planned around seasonal changes in flood risk. Capital improvements programming provides opportunities for hazard management as funds become available. Shoreline/riverine setbacks are already in place as required by the Chesapeake Bay Act and will continue to be enforced at the local level with no changes anticipated.

2. Property Protection

Property protection measures involve the modification of existing buildings and structures or the removal of the structures from hazardous locations. Examples include:

- Acquisition
- Relocation
- Building elevation
- Critical facilities protection
- Retrofitting (i.e., windproofing, floodproofing, seismic design)
- Safe rooms, shutters, shatter-resistant glass
- Insurance

2014 Committee Discussion: Property protection measures have been implemented in the past in Poquoson and in the Commonwealth of Virginia, will be ongoing primarily through HMGP projects, and will continue to be included in this and future mitigation action plans. Building elevation projects, critical facilities protection, and floodproofing/retrofitting are popular alternatives with the HMPC and the City's emergency managers as the City has seen a gradual reduction in flood risk and sea level rise risk as a result. The Community Rating System rank and related activities highlight several property protection measures ongoing in the city. The committee decided to continue relocation, and elevation measures for all flooded properties (not just those considered NFIP repetitive losses), including critical facilities retrofits, in the Mitigation Action Plan, but did not act on any actions specifically for safe rooms or shatter-resistance glass as tornadoes are not a high risk critical hazard. Acquisition of flood-prone properties is not considered a viable alternative for protection of flood-prone properties in Poquoson, according to the City Manager's Office. Promotion of the purchase of flood insurance has been successful and has resulted in an increase in the number of policies over time. Information is disseminated in both formal and informal ways, and this practice will continue through a more organized strategy developed as part of the Plan for Public Involvement.

3. Natural Resource Protection

Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their protective functions. Natural areas could include floodplains, wetlands, steep slopes, barrier islands and sand dunes. Parks, recreation or conservation agencies and organizations often implement these measures. Examples include:

- Land acquisition
- Floodplain protection
- Watershed management
- Beach and dune preservation
- Riparian buffers
- Forest and vegetation management (i.e., fire resistant landscaping, fuel breaks)
- Erosion and sediment control
- Wetland preservation and restoration

- Habitat preservation
- Slope stabilization
- Historic properties and archaeological site preservation

2014 Committee Discussion: Natural Resource Protection measures remain commonly-used both in Poquoson and throughout the coastal Virginia region. Many state programs discussed in Section 6, such as the Chesapeake Bay Act, are established Natural Resource Protection measures that are not expected to be weakened in the near- or long-term as their effectiveness at protecting valuable waterway buffers and shorelines is undeniable. The most important of these measures in relation to Poquoson's critical hazards are floodplain protection, riparian buffers, erosion and sediment control, wetland preservation, and watershed management. The HMPC discussed a possible action to expedite shoreline applications that request actions consistent with VIMS recommendations in the Shoreline Management Plan, but rejected the idea because these permits are already priced only to cover costs and reviewed as quickly as possible. Firebreaks, as proposed as a mitigation action in the previous plan, are no longer considered a necessary part of wildland fire management in Poquoson and the city has partnered with Virginia Tech and others to use drones for fire management in some parts of the City. With regard to land acquisition and management, the City was the recent recipient of a land gift at the end of Poquoson Avenue and will manage that land in the future to protect natural resources. Management of land areas in Poquoson based on watersheds is not common as the land is primarily low-lying and dominated by creeks and tidal tributaries. There are no land areas in Poquoson requiring beach and dune preservation at the local level.

4. Structural Projects

Structural mitigation projects are intended to lessen the impact of a hazard by modifying the hazard itself through construction. These projects are usually designed by engineers and managed or maintained by public works staff. Examples include:

- Reservoirs
- Dams/levees/dikes/floodwalls/seawalls
- Diversions/detention/retention
- Channel modification
- Beach nourishment
- Storm sewers

2014 Committee Discussion: The topography of Poquoson, the series of creeks and the ditches that provide drainage and the tidal flood hazard, preclude the use of some measures (e.g., dams, beach nourishment). Other structural protection measures are in place and must be maintained by the city or private owners. Channel modifications, diversions, and detention/retention have been effective in reducing flood hazards in some areas of the City and will remain viable mitigation actions in the future, especially for reducing the effects of floods, nor'easters and sea level rise. Stormwater management best management practices were discussed as potential structural projects, with a desire for new projects to increase existing storage capacity. The committee decided not to implement new high-cost mitigation actions such as dams, levees or reservoirs in the Mitigation Action Plan, and that *requirements* for stormwater management to exceed State minimum requirements are not likely to be implemented. Dikes, floodwalls and seawalls are not consistent with environmental goals and natural resources protection measures currently in place.

5. Emergency Services

Although not typically considered a "mitigation" technique, emergency services can minimize the impacts of a hazard event on people and property. These actions are often taken prior to, during, or in response to an emergency or disaster. Examples include:

- Warning systems
- Evacuation planning and management
- Emergency response training and exercises
- Sandbagging for flood protection
- Installing temporary shutters for wind protection

2014 Committee Discussion: Traditional riverine warning systems are inappropriate for Poquoson's flood hazard, but systems of predictive tidal storm surge modeling are useful. A new tool created in partnership with NASA will be expanded as a mitigation action in this plan. Evacuation planning is aided at the regional and state levels, but City planners use many tools to continually manage and improve the program. Bridge replacements at Wythe Creek Road and Victory Boulevard include bridge elevations and road widening, which are necessary as these roads are the only evacuation routes for City residents. Poquoson participates in regional emergency response training and exercises and officials did not feel it necessary to include these exercises as mitigation actions in the plan. Likewise, sandbagging for flood protection is not feasible due to the large expanse of low-lying floodprone areas. Individual property owners may decide to sandbag for protection, but this is not an action the HMPC wants to include in the MAP, as structural protection methods are deemed preferable. A wildfire warning system using unmanned drone aircraft is under development with Virginia Tech and may provide additional emergency management related services after implementation. Re-entry into the City following disasters is a concern of the Police Department and a recent windshield decal program has been very successful. Expansion of the re-entry program was determined to be an important mitigation action moving forward in order to continue to protect residents' property from damage inflicted by careless sightseers and to maximize the use of valuable police officer hours. Shutters for wind protection are being considered for critical facility protection, which is reflected in the Mitigation Action Plan.

6. Public Education and Awareness

Public education and awareness activities are used to advise residents, elected officials, business owners, potential property buyers, and visitors about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property. Examples of measures used to educate and inform the public include:

- Outreach projects
- Speaker series/demonstration events
- Hazard mapping
- Real estate disclosure
- Library materials
- School children educational programs
- Hazard expositions
- Inter-governmental coordination

2014 Committee Discussion: Public education activities are a particular focus of the HMPC and the City's Office of Emergency Management. Although these activities are important, HMPC does not consider each one appropriate for the mitigation action plan. Many will be captured under the umbrella mitigation action regarding development of a regional Plan for Public Information (PPI). That activity proposes a methodical and organized approach to public outreach as developed by a separate committee and possibly in conjunction with adjoining jurisdictions or the HRPDC. Outreach projects and speakers at public events work well in Poquoson and will be included in future awareness activities. Additional hazard mapping was discussed and not considered necessary at all for the City, and real estate disclosure is guided by State regulations and not influenced by local government. Library materials, school programs, open houses and coordination with other jurisdictions are appropriate for implementation in Poquoson and are, therefore, included in the PPI umbrella action. The HMPC discussed train-the-trainer opportunities in conjunction with the City's Community Emergency Response Team (CERT) and decided that a separate action is not necessary as this is already ongoing and expected to continue. Hazard expositions at local events such as the Poquoson Seafood Festival are appropriate and the details will be considered under the PPI.

SELECTION OF MITIGATION TECHNIQUES

In order to determine the most appropriate mitigation techniques, HMPC members and other community officials reviewed and considered the findings of the *Capability Assessment* and *Risk Assessment*. Other considerations included each mitigation action's effect on overall risk reduction, its ease of implementation, its degree of political and community support, its general cost-effectiveness and funding availability.

FEMA guidance for meeting the planning requirements of the Disaster Mitigation Act of 2000 also specifies that local governments should prioritize their mitigation actions based on the level of risk a hazard poses to the lives and property of a given jurisdiction. A Mitigation Technique Matrix (**Table 7.2**) shows that those hazards posing the greatest threat are addressed by the updated MAP.

The matrix provides the committee with the opportunity to cross-reference each of the priority hazards (as determined through the *Risk Assessment*) with the comprehensive range of available mitigation categories, including prevention, property protection, natural resource protection, structural projects, emergency services, and public education and awareness. The *Mitigation Action Plan* includes an array of techniques targeting multiple hazards, not just those classified as either high or moderate risk.

As part of the 2014 update, the Committee reviewed several documents to assist with the development of new mitigation actions and the assessment of existing actions. Review documents included: 1) an overview of several mitigation actions included in the 2013 *Commonwealth of Virginia Hazard Mitigation Plan*; 2) Poquoson's Comprehensive Plan, specifically components that may be compatible with mitigation goals, or that may be appropriate as mitigation actions; 3) Floodplain Regulations and 4) the mitigation action items from the 2009 plan with 2014 status information.

TABLE 7.2: MITIGATION TECHNIQUE MATRIX

MITIGATION TECHNIQUE	HIGH RISK HAZARDS		MODERATE RISK HAZARDS		
	Flooding	Hurricanes	Tornadoes	Severe Thunderstorms	Sea Level Rise
PREVENTION	✓				
PROPERTY PROTECTION	✓	✓	✓	✓	✓
NATURAL RESOURCE PROTECTION	✓	✓	✓		✓
STRUCTURAL PROJECTS	✓		✓	✓	✓
EMERGENCY SERVICES	✓	✓	✓	✓	
PUBLIC EDUCATION AND AWARENESS	✓	✓	✓	✓	✓

MITIGATION ACTION PLAN

The mitigation actions proposed for local adoption are listed in the MAP on the pages that follow. They will be implemented according to the plan maintenance procedures established for the *City of Poquoson Hazard Mitigation Plan* (see Section 8: Plan Maintenance Procedures). The action items have been designed to achieve the mitigation goals and priorities established by the HMPC.

Each proposed mitigation action has been identified as an effective measure to reduce hazard risk in Poquoson. Each action is described with background information such as the specific location of the project and general cost benefit information.

Other information provided includes data on cost estimates and potential funding sources to implement the action should funding be required (not all proposed actions are contingent upon funding). Most importantly, implementation mechanisms are provided for each action, including the designation of a lead agency or department responsible for carrying the action out, as well as a timeframe for its completion. These implementation mechanisms ensure that the *City of Poquoson Hazard Mitigation Plan* remains a functional document that can be monitored for progress over time. Proposed actions are not listed in exact priority order though each has been assigned a priority level of “high,” “moderate” or “low” as described in the previous section.

Table 7.3 describes the key elements of the Mitigation Action Plan, and **Table 7.4** lists the additional considerations that were evaluated for each proposed action once selected for inclusion in the Mitigation Action Plan. This includes social, technical, administrative, political, legal, economic, and environmental considerations collectively known as "STAPLEE" evaluation criteria.

As part of the plan update process in 2014, the HMPC reviewed the list of recommended actions included in the existing (2009) plan to determine if the actions should be deleted because they are completed, deferred, cancelled, or continued, and made recommendations regarding modified and new actions. The results of this review are included in **Table 7.5**.

TABLE 7.3: KEY ELEMENTS OF THE MITIGATION ACTION PLAN	
Proposed Action	Identifies a specific action that, if accomplished, will reduce vulnerability and risk in the impact area. Actions may be in the form of local policies (i.e., regulatory or incentive-based measures), programs or structural mitigation projects and should be consistent with any pre-identified mitigation goals and objectives.
Site and Location	Provides details with regard to the physical location or geographic extent of the proposed action, such as the location of a specific structure to be mitigated, whether a program will be citywide, countywide or regional, etc.
Cost Benefit	Provides a brief synopsis of how the proposed action will reduce damages for one or more hazards.
Hazard(s) Addressed	Lists the hazard(s) the proposed action is designed to mitigate for.
Goal(s) Addressed	Indicates the Plan's established mitigation goal(s) the proposed action is designed to help achieve.
Priority	Indicates whether the action is a "high" priority, "moderate" priority, or "low" priority based on the established prioritization criteria.
Estimated Cost	Indicates what the total cost will be to accomplish this action. This amount will be an estimate until actual final dollar amounts can be determined.
Potential Funding Sources	If applicable, indicates how the cost to complete the action will be funded. For example, funds may be provided from existing operating budgets or general funds, a previously established contingency fund, or a cost-sharing federal or state grant program.
Lead Agency/Department Responsible	Identifies the local agency, department or organization that is best suited to implement the proposed action.
Implementation Schedule	Indicates when the action will begin and when it is to be completed. Remember that some actions will require only a minimal amount of time, while others may require a long-term or continuous effort.

TABLE 7.4: ADDITIONAL CONSIDERATIONS (STAPLEE EVALUATION)	
Socially Acceptable	Is the proposed action socially acceptable to the community? Is the action compatible with present and future community values? Are there equity issues involved that would mean that one segment of the community is adversely affected?
Technically Feasible	Will the proposed action serve as a long term solution? Will it create any negative secondary impacts? Are there any foreseeable problems or technical constraints that could limit its effectiveness?
Administratively Possible	Does the community have the capability to implement the proposed action? Is there someone available to coordinate and sustain the effort?
Politically Acceptable	Is there political support to implement the proposed action? Is there enough public support to ensure the success of the action?
Legal	Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for the action? Are there any potential legal consequences of the action?
Economically Sound	What are the costs and benefits of the proposed action? Does the cost seem reasonable for the size of the problem and the estimated benefits? Are there funding sources available to help offset costs of the action? Is the action compatible with other economic goals of the community?
Environmentally Sound	How will the action impact the environment? Will the action require any environmental regulatory approvals? Is the action consistent with other environmental goals of the community?

TABLE 7.5: STATUS OF MITIGATION ACTIONS FROM THE 2009 MITIGATION ACTION PLAN		
2009 PLAN MITIGATION ACTIONS	**PROGRESS 2009- 2014**	**STATUS IN 2014 PLAN**
1. Continue to increase flood protection and flood access/egress for critical facilities and infrastructure. Elevate new critical facilities, retrofit existing facilities as necessary, and elevate roads to provide access to elevated critical facilities.	Fire Station #1 rebuilt above BFE; equipment storage building rebuilt above BFE; pump stations elevated; Public Works Department building is new and elevated above BFE; the flood-prone Parks building is no longer the City Archives; Wythe Creek Road and Victory Boulevard widening/elevation projects ongoing	Retained with minor modifications to include wind retrofitting.
2. Prepare a Shoreline Management Plan.	City and VIMS fast-tracked Poquoson's plan to completion. Available at: http:ccrm.vims.edu/ccrmp	Retained with modifications. Plan preparation is complete, but HMPC will explore additional ways to put the plan tools to use.
3. Collect and share hazard-related data in GIS-compatible format.	Ongoing	Retained to include: 1) real-time storm surge/tidal conditions mapping project in conjunction with NASA; 2) ongoing campaign to collect old Elevation Certificates on all existing structures. City has data on finished floor elevation for all City-owned structures. City has program to collect high water marks in 2 areas after significant floods, and a damage assessment team to be deployed after events.
4. Provide portable radios for additional City employees to improve emergency communications and expand regional interoperability in disaster response.	Completed – New radios purchased for school system, CERT members and Public Works.	Removed
5. Prepare a Pre-Disaster Debris Management Plan	Completed through Public Works	Retained to indicate ongoing implementation of the plan.
6. Become a member of the National Preparedness Month Coalition and implement new awareness projects using CERT. Staff training will receive emphasis during Preparedness Month and will increase Certified Floodplain Managers (CFM) on staff.	Completed, but with no additional CFMs on staff. Focus is on debris, emergency plans, evacuation/communication. The *Island Tide* magazine includes information 3 times per year on seasonal weather preparedness. Code Red and City TV channel are used to alert residents, as well.	Removed. Action substantially complete and will continue. Additional CFMs not financially feasible at present.
7. Conduct mitigation retrofit projects on buildings to protect public and private property and repetitive flood losses from natural hazards.	Ongoing – Poquoson has submitted requests for 20 grants since 2009. Grant received in 2014 to elevate 19 homes to 3 ft above BFE.	Retained with modifications
8. Identify, map and regulate highly vulnerable Coastal AE Zones to V Zone standards.	In Progress - In 2009, City expected new maps would show LiMWA, but they did not. Preliminary FEMA maps now in appeal period will show LiMWA; expected effective date in 2015.	Retained with modifications to include education and consideration of additional regulations in Coastal A Zone.
9. Prepare and distribute new homeowner Welcome Bag, which contains hazard, insurance and mitigation information.	Partially Complete – packet developed for new library patrons that include some hazard information.	Retained as part of PPI umbrella mitigation action; additional hazard-related packet materials will be identified for inclusion.
10. Coordinate with public utilities, and use City resources to trim trees in the public right-of-way.	Ongoing	Retained
11. Select the most desirable locations for installing fire breaks citywide, then investigate costs and feasibility of: any easements required, grubbing, clearing, and maintenance.	Not completed	Removed; wildfire is no longer considered a critical hazard and ownership of potential firebreak land make this an unrealistic action.

