Hazard Mitigation Plan

THE EASTERN SHORE OF VIRGINIA

Eastern Shore Hazard Mitigation Planning Committee

Accomack-Northampton Planning District Commission

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Hazard Mitigation Plan

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Introduction

Since the 1960s, Congress and the President have been under increasing pressure to organize resources for the nation during large disasters. The government has increasingly turned its attention to the federal response to these types of disasters. In the 1960s, the government created the National Flood Insurance Program to shift some of the costs to those who choose to live in the areas of most risk. In the 1970s, the Federal Emergency Management Agency (FEMA) was created to centralize a great deal of the assistance the federal government offers to states in emergency situations. In the 80s, the Stafford Act was passed to standardize the federal response and to institute programs to decrease the United States' vulnerability to disasters. In the early '90s, the National Flood Insurance Program was reformed to increase the participation of those most at risk to flooding. Still, disaster assistance costs mounted and the late '80s and early '90s saw some of the largest disasters the country has ever experienced. This included multiple billion dollar events such as Hurricane Hugo, the Loma Prieta Earthquake, the Northridge Earthquake, Oakland wildfire, the Midwest Floods of 1993, Hurricane Andrew and Hurricane Iniki (Planning for Post-Disaster Recovery and Reconstruction, 1998).

In October 2000, the United States Congress passed an amendment to the Stafford Act called the Disaster Mitigation Act of 2000. This act seeks to protect lives and property and to reduce disaster assistance costs by mitigation, sustained actions to reduce long-term risk. FEMA has since written regulations based on this act. Local governments are required to complete a Hazard Mitigation Plan to continue to receive certain types of disaster assistance. In spring of 2003, the Virginia Department of Emergency Management asked the counties of the Eastern Shore and the Accomack-Northampton Planning District Commission (PDC) to undertake this work and directed the PDC to apply for a Pre-disaster mitigation grant to finance the planning process.

In the beginning of this planning process, Virginia had its own billion dollar event, Hurricane Isabel. This event and a preceding event, Hurricane Floyd in 1999, highlighted the need to complete the Eastern Shore's plan. The counties have diligently worked to fulfill the letter and spirit of this law. The following information is presented to address the requirements of the Disaster Mitigation Act of 2000.

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Chapter 1

Hazards on the Shore

The Great September Gust of 1821 was for much of the Eastern Shore the worst disaster ever experienced in recorded history. This hurricane caused an ocean recession in the vicinity of the Island of Chincoteague. Although not completely understood it is believed that the hurricane may have triggered a landslide on the continental slope causing a tsunami in tandem with the force of the hurricane. This destroyed so many homes it is unlikely that any of the homes standing today predate this event. In fact, two of the oldest homes on the island were probably erected to replace destroyed houses. (Once Upon an Island, Kirk Mariner)

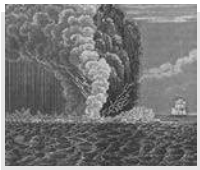
Cold snaps, wildfires, and high coastal winds have also caused substantial damage to the communities on the Shore. These events have destroyed property, caused extended isolation of communities where provisions such as fuel and food have grown thin and at several times whole industries have been wiped out or dealt such a heavy blow that months or years were necessary to recover.

Chronology of Hazard Events on the Shore

1564-1799

Virginia was affected by great storms throughout the 16th, 17th and 18th centuries. Shipwrecks caused some 16th century storms to be recorded. The first of these storms occurred in 1564. Others followed in June 1566, June 1586, August 1587 and August 1591. The June 1586 storm dropped hail and caused waterspouts to threaten Sir Francis Drake's crew. In October 1703, an early snowstorm heralded the arrival of a hurricane just days later. The September 1667 hurricane, called the Dreadful Hurricane

of 1667, was a great storm that destroyed many homes in Virginia. From the records this hurricane and a July 1788 hurricane may have followed a similar track to the 1933 hurricane, which caused massive devastation on the Eastern Shore. Twelve days of rain accompanied the storm, potentially indicating a second storm skirting the coast. The October 1749 storm was a great disaster for Virginians. Besides starting Willoughby Spit in Norfolk, the storm flooded the City of Hampton with four feet of water and bodies from shipwrecks washed up for days after the storm. (Virginia Hurricanes, VDEM)