Key to Potential Funding Source acronyms:

DHS U.S. Department of Homeland Security

- **PDM –** Predisaster Mitigation Program
- **HMGP –** Hazard Mitigation Grant Program
- **FMA –** Flood Mitigation Assistance Program
- **BZPP –** Buffer Zone Protection Program
- **HGSP –** Homeland Security Grant Program
- **TSGP –** Transit Security Grant Program
- **PA –** Public Assistance Program
- **NEHRP –** National Earthquake Hazards Reduction Program
- **AFGP –** Assistance to Firefighters Grant Program
- **FMAG –** Fire Management Assistance Grants
- **RFC –** Repetitive Flood Claims Program

USACE U.S. Army Corps of Engineers

- **FCW/EW –** Flood Control Works/Emergency Rehabilitation
- **ESSP –** Emergency Streambank and Shoreline Protection
- **SFCP** – Small Flood Control Projects
- **FPMS** – Flood Plain Management Services Program

DOI U.S. Department of the Interior

- **LWCF –** Land and Water Conservation Fund Grants

EDA U.S. Economic Development Administration

- **DMTA –** Disaster Mitigation and Technical Assistance Grants

EPA U.S. Environmental Protection Agency

- **CWA –** Clean Water Act Section 319 Grants

HUD U.S. Department of Housing and Urban Development

- **CDBG –** Community Development Grant Program

SBA U.S. Small Business Administration

- **PDMLP –** Pre-Disaster Mitigation Loan Program

USDA U.S. Department of Agriculture

- **EWP –** Emergency Watershed Protection
- **WPFP –** Watershed Protection and Flood Prevention
- **WSP –** Watershed Surveys and Planning

VDCR Virginia Department of Conservation and Recreation

- **VRTF -** Virginia Recreational Trails Fund
- **L&WCF -** Land and Water Conservation Fund
- **VCWRLF** - Clean Water Financing and Assistance - Land Conservation Loan Program

CITY OF POQUOSON MITIGATION ACTION 1	
Participate in annual Hampton Roads Planning District Commission Mitigation Funding Workshop (if available).	
BACKGROUND INFORMATION	
Site and Location:	Citywide and regional
Cost Benefit:	HRPDC will provide no-cost assistance to the communities to help satisfy reporting requirements, make progress on mitigation actions, and apply for mitigation grant funding.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	All
Goal(s) Addressed:	Goals #1, #2 and #4
Priority (High, Moderate, Low):	Low
Estimated Cost:	Travel costs and staff time
Potential Funding Sources:	Existing budgets
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	Annually
ADDITIONAL COMMENTS	
Proposed workshop agenda: 1. HRPDC and VDEM to provide update on funds available, details on how to apply, and what projects are eligible; 2. HRPDC update on regional mitigation actions and progress; 3. Break into community-based work groups: a) provide report on status of each mitigation action (modified, complete, not started and why); b) implement one mitigation action that day at the workshop.	

CITY OF POQUOSON MITIGATION ACTION 2	
Continue participating in the National Flood Insurance Program and the Community Rating System. Continue enforcement of standards in existing floodplain management ordinance that meet and exceed NFIP minimum requirements. **Study feasibility of implementing additional floodplain management ordinance changes, including:** **1. Changes to the definition of "substantial improvement" that would require accumulation of costs of improvements and repairs of buildings, based on issued building permits, over a set time period; and,** **2. Coastal A Zone regulations that apply coastal high hazard area requirements in areas delineated by FEMA as subject to wave heights between 3 feet and 1.5 feet high.**	
BACKGROUND INFORMATION	
Site and Location:	Special Flood Hazard Areas of Poquoson
Cost Benefit:	Additional measures to manage floodplains can further reduce flood response needs in the long-term, and reduce flood insurance premiums through CRS rating changes in the near-term. The NFIP and related flood mapping and development regulations have proven benefits nationwide.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flooding, Hurricanes, Sea Level Rise
Goal(s) Addressed:	Goal #1, Objectives 1.1 and 1.2
Priority (High, Moderate, Low):	High
Estimated Cost:	Travel costs and staff time
Potential Funding Sources:	Existing budgets
Lead Agency/Department Responsible:	Building Inspections
Implementation Schedule:	Ongoing with study of additional measures in 2015 and 2016
ADDITIONAL COMMENTS	

CITY OF POQUOSON MITIGATION ACTION 3	
Elevate, relocate, retrofit or floodproof structures in hurricane prone areas. Flood protection may include minor localized flood reduction projects, as well. Wind retrofit measures are also included and may be appropriate for some structures, especially publicly-owned structures.	
BACKGROUND INFORMATION	
Site and Location:	Flood-prone areas Citywide, and Citywide for wind retrofits
Cost Benefit:	Retrofit measures that address flood- and wind-prone structures, particularly those designated as repetitive loss or severe repetitive loss by the NFIP, have quantifiable benefits by reducing future damages to the structures.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flooding, Hurricanes, Sea Level Rise, Severe Thunderstorms
Goal(s) Addressed:	Goal #1, Objectives 1.1 and 1.3, and Goal #4
Priority (High, Moderate, Low):	High
Estimated Cost:	In multiple $250,000 phases as grant money becomes available. Individual structure costs vary.
Potential Funding Sources:	DHS: PDM, HMGP, FMA, RFC; USDA
Lead Agency/Department Responsible:	Emergency Management and Building Inspections
Implementation Schedule:	Ongoing
ADDITIONAL COMMENTS	

CITY OF POQUOSON MITIGATION ACTION 4	
Implement the Shoreline Management Plan developed by Virginia Institute of Marine Science, as conditions warrant.	
BACKGROUND INFORMATION	
Site and Location:	Shorelines Citywide
Cost Benefit:	Implementation is not costly and could be absorbed by existing department budgets. Materials to share with property owners and training for staff (and interested property owners) are available from VIMS at very low cost. Adding links from the City web page to the VIMS toolbox is low cost but would provide valuable information to property owners.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flooding, Hurricanes, Sea Level Rise
Goal(s) Addressed:	Goal #1, Goal #2, Objective 2.2
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff time only
Potential Funding Sources:	Existing budgets
Lead Agency/Department Responsible:	Planning Department, Permitting, and Engineering
Implementation Schedule:	Ongoing
ADDITIONAL COMMENTS	
Currently, Virginia's Shoreline Erosion Advisory Service is not funded. Property owners need guidance on best management shoreline protection methods from reliable sources and not necessarily just from shoreline repair contractors. The *City of Poquoson Comprehensive Plan 2008-2028*, Environmental Management Element, Shoreline Sub-Element, states as its second goal, "Develop a shoreline management plan to ensure property shoreline protection and create a framework for incentive[s] based on programs to encourage less intrusive means of shoreline protection." While permitting incentives were considered that might encourage living shorelines, City staff determined that permit fees and review times are already as low as possible.	

CITY OF POQUOSON MITIGATION ACTION 5	
Continue to increase flood and wind protection and flood access/egress for critical facilities and infrastructure. Elevate new critical facilities, retrofit existing facilities as necessary, and elevate roads to provide access to elevated critical facilities. Retrofits may include but are not limited to: installation of emergency backup power, elevation of structure or components, relocation or retrofit of building components. Coordinate with public utilities to protect or retrofit transformers, critical infrastructure and overhead power lines.	
BACKGROUND INFORMATION	
Site and Location:	Critical facilities Citywide
Cost Benefit:	Benefits of mitigating flood damage to critical facilities are realized by all citizens through the city's ability to maintain the highest operational capabilities post-disaster. Flooding of roads prevents access to elevated critical facilities. Benefits are based on reduced response times, and longevity of critical infrastructure. Elevation of roads could reduce evacuation times once flooding begins, and protect road beds from erosion associated with sea level rise in the future.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flooding, Hurricanes, Sea Level Rise, Severe Thunderstorms
Goal(s) Addressed:	Goal #1, Objective 1.1 and 1.3, Goal #3, Goal #4
Priority (High, Moderate, Low):	High
Estimated Cost:	Cost will be based on specific flood protection measures chosen for each building
Potential Funding Sources:	DHS: PDM, HMGP, FMA, RFC; Stafford Act Section 406 - post-disaster mitigation funds under Public Assistance for damaged public facilities
Lead Agency/Department Responsible:	Public Works/Engineering, Fire Department, Police Department, Public Utilities
Implementation Schedule:	Ongoing
ADDITIONAL COMMENTS	
Some vital infrastructure such as storm sewer and sanitary sewer are subject to flooding, and possibly vulnerable to sea level rise in the future.	

CITY OF POQUOSON MITIGATION ACTION 6	
Collect and share hazard-related data in GIS-compatible format, including but not limited to: **1) collect high water marks and calculate flood frequency for all coastal storms;** **2) continue to collect Elevation Certificates for each structure in the 100-year floodplain;** **3) use real-time storm surge/tidal conditions mapping developed in conjunction with NASA; and,** **4) inventory and prioritize low-lying secondary roads and intersections critical to evacuation.**	
BACKGROUND INFORMATION	
Site and Location:	Citywide
Cost Benefit:	Collection of elevation information and retention of Elevation Certificates can reduce surveying costs for property owners and buyers in the future. The partnership with NASA for real-time mapping has been a very successful and low-cost venture.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flooding, Hurricanes, Sea Level Rise
Goal(s) Addressed:	Goal #1, Objective 1.1, Goal #2, Objective 2.1, 2.3, Goal #3, Goal #4
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time Post-disaster surveys could be used to collect structure elevations at approximately $300/structure (for a large number of structures at once)
Potential Funding Sources:	USACE: FPMS; VDEM: HMGP, USGS
Lead Agency/Department Responsible:	Engineering, Building Inspections, Emergency Management
Implementation Schedule:	Ongoing
ADDITIONAL COMMENTS	
The City Building Inspector continues to compile a collection of Elevation Certificates for existing structures, elevated/mitigated structures and new structures, and he maintains pertinent data from the forms in a digital format. Structural inventories with elevations, high water marks, and flood frequency data help prepare accurate cost-benefit analyses for a large number of structures rapidly, which is especially useful in a post-disaster scenario.	

CITY OF POQUOSON MITIGATION ACTION 7	
Implement Pre-Disaster Debris Management Plan.	
BACKGROUND INFORMATION	
Site and Location:	Citywide
Cost Benefit:	Pre-disaster debris management reduces damage to structures and infrastructure from flood and wind. Also, regular clean-up requirements can reduce the costs of post-disaster debris clean-up. City could also have access to the additional 5-percent cost incentive from FEMA's Public Assistance money.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flooding, Hurricanes, Severe Thunderstorms, Tornadoes, Winter Storms
Goal(s) Addressed:	Goal #1, Objective 1.1, Goal #3
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time
Potential Funding Sources:	Existing capital budgets; HMGP, PDM or FMA (with very clearly articulated benefits for flood damage reduction)
Lead Agency/Department Responsible:	Public Works, Solid Waste
Implementation Schedule:	Ongoing
ADDITIONAL COMMENTS	

CITY OF POQUOSON MITIGATION ACTION 8	
Coordinate with public utilities, and use City resources to trim trees in the public right-of-way.	
BACKGROUND INFORMATION	
Site and Location:	Citywide
Cost Benefit:	Benefits include reduced debris clean-up costs and increased utility service reliability.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricanes, Tornadoes, Severe Thunderstorms
Goal(s) Addressed:	Goal #1, Objectives 1.1 and 1.3, Goal #3
Priority (High, Moderate, Low):	High
Estimated Cost:	$100,000, including contributions from utility providers
Potential Funding Sources:	Existing capital budgets, HMGP. In some cases, utilities may be eligible for some FEMA grant monies, as well.
Lead Agency/Department Responsible:	Public Works, utility providers
Implementation Schedule:	Ongoing
ADDITIONAL COMMENTS	

CITY OF POQUOSON MITIGATION ACTION 9	
Eliminate barriers to the orderly evacuation of citizens: **1) Elevate and widen the causeway to Hampton (Wythe Creek Road);** **2) Widen Victory Boulevard;** **3) Continue car evacuation agreement with Langley Motor Speedway to allow citizens to park cars there prior to expected flooding; and,** **4) Address low-lying roadways/intersections identified in Mitigation Action #6.**	
BACKGROUND INFORMATION	
Site and Location:	Wythe Creek Road and Victory Boulevard
Cost Benefit:	These two roadways are considered critical infrastructure for the evacuation and protection of citizens in Poquoson. Wythe Creek Road floods regularly at high tide, cutting off the route and requiring all citizens to evacuate via Victory Boulevard. Providing a no-cost alternative for parking vehicles out of harm's way encourages people to consider the advantages and consequences of evacuating cars and people.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flooding, Hurricanes, Sea Level Rise
Goal(s) Addressed:	Goal #1, Objective 1.3, Goal #2, Objective 2.1, Goal #3
Priority (High, Moderate, Low):	High
Estimated Cost to Poquoson:	Wythe Creek Road - $19.8 million Victory Boulevard - $22.7 million
Potential Funding Sources:	VDOT, City of Hampton, York County and other partners
Lead Agency/Department Responsible:	Engineering and City Manager's Office
Implementation Schedule:	Wythe Creek Road is scheduled for construction in 2018; Victory Boulevard widening is in the early stages and not expected until after 2018. Negotiations are underway with speedway officials.
ADDITIONAL COMMENTS	

CITY OF POQUOSON MITIGATION ACTION 10	
Support and maintain decal system for re-entry to the City following a disaster. Use social networking to strengthen the system.	
BACKGROUND INFORMATION	
Site and Location:	Citywide
Cost Benefit:	Benefits accrue to: 1. property owners through reduced secondary damage (*e.g.,* from car wakes on flooded streets); and, 2. Police operating budgets through reduced traffic management costs, better response times and more efficient use of staff following a disaster.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flooding, Hurricanes, Tornadoes, Severe Thunderstorms
Goal(s) Addressed:	Goal #1, Objectives 1.1 and 1.3, Goal #2, Objective 2.1, Goal #3
Priority (High, Moderate, Low):	High
Estimated Cost:	$2,500 annually
Potential Funding Sources:	Capital budget
Lead Agency/Department Responsible:	City Manager's Office; Emergency Management
Implementation Schedule:	Ongoing
ADDITIONAL COMMENTS	
Gawkers and sightseers from outside Poquoson are not cognizant of the added damage and inconvenience their visits can inflict. A low-cost decal system was put in place in 2010, and together with police presence at key entry points to the City, officials can now control re-entry.	

CITY OF POQUOSON MITIGATION ACTION 11	
Support and maintain Code Red, the City's Reverse 911 system. Prepare messages to release to citizens before and after a natural hazard event.	
BACKGROUND INFORMATION	
Site and Location:	Citywide
Cost Benefit:	Other methods of notifying citizens require massive amounts of staff time which exceed budgetary restraints. Code Red quickly and efficiently uses existing infrastructure to notify property owners of appropriate pre- and post-disaster mitigation actions.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	All
Goal(s) Addressed:	Goal #1, Goal #2, Objective 2.1, Goal #3
Priority (High, Moderate, Low):	High
Estimated Cost:	$10,000 to $15,000
Potential Funding Sources:	Existing budgets
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	Ongoing
ADDITIONAL COMMENTS	
While the Code Red system is already functioning, an opportunity to use the system to urge property owners to take mitigative actions exists. Examine special needs population capabilities, availability of contract minutes and additional features, and additional messages to address other hazards.	

CITY OF POQUOSON MITIGATION ACTION 12	
Protect flood-prone natural resources as a buffer against sea level rise, including, but not limited to: **1) Protect in perpetuity the 69 acres of natural land at the end of Poquoson Avenue donated to the City;** **2) Provide additional access points for the City's Blueway system, a series of canoe and kayak water trails in and around the City and Plum Tree Island; and,** **3) Provide opportunities for retail and residential development on land that is less prone to flooding and sea level rise, such as the Big Woods area.**	
BACKGROUND INFORMATION	
Site and Location:	Eastern portion of the City, especially undeveloped portions along the water
Cost Benefit:	Just as damages from sea level rise are not easily quantifiable, the benefits of adjusting to sea level rise are also more abstract. These measures are relatively low in cost compared to the damages that flooding will continue to inflict in Poquoson if no adjustments are made.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Sea Level Rise, Flooding, Hurricanes
Goal(s) Addressed:	Goal #1, Objective 1.2, Goal #2, Objective 2.2, Goal #4
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	1) Existing budgets for legal and real estate costs. 2) access points on the Blueway may incur costs to the city as additional sites are identified. Costs would be dependent on site amenities. 3) Staff time
Potential Funding Sources:	Existing budgets; VDCR: VRTF, L&WCF, VCWRLF
Lead Agency/Department Responsible:	Parks, City Manager's Office, Planning
Implementation Schedule:	Ongoing
ADDITIONAL COMMENTS	
A long-term plan of gradual adjustment begins with small steps. This action highlights the opportunity to identify additional ways to protect flood-prone areas with multiple benefits for citizens in the long- and short-term. CRS points may be available for sub-action #1.	

CITY OF POQUOSON MITIGATION ACTION 13	
Continue to participate in coalition with Virginia Tech and others using drones for storm damage assessment and wildland fire management.	
BACKGROUND INFORMATION	
Site and Location:	Eastern portion of the City, primarily
Cost Benefit:	This low-cost method of assessing damage after a storm or to assess wildfire potential in undeveloped areas has benefits for the reduction of spreading wildfire risk and the management of post-flood redevelopment.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Sea Level Rise, Flooding, Hurricanes, Wildfire
Goal(s) Addressed:	Goal #1, Objective 1.2, Goal #2, Objective 2.2, Goal #4
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff time
Potential Funding Sources:	Existing budgets; VDCR: VRTF, L&WCF, VCWRLF
Lead Agency/Department Responsible:	City Manager's Office
Implementation Schedule:	Ongoing
ADDITIONAL COMMENTS	

CITY OF POQUOSON MITIGATION ACTION 14	
Continue outreach efforts through a strategically-developed Plan for Public Information (PPI) using the following seven steps: **1. Create a PPI Committee** **2. Assess Poquoson's public information needs** **3. Formulate messages** **4. Identify outreach projects to convey the messages** **5. Examine other public information initiatives** **6. Prepare the PPI document** **7. Implement, monitor and evaluate the program**	
BACKGROUND INFORMATION	
Site and Location:	Citywide
Cost Benefit:	Benefits derive from CRS credits and reduced flood insurance premiums as a result of this initiative. The organized nature of the approach reduces long-term costs by: 1) minimizing need to repeat messages; 2) involving outreach/marketing professionals from within City government; 3) investigating regional partnerships that could result in additional cost savings through cost sharing; 4) using existing programs and resources to maximum advantage.
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	All, but primarily Flooding, Sea Level Rise, Hurricanes, and Winter Storms
Goal(s) Addressed:	Goal #1, Goal #2, Objectives 2.1, 2.2, 2.3, Goal #3, Objective 3.1, Goal #4
Priority (High, Moderate, Low):	High
Estimated Cost:	$10,000
Potential Funding Sources:	Existing budgets and staff time
Lead Agency/Department Responsible:	Building Inspections
Implementation Schedule:	2015 for Steps 1 and 2, 2016 for remainder

ADDITIONAL COMMENTS
Audiences include: property owners, businesses, city officials and schoolchildren. Stakeholders may include: Planning Department, HRPDC, CERT, Tidewater Builders Association, Parent Teacher Associations, VDEM, DEQ, DCR, adjacent communities and American Red Cross. Potential outreach needs include: focus on repetitive loss property owners in outreach efforts, publicizing the City's mitigation efforts, informing property owners of long-term and short-term property protection measures (*e.g.,* protecting vinyl siding windows from wind damage), creating a dedicated web site for floodplain management permitting process, early preparation of post-disaster permitting and redevelopment materials such as press releases, videos, brochures, forms, and fees (CRS credits available); integrate social networking and CodeRed into the methods of notification used by the City. Use questionnaires on social media to garner feedback. Continue to refine contents of the Library Welcome Bag and methods of distribution. Continue City TV channel disaster information series, postcards to citizens regarding new flood maps, and *Island Tide* magazine seasonal information bursts. Prepare press releases highlighting mitigation success stories. PPI should include analysis of staff and citizen training, cross-training, and train-the-trainer opportunities on an annual basis.

PLAN MAINTENANCE PROCEDURES

2014 UPDATE

Section 8 was updated to align the document with the *2011 Southside Hampton Roads Hazard Mitigation Plan*.

INTRODUCTION

This section discusses how the *Mitigation Strategy* will be implemented by the City and how the overall Hazard Mitigation Plan will be evaluated and enhanced over time. This section also discusses how the public and participating stakeholders will continue to be involved in the hazard mitigation planning process in the future. This section consists of the following three subsections:

- IMPLEMENTATION
- MONITORING, EVALUATION AND ENHANCEMENT
- CONTINUED PUBLIC INVOLVEMENT

IMPLEMENTATION

44 CFR Requirement

Part 201.6(c)(4)(i): The plan shall include a plan maintenance process that includes a section describing the method and schedule of monitoring, evaluating and updating the mitigation plan within a five-year cycle.

In addition to the assignment of a lead department or agency, an implementation time period has been established for each mitigation action in order to assess whether actions are being implemented in a timely fashion. Poquoson will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. When applicable, potential funding sources have been identified for proposed actions listed in each *Mitigation Action Plan*.

44 CFR Requirement

Part 201.6(c)(4)(ii): The plan maintenance process shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

The HMPC and Emergency Management officials will be responsible for determining additional implementation procedures beyond those listed within the *Mitigation Action Plan*. This includes integrating the Hazard Mitigation Plan into other local planning documents such as comprehensive or capital improvement plans, when appropriate. The members of the HMPC remain charged with ensuring that the goals and strategies of new and updated local planning documents (such as Comprehensive

Plans and Zoning Ordinances) are consistent with the goals and actions of the Hazard Mitigation Plan, and will not contribute to an increased level of hazard vulnerability in the City.

Opportunities to integrate the requirements of this Plan into other local planning mechanisms will continue to be identified through future meetings of the HMPC and through the five-year review process described in this section.

Poquoson will integrate the tenets of this mitigation plan into relevant local government decision making processes or mechanisms. The primary means for integrating mitigation strategies into other local planning documents will be accomplished through the revision, update, and implementation of the Mitigation Action Plan that requires specific planning and administrative tasks (i.e., plan amendments, ordinance revisions, and capital improvement projects). In addition, Poquoson will incorporate existing planning processes and programs addressing flood hazard mitigation into this document by reference.

MONITORING, EVALUATION AND ENHANCEMENT

Periodic revisions and updates to the Plan are required to ensure that the goals of the Plan are kept current, taking into account potential changes in hazard vulnerability and mitigation priorities. In addition, revisions may be necessary to ensure that the Plan is in full compliance with applicable federal, state and local regulations. Periodic evaluation of the Plan will also ensure that specific mitigation actions are being reviewed and carried out according to the *Mitigation Action Plan*.

The HMPC will continue to meet at least twice a year and following any disaster events warranting a re-examination of the mitigation actions. This will ensure that the Plan is continuously updated to reflect changing conditions and needs within the City. An annual report on the Plan will be developed and presented to City Council in order to report progress on the actions identified in the Plan and to provide information on the latest legislative requirements. The report may also highlight proposed additions or improvements to the Plan. The report will be released to the media and made available to the public via the City's web site.

ANNUAL PROGRESS REPORTS

The HMPC will be responsible for producing an annual progress report to evaluate the Plan's overall effectiveness.

FIVE-YEAR PLAN REVIEW

At a minimum, the Plan will be reviewed and must be updated every 5 years by the HMPC as required by the Disaster Mitigation Act of 2000. The purpose of the review and update is to determine whether there have been any significant changes that may, in turn, necessitate changes in the types of 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 examples of factors that may affect changes in the content of the Plan.

If the HRPDC invites Poquoson to participate in a multi-jurisdictional planning process in the future, the HMPC will review the opportunity and both the merits and drawbacks of the process, and make a recommendation to the City Manager and the City Council regarding participation.

The plan review provides community officials with an opportunity to evaluate those actions that have been successful and to explore the possibility of documenting potential losses avoided due to the implementation of specific mitigation measures. The plan review also provides the opportunity to address mitigation actions that may not have been successfully implemented. The HMPC shall be responsible for reconvening and conducting the five-year review.

During the five-year plan review process, the following questions will be considered as criteria for assessing the effectiveness and appropriateness of the Plan:

- Do the goals and actions address current and expected conditions?
- Has the nature or magnitude of hazard risk changed?
- Are current resources adequate to implement the Plan?
- Should additional local resources be committed to address identified hazard threats?
- Are there any issues that have limited the current implementation schedule?
- Have the implementation of identified mitigation actions resulted in expected outcomes?
- Has the HMPC measured the effectiveness of completed hazard mitigation projects in terms of specific dollar losses avoided?
- Did the jurisdiction, agencies and other partners participate in the plan implementation process as proposed?

Following the five-year review, any revisions deemed necessary shall be summarized and implemented according to the reporting procedures and plan amendment process outlined in this section. Upon completion of the review and update process, the Plan shall be submitted to the Virginia Department of Emergency Management State Hazard Mitigation Officer for review and approval. The State Hazard Mitigation Officer shall submit the Plan amendments to the Federal Emergency Management Agency for final review as required by the Disaster Mitigation Act of 2000.

DISASTER DECLARATION

Following a state or federal disaster declaration, the HMPC will reconvene and the Plan will be revised as necessary to reflect lessons learned or to address specific circumstances arising from the event. The committee may find it necessary to convene following localized emergencies and disasters in order to determine if changes to the Plan are warranted.

REPORTING PROCEDURES

The results of the five-year review will be summarized by the HMPC 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 a brief progress report for each mitigation action, including the identification of delays or obstacles to their completion along with recommended strategies to overcome them. Any necessary revisions to the Plan must follow the plan amendment process outlined herein.

PLAN AMENDMENT PROCESS

Upon initiation of the amendment process, Poquoson will forward information on the proposed change(s) to interested parties, including affected municipal departments. Information will also be forwarded to the Virginia Department of Emergency Management. This information will be disseminated in order to seek input on the proposed amendment(s) for not less than a 5-day review and comment period.

At the end of the 5-day review and comment period, the proposed amendment(s) and all comments will be forwarded to the HMPC for final consideration. The committee will review the proposed amendments along with the comments received from other parties, and if acceptable, the committee will submit a recommendation for the approval and adoption of changes to the Plan. Minor revisions may be approved by the City's Chief Administrative Officer, while substantial amendments and addendums must be approved by City Council. In determining whether to recommend approval or denial of a Plan amendment request, the following factors will be considered by the HMPC:

- There are errors, inaccuracies or omissions made in the identification of issues/needs in the Plan;
- New issues/needs have been identified which are not adequately addressed in the Plan;
- There has been a change in data or assumptions from those upon which the Plan is based.

Upon receiving the recommendation from the HMPC and prior to adoption of the Plan, City Council will hold a public hearing. The governing body will review the recommendation from the committee (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 amendments as presented;
- Adopt the proposed amendments with modifications;
- Refer the amendments request back to the HMPC for further revision; or
- Defer the amendment request back to the HMPC for further consideration and/or additional hearings.

CONTINUED PUBLIC INVOLVEMENT

44 CFR Requirement

Part 201.6(c)(4)(iii): The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.

Public participation is an integral component of the mitigation planning process. As described above, significant changes or amendments to the Plan will require a public hearing prior to any adoption procedures.

Other efforts to involve the public in the maintenance, evaluation and revision process will be made as necessary. These efforts are expected to include:

- Advertising meetings of the HMPC in the local newspaper, public bulletin boards, web sites, social media and City buildings;
- Designating willing citizens and private sector representatives as official members of the HMPC;
- Using local media to update the public about any maintenance or periodic review activities taking place;
- Using questionnaires to obtain public comments on the Plan and its implementation;
- Using City web sites to advertise any maintenance or periodic review activities taking place; and
- Maintaining copies of the Plan in public libraries, on the web, or other appropriate venues.

APPENDIX A

This Appendix provides a copy of the FEMA Region III, Local Hazard Mitigation Plan Review Crosswalk. This crosswalk documents which sections of the Plan contain the FEMA hazard mitigation planning requirements.

U.S. Department of Homeland Security
Region III
One Independence Mall, 6th Floor
615 Chestnut Street
Philadelphia, PA 19106-4404

FEMA

DEC 09 2014

J. Randall Wheeler
Manager, City of Poquoson
500 City Hall Avenue
Poquoson, Virginia 23662

Dear Mr. Wheeler:

The Federal Emergency Management Agency (FEMA) has completed our review of the City of Poquoson's Hazard Mitigation Plan, based on the standards contained in 44 CRF, Part 201, as authorized by the Disaster Mitigation Act of 2000 (DMA2K). These criteria address the planning process, hazard identification and risk assessment, mitigation strategy and plan maintenance requirements.

The plan received a "satisfactory" rating for all required criteria and is approval. However prior to formal approval, the City is required to provide FEMA with an adoption resolution.

We commend you for your dedication demonstrated in supporting the DMA2K and the City of Poquoson's commitment to reduce future disaster losses.

If you have questions, please contact Tess Grubb at (215) 931-5528.

Sincerely,

Eugene K. Gruber, P.E.
Director, Mitigation Division

cc: Matthew Wall, State Hazard Mitigation Officer

LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: **City of Poquoson**	**Title of Plan:** **Hazard Mitigation Plan, City of Poquoson, VA**	**Date of Plan:** 07/14
Local Point of Contact: **Michael Bryant**	**Address:**	
Title: **Deputy Fire Chief/ EM Coordinator**		
Agency: **Fire/Rescue**		
Phone Number:	**E-Mail:**	

State Reviewer: **Amy Howard**	**Title:**	**Date:**

FEMA Reviewer: **Matthew McCullough**	**Title:** Community Planner	**Date:** 10/08/14
Date Received in FEMA Region *(insert #)*		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1:
REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Section 2	X	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Section 2	X	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Section 2, throughout	X	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Section 2, pg 6	X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Section 8	X	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Section 8	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met

ELEMENT A: REQUIRED REVISIONS

Element A.5.
Note:
Tremendous amount of effort and time spent to gain public input. Numerous outlets for comment/participation were utilized. Very good to see.

Element A.6
Question:
Did the annual meetings, noted in the 2009 plan (Section 6.1: Maintenance- Pg. 91), occur?

Suggestion:
Pg. 8:2
Use the questions under the Five-Year Plan Review section on Pg. 8:3 as a basis for your Annual Progress Reports stated on 8:2. This could give you a more detailed description of your overall effectiveness each year.

ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Section 4		X
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Section 4	X	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Section 4 & 5		X
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Section 5		X

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met

ELEMENT B: REQUIRED REVISIONS

Required Revision:
Pg. 4:27 Severe Thunderstorms
Please remove statement: "All building stock, infrastructure and critical facilities are equally vulnerable to these hazards"
It is acknowledged that while the same chance of this hazard occurring in all areas of the city is uniform, the uniformity of vulnerability is not the same to all structures. IE straight line winds (100mph) for a manufactured home compared to a brick and mortar critical facility.

Element B.1
Required Revision:
Pg. 4:43 Earthquake
Is there a map or a better description of the Central Virginia Seismic Zone? Looking for a more accurate relationship to where Poquoson is in relation to this area.

Element B.1
Required Revision:
Pg. 4:46 Drought

- Please include the Drought map from the Commonwealth's HMP. Or give a description of the areas that are more susceptible to drought. IE vegetation areas which could lead to higher vulnerability
- Did the City receive disaster assistance from the Nov. 2010 declaration? If so, how much?

Element B.3
Required Revision:
Impact for each of the following hazards needs to be addressed in more detail. Give a more in-depth description as to what aspects of the City (roads, bridges, communications, commerce, residential) will be affected if this given events were to occur. Also what building or building types are more susceptible to each given event…… IE mobile home vs. brick and mortar structure.
Tornado
Severe Thunderstorms
Winter Storms

HAZUS Discussion: Pg. 5:2
What type of local data was entered to perform the Flood run? Region III may be able to assist the City in enhanced data collection for more accurate runs in future HAZUS runs

Recommendation:
Sea Level Rise: include an action that would have the City strive to identify structures within a certain proximity to the areas noted on the multiple maps for this hazard. (1% Annual Chance floods compared to nuisance flooding…Future condition standards)

Element B.4
Required Revision:
Pg. 5:7

- Definition for Repetitive Loss is inaccurate. The statement should read: An NFIP-insured structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978.
- 2012 data is being used. Is this the most up to date information available?
- The types and numbers of buildings identified as Repetitive Loss need to be stated IE…Residential, commercial

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Section 6	X	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Section 6	X	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Section 7, Pg. 7.2	X	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Section 7		X
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Section 7, pgs. 8-11	X	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Section 6	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**

ELEMENT C: REQUIRED REVISIONS

Note:
Very good write up on the City's participation within the NFIP & CRS programs. In order to make these sections even stronger, two pieces of guidance will be offered to create an even more detailed Capability and NFIP sections. These will be discussed on the review call.

Note:
Pg. 6:13
Table 6.7: The narrative of previously implemented projects and accomplishments allows the lineage between different plan iterations to acknowledge the culture of risk reduction within the community. IE Long-term Wildfire efforts.
Suggestion:
Include the number of elevated structures that have occurred.

Note:
Pg. 7:15
Action2- great to see this type of initiative; multiple points of highly progressive risk reducing activities being examined

Element C.4.
Required Revision:
Please include an action stating that the City will Acquire or Buy-out properties from floodprone areas. It is acknowledged that Action 3 indicates the City would like to "elevate, relocate, retrofit or floodproof structures"

Element C.6.
Recommendation:
During the next 5-year planning cycle please ensure to better document the process by which existing planning mechanisms are reviewed and incorporated into the HMP.
The recently finalized FEMA: Plan Integration Guide can be a useful tool to assisting in this effort.

ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Section 3,5 & 6	X	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Section 6 & 7	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Section 7	X	

ELEMENT D: REQUIRED REVISIONS

Note:
Well described and detailed changes in Goals and Objectives

ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))			X
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))			X

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT E: REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:
PLAN ASSESSMENT

INSTRUCTIONS: The purpose of the Plan Assessment is to offer the local community more comprehensive feedback to the community on the quality and utility of the plan in a narrative format. The audience for the Plan Assessment is not only the plan developer/local community planner, but also elected officials, local departments and agencies, and others involved in implementing the Local Mitigation Plan. The Plan Assessment must be completed by FEMA. The Assessment is an opportunity for FEMA to provide feedback and information to the community on: 1) suggested improvements to the Plan; 2) specific sections in the Plan where the community has gone above and beyond minimum requirements; 3) recommendations for plan implementation; and 4) ongoing partnership(s) and information on other FEMA programs, specifically RiskMAP and Hazard Mitigation Assistance programs. The Plan Assessment is divided into two sections:

1. Plan Strengths and Opportunities for Improvement
2. Resources for Implementing Your Approved Plan

Plan Strengths and Opportunities for Improvement is organized according to the plan Elements listed in the Regulation Checklist. Each Element includes a series of italicized bulleted items that are suggested topics for consideration while evaluating plans, but it is not intended to be a comprehensive list. FEMA Mitigation Planners are not required to answer each bullet item, and should use them as a guide to paraphrase their own written assessment (2-3 sentences) of each Element.

The Plan Assessment must not reiterate the required revisions from the Regulation Checklist or be regulatory in nature, and should be open-ended and to provide the community with suggestions for improvements or recommended revisions. The recommended revisions are suggestions for improvement and are not required to be made for the Plan to meet Federal regulatory requirements. The italicized text should be deleted once FEMA has added comments regarding strengths of the plan and potential improvements for future plan revisions. It is recommended that the Plan Assessment be a short synopsis of the overall strengths and weaknesses of the Plan (no longer than two pages), rather than a complete recap section by section.

Resources for Implementing Your Approved Plan provides a place for FEMA to offer information, data sources and general suggestions on the overall plan implementation and maintenance process. Information on other possible sources of assistance including, but not limited to, existing publications, grant funding or training opportunities, can be provided. States may add state and local resources, if available.