The 19th Century

After the Great September Gust of 1821, hurricanes and other storms swept up the Virginia coast. The residents of Smith Island reported to Second Lieutenant Robert E. Lee that the April Gale in 1831 nearly covered all of Smith Island with seawater. The October 1878 hurricane completely inundated Smith and Cobb Islands located in Northampton County. The April 1889 storm came from the east and inundated the Island of Tangier for 48 hours. During January 1893, the Eastern Shore suffered extreme cold, the Town of Accomac had 14 inches of snow and men could walk from Chesconessex to Watts Island. (Seashore Chronicles, Brooks Miles Barnes & Barry R. Truitt)

The 20th Century

Major storms have continued to strike the Eastern Shore throughout the 20th century. The century started with three relatively quiet decades after the tremendous damages that occurred during the 1890s. The 1930s would change that trend.

The Chesapeake-Potomac Hurricane of 1933, also called the August storm, wreaked much havoc on the various communities on the Eastern Shore. The sea broke over Assateague Island in 25 foot waves. On Chincoteague, Main Street was flooded. (The Great Hurricane of 1933, Assateague Naturalist, www.assateague.com) On the Eastern Shore, 6 people died. Much of Tangier Island was inundated and children jumped from second floor windows to swim. When the water receded parts of the island were gone. (God's Island: The History of Tangier, Kirk Mariner) In addition, the towns of Cape Charles, Chincoteague, Wachapreague and villages of Willis Wharf and Kiptopeke all were

flooded. In September, another hurricane followed causing more damage. The September 1936 hurricane caused heavy damage to agriculture and aquaculture. Oyster beds were damaged. Late crops were destroyed and some 60,000 broiler chickens were killed.

PICTURE 1.1 Flooding on Randolph Avenue, 3 ½ blocks from the Chesapeake Bay, in Cape Charles from one of the 1930s hurricanes. *Photo printed in the Army Corp of Engineers Flood Plain Report for Cape Charles*

Hurricane Hazel swept through Virginia on October 15th, 1954. Her eye tracked through the center of Virginia and she caused a great deal of damage over the entire state. She caused a storm surge of 3 to 7.5 feet. This surge caused large amounts of erosion. Electric lines were damaged and many were without power (Army Corp of Engineers Flood Reports of the 1962 Ash Wednesday Storm)

The northeaster of October 1957 caused tides in the Town of Wachapreague four feet above normal. Many boats were sunk. The storm also caused wind gusts of 70 mph and caused a great deal of rain. (Army Corp of Engineers Flood Reports of the 1962 Ash Wednesday Storm)

Hurricane Donna, September 1960, struck the Eastern Shore with damaging wind, surge and rain. Much of her damage was concentrated

on the bayside. Flooding occurred in Cape Charles, Bayford, Onancock and other areas on the Chesapeake Bay. She was considered the most destructive storm since accurate weather records began in 1840. (Army Corp of Engineers Flood Reports of the 1962 Ash Wednesday Storm)

The Ash Wednesday storm was a northeaster that moved north over the Eastern Shore and then reversed course moving south. Coastal flooding continued for several days. There was flooding on Chincoteague's Main Street. Waves from Chincoteague Bay were breaking on the High School and splashing the roof. In all on the island, five homes were destroyed, and almost 1000 homes had had water in them. One hundred of the famous Assateague ponies were killed in this storm. This storm also dealt a deathblow to the poultry industry on Chincoteague. The seafood industry while damaged would survive this northeaster. Many other coastal communities also were flooded during this storm. (Army Corp of Engineers Flood Reports of the 1962 Ash Wednesday Storm)

PICTURE 1.2 Flooding during the Ash Wednesday Storm of 1962. This same intersection during Hurricane Isabel is printed on page 35. *Photo printed in the Army Corp of Engineers Flood Plain Report for Wachapreague*

The storm of March 28-29th, 1984 dealt a harsh blow to Virginia and in particular Accomack County. This winter storm produced rain in the Tidewater area of Virginia. The storm's track over the lower Chesapeake Bay caused the worst tidal flooding in Accomack County since the 1962 Ash Wednesday storm. Gusts of 50 mph were recorded and towns on the bayside were inundated with water, Saxis and Onancock were inundated with as much as 5 feet of water. Tangier Island had a foot of water over 75% of the island. East Point, Chesconessex, Mears and Sanford were all flooded. (Accomack County Community Rating System application)