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

How does the Plan go above and beyond minimum requirements to document the planning process with respect to:

- *Involvement of stakeholders (elected officials/decision makers, plan implementers, business owners, academic institutions, utility companies, water/sanitation districts, etc.);*
- *Involvement of Planning, Emergency Management, Public Works Departments or other planning agencies (i.e., regional planning councils);*
- *Diverse methods of participation (meetings, surveys, online, etc.); and*
- *Reflective of an open and inclusive public involvement process.*

Element B: Hazard Identification and Risk Assessment

In addition to the requirements listed in the Regulation Checklist, 44 CFR 201.6 Local Mitigation Plans identifies additional elements that should be included as part of a plan's risk assessment. The plan should describe vulnerability in terms of:

1) *A general description of land uses and future development trends within the community so that mitigation options can be considered in future land use decisions;*
2) *The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; and*
3) *A description of potential dollar losses to vulnerable structures, and a description of the methodology used to prepare the estimate.*

How does the Plan go above and beyond minimum requirements to document the Hazard Identification and Risk Assessment with respect to:

- *Use of best available data (flood maps, HAZUS, flood studies) to describe significant hazards;*
- *Communication of risk on people, property, and infrastructure to the public (through tables, charts, maps, photos, etc.);*
- *Incorporation of techniques and methodologies to estimate dollar losses to vulnerable structures;*
- *Incorporation of Risk MAP products (i.e., depth grids, Flood Risk Report, Changes Since Last FIRM, Areas of Mitigation Interest, etc.); and*
- *Identification of any data gaps that can be filled as new data became available.*

Element C: Mitigation Strategy

How does the Plan go above and beyond minimum requirements to document the Mitigation Strategy with respect to:

- *Key problems identified in, and linkages to, the vulnerability assessment;*
- *Serving as a blueprint for reducing potential losses identified in the Hazard Identification and Risk Assessment;*
- *Plan content flow from the risk assessment (problem identification) to goal setting to mitigation action development;*
- *An understanding of mitigation principles (diversity of actions that include structural projects, preventative measures, outreach activities, property protection measures, post-disaster actions, etc);*
- *Specific mitigation actions for each participating jurisdictions that reflects their unique risks and capabilities;*
- *Integration of mitigation actions with existing local authorities, policies, programs, and resources; and*
- *Discussion of existing programs (including the NFIP), plans, and policies that could be used to implement mitigation, as well as document past projects.*

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

How does the Plan go above and beyond minimum requirements to document the 5-year Evaluation and Implementation measures with respect to:

- *Status of previously recommended mitigation actions;*
- *Identification of barriers or obstacles to successful implementation or completion of mitigation actions, along with possible solutions for overcoming risk;*
- *Documentation of annual reviews and committee involvement;*
- *Identification of a lead person to take ownership of, and champion the Plan;*
- *Reducing risks from natural hazards and serving as a guide for decisions makers as they commit resources to reducing the effects of natural hazards;*
- *An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, change in built environment etc.);*
- *Discussion of how changing conditions and opportunities could impact community resilience in the long term; and*
- *Discussion of how the mitigation goals and actions support the long-term community vision for increased resilience.*

B. Resources for Implementing Your Approved Plan

Ideas may be offered on moving the mitigation plan forward and continuing the relationship with key mitigation stakeholders such as the following:

- *What FEMA assistance (funding) programs are available (for example, Hazard Mitigation Assistance (HMA)) to the jurisdiction(s) to assist with implementing the mitigation actions?*
- *What other Federal programs (National Flood Insurance Program (NFIP), Community Rating System (CRS), Risk MAP, etc.) may provide assistance for mitigation activities?*
- *What publications, technical guidance or other resources are available to the jurisdiction(s) relevant to the identified mitigation actions?*
- *Are there upcoming trainings/workshops (Benefit-Cost Analysis (BCA), HMA, etc.) to assist the jurisdictions(s)?*
- *What mitigation actions can be funded by other Federal agencies (for example, U.S. Forest Service, National Oceanic and Atmospheric Administration (NOAA), Environmental Protection Agency (EPA) Smart Growth, Housing and Urban Development (HUD) Sustainable Communities, etc.) and/or state and local agencies?*

SECTION 3:
MULTI-JURISDICTION SUMMARY SHEET (OPTIONAL)

INSTRUCTIONS: For multi-jurisdictional plans, a Multi-jurisdiction Summary Spreadsheet may be completed by listing each participating jurisdiction, which required Elements for each jurisdiction were 'Met' or 'Not Met,' and when the adoption resolutions were received. This Summary Sheet does not imply that a mini-plan be developed for each jurisdiction; it should be used as an optional worksheet to ensure that each jurisdiction participating in the Plan has been documented and has met the requirements for those Elements (A through E).

MULTI-JURISDICTION SUMMARY SHEET												
#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N)					
							A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Require-ments
1												
2												
3												
4												
5												
6												
7												
8												
9												

MULTI-JURISDICTION SUMMARY SHEET												
#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N)					
							A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Require-ments
10												
11												
12												
13												
14												
15												
16												
17												
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19												
20												

APPENDIX B

This Appendix provides a copy of the adoption resolution for this plan.

APPENDIX C: HMPC MEETINGS

This section of the Plan includes the HMPC and Public meeting minutes, notes, attendance sheets, public notices and photographs collected during the process of updating this Plan.

City of Poquoson
Hazard Mitigation Plan Update

Kickoff Meeting Minutes

Monday, November 25, 2013 at 9:00am
City of Poquoson, Conference Call

ATTENDEES
Deputy Fire Chief Michael Bryant
Robert Lawrence, Hampton Roads Planning District Commission
Leigh Chapman, Salter's Creek Consulting, Inc.

AGENDA

1. Discuss Schedule
2. Discuss Data Needs (pictures, hazard event info, ordinances, Comp Plan update?)
3. Hazard Mitigation Planning Committee Resolution for Council

MEETING NOTES

- Project schedule: Ms. Chapman presented the schedule. Dep. Chief Bryant will move forward with reserving meeting spaces for the HMPC Meeting #1 and Public Meeting #1 in early February. Mr. Lawrence and Ms. Chapman will move forward with updates to the Hazard Identification and Risk Assessment portion of the plan for presentation in February to the HMPC.
- Activating the HMPC: Poquoson receives CRS credit for activating the HMPC for each update via City Council resolution. Ms. Chapman will forward a sample resolution that can be used for this purpose (completed 12/2/13).

DATA NEEDS

- Poquoson staff will begin collecting pictures and narrative descriptions of hazard events since the previous plan.
- Salter's Creek will need an update on status of each strategy included in the previous plan. This can be provided as an Excel spreadsheet, narrative form, or via email. This is not urgent for the plan update, but will be required in the spring of 2014.
- Still awaiting CRS/ISO Repetitive flood loss data list, single loss data list, and the spreadsheet of Elevation Certificate data from Mr. Ken Somerset, Building Official for Poquoson.
- Many data needs have already been satisfied, with data forwarded to Mr. Lawrence at HRPDC.

City of Poquoson
Hazard Mitigation Plan Update

HMPC Meeting #1 and Public Meeting #1 Minutes

Monday, February 10, 2014 at 6:00pm
City of Poquoson, Community Center, 49 Odd Rd, Poquoson

AGENDA

- Opening Remarks and Introductions
- Review of Planning Process and Progress
- Hazard Risk Assessment Highlights
    - Changes to Hazards Identified
    - Updated History Data since Previous Plan
    - Qualitative and Quantitative Analysis Results
- Next Meeting Dates & Locations
- Discussion and Comment

MEETING NOTES

- The number of residential buildings in the HAZUS results looks low. Compare with assessor's database for accuracy.
- Beginning in 2009, the City formed a damage assessment team for assessing building damage after storm or other events. City officials will forward damage assessment team results to Ms. Chapman for inclusion.
- With regard to flooding and nor'easters, the most critical predictive factors that City officials use to determined severity of an approaching event are: previous precipitation (ground moisture); length/duration of approaching storm; and current condition of drainage system ditches.

DATA NEEDS

- Repetitive flood loss data approved by ISO/Verisk.
- Damage assessment team findings
- Pictures of damaged or mitigated structures for inclusion in the final plan

INVITEES

Email invitations were issued 1/29/14 and 2/10/14 to each of the following committee members:

- Theresa Owens, Finance
- Cliff Bowen, Police
- Robert Holloway, Fire
- Ellen Roberts, Engineering
- Jerry Cagle, Public Works
- James Beach, Facilities and Grounds
- Harold Horton, Citizen/CERT
- Kevin Wyne, Planning Department
- Philip Prisco, Citizen/Wetlands Board
- Bob Speechley, Utilities
- Angela Costello, Public Information Officer
- Amy Blow, Library
- Randy Wheeler, City Manager
- Frank Kreiger, Citizen
- Michelle Hamor, U.S. Army Corps of Engineers
- Robin Bellamy, Finance
- Mike Bryant, Emergency Management
- Robert Lawrence, Hampton Roads Planning District Commission
- Ben McFarlane, Hampton Roads Planning District Commission
- John Boon, Virginia Institute of Marine Science
- Cliff Coffman, CERT
- Michelle Sheeler, CERT

- Debbie Vest, City Planning
- Karen Holloway, E&S Inspection Coordinator
- Lisa Holloway, Citizen/CERT
- John Young, Emergency Management
- Charley Banks, Va Dept of Conservation and Recreation
- Amy Howard, Va Department of Emergency Management
- J. Clifton Tinsley, Citizen
- Les Nagel, Board of Zoning Appeals Member
- Ken Somerset, Floodplain Manager
- Percy Ward, Police Department
- Jim Gouthy, American Red Cross
- Tom Jones, City Public Works
- Steve Elledge, Citizen
- Cory Gifford, CERT
- Kristin Moore, City Building Inspections
- Ken McFetridge, Citizen
- Paul Long, York County Office of Emergency Management
- Bill Sammler, National Weather Service
- Matthew Wall, Virginia Department of Emergency Management
- Hui-Shan Walker, Hampton Emergency Management
- George Glazner, Newport News Emergency Management

Leigh Morgan Chapman

From: Leigh Morgan Chapman <leigh.morgan2@verizon.net>
Sent: Wednesday, January 29, 2014 4:28 PM
To: 'towens@poquoson-va.gov'; 'cbowen@poquoson-va.gov'; 'rholloway@poquoson-va.gov'; 'Ellen.Roberts@poquoson-va.gov'; 'Jerry.Cagle@poquoson-va.gov'; 'jbeach@ci.poquoson-va.gov'; 'Kevin.Wyne@poquoson-va.gov'; 'prisco79@cox.net'; 'rspeechl@poquoson-va.gov'; 'angela.costello@post.harvard.edu'; 'Amy.Blow@poquoson-va.gov'; 'Randy.Wheeler@poquoson-va.gov'; 'Michelle.L.Hamor@usacoe.army.mil'; 'rbellamy@poquoson-va.gov'; 'Michael.Bryant@poquoson-va.gov'; 'rlawrence@hrpdcva.gov'; 'bmcfarlane@hrpdcva.gov'; 'boon@vims.edu'; 'occmaple6@cox.net'; 'Debbie.Vest@poquoson-va.gov'; 'Karen.Holloway@poquoson-va.gov'; 'Lisa.Holloway@poquoson-va.gov'; 'John.Young@poquoson-va.gov'; 'charleybanks@dcr.virginia.gov'; 'Amy.Howard@vdem.virginia.gov'; 'jctvmi@cox.net'; 'dlenagel1@verizon.net'; 'ksomerset@poquoson-va.gov'; 'pward@poquoson-va.gov'; 'disastersrc@ypcredcross.org'; 'corygifford@verizon.net'; 'kmoore@poquoson-va.gov'; 'longr@yorkcounty.gov'; 'william.sammler@noaa.gov'; 'Wall, Matthew'; 'charleybanks@dcr.virginia.gov'; 'Walker, Hui-Shan'; 'PIOFC@YORKCOUNTY.GOV'; 'gglazner@nngov.com'
Subject: Hazard Mitigation Planning Committee - Updating the 2009 Hazard Mitigation Plan for Poquoson
Attachments: PoquHazMitigMtgFeb10.pdf

Hello everyone,

I realize that we are all in the midst of a natural hazard at the moment, and that this is not an ideal time to share this information, but as the date rapidly approaches, I wanted to get the information out!

On Monday, February 10, 2014 at 6pm, Poquoson will host the first of our meetings and workshops toward updating the *2009 Multi-Hazard Mitigation Plan*. This meeting will introduce the process, the background data and the people involved in the update. This is a public meeting and all are welcome. Many of you have agreed to serve on the Hazard Mitigation Planning Committee once again (welcome back!), several of you are new to the process, and a few of you work with stakeholder agencies at the State or Federal level or in adjacent communities. I hope you can all join us at the Poquoson Community Center in a week and half. A flier with details is attached to this email.

Thank you and I hope everyone digs out of this snow safely and successfully!

Leigh Chapman

Salter's Creek
CONSULTING
LEIGH CHAPMAN, CFM
1 Peek Street | Hampton VA 23669
Phone (757) 726-9640 | Mobile (757) 593-0250

Leigh Morgan Chapman

From: Leigh Morgan Chapman <leigh.morgan2@verizon.net>
Sent: Monday, February 10, 2014 9:59 AM
To: 'towens@poquoson-va.gov'; 'cbowen@poquoson-va.gov'; 'rholloway@poquoson-va.gov'; 'Ellen.Roberts@poquoson-va.gov'; 'Jerry.Cagle@poquoson-va.gov'; 'jbeach@ci.poquoson-va.gov'; 'prisco79@cox.net'; 'rspeechl@poquoson-va.gov'; 'angela.costello@post.harvard.edu'; 'Amy.Blow@poquoson-va.gov'; 'Randy.Wheeler@poquoson-va.gov'; 'Michelle.L.Hamor@usacoe.army.mil'; 'rbellamy@poquoson-va.gov'; 'Michael.Bryant@poquoson-va.gov'; 'rlawrence@hrpdcva.gov'; 'bmcfarlane@hrpdcva.gov'; 'boon@vims.edu'; 'occmaple6@cox.net'; 'Debbie.Vest@poquoson-va.gov'; 'Karen.Holloway@poquoson-va.gov'; 'Lisa.Holloway@poquoson-va.gov'; 'John.Young@poquoson-va.gov'; 'charleybanks@dcr.virginia.gov'; 'Amy.Howard@vdem.virginia.gov'; 'jctvmi@cox.net'; 'dlenagel1@verizon.net'; 'ksomerset@poquoson-va.gov'; 'pward@poquoson-va.gov'; 'disastersrc@ypcredcross.org'; 'corygifford@verizon.net'; 'kmoore@poquoson-va.gov'; 'longr@yorkcounty.gov'; 'william.sammler@noaa.gov'; 'Wall, Matthew'; 'charleybanks@dcr.virginia.gov'; 'Walker, Hui-Shan'; 'PIOFC@YORKCOUNTY.GOV'; 'gglazner@nngov.com'; Kevin Wyne (Kevin.Wyne@poquoson-va.gov); 'bobsampe@cox.net'; 'gigcowets@gmail.com'; 'sheelermb@aol.com'
Subject: REMINDER: Hazard Mitigation Planning Committee Meeting Tonight

REMINDER:

The City of Poquoson Emergency Management Office will present and explain Poquoson's planning process for reducing the effects of various natural hazards during a

Stakeholders Workshop TONIGHT at 6:00 p.m., February 10, at the Poquoson Community Center, 49 Odd Road.

Hope to see you there.

Leigh

Salter's Creek
CONSULTING
LEIGH CHAPMAN, CFM
1 Peek Street | Hampton VA 23669
Phone (757) 726-9640 | Mobile (757) 593-0250

From: Leigh Morgan Chapman [mailto:leigh.morgan2@verizon.net]
Sent: Wednesday, January 29, 2014 4:28 PM
To: 'towens@poquoson-va.gov'; 'cbowen@poquoson-va.gov'; 'rholloway@poquoson-va.gov'; 'Ellen.Roberts@poquoson-va.gov'; 'Jerry.Cagle@poquoson-va.gov'; 'jbeach@ci.poquoson-va.gov'; 'Kevin.Wyne@poquoson-va.gov'; 'prisco79@cox.net'; 'rspeechl@poquoson-va.gov'; 'angela.costello@post.harvard.edu'; 'Amy.Blow@poquoson-va.gov'; 'Randy.Wheeler@poquoson-va.gov'; 'Michelle.L.Hamor@usacoe.army.mil'; 'rbellamy@poquoson-va.gov'; 'Michael.Bryant@poquoson-va.gov'; 'rlawrence@hrpdcva.gov'; 'bmcfarlane@hrpdcva.gov'; 'boon@vims.edu'; 'occmaple6@cox.net'; 'Debbie.Vest@poquoson-va.gov'; 'Karen.Holloway@poquoson-va.gov'; 'Lisa.Holloway@poquoson-

PUBLIC ADVERTISEMENT

Public advertisement of the HMPC and public meeting was published twice in *The Daily Press*, the local newspaper. The ad is shown below.

ATTENTION

Citizens of the City of Poquoson

Notice of Poquoson Multi-Hazard Mitigation Plan Stakeholders Meeting

Date: Monday, February 10, 2014
Time: 6:00pm
Where: Poquoson Community Center
49 Odd Road
Poquoson, VA 23662

Share your local knowledge and thoughts on the revision of the City of Poquoson Multi-Hazard Mitigation Plan.

For More Information Visit:
http://www.poquoson-va.gov/general/emergency_information

Or Contact:
Dep. Chief Michael Bryant, Poquoson Fire/Rescue
(757) 868-3510 or michael.bryant@poquoson-va.gov

The HRPDC will strive to provide reasonable accommodations and services for persons who require special assistance to participate in this public involvement opportunity. Contact Robert Lawrence, Sr. Regional Emergency Management Planner at (757) 420-8300 for more information.

ATTENDANCE

- 12 people were in attendance. Attendance sheets are shown below; Leigh Chapman, Salter's Creek Consulting, Inc., did not sign the attendance sheet but was present.

SIGN IN SHEET
POQUOSON HAZARD MITIGATION PLAN 2014 UPDATE
Monday, February 10, 2014

NAME	AGENCY	PHONE	E-MAIL
Bob Speechley	City of Poquoson		
CLIFF BOWEN	POQUOSON POLICE DEPT.		
KEN SOMERSET	City of Poquoson Inspections		
Robin Bellamy	City of Poquoson Finance		
Greg Gecowets	CERT		
Robert Sampe	CERT		
Dawn Brantley	HRPDC		
CLIFF COFFMAN	CERT		
Mike Bryant	Fire Dept.		
MICHELLE SHEELER	CERT		
Robert Lawrence			

City of Poquoson
Hazard Mitigation Plan Update

HMPC Meeting #2 Minutes

Tuesday, April 29, 2014 at 2:00pm
City of Poquoson, City Council Chambers

AGENDA

- Opening Remarks and Introductions
- Review of Planning Process and Progress
- Revisiting the Hazard Identification & Risk Assessment
- Capability Assessment Highlights
- Reworking Goals and Objectives
- Discussion and Comment

MEETING NOTES

- Ken Somerset noted that the number of V zone structures appears high
- The flood-prone Parks Building is no longer the City Archives, and there was discussion regarding additional City facilities that have been retrofitted or rebuilt in the past 5 years
- The group voted on the natural hazards which necessitated the most mitigation funds in order to prioritize which hazards should be classified as critical
- Together, the group brainstormed about key words and important phrases that should be incorporated into the City's mitigation goals and objectives moving forward. The planning consultant agreed to take that information and propose new goals and objectives to the group at the next meeting.

INVITEES

Email invitations were issued 4/8/14 and 4/28/14 to each of the following committee members:

- Theresa Owens, Finance
- Cliff Bowen, Police
- Robert Holloway, Fire
- Ellen Roberts, Engineering
- Jerry Cagle, Public Works
- James Beach, Facilities and Grounds
- Harold Horton, Citizen/CERT
- Kevin Wyne, Planning Department
- Philip Prisco, Citizen/Wetlands Board
- Bob Speechley, Utilities
- Angela Costello, Public Information Officer
- Amy Blow, Library
- Randy Wheeler, City Manager
- Frank Kreiger, Citizen
- Michelle Hamor, U.S. Army Corps of Engineers
- Robin Bellamy, Finance
- Mike Bryant, Emergency Management
- Robert Lawrence, Hampton Roads Planning District Commission
- Ben McFarlane, Hampton Roads Planning District Commission
- John Boon, Virginia Institute of Marine Science
- Cliff Coffman, CERT
- Michelle Sheeler, CERT
- Debbie Vest, City Planning
- Karen Holloway, E&S Inspection Coordinator
- Lisa Holloway, Citizen/CERT
- John Young, Emergency Management
- Charley Banks, Va Dept of Conservation and Recreation
- Amy Howard, Va Department of Emergency Management
- J. Clifton Tinsley, Citizen
- Les Nagel, Board of Zoning Appeals Member
- Ken Somerset, Floodplain Manager
- Percy Ward, Police Department

- Jim Gouthy, American Red Cross
- Tom Jones, City Public Works
- Steve Elledge, Citizen
- Cory Gifford, CERT
- Kristin Moore, City Building Inspections
- Ken McFetridge, Citizen
- Paul Long, York County Office of Emergency Management
- Bill Sammler, National Weather Service
- Matthew Wall, Virginia Department of Emergency Management
- Hui-Shan Walker, Hampton Emergency Management
- George Glazner, Newport News Emergency Management
- Tammy Waldroup, Christopher Newport University
- Doug Smith, Riverside Hospital
- Alan Bradshaw, Dominion Power

Leigh Morgan Chapman

From: Leigh Morgan Chapman <leigh.morgan2@verizon.net>
Sent: Tuesday, April 08, 2014 10:50 AM
To: 'towens@poquoson-va.gov'; 'cbowen@poquoson-va.gov'; 'rholloway@poquoson-va.gov'; 'Ellen.Roberts@poquoson-va.gov'; 'Jerry.Cagle@poquoson-va.gov'; 'jbeach@ci.poquoson-va.gov'; 'prisco79@cox.net'; 'rspeechl@poquoson-va.gov'; 'angela.costello@post.harvard.edu'; 'Amy.Blow@poquoson-va.gov'; 'Randy.Wheeler@poquoson-va.gov'; 'Michelle.L.Hamor@usace.army.mil'; 'rbellamy@poquoson-va.gov'; 'Michael.Bryant@poquoson-va.gov'; 'rlawrence@hrpdcva.gov'; 'bmcfarlane@hrpdcva.gov'; 'boon@vims.edu'; 'occmaple6@cox.net'; 'Debbie.Vest@poquoson-va.gov'; 'Karen.Holloway@poquoson-va.gov'; 'Lisa.Holloway@poquoson-va.gov'; 'John.Young@poquoson-va.gov'; 'charleybanks@dcr.virginia.gov'; 'Amy.Howard@vdem.virginia.gov'; 'jctvmi@cox.net'; 'dlenagel1@verizon.net'; 'ksomerset@poquoson-va.gov'; 'pward@poquoson-va.gov'; 'disastersrc@ypcredcross.org'; 'corygifford@verizon.net'; 'kmoore@poquoson-va.gov'; 'longr@yorkcounty.gov'; 'william.sammler@noaa.gov'; 'Wall, Matthew'; 'charleybanks@dcr.virginia.gov'; 'Walker, Hui-Shan'; 'PIOFC@YORKCOUNTY.GOV'; 'gglazner@nngov.com'; Kevin Wyne (Kevin.Wyne@poquoson-va.gov); 'bobsampe@cox.net'; 'gjgcowets@gmail.com'; 'sheelermb@aol.com'
Subject: RESCHEDULED: Poquoson Hazard Mitigation Planning Committee Meetings April 29 and 30, 2 to 4pm

Good morning, everyone:

We have rescheduled the **Poquoson Hazard Mitigation Planning Committee Meetings** to the end of this month. The two meetings will be held in Poquoson Council chambers, from 2 to 4 pm on April 29 and 30. These are the 2 primary working sessions needed to bring the updated plan together.

At the **April 29 meeting**, we will very briefly go over the vulnerability information that Robert Lawrence and I have developed. I will have some questions for you all about updated capabilities with regard to natural hazards, especially in light of accomplishments from the last plan. We will then revisit the existing plan Goals and Objectives to make sure they represent how you all want to move forward.

The **April 30 meeting** will be the most important (if you have to choose), as that is when we will revisit the existing mitigation actions, determine which are kept/revised, and develop any necessary new mitigation actions. The fun part!

I hope you can make plans to attend.

Thanks,
Leigh

Salter's Creek
CONSULTING
LEIGH CHAPMAN, CFM
1 Peek Street | Hampton VA 23669

1

Leigh Morgan Chapman

From: Leigh Morgan Chapman <leigh.morgan2@verizon.net>
Sent: Monday, April 28, 2014 10:03 AM
To: 'towens@poquoson-va.gov'; 'cbowen@poquoson-va.gov'; 'rholloway@poquoson-va.gov'; 'Ellen.Roberts@poquoson-va.gov'; 'Jerry.Cagle@poquoson-va.gov'; 'jbeach@ci.poquoson-va.gov'; 'prisco79@cox.net'; 'rspeechl@poquoson-va.gov'; 'angela.costello@post.harvard.edu'; 'Amy.Blow@poquoson-va.gov'; 'Randy.Wheeler@poquoson-va.gov'; 'Michelle.L.Hamor@usace.army.mil'; 'rbellamy@poquoson-va.gov'; 'Michael.Bryant@poquoson-va.gov'; 'rlawrence@hrpdcva.gov'; 'bmcfarlane@hrpdcva.gov'; 'boon@vims.edu'; 'occmaple6@cox.net'; 'Debbie.Vest@poquoson-va.gov'; 'Karen.Holloway@poquoson-va.gov'; 'Lisa.Holloway@poquoson-va.gov'; 'John.Young@poquoson-va.gov'; 'charleybanks@dcr.virginia.gov'; 'Amy.Howard@vdem.virginia.gov'; 'jctvmi@cox.net'; 'dlenagel1@verizon.net'; 'ksomerset@poquoson-va.gov'; 'pward@poquoson-va.gov'; 'disastersrc@ypcredcross.org'; 'corygifford@verizon.net'; 'kmoore@poquoson-va.gov'; 'longr@yorkcounty.gov'; 'Wall, Matthew'; 'charleybanks@dcr.virginia.gov'; 'Walker, Hui-Shan'; 'PIOFC@YORKCOUNTY.GOV'; 'gglazner@nngov.com'; Kevin Wyne (Kevin.Wyne@poquoson-va.gov); 'bobsampe@cox.net'; 'gjgcowets@gmail.com'; 'sheelermb@aol.com'; 'Tammy Waldroup'; 'doug.smith@rivhs.com'; 'alan.bradshaw@dom.com'
Subject: REMINDER: Poquoson Hazard Mitigation Planning Committee Meetings April 29 and 30, 2 to 4pm
Attachments: 2009 Goals, Objectives and Actions.docx

Good morning, everyone!

Reminder that we have two Poquoson Hazard Mitigation Planning Committee Meetings (I prefer the term "Workshops") this week. The process needs your input, so I hope you can make plans to attend. Even better, if you can review the attached excerpted information from the 2009 plan, you'll be primed to contribute!

Both workshops will be held in Poquoson Council chambers, from 2 to 4 pm on April 29 and 30.

At the **April 29 meeting**, we will very briefly go over the vulnerability information that Robert Lawrence and I have developed. I will have some questions for you all about updated capabilities with regard to natural hazards, especially in light of accomplishments from the last plan. We will then revisit the existing plan Goals and Objectives to make sure they represent how you all want to move forward.

The **April 30 meeting** will be the most important (if you have to choose), as that is when we will revisit the existing mitigation actions, determine which are kept/revised, and develop any necessary new mitigation actions. The fun part!

The schedule is also set for our final meetings: **June 16,** with the HMPC meeting at 2:00pm to go over the final plan and a public meeting at 4:00pm to present the information to the public prior to adoption by City Council. You can go ahead and add these to your schedule.

Hope to see you tomorrow!
Leigh

1

ATTENDANCE

- 16 people were in attendance. Attendance sheet is shown below; Leigh Chapman, Salter's Creek Consulting, Inc., did not sign the attendance sheet but was present.

SIGN-IN SHEET
CITY OF POQUOSON HMPC MEETING #2
TUESDAY, APRIL 29, 2014

NAME	AGENCY	PHONE #	E-MAIL
Mike Bryant	Fire/EM		
CLIFF GOFFMAN	CERT		
DEN McFARLANE	HRPDC		
Ellen Roberts	Poquoson		
Clifford T. Bowen	Poquoson Police		
John Young	Fire / EM		
Robert T. Holloway Sr	Fire/Rescue		
Lester Paul	Dominion		
Robin Bellamy	City of Poquoson		
Bob Speechley	City of Poquoson		
Kevin Wynne	City of Poquoson		
Percy Ward	Poquoson Police		
Kenneth Somerset	City of Poquoson		
Michelle Sheeler	CERT		
Amy Howard	VDEM		

City of Poquoson
Hazard Mitigation Plan Update

HMPC Meeting #3 Minutes

Tuesday, April 30, 2014 at 2:00pm
City of Poquoson, City Council Chambers

AGENDA

- Opening Remarks and Introductions
- Review of Planning Process and Progress
- Revisiting the Goals and Objectives
- Reviewing Possible Mitigation Activities for Flood
- Reviewing Existing Mitigation Actions
- Finalizing Mitigation Actions – All Hazards

MEETING NOTES

- Despite group voting which indicated Winter Storms could be a critical hazard, the group decided the low level of damages indicated it is a noncritical hazard for purposes of the report.
- Much discussion ensued regarding word changes and edits to the goals and objectives.
- Group discussed status of 2009 mitigation actions, which to keep, which to remove. Discussed mitigation grants with Amy Howard from VDEM. Discussed PPI, re-entry procedures, Shoreline Management Plan, evacuation route elevation/widening projects, car evacuation to Langley Speedway, additional floodplain management measures that may be appropriate, sea level rise mitigation measures, Blueways, use of social networks, wildfire management/mitigation successes

INVITEES

Email invitations were issued 4/8/14 and 4/28/14 to each of the following committee members:

- Theresa Owens, Finance
- Cliff Bowen, Police
- Robert Holloway, Fire
- Ellen Roberts, Engineering
- Jerry Cagle, Public Works
- James Beach, Facilities and Grounds
- Harold Horton, Citizen/CERT
- Kevin Wyne, Planning Department
- Philip Prisco, Citizen/Wetlands Board
- Bob Speechley, Utilities
- Angela Costello, Public Information Officer
- Amy Blow, Library
- Randy Wheeler, City Manager
- Frank Kreiger, Citizen
- Michelle Hamor, U.S. Army Corps of Engineers
- Robin Bellamy, Finance
- Mike Bryant, Emergency Management
- Robert Lawrence, Hampton Roads Planning District Commission
- Ben McFarlane, Hampton Roads Planning District Commission
- John Boon, Virginia Institute of Marine Science
- Cliff Coffman, CERT
- Michelle Sheeler, CERT
- Debbie Vest, City Planning
- Karen Holloway, E&S Inspection Coordinator
- Lisa Holloway, Citizen/CERT
- John Young, Emergency Management
- Charley Banks, Va Dept of Conservation and Recreation
- Amy Howard, Va Department of Emergency Management
- J. Clifton Tinsley, Citizen
- Les Nagel, Board of Zoning Appeals Member
- Ken Somerset, Floodplain Manager
- Percy Ward, Police Department

- Jim Gouthy, American Red Cross
- Tom Jones, City Public Works
- Steve Elledge, Citizen
- Cory Gifford, CERT
- Kristin Moore, City Building Inspections
- Ken McFetridge, Citizen
- Paul Long, York County Office of Emergency Management
- Bill Sammler, National Weather Service
- Matthew Wall, Virginia Department of Emergency Management
- Hui-Shan Walker, Hampton Emergency Management
- George Glazner, Newport News Emergency Management
- Tammy Waldroup, Christopher Newport University
- Doug Smith, Riverside Hospital
- Alan Bradshaw, Dominion Power

Leigh Morgan Chapman

From: Leigh Morgan Chapman <leigh.morgan2@verizon.net>
Sent: Tuesday, April 08, 2014 10:50 AM
To: 'towens@poquoson-va.gov'; 'cbowen@poquoson-va.gov'; 'rholloway@poquoson-va.gov'; 'Ellen.Roberts@poquoson-va.gov'; 'Jerry.Cagle@poquoson-va.gov'; 'jbeach@ci.poquoson-va.gov'; 'prisco79@cox.net'; 'rspeechl@poquoson-va.gov'; 'angela.costello@post.harvard.edu'; 'Amy.Blow@poquoson-va.gov'; 'Randy.Wheeler@poquoson-va.gov'; 'Michelle.L.Hamor@usacoe.army.mil'; 'rbellamy@poquoson-va.gov'; 'Michael.Bryant@poquoson-va.gov'; 'rlawrence@hrpdcva.gov'; 'bmcfarlane@hrpdcva.gov'; 'boon@vims.edu'; 'occmaple6@cox.net'; 'Debbie.Vest@poquoson-va.gov'; 'Karen.Holloway@poquoson-va.gov'; 'Lisa.Holloway@poquoson-va.gov'; 'John.Young@poquoson-va.gov'; 'charleybanks@dcr.virginia.gov'; 'Amy.Howard@vdem.virginia.gov'; 'jctvmi@cox.net'; 'dlenagel1@verizon.net'; 'ksomerset@poquoson-va.gov'; 'pward@poquoson-va.gov'; 'disastersrc@ypcredcross.org'; 'corygifford@verizon.net'; 'kmoore@poquoson-va.gov'; 'longr@yorkcounty.gov'; 'william.sammler@noaa.gov'; 'Wall, Matthew'; 'charleybanks@dcr.virginia.gov'; 'Walker, Hui-Shan'; 'PIOFC@YORKCOUNTY.GOV'; 'gglazner@nngov.com'; Kevin Wyne (Kevin.Wyne@poquoson-va.gov); 'bobsampe@cox.net'; 'gjgcowets@gmail.com'; 'sheelermb@aol.com'
Subject: RESCHEDULED: Poquoson Hazard Mitigation Planning Committee Meetings April 29 and 30, 2 to 4pm

Good morning, everyone:

We have rescheduled the **Poquoson Hazard Mitigation Planning Committee Meetings** to the end of this month. The two meetings will be held in Poquoson Council chambers, from 2 to 4 pm on April 29 and 30. These are the 2 primary working sessions needed to bring the updated plan together.

At the **April 29 meeting**, we will very briefly go over the vulnerability information that Robert Lawrence and I have developed. I will have some questions for you all about updated capabilities with regard to natural hazards, especially in light of accomplishments from the last plan. We will then revisit the existing plan Goals and Objectives to make sure they represent how you all want to move forward.

The **April 30 meeting** will be the most important (if you have to choose), as that is when we will revisit the existing mitigation actions, determine which are kept/revised, and develop any necessary new mitigation actions. The fun part!

I hope you can make plans to attend.

Thanks,
Leigh

Salter's Creek
CONSULTING
LEIGH CHAPMAN, CFM
1 Peek Street | Hampton VA 23669

1

Leigh Morgan Chapman

From: Leigh Morgan Chapman <leigh.morgan2@verizon.net>
Sent: Monday, April 28, 2014 10:03 AM
To: 'towens@poquoson-va.gov'; 'cbowen@poquoson-va.gov'; 'rholloway@poquoson-va.gov'; 'Ellen.Roberts@poquoson-va.gov'; 'Jerry.Cagle@poquoson-va.gov'; 'jbeach@ci.poquoson-va.gov'; 'prisco79@cox.net'; 'rspeechl@poquoson-va.gov'; 'angela.costello@post.harvard.edu'; 'Amy.Blow@poquoson-va.gov'; 'Randy.Wheeler@poquoson-va.gov'; 'Michelle.L.Hamor@usacoe.army.mil'; 'rbellamy@poquoson-va.gov'; 'Michael.Bryant@poquoson-va.gov'; 'rlawrence@hrpdcva.gov'; 'bmcfarlane@hrpdcva.gov'; 'boon@vims.edu'; 'occmaple6@cox.net'; 'Debbie.Vest@poquoson-va.gov'; 'Karen.Holloway@poquoson-va.gov'; 'Lisa.Holloway@poquoson-va.gov'; 'John.Young@poquoson-va.gov'; 'charleybanks@dcr.virginia.gov'; 'Amy.Howard@vdem.virginia.gov'; 'jctvmi@cox.net'; 'dlenagel1@verizon.net'; 'ksomerset@poquoson-va.gov'; 'pward@poquoson-va.gov'; 'disastersrc@ypcredcross.org'; 'corygifford@verizon.net'; 'kmoore@poquoson-va.gov'; 'longr@yorkcounty.gov'; 'Wall, Matthew'; 'charleybanks@dcr.virginia.gov'; 'Walker, Hui-Shan'; 'PIOFC@YORKCOUNTY.GOV'; 'gglazner@nngov.com'; Kevin Wyne (Kevin.Wyne@poquoson-va.gov); 'bobsampe@cox.net'; 'gjgcowets@gmail.com'; 'sheelermb@aol.com'; 'Tammy Waldroup'; 'doug.smith@rivhs.com'; 'alan.bradshaw@dom.com'
Subject: REMINDER: Poquoson Hazard Mitigation Planning Committee Meetings April 29 and 30, 2 to 4pm
Attachments: 2009 Goals, Objectives and Actions.docx

Good morning, everyone!