Hurricane Gloria brushed past the Eastern Shore in 1985 causing $2 million in damage to Accomack County. She was a Category 2 hurricane that caused wind gusts and rain but did not directly strike the area. (Accomack County Community Rating System application)

The Halloween Storm of 1991 hit the Eastern Shore unexpectedly. It caused extensive damage to the barrier islands. Many piers and a motel were destroyed by the storm. Many residents did not react in time to keep themselves from being stranded by the storm. (Accomack County Community Rating System application)

Hurricane Fran, September 1996, hit Virginia as a tropical storm. She created a lot of wind and the Eastern Shore had damage from that and also several tornados that touched down during the storm. (Accomack County Community Rating System application)

The Twin Northeasters, February 1998, created a great deal of damage. Roofs were damaged by strong winds and many areas were flooded by storm water. After the two storms moved out standing water remained on much of the Eastern Shore. The fields along Route 13 appeared to be lakes. During the storms, half of Chincoteague was submerged and many Tangier residents could not remember a storm with higher tides. (Accomack County Community Rating System application)

The end of the century did not leave quietly. Hurricane Floyd, September 1999, struck the Eastern Shore after it had weakened substantially. It still caused a great deal of bayside flooding. Three hundred buildings had flood damage from 7-foot surge. Over the course of the storm the peninsula received 10 to 20 inches of rain creating a great deal of storm

water flooding. (Accomack County Community Rating System application)

The 21st Century

As Hurricane Isabel approached the Eastern Coast as a Category 4 hurricane, Virginians avidly checked her progress. When she got to the coast her highest winds considerably reduced in speed but her dangerous hurricane and tropical force winds dramatically expanded over a huge area. On September 18, 2003, Hurricane Isabel made landfall near Ocracoke Inlet, NC and quickly moved into Virginia. Her path was quite similar to Hazel in 1954. For 29 hours, tropical storm force wind battered much of Virginia. Virginia suffered extreme tree damage and power outages over large sections of the state. In Hampton Roads, the outages lasted up to 2 weeks for some. During the height of the storm, 2 million Virginians were without power. Other heavily damaged places or remote locations were out for over a month. In the end it was estimated that Hurricane Isabel had generated an overwhelming 20 million cubic yards of debris and destroyed or heavily damaged thousands of homes and businesses.

On the Eastern Shore, surge swept into many communities on the seaside and bayside of the peninsula. Wachapreague, Oyster, Tangier and Saxis all received flooding from surge. The Town of Wachapreague's tide monitor was swept away; the Chesapeake Bay Bridge-Tunnel registered a surge of 7.4 feet and at Kiptopeke the surge registered at 6.4 feet. Other hazards caused damage to the Eastern Shore, farmers lost crops due to salty air caused by the high winds associated with the hurricane and this same salt coated the power lines causing power outages until precipitation after the hurricane washed the salt off the lines. (Local oral accounts of the storm)

Description of Conditions

The Eastern Shore is a peninsula consisting of very sandy soil separating two great bodies of water, the Chesapeake Bay and the Atlantic Ocean. The highest point on the Shore is in the Town of Melfa, in Accomack County, at just 53 feet above sea level.

Glaciers in the past caused the coastal plain in Virginia to uplift. When these glaciers disappeared the forces causing the uplift also disappeared. The Eastern Shore is currently subsiding. The Chesapeake Bay was formed about 5,000 to 6,000 years ago as the Susquehanna River valley was submerged. (Sea Level Rise meeting with the EPA, February 2004)

In addition to the peninsula, uninhabited barrier islands protect the Atlantic coastline. Many of these are part of the Nature Conservancy's Virginia Coastal Reserve. Some islands also exist in the Chesapeake Bay. Many of these islands once held communities but in recent years many have been abandoned in the face of hazards from the sea. Five of the islands still have development in some manner. Chincoteague Island, Wallops Island and Cedar Island in the Atlantic and Tangier Island and Saxis Island in the Chesapeake Bay.