Reminder that we have two Poquoson Hazard Mitigation Planning Committee Meetings (I prefer the term "Workshops") this week. The process needs your input, so I hope you can make plans to attend. Even better, if you can review the attached excerpted information from the 2009 plan, you'll be primed to contribute!

Both workshops will be held in Poquoson Council chambers, from 2 to 4 pm on April 29 and 30.

At the **April 29 meeting**, we will very briefly go over the vulnerability information that Robert Lawrence and I have developed. I will have some questions for you all about updated capabilities with regard to natural hazards, especially in light of accomplishments from the last plan. We will then revisit the existing plan Goals and Objectives to make sure they represent how you all want to move forward.

The **April 30 meeting** will be the most important (if you have to choose), as that is when we will revisit the existing mitigation actions, determine which are kept/revised, and develop any necessary new mitigation actions. The fun part!

The schedule is also set for our final meetings: **June 16,** with the HMPC meeting at 2:00pm to go over the final plan and a public meeting at 4:00pm to present the information to the public prior to adoption by City Council. You can go ahead and add these to your schedule.

Hope to see you tomorrow!
Leigh

1

ATTENDANCE

- 15 people were in attendance. Attendance sheet is shown below; Leigh Chapman, Salter's Creek Consulting, Inc., did not sign the attendance sheet but was present.

SIGN-IN SHEET
CITY OF POQUOSON HMPC MEETING #3
WEDNESDAY ~~TUESDAY~~, APRIL 30, 2014

NAME	AGENCY	PHONE #	E-MAIL
CLIFF COFFMAN	CERT	[redacted]	
[illegible]	FAA		
Robert T. Holloway Jr.	Poq. Fire/Resc		
Mike Bryant	Fire/EM		
Robin Bellamy	City of Poquoson		
[illegible]	[illegible]		
Perry Ward	Police		
Bob Speechley	utilities		
Kevin Wyne	Planning		
Kenneth Somerset	Building Inspector		
CLIFFORD BOWEN	POQUOSON POLICE		
Randy Wheeler	Cty Mgr		
MICHELLE SHEBLER	CERT		
Theresa Owens	Finance COP		

City of Poquoson
Hazard Mitigation Plan Update

HMPC Meeting #4 Minutes

Monday, June 16, 2014 at 2:00pm
City of Poquoson, City Council Chambers

AGENDA

- Review of Planning Process and Progress
- Reviewing Mitigation Activities and Priorities
- Next Steps and Schedule

MEETING NOTES

- Group discussed possibility of multi-jurisdictional plan through HRPDC. Decided to add paragraph to Section 8 indicating that if the opportunity arises to participate in larger planning process, the HMPC will review the specific details and make a recommendation to Manager and Council.
- Group reviewed and discussed each mitigation action, the wording of the action and the priority.
- Consultant will setup table and provide opportunity for public review of the draft Hazard Mitigation Plan at the FEMA Open House on July 8.
- In the acronym appendix, provide additional hyperlinks and information on each acronym.
- Dep. Chief Bryant indicated an additional capability regarding retrofits for hurricane shutters at the EOC. City Council chambers and the AV room in 2014, and hurricane shutters to the library in 2015. The report will be modified to include these anticipated projects.

INVITEES

Email invitations were issued 4/28/14, 6/9/14 and 6/16/14 to each of the following committee members:

- Theresa Owens, Finance
- Cliff Bowen, Police
- Robert Holloway, Fire
- Ellen Roberts, Engineering
- Jerry Cagle, Public Works
- James Beach, Facilities and Grounds
- Harold Horton, Citizen/CERT
- Kevin Wyne, Planning Department
- Philip Prisco, Citizen/Wetlands Board
- Bob Speechley, Utilities
- Angela Costello, Public Information Officer
- Amy Blow, Library
- Randy Wheeler, City Manager
- Frank Kreiger, Citizen
- Michelle Hamor, U.S. Army Corps of Engineers
- Robin Bellamy, Finance
- Mike Bryant, Emergency Management
- Robert Lawrence, Hampton Roads Planning District Commission
- John Sadler, Hampton Roads Planning District Commission
- Dawn Brantley, Hampton Roads Planning District Commission
- John Boon, Virginia Institute of Marine Science
- Cliff Coffman, CERT
- Michelle Sheeler, CERT
- Debbie Vest, City Planning
- Karen Holloway, E&S Inspection Coordinator
- Lisa Holloway, Citizen/CERT
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- Amy Howard, Va Department of Emergency Management
- J. Clifton Tinsley, Citizen
- Les Nagel, Board of Zoning Appeals Member
- Ken Somerset, Floodplain Manager
- Percy Ward, Police Department
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- Cory Gifford, CERT
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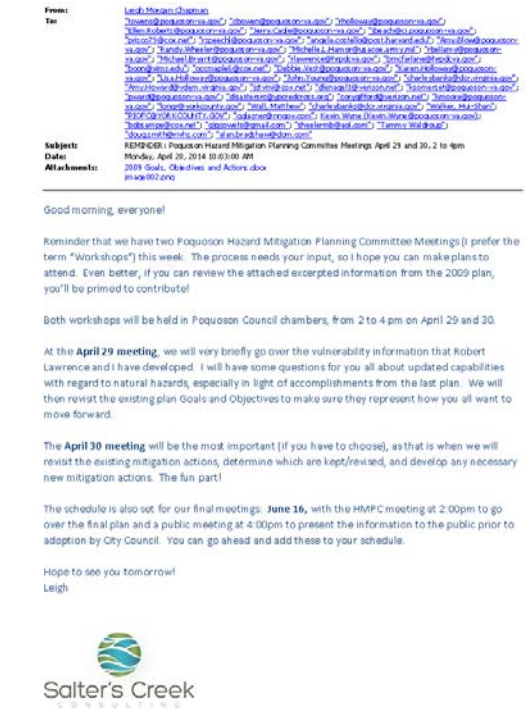
- Ken McFetridge, Citizen
- Paul Long, York County Office of Emergency Management
- Bill Sammler, National Weather Service
- Matthew Wall, Virginia Department of Emergency Management
- Hui-Shan Walker, Hampton Emergency Management
- George Glazner, Newport News Emergency Management
- Tammy Waldroup, Christopher Newport University
- Doug Smith, Riverside Hospital
- Alan Bradshaw, Dominion Power



From: Leigh Morgan Chapman
To: "towens@poquoson-va.gov"; "cbowen@poquoson-va.gov"; "hholloway@poquoson-va.gov"; "Ellen.Roberts@poquoson-va.gov"; "Jerry.Cagle@poquoson-va.gov"; "jbeachbo@poquoson-va.gov"; "prisco79@cox.net"; "rspeech1@poquoson-va.gov"; "angela.costello@post.harvard.edu"; "Amy.Blow@poquoson-va.gov"; "Randy.Wheeler@poquoson-va.gov"; "Michelle.L.Hamor@usacoe.army.mil"; "vbellamy@poquoson-va.gov"; "Michael.Bryant@poquoson-va.gov"; "Lawrence@hrpdcva.gov"; "bmcfarlane@hrpdcva.gov"; "boon@vims.edu"; "occmaple6@cox.net"; "Debbie.Vest@poquoson-va.gov"; "Karen.Holloway@poquoson-va.gov"; "Lisa.Holloway@poquoson-va.gov"; "John.Young@poquoson-va.gov"; "charlie.banks@dcr.virginia.gov"; "Amy.Howell@vdem.virginia.gov"; "jdsmith@cox.net"; "dbragg1@verizon.net"; "boomer4@poquoson-va.gov"; "jpowell@poquoson-va.gov"; "dlusterson@sperredcross.org"; "corgolfer@verizon.net"; "bmoore@poquoson-va.gov"; "bonar@workcounty.gov"; "Wall, Matthew"; "charlie.banks@dcr.virginia.gov"; "Walker, Hui-Shan"; "PIOFC@YORKCOUNTY.GOV"; "galazner@nnpw.com"; Kevin.Wine (Kevin.Wine@poquoson-va.gov); "bobsamps@cox.net"; "sgpowell@gmail.com"; "sheelermb@aol.com"; "Tammy.Waldroup"; "dougsmith@rmhs.com"; "alanbradshaw@dom.com"
Subject: REMINDER: Poquoson Hazard Mitigation Planning Committee Meetings April 29 and 30, 2 to 4pm
Date: Monday, April 28, 2014 10:03:00 AM
Attachments: 2009 Goals, Objectives and Actions.docx; image002.png

Good morning, everyone!

Reminder that we have two Poquoson Hazard Mitigation Planning Committee Meetings (I prefer the term "Workshops") this week. The process needs your input, so I hope you can make plans to attend. Even better, if you can review the attached excerpted information from the 2009 plan, you'll be primed to contribute!

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The schedule is also set for our final meetings: **June 16,** with the HMPC meeting at 2:00pm to go over the final plan and a public meeting at 4:00pm to present the information to the public prior to adoption by City Council. You can go ahead and add these to your schedule.

Hope to see you tomorrow!
Leigh

Salter's Creek
CONSULTING

From: Leigh Morgan Chapman
To: "towens@poquoson-va.gov"; "cbowen@poquoson-va.gov"; "hholloway@poquoson-va.gov"; "Ellen.Roberts@poquoson-va.gov"; "Jerry.Cagle@poquoson-va.gov"; "jbeachbo@poquoson-va.gov"; "prisco79@cox.net"; "rspeech1@poquoson-va.gov"; "angela.costello@post.harvard.edu"; "Amy.Blow@poquoson-va.gov"; "Randy.Wheeler@poquoson-va.gov"; "Michelle.L.Hamor@usacoe.army.mil"; "vbellamy@poquoson-va.gov"; "Michael.Bryant@poquoson-va.gov"; "Lawrence@hrpdcva.gov"; "bmcfarlane@hrpdcva.gov"; "boon@vims.edu"; "occmaple6@cox.net"; "Debbie.Vest@poquoson-va.gov"; "Karen.Holloway@poquoson-va.gov"; "Lisa.Holloway@poquoson-va.gov"; "John.Young@poquoson-va.gov"; "charlie.banks@dcr.virginia.gov"; "Amy.Howell@vdem.virginia.gov"; "jdsmith@cox.net"; "dbragg1@verizon.net"; "boomer4@poquoson-va.gov"; "jpowell@poquoson-va.gov"; "dlusterson@sperredcross.org"; "corgolfer@verizon.net"; "bmoore@poquoson-va.gov"; "bonar@workcounty.gov"; "Wall, Matthew"; "charlie.banks@dcr.virginia.gov"; "Walker, Hui-Shan"; "PIOFC@YORKCOUNTY.GOV"; "galazner@nnpw.com"; Kevin.Wine (Kevin.Wine@poquoson-va.gov); "bobsamps@cox.net"; "sgpowell@gmail.com"; "sheelermb@aol.com"; "Tammy.Waldroup"; "dougsmith@rmhs.com"; "alanbradshaw@dom.com"; "John.Sadler"; "Dawn.Brantley"
Subject: REMINDER: Poquoson Hazard Mitigation Planning Committee Meeting and Public Meeting, June 16
Date: Monday, June 09, 2014 1:57:00 PM
Attachments: image004.png; sect 7 mitigation strategy.doc; image003.png

Good afternoon, everyone. Just a reminder that we are meeting briefly at 2pm next Monday. A public meeting to present the draft plan, particularly the mitigation actions, will follow. As soon as possible following the public meeting, I'll issue a draft of the plan for a 2 week public review/comment period when you can all review the entire document at your leisure.

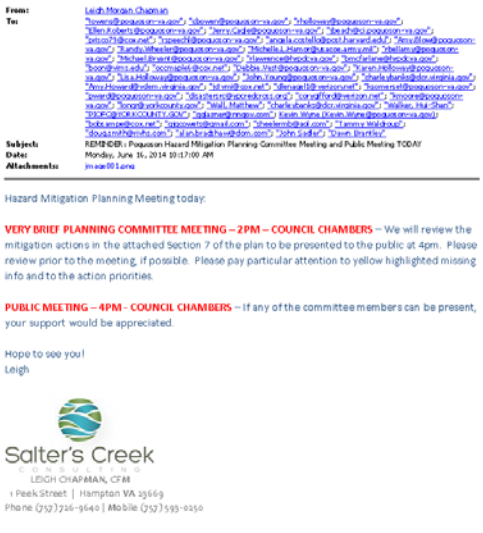
VERY BRIEF PLANNING COMMITTEE MEETING – 2PM – COUNCIL CHAMBERS – We will review the mitigation actions in the attached Section 7 of the plan to be presented to the public at 4pm. Please review prior to the meeting, if possible. Please pay particular attention to yellow highlighted missing info and to the action priorities.

PUBLIC MEETING – 4PM - COUNCIL CHAMBERS – If any of the committee members can be present, your support would be appreciated.

Hope to see you next week!
Leigh

Salter's Creek
CONSULTING
LEIGH CHAPMAN, CFM
1 Peek Street | Hampton VA 23669
Phone (757) 726-9640 | Mobile (757) 595-0250

From: Leigh Morgan Chapman [mailto:leigh.morgan2@verizon.net]
Sent: Monday, April 28, 2014 10:03 AM
To: 'towens@poquoson-va.gov'; 'cbowen@poquoson-va.gov'; 'hholloway@poquoson-va.gov'; 'Ellen.Roberts@poquoson-va.gov'; 'Jerry.Cagle@poquoson-va.gov'; 'jbeachbo@poquoson-va.gov'; 'prisco79@cox.net'; 'rspeech1@poquoson-va.gov'; 'angela.costello@post.harvard.edu'; 'Amy.Blow@poquoson-va.gov'; 'Randy.Wheeler@poquoson-va.gov'; 'Michelle.L.Hamor@usacoe.army.mil'; 'vbellamy@poquoson-va.gov'; 'Michael.Bryant@poquoson-va.gov'; 'Lawrence@hrpdcva.gov'; 'bmcfarlane@hrpdcva.gov'; 'boon@vims.edu'; 'occmaple6@cox.net'; 'Debbie.Vest@poquoson-va.gov'; 'Karen.Holloway@poquoson-va.gov'; 'Lisa.Holloway@poquoson-



From: Leigh Morgan Chapman
To: "towens@poquoson-va.gov"; "cbowen@poquoson-va.gov"; "hholloway@poquoson-va.gov"; "Ellen.Roberts@poquoson-va.gov"; "Jerry.Cagle@poquoson-va.gov"; "jbeachbo@poquoson-va.gov"; "prisco79@cox.net"; "rspeech1@poquoson-va.gov"; "angela.costello@post.harvard.edu"; "Amy.Blow@poquoson-va.gov"; "Randy.Wheeler@poquoson-va.gov"; "Michelle.L.Hamor@usacoe.army.mil"; "vbellamy@poquoson-va.gov"; "Michael.Bryant@poquoson-va.gov"; "Lawrence@hrpdcva.gov"; "bmcfarlane@hrpdcva.gov"; "boon@vims.edu"; "occmaple6@cox.net"; "Debbie.Vest@poquoson-va.gov"; "Karen.Holloway@poquoson-va.gov"; "Lisa.Holloway@poquoson-va.gov"; "John.Young@poquoson-va.gov"; "charlie.banks@dcr.virginia.gov"; "Amy.Howell@vdem.virginia.gov"; "jdsmith@cox.net"; "dbragg1@verizon.net"; "boomer4@poquoson-va.gov"; "jpowell@poquoson-va.gov"; "dlusterson@sperredcross.org"; "corgolfer@verizon.net"; "bmoore@poquoson-va.gov"; "bonar@workcounty.gov"; "Wall, Matthew"; "charlie.banks@dcr.virginia.gov"; "Walker, Hui-Shan"; "PIOFC@YORKCOUNTY.GOV"; "galazner@nnpw.com"; Kevin.Wine (Kevin.Wine@poquoson-va.gov); "bobsamps@cox.net"; "sgpowell@gmail.com"; "sheelermb@aol.com"; "Tammy.Waldroup"; "dougsmith@rmhs.com"; "alanbradshaw@dom.com"; "John.Sadler"; "Dawn.Brantley"
Subject: REMINDER: Poquoson Hazard Mitigation Planning Committee Meeting and Public Meeting TODAY
Date: Monday, June 16, 2014 10:17:00 AM
Attachments: image001.png

Hazard Mitigation Planning Meeting today.

VERY BRIEF PLANNING COMMITTEE MEETING – 2PM – COUNCIL CHAMBERS – We will review the mitigation actions in the attached Section 7 of the plan to be presented to the public at 4pm. Please review prior to the meeting, if possible. Please pay particular attention to yellow highlighted missing info and to the action priorities.

PUBLIC MEETING – 4PM - COUNCIL CHAMBERS – If any of the committee members can be present, your support would be appreciated.

Hope to see you!
Leigh

Salter's Creek
CONSULTING
LEIGH CHAPMAN, CFM
1 Peek Street | Hampton VA 23669
Phone (757) 726-9640 | Mobile (757) 595-0250

ATTENDANCE

- 13 people were in attendance. Attendance sheet is shown below.

SIGN-IN SHEET
CITY OF POQUOSON, HMPC MEETING #4
MONDAY, JUNE 16, 2014

NAME	AGENCY		
LES NAGEL	Poq - BZA		
Mike Bryant	Fire/EM		
Robert T. Holloway Jr.	Fire/EMS		
Randy Wheeler	City Managers Office		
CLIFF COFFMAN	POQ. CERT		
Gretchen Gochenour	Community Recreation City of Poq		
MICHELLE SHEELER	POQ. CERT		
Ellen Roberts	Eng		
Kevin Wyne	Community Developm		
Theresa Owens	FIN DEPT		
Bob Speechley	Poquoson Utilities		
Ken Somerset	Building Inspectors		
Leigh Chapman	Salter's Creek Consulting		

City of Poquoson
Hazard Mitigation Plan Update

Public Meeting #2 Minutes

Monday, June 16, 2014 at 4:00pm
City of Poquoson, City Council Chambers

AGENDA

- Review of Planning Process and Progress
- Reviewing Mitigation Activities and Priorities
- Next Steps and Schedule

MEETING NOTES

- Group reviewed and discussed each mitigation action, the wording of the action and the priority.
- Consultant will setup table and provide opportunity for public review of the draft Hazard Mitigation Plan at the FEMA Open House on July 8.

INVITEES

Email invitations were issued 4/28/14, 6/9/14 and 6/16/14 to each of the following committee members:

- Theresa Owens, Finance
- Cliff Bowen, Police
- Robert Holloway, Fire
- Ellen Roberts, Engineering
- Jerry Cagle, Public Works
- James Beach, Facilities and Grounds
- Harold Horton, Citizen/CERT
- Kevin Wyne, Planning Department
- Philip Prisco, Citizen/Wetlands Board
- Bob Speechley, Utilities
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- Amy Blow, Library
- Randy Wheeler, City Manager
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- Robin Bellamy, Finance
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- Robert Lawrence, Hampton Roads Planning District Commission
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- John Boon, Virginia Institute of Marine Science
- Cliff Coffman, CERT
- Michelle Sheeler, CERT
- Debbie Vest, City Planning
- Karen Holloway, E&S Inspection Coordinator
- Lisa Holloway, Citizen/CERT
- John Young, Emergency Management
- Charley Banks, Va Dept of Conservation and Recreation
- Amy Howard, Va Department of Emergency Management
- J. Clifton Tinsley, Citizen
- Les Nagel, Board of Zoning Appeals Member
- Ken Somerset, Floodplain Manager
- Percy Ward, Police Department
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- Tom Jones, City Public Works
- Steve Elledge, Citizen
- Cory Gifford, CERT
- Kristin Moore, City Building Inspections
- Ken McFetridge, Citizen
- Paul Long, York County Office of Emergency Management
- Bill Sammler, National Weather Service
- Matthew Wall, Virginia Department of Emergency Management
- Hui-Shan Walker, Hampton Emergency Management
- George Glazner, Newport News Emergency Management

- Tammy Waldroup, Christopher Newport University

From: Leigh Morgan Chapman
To: "towens@poquoson-va.gov"; "cbowen@poquoson-va.gov"; "hholloway@poquoson-va.gov"; "Ellen.Roberts@poquoson-va.gov"; "Jerry.Cagle@poquoson-va.gov"; "Beach@ci.poquoson-va.gov"; "prisco79@cox.net"; "rspeech1@poquoson-va.gov"; "angela.costello@post.harvard.edu"; "Amy.Blow@poquoson-va.gov"; "Randy.Wheeler@poquoson-va.gov"; "Michelle.L.Hamor@usace.army.mil"; "tbellamy@poquoson-va.gov"; "Michael.Bryant@poquoson-va.gov"; "Lawrence@hrpdcva.gov"; "bmcfarlane@hrpdcva.gov"; "boon@wms.edu"; "occmaple6@cox.net"; "Debbie.Vest@poquoson-va.gov"; "Karen.Holloway@poquoson-va.gov"; "Lisa.Holloway@poquoson-va.gov"; "John.Young@poquoson-va.gov"; "charla.banks@dcr.virginia.gov"; "Amy.Howard@vdem.virginia.gov"; "sdtrim@cox.net"; "dlengel1@verizon.net"; "tcomartell@poquoson-va.gov"; "jower@poquoson-va.gov"; "dlustarns@apcredcross.org"; "sorgafford@verizon.net"; "tmoore@poquoson-va.gov"; "longr@yorkcounty.gov"; "Wall, Matthew"; "charla.banks@dcr.virginia.gov"; "Walker, Hui-Shan"; "PIOFC@YORKCOUNTY.GOV"; "galazner@mnpov.com"; Kevin Wine (Kevin.Wine@poquoson-va.gov); "bobcamper@cox.net"; "sapowell@gmail.com"; "sheelemb@aol.com"; "Tammy Waldroup"; "doug.smith@mhs.com"; "alan.bradshaw@dom.com"
Subject: REMINDER : Poquoson Hazard Mitigation Planning Committee Meetings April 29 and 30, 2 to 4pm
Date: Monday, April 28, 2014 10:03:00 AM
Attachments: 2009 Goals, Objectives and Actions.docx
image002.png

Good morning, everyone!

Reminder that we have two Poquoson Hazard Mitigation Planning Committee Meetings (I prefer the term "Workshops") this week. The process needs your input, so I hope you can make plans to attend. Even better, if you can review the attached excerpted information from the 2009 plan, you'll be primed to contribute!

Both workshops will be held in Poquoson Council chambers, from 2 to 4 pm on April 29 and 30.

At the **April 29 meeting**, we will very briefly go over the vulnerability information that Robert Lawrence and I have developed. I will have some questions for you all about updated capabilities with regard to natural hazards, especially in light of accomplishments from the last plan. We will then revisit the existing plan Goals and Objectives to make sure they represent how you all want to move forward.

The **April 30 meeting** will be the most important (if you have to choose), as that is when we will revisit the existing mitigation actions, determine which are kept/revised, and develop any necessary new mitigation actions. The fun part!

The schedule is also set for our final meetings: **June 16,** with the HMPC meeting at 2:00pm to go over the final plan and a public meeting at 4:00pm to present the information to the public prior to adoption by City Council. You can go ahead and add these to your schedule.

Hope to see you tomorrow!
Leigh

Salter's Creek
CONSULTING

- Doug Smith, Riverside Hospital
- Alan Bradshaw, Dominion Power

From: Leigh Morgan Chapman
To: "towens@poquoson-va.gov"; "cbowen@poquoson-va.gov"; "hholloway@poquoson-va.gov"; "Ellen.Roberts@poquoson-va.gov"; "Jerry.Cagle@poquoson-va.gov"; "Beach@ci.poquoson-va.gov"; "prisco79@cox.net"; "rspeech1@poquoson-va.gov"; "angela.costello@post.harvard.edu"; "Amy.Blow@poquoson-va.gov"; "Randy.Wheeler@poquoson-va.gov"; "Michelle.L.Hamor@usace.army.mil"; "tbellamy@poquoson-va.gov"; "Michael.Bryant@poquoson-va.gov"; "Lawrence@hrpdcva.gov"; "bmcfarlane@hrpdcva.gov"; "boon@wms.edu"; "occmaple6@cox.net"; "Debbie.Vest@poquoson-va.gov"; "Karen.Holloway@poquoson-va.gov"; "Lisa.Holloway@poquoson-va.gov"; "John.Young@poquoson-va.gov"; "charla.banks@dcr.virginia.gov"; "Amy.Howard@vdem.virginia.gov"; "sdtrim@cox.net"; "dlengel1@verizon.net"; "tcomartell@poquoson-va.gov"; "jower@poquoson-va.gov"; "dlustarns@apcredcross.org"; "sorgafford@verizon.net"; "tmoore@poquoson-va.gov"; "longr@yorkcounty.gov"; "Wall, Matthew"; "charla.banks@dcr.virginia.gov"; "Walker, Hui-Shan"; "PIOFC@YORKCOUNTY.GOV"; "galazner@mnpov.com"; Kevin Wine (Kevin.Wine@poquoson-va.gov); "bobcamper@cox.net"; "sapowell@gmail.com"; "sheelemb@aol.com"; "Tammy Waldroup"; "doug.smith@mhs.com"; "alan.bradshaw@dom.com"; "John Sadler"; "Dawn Brantley"
Subject: REMINDER : Poquoson Hazard Mitigation Planning Committee Meeting and Public Meeting, June 16
Date: Monday, June 09, 2014 1:57:00 PM
Attachments: image004.png
sect 7 mitigation strategy.doc
image003.png

Good afternoon, everyone. Just a reminder that we are meeting briefly at 2pm next Monday. A public meeting to present the draft plan, particularly the mitigation actions, will follow. As soon as possible following the public meeting, I'll issue a draft of the plan for a 2 week public review/comment period when you can all review the entire document at your leisure.

VERY BRIEF PLANNING COMMITTEE MEETING – 2PM – COUNCIL CHAMBERS – We will review the mitigation actions in the attached Section 7 of the plan to be presented to the public at 4pm. Please review prior to the meeting, if possible. Please pay particular attention to yellow highlighted missing info and to the action priorities.

PUBLIC MEETING – 4PM - COUNCIL CHAMBERS – If any of the committee members can be present, your support would be appreciated.

Hope to see you next week!
Leigh

Salter's Creek
CONSULTING
LEIGH CHAPMAN, CFM
1 Peek Street | Hampton VA 23669
Phone (757) 726-9640 | Mobile (757) 595-0250

From: Leigh Morgan Chapman [mailto:leigh.morgan2@verizon.net]
Sent: Monday, April 28, 2014 10:03 AM
To: 'towens@poquoson-va.gov'; 'cbowen@poquoson-va.gov'; 'hholloway@poquoson-va.gov'; 'Ellen.Roberts@poquoson-va.gov'; 'Jerry.Cagle@poquoson-va.gov'; 'Beach@ci.poquoson-va.gov'; 'prisco79@cox.net'; 'rspeech1@poquoson-va.gov'; 'angela.costello@post.harvard.edu'; 'Amy.Blow@poquoson-va.gov'; 'Randy.Wheeler@poquoson-va.gov'; 'Michelle.L.Hamor@usace.army.mil'; 'tbellamy@poquoson-va.gov'; 'Michael.Bryant@poquoson-va.gov'; 'Lawrence@hrpdcva.gov'; 'bmcfarlane@hrpdcva.gov'; 'boon@wms.edu'; 'occmaple6@cox.net'; 'Debbie.Vest@poquoson-va.gov'; 'Karen.Holloway@poquoson-va.gov'; 'Lisa.Holloway@poquoson-

From: Leigh Morgan Chapman
To: "towens@poquoson-va.gov"; "cbowen@poquoson-va.gov"; "hholloway@poquoson-va.gov"; "Ellen.Roberts@poquoson-va.gov"; "Jerry.Cagle@poquoson-va.gov"; "Beach@ci.poquoson-va.gov"; "prisco79@cox.net"; "rspeech1@poquoson-va.gov"; "angela.costello@post.harvard.edu"; "Amy.Blow@poquoson-va.gov"; "Randy.Wheeler@poquoson-va.gov"; "Michelle.L.Hamor@usace.army.mil"; "tbellamy@poquoson-va.gov"; "Michael.Bryant@poquoson-va.gov"; "Lawrence@hrpdcva.gov"; "bmcfarlane@hrpdcva.gov"; "boon@wms.edu"; "occmaple6@cox.net"; "Debbie.Vest@poquoson-va.gov"; "Karen.Holloway@poquoson-va.gov"; "Lisa.Holloway@poquoson-va.gov"; "John.Young@poquoson-va.gov"; "charla.banks@dcr.virginia.gov"; "Amy.Howard@vdem.virginia.gov"; "sdtrim@cox.net"; "dlengel1@verizon.net"; "tcomartell@poquoson-va.gov"; "jower@poquoson-va.gov"; "dlustarns@apcredcross.org"; "sorgafford@verizon.net"; "tmoore@poquoson-va.gov"; "longr@yorkcounty.gov"; "Wall, Matthew"; "charla.banks@dcr.virginia.gov"; "Walker, Hui-Shan"; "PIOFC@YORKCOUNTY.GOV"; "galazner@mnpov.com"; Kevin Wine (Kevin.Wine@poquoson-va.gov); "bobcamper@cox.net"; "sapowell@gmail.com"; "sheelemb@aol.com"; "Tammy Waldroup"; "doug.smith@mhs.com"; "alan.bradshaw@dom.com"; "John Sadler"; "Dawn Brantley"
Subject: REMINDER : Poquoson Hazard Mitigation Planning Committee Meeting and Public Meeting TODAY
Date: Monday, June 16, 2014 10:17:00 AM
Attachments: image001.png

Hazard Mitigation Planning Meeting today.

VERY BRIEF PLANNING COMMITTEE MEETING – 2PM – COUNCIL CHAMBERS – We will review the mitigation actions in the attached Section 7 of the plan to be presented to the public at 4pm. Please review prior to the meeting, if possible. Please pay particular attention to yellow highlighted missing info and to the action priorities.

PUBLIC MEETING – 4PM - COUNCIL CHAMBERS – If any of the committee members can be present, your support would be appreciated.

Hope to see you!
Leigh

Salter's Creek
CONSULTING
LEIGH CHAPMAN, CFM
1 Peek Street | Hampton VA 23669
Phone (757) 726-9640 | Mobile (757) 595-0250

ATTENDANCE

- 8 people were in attendance, including 1 interested member of the public. Attendance sheet is shown below.

SIGN-IN SHEET
CITY OF POQUOSON, PUBLIC MEETING #2
MONDAY, JUNE 16, 2014

NAME	AGENCY	PHONE #	E-MAIL
Mike Bryant	Fire/EM		
Randy Wheeler	City Mgrs office		
Bob Speechley	utilities		
Leigh Chapman	Salter's Creek		
Deborah Vick	Planning Dept		
Kenneth Somerset	Bldg Inspector		
Kevin Wyne	Planning		
Tom Freeman	Property owner		

Search

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Poquoson GIS
Poquoson Seafood Festival
City Budgets
VPPSA Recycling Info

Welcome to the City of Poquoson!

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Become involved in local Government

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Tweets Follow

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City of Poquoson 3 Jul
@CityofPoquoson
HUR RICANE ARTHUR - Please monitor trends in the storm's forecast track and your local wind forecasts. poquoson-va.gov

City of Poquoson 3 Jul
@CityofPoquoson
Poquoson Hazard Mitigation Plan is posted on poquoson-va.gov for public review until July 18, 2014

City of Poquoson 3 Jul
@CityofPoquoson
HURRICANE ARTHUR - Expecting 10 to 20 mph wind with heary rain along coast late Thurs/early Fri. See poquoson-va.gov for details.

City of Poquoson 2 Jul
@CityofPoquoson
THE NEW RECYCLING PROGRAM WENT INTO EFFECT ON JUNE 30TH, THE FIRST PICKUP WILL NOT OCCUR UNTIL FRIDAY, JULY 4TH SEE poquoson-va.gov

Tweet to @CityofPoquoson

Find us on Facebook

Contact Us!

APPENDIX D: REVIEW COMMENTS

This section of the Plan includes each of the written comments received by various parties during review of the plan, as well as a response from the primary consultant addressing each comment in detail.

Reviewer: Robin Bellamy, City of Poquoson
Date: July 7, 2014

1. **Comment**: Report Documentation. Under Grant/Sponsoring Agency, include that the grant was administered by HRPDC. Also, write out acronym HMPC.
   Response: Concur.
2. **Comment**: p.2:4, Table 2.1. Dominion "Virginia" Power
   Response: Concur.
3. **Comment**: p.2:6, November 25, 2014 Project Kickoff Meeting should be "2013"
   Response: Concur.
4. **Comment**: p.2:8, 2014 Public Meetings, 3rd paragraph citation of City's web site is incorrect. Should be www.poquoson-va.gov.
   Response: Concur.
5. **Comment**: p. 3:1, 2014 update. Why is it important to align with the 2011 Southside Plan?
   Response: Consistency among the regional plans would make it easier in the future if Poquoson decides to participate in the larger, regional plan being contemplated by regional planners.
6. **Comment**: p. 3:7, 1st paragraph, last sentence. What does "although the data appear to be missing several major employers" mean? Looks we have bad info.
   Response: concur. Sentence revised.
7. **Comment**: Table 4.2. Data for Deaths/Injuries and Property Damage is missing for several events.
   Response: Concur. Input "None reported" to indicate that there was no report of deaths, injuries or damage for these events.
8. **Comment**: p. 4:35, 1st complete paragraph. What is "Boon"?
   Response: Concur. Descriptive information provided.
9. **Comment**: p. 4:42, 4th paragraph table cross references. Tables on the next page are 4.10 and 4.11, yet above references 4.17 and 4.18.
   Response: Corrected.
10. **Comment**: p. 4:44, 5th paragraph, 4th sentence. Should refer to "Dominion Virginia Power".
    Response: Concur.
11. **Comment**: p. 6:14, 1st paragraph citation of City's web site is incorrect. Should be www.poquoson-va.gov.
    Response: Concur.
12. **Comment**: p. 7:21, sub action #3. This evacuation agreement is already in place that citizens can park there.
    Response: Concur.
13. **Comment**: In the appendices, HMPC Meeting #1 and Public Meeting #1 minutes, Angela Costello is spelled incorrectly, Cliff Coffman, Michelle Sheeler and Cory Gifford are CERT members.
    Response: Concur.
14. **Comment**: In the appendices, HMPC Meeting #2, Angela Costello is spelled incorrectly. Need to black out the phone and email addresses of attendees.
    Response: Concur.
15. **Comment**: In the appendices, HMPC Meeting #3, need to black out the phone and email addresses of attendees.
    Response: Concur.
16. **Comment**: Appendix E, where is the summary of results?
    Response: There had been no questionnaires completed as of the draft review. We have since had 1 response which is now summarized in the final draft.

Reviewer: Matthew McCullough, FEMA Region III
Date: October 23, 2014

17. **Comment**: Did the annual meetings, noted in the 2009 plan (Section 6.1: Maintenance – pg. 91), occur?
    Response: Yes, in fact the committee met quarterly. This has been added to Section 2, p. 2:4, final paragraph, with the addition of the following text: "The committee met quarterly between 2009 and 2014, but expects to move to twice-a-year meetings beginning in 2015." Section 8, p. 8:2, 2nd paragraph under Monitoring, Evaluation and Enhancement, changed to state, "the HMPC will continue to meet at least twice a year."
18. **Comment**: P. 4: 27 – Severe Thunderstorm. Please remove statement: "All building stock, infrastructure and critical facilities are equally vulnerable to these hazards". It is acknowledged that while the same chance of this hazard occurring in all areas of the city is uniform, the uniformity of vulnerability is not the same to all structures. IE straight line winds (100mph) for a manufactured home compared to a brick and mortar critical facility.
    Response: Concur.
19. **Comment**: Pg. 4:43 Earthquake. Is there a map or a better description of the Central Virginia Seismic Zone? Looking for a more accurate relationship to where Poquoson is in relation to this area.
    Response: Concur. See new Figure 4.14 on p. 4:44.
20. **Comment**: Pg. 4:46 Drought. Please include the Drought map from the Commonwealth's HMP. Or give a description of the areas that are more susceptible to drought. IE vegetation areas which could lead to higher vulnerability. Did the City receive disaster assistance from the Nov. 2010 declaration? If so, how much?
    Response: Concur. See new Figure 4.15 on p. 4:47. The City did not receive any disaster assistance from the November 2010 declaration, as now stated at the end of the 5th paragraph on p. 4:46.
21. **Comment**: Impact for each of the following hazards needs to be addressed in more detail. Give a more in-depth description as to what aspects of the City (roads, bridges, communications, commerce, residential) will be affected if this given events were to occur. Also what building or building types are more susceptible to each given event…… IE mobile home vs. brick and mortar structure. Tornado, Severe Thunderstorms, Winter Storms
    Response: Tornado discussion on p. 4:22 (Location & Spatial Extent) and p. 5:12 modified to include possible impacts and provide number/value of structures built before building codes in effect. Number of mobile homes also provided as of 2000. Severe Thunderstorm discussion on 4:26 and 4:27 modified to specify possible impacts to Poquoson. Winter Storm description on 4:37 slightly modified to indicate the consequences of bad roads for a community made up of tiny finger peninsulas and impacts to vulnerable populations. Winter Storm vulnerability on p. 5:25, was modified to include discussion of pre-building code structures and mobile homes.
22. **Comment**: HAZUS Discussion: Pg. 5:2. What type of local data was entered to perform the Flood run? Region III may be able to assist the City in enhanced data collection for more accurate runs in future HAZUS runs.
    Response: Additional discussion included in the 3rd paragraph, p. 5:2 to clarify data used for HAZUS during this limited update.
23. **Recommendation**: Sea Level Rise: include an action that would have the City strive to identify structures within a certain proximity to the areas noted on the multiple maps for this hazard. (1% Annual Chance floods compared to nuisance flooding…Future condition standards)

Response: A sub-group of committee members, including the City Manager, separately considered taking action on this recommendation and carefully discussed the pros and cons. They decided not to include such an action because they feel that the mapping tool they have provides planners with a good idea of future risk and a separate inventory is not needed for structure identification.

24. **Comment**: Pg. 5:7 .Definition for Repetitive Loss is inaccurate. The statement should read: An NFIP-insured structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978. 2012 data is being used. Is this the most up to date information available? The types and numbers of buildings identified as Repetitive Loss need to be stated IE…Residential, commercial
    Response: Definition of RL modified. The RL and SRL data were updated again for November 2014 based on data provide on 11/5/2014 by VDEM. Residential vs. commercial breakdown still provided at end of 4th paragraph on p. 5:7.
25. **Suggestion**: Include the number of elevated structures that have occurred.
    Response: Page 5:7 contains this info in 4th paragraph. Wording has been modified to indicate that there may be more: "As of November 5, 2014, a total of 971 RL properties as defined by the NFIP have been identified within the City of Poquoson, but the City estimates that at least 274 of these properties have been mitigated and/or elevated to protect against flood damage." Also, in response to comment #28 below, the discussion of elevated structures funded by grants on p. 6:11 was modified to show the most recent grant award for elevation of an additional 19 homes in the next 3 years. The Building Official is launching an effort to more precisely field-document these numbers prior to the next plan update.
26. **Comment**: Please include an action stating that the City will Acquire or Buy-out properties from floodprone areas. It is acknowledged that Action 3 indicates the City would like to "elevate, relocate, retrofit or floodproof structures"
    Response: The City Manager and Council do not wish to pursue acquisition or buy-outs of properties in floodprone areas.
27. **Recommendation**: During the next 5-year planning cycle please ensure to better document the process by which existing planning mechanisms are reviewed and incorporated into the HMP. The recently finalized FEMA: Plan Integration Guide can be a useful tool to assisting in this effort.
    Response: This is done quite extensively in Section 2 (p. 2:6) as well as summarized in Section 8. Recommendation duly noted.

Reviewer: Randy Wheeler, Poquoson City Manager
Date: November 14, 2014

28. **Comment**: Two things have happened since the last time I saw you that are relevant to our plan, but happened fairly late the in the process and thus may not be reflected in the draft but probably should be. 1) in the last few months FEMA has approved two house elevation grants for a combined total of 19 homes – we are moving forward and expect to complete all 19 within three years. 2) This week the City Council approved the updated flood ordinance which increased our freeboard requirement from 1 to 3 feet and clarified that all duct work and related needs to be at BFE or higher. The added bonus as it relates to their timing is that now the new elevation grant will be designed/constructed to the 3 foot freeboard requirement.
    Response: Discussion of grants added to the last paragraph on p. 6:11, and Table 7.5, bullet # 7 updated. Discussion of freeboard added to Capability Assessment at the top of p. 6:9, and Mitigation Action 2 updated to exclude consideration of 3-foot freeboard requirement.

APPENDIX E

This Appendix provides a copy of the (blank) 2014 Public Participation Survey.

There was only a single respondent. He indicated that while he has never been impacted by a natural disaster he is extremely concerned about them and feels that flood is the highest threat to his neighborhood, with wind events being the second highest threat. His home is located in the floodplain and he does have flood insurance. He has not taken any steps to make his home more resilient, but is interested in doing so. Public workshops/meetings and email are the most effective ways to get information to this resident. He indicated that all six categories of mitigation measures are very important in reducing community-wide risk from natural hazards.

PUBLIC PARTICIPATION SURVEY
FOR NATURAL HAZARD MITIGATION PLANNING

We need your help!
Our community is currently engaged in a planning process to become less vulnerable to natural disasters, and your participation is important to us!

The City of Poquoson is updating our *2009Multi-Hazard Mitigation Plan*. The purpose of these plans is to identify and assess our community's natural hazard risks (such as floods, hurricanes, nor'easters, and winter storms), and determine how to best minimize or manage those risks. Upon completion, the plan will be presented to City Council for adoption and submitted to the Virginia Division of Emergency Management and Federal Emergency Management Agency for review and approval.

This survey questionnaire provides an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand your natural hazard concerns and can lead to mitigation activities that should help lessen the impact of future natural hazard events.

Please help us by completing this survey and returning it to our planning consultant:

Leigh Chapman, CFM
Salter's Creek Consulting, Inc.
1 Peek Street
Hampton, VA 23669
Fax: 270-721-9649
lchapman@remsainc.com

If you have any questions regarding this survey, or would like to learn about more ways you can participate in the development of our Natural Hazard Mitigation Plan, please contact

Mike Bryant
Deputy Fire Chief/EM Coordinator
City of Poquoson Fire/Rescue
(757) 868-3510
Michael.Bryant@poquoson-va.gov

1. **In what neighborhood of Poquoson do you live?** _____

2. **Have you ever experienced or been impacted by a natural disaster?**
   - ❑ Yes (please explain): _____
   - ❑ No

3. **How concerned are you about the possibility of our community being impacted by a natural disaster?**
   - ❑ Extremely concerned
   - ❑ Somewhat concerned
   - ❑ Not concerned

4. **Please select the <u>one</u> natural hazard you think is the *highest threat* to your neighborhood:**

Natural Hazards
☐ Flood
☐ Sea Level Rise
☐ Wind Events (Hurricanes, Tornadoes, Severe Thunderstorms)
☐ Wildfire
☐ Winter Storms and Nor'easters
☐ Drought
☐ Extreme Heat
☐ Mosquito Borne Disease

5. **Please select the <u>one</u> natural hazard you think is the *second highest threat* to your neighborhood:**

Natural Hazards
☐ Flood
☐ Sea Level Rise
☐ Wind Events (Hurricanes, Tornadoes, Severe Thunderstorms)
☐ Wildfire
☐ Winter Storms and Nor'easters
☐ Drought
☐ Extreme Heat
☐ Mosquito Borne Disease

6. **Is there another natural hazard not listed above that you think is a wide-scale threat to your neighborhood?**

   ❑ Yes (please explain): _____
   ❑ No

7. **Is your home located in a floodplain?**

   ❑ Yes
   ❑ No
   ❑ I don't know

8. **Do you have flood insurance?**

   ❑ Yes
   ❑ No
   ❑ I don't know

   a. **If "No", why not?**

- ❑ Not located in floodplain
- ❑ Too expensive
- ❑ Not necessary because it never floods
- ❑ Not necessary because I'm elevated or otherwise protected
- ❑ Not necessary because I own my house
- ❑ Never really considered it
- ❑ Other (please explain): _____

9. Have you taken any actions to make your home or neighborhood more resistant to natural hazards?

- ❑ Yes
- ❑ No

a. If "Yes", please explain:

10. Are you interested in making your home or neighborhood more resistant to natural hazards?

- ❑ Yes
- ❑ No

11. What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to natural hazards?

- ❑ Newspaper
- ❑ Television
- ❑ Radio
- ❑ Internet
- ❑ Mail
- ❑ Public workshops/meetings
- ❑ E-Mail
- ❑ Phone
- ❑ Other (please explain): _____

12. In your opinion, what are some steps your local government could take to reduce or eliminate the risk of future natural hazard damages in your neighborhood?

13. **Are there any other issues regarding the reduction of risk and loss associated with natural hazards or natural disasters in the community that you think are important?**

14. **A number of community-wide activities can reduce our risk from natural hazards. In general, these activities fall into one of the following six broad categories. Please tell us how important you think each one is for your community to consider pursuing.**

Category	Very Important	Somewhat Important	Not Important
1. Prevention Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.	❑	❑	❑
2. Property Protection Actions that involve the modification of existing buildings to protect them from a natural hazard or removal from the natural hazard area. Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.	❑	❑	❑

3. Natural Resource Protection Actions that, in addition to minimizing natural hazard losses, also preserve or restore the functions of natural systems. Examples include: floodplain protection, habitat preservation, slope stabilization, riparian buffers, and forest management.	❑	❑	❑
4. Structural Projects Actions intended to lessen the impact of a natural hazard by modifying the natural progression of the natural hazard. Examples include dams, levees, seawalls, detention/retention basins, channel modification, retaining walls and storm sewers.	❑	❑	❑
5. Emergency Services Actions that protect people and property during and immediately after a natural hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of critical emergency facilities or systems.	❑	❑	❑
6. Public Education and Awareness Actions to inform citizens about natural hazards and the techniques they can use to protect themselves and their property. Examples include outreach projects, school education programs, library materials and demonstration events.	❑	❑	❑

THANK YOU FOR YOUR PARTICIPATION!

This survey may be submitted anonymously, however if you provide us with your name and contact information below we will have the ability to follow up with you to learn more about your ideas or concerns (optional):

Name: _____

Address: _____

_____

Phone: _____

APPENDIX F: ACRONYMS

The following list of acronyms and hyperlinks may help with interpretation of terms used in this document.

Acronym List

ASCE – American Society of Civil Engineers – www.asce.org

BCEGS - Building Code Effectiveness Grading Schedule – www.isomitigation.com/bcegs

BFE – Base Flood Elevation - http://www.fema.gov/national-flood-insurance-program/base-flood-elevation

CBIC – Chesapeake Bay Impact Crater

CDBG – Community Development Block Grant Program - www.hud.gov/cdbg

CERT – Community Emergency Response Team - http://www.fema.gov/community-emergency-response-teams

CFM – Certified Floodplain Manager – www.floods.org/Certification

CRS – Community Rating System - http://www.fema.gov/national-flood-insurance-program-2/community-rating-system

CWA – Clean Water Act Section 319 Grants - http://water.epa.gov/polwaste/nps/cwact.cfm

CZM – Virginia Coastal Zone Management Program - http://www.deq.state.va.us/programs/coastalzonemanagement.aspx

DHS – U.S. Department of Homeland Security – www.dhs.gov

DMA 2000 – Disaster Mitigation Act of 2000 - http://www.fema.gov/media-library/assets/documents/4596

DMTA – Disaster Mitigation and Technical Assistance Grants - http://www.fema.gov/grants-management-toolkit

DOI – U.S. Department of the Interior – www.doi.gov

EDA – U.S. Economic Development Administration – www.eda.gov

EEE – Eastern Equine Encephalitis - http://www.cdc.gov/easternequineencephalitis/

EPA – U.S. Environmental Protection Agency – www.epa.gov

EPCRA - Emergency Planning and Community Right-to-Know Act - http://www2.epa.gov/epcra

EWP – Emergency Watershed Protection - http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/

FEMA – Federal Emergency Management Agency – www.fema.gov

FIRM – Flood Insurance Rate Map - http://www.fema.gov/floodplain-management/flood-insurance-rate-map-firm

FMA – Flood Mitigation Assistance Program - http://www.fema.gov/flood-mitigation-assistance-program

FPMS – Flood Plain Management Services Program - http://www.nao.usace.army.mil/BusinessWithUs/FloodPlainManagement.aspx

GIS – Geographical Information System

HAZUS-MH – Hazards U.S. Multi-Hazard - http://www.fema.gov/hazus

HIRA – Hazard Identification Risk Assessment

HMA – Hazard Mitigation Assistance - http://www.fema.gov/hazard-mitigation-assistance

HMGP – Hazard Mitigation Grant Program - http://www.fema.gov/hazard-mitigation-grant-program

HMPC – Hazard Mitigation Planning Committee

HRPDC – Hampton-Roads Planning District Commission – www.hrpdc.org

HUD – U.S. Department of Housing and Urban Development – www.hud.gov/

HVA – Hazard Vulnerability Assessment

IDA – Intensely Developed Area - http://www.deq.virginia.gov/Programs/Water/ChesapeakeBay/ChesapeakeBayPreservationAct.aspx

ISO – Insurance Services Office - http://www.iso.com/

LEPC – Local Emergency Planning Committee - http://www2.epa.gov/epcra/local-emergency-planning-committees

LWCF – Land and Water Conservation Fund Grants - http://lwcfcoalition.org/

MAP – Mitigation Action Plan

MLLW – Mean Lower Low Water

NAS – Naval Air Station

NCDC – National Climatic Data Center - http://www.ncdc.noaa.gov/stormevents/

NFIP – National Flood Insurance Program - http://www.fema.gov/national-flood-insurance-program

NOAA – National Oceanic Atmospheric Administration – www.noaa.gov

NWS – National Weather Service – www.weather.gov

PDM – Pre-Disaster Mitigation Program - http://www.fema.gov/pre-disaster-mitigation-grant-program

PDSI – Palmer Drought Severity Index - http://www.drought.gov/drought/content/products-current-drought-and-monitoring-drought-indicators/palmer-drought-severity-index

RFC – Repetitive Flood Claims Program - http://www.fema.gov/repetitive-flood-claims-program

RL – Repetitive [flood] Loss

RMA – Resource Management Area - http://www.deq.virginia.gov/Programs/Water/ChesapeakeBay/ChesapeakeBayPreservationAct.aspx

RPA – Resource Protection Area - http://www.deq.virginia.gov/Programs/Water/ChesapeakeBay/ChesapeakeBayPreservationAct.aspx

SARA - Superfund Amendments and Reauthorization Act - http://www.epa.gov/superfund/policy/sara.htm

SFCP – Small Flood Control Projects - http://www.nao.usace.army.mil/BusinessWithUs/FloodPlainManagement.aspx

SFHA – Special Flood Hazard Area - http://www.fema.gov/floodplain-management/special-flood-hazard-area

SLOSH – Sea, Lake and Overland Surges from Hurricanes - http://www.nhc.noaa.gov/surge/slosh.php

SRL – Severe Repetitive [flood] Loss - http://www.fema.gov/severe-repetitive-loss-program

STAPLE/E – Social, Technical, Administrative, Political, Legal, Economic and Environmental

TBA – Tidewater Builders Association - http://www.tbaonline.org/

USACE – U.S. Army Corps of Engineers - http://www.nao.usace.army.mil/

USBC - Virginia Uniform Statewide Building Code - http://www.dhcd.virginia.gov/index.php/va-building-codes/building-and-fire-codes/regulations/uniform-statewide-building-code-usbc.html

USDA – United States Department of Agriculture - http://www.usda.gov/wps/portal/usda/usdahome

USGS – United States Geological Survey - http://www.usgs.gov/

VDEM – Virginia Department of Emergency Management – www.vaemergency.gov

VDEQ – Virginia Department of Environmental Quality – www.deq.virginia.gov

VDOF – Virginia Department of Forestry - http://www.dof.virginia.gov/

VIMS – Virginia Institute of Marine Science – www.vims.edu

VMRC – Virginia Marine Resources Commission – www.mrc.virginia.gov

WHO – World Health Organization - http://www.who.int/en/

WNV – West Nile Virus

WFPO – Watershed and Flood Prevention Operations - http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/landscape/wfpo/?cid=nrcs143_008271

WUI – Wildland Urban Interface - http://dof.virginia.gov/fire/protect/home/wui-property-owners.htm