Chapter

2

Brief Description of Risk

At the initial Eastern Shore Hazard Mitigation Planning Committee meeting, sheets from the FEMA publication, State and Local Mitigation Planning, How-to Guiders were passed out. Members reviewed these sheets and listed all the hazards on the sheets that affect the Eastern Shore and some unique hazards that were not listed including:

- Coastal Flooding
- Storm Water Flooding
- High Wind
- Coastal Erosion
- Wildfire
- Ice-Snow
- Hazmat Incidences
- Heat Wave
- Fish Kills
- Sewage Spills
- Well Contamination
- Drought

The Eastern Shore Hazard Mitigation Planning Committee chose five criteria to rank the hazards from highest to lowest priority. Those five categories included probability based on past events, number of structures damaged, primary impacts, secondary impacts and potential mitigation options. The following definitions were agreed upon to use as a standard for evaluation of all the hazards.

Probability
Frequency of occurrence based on historical data of all potential hazards

Level	
1	Unlikely (less than 1% occurrence: no events in the last 100 yrs)
2	Likely (between 1% and 10% occurrence: 1 - 10 events in the last 100 yrs)
3	Highly Likely (over 10% occurrence: 11 events or more in the last 100 yrs)

Affected Structures
Number of structures affected

Level	
1	Small (limited to 1 building)
2	Medium (limited to 2-10 buildings)
3	Large (over 10 buildings)

Primary Impacts
Based on percentage of damage to typical structure or industry in the community

Level	
1	Negligible (less than 3% damage)
2	Limited (between 3% and 49% damage)
3	Critical (more than 49% damage)

Secondary Impacts
Based on impacts to the community at large

Level	
1	Negligible (no loss of function, no displacement time, no evacuations)
2	Limited (some loss of function, displacement time or evacuations)
3	Critical (major loss of function, displacement time or evacuations)

Mitigation Options
Number of cost effective mitigation options

Level	
1	Few (0-1 cost effective mitigation options)
2	Several (2-3 cost effective mitigation options)
3	Many (over 3 cost effective mitigation options)

TABLE 2.1 Prioritization Criteria for Hazards on the Eastern Shore.

The Eastern Shore Hazard Mitigation Planning Committee then prioritized and ranked these hazards based on the preceding criteria. In the general discussion of the hazards, the committee determined that sewage spills and well contamination are usually secondary effects of coastal or storm water flooding. For this reason, a discussion of those two hazards will be included with the coastal flooding profile. The four hazards that have the highest priority are coastal flooding, storm water flooding, high wind and coastal erosion. The following table represents the committee's prioritization criteria and how each individual hazard was ranked.

		Impacts					
Hazard Type	Probability	Affected Structures	Primary Impact	Secondary Impact	Mitigation Options	Total Score	Hazard Priority
Coastal Flooding	3	3	3	3	3	15	High
Storm Water Flooding	3	3	3	2	3	14	High
High Wind	3	3	2	2	3	13	High
Coastal Erosion	3	3	3	1	2	12	High
Wildfire	2	1	1	1	3	8	Low
Ice-Snow	2	1	1	3	2	9	Medium
Hazmat Incidents	2	1	1	1	1	6	Low
Heat Wave	3	1	3	1	1	9	Medium
Fish Kills	2	Na	3	1	1	7	Low
Sewage Spills	3	Na	-	-	-	-	-
Well Contamination	3	Na	-	-	-	-	-
Drought	2	Na	3	2	2	9	Medium

HIGH 12-15
MEDIUM 9-11
LOW 5-8

TABLE 2.2 Prioritization worksheet for Hazards on the Eastern Shore.

Definitions of Hazards on the Eastern Shore

Coastal flooding events are highly likely, affecting large numbers of buildings. Damages can be critical with buildings suffering over 49% damage from these events. These events are also typically very disruptive to the region causing major displacement and evacuations.

Storm water flooding events are highly likely, affecting large numbers of buildings. Damages can be critical with buildings suffering over 49%

damage from these events. These events are also typically disruptive to the region causing some displacement and evacuations.

High wind events are highly likely, affecting large numbers of buildings. Damages are limited, buildings suffering between 3% and 49% damage from these events. These events are also typically disruptive to the region causing some displacement and evacuations.

Coastal erosion events are highly likely, affecting large numbers of buildings. Damages can be critical with buildings suffering over 49% damage from these events. These events are not typically disruptive to the region.

Wildfires are likely but affect small numbers of structures. Wildfires generally cause negligible damage to the larger wood product industry. These events are not typically disruptive to the region.

Winter weather events are likely but affect small numbers of structures. Ice and snow cause negligible damage to the structures on the Eastern Shore. Winter weather is very disruptive to the region, causing major loss of function to the area's businesses and schools.

Hazmat incidents are likely but affect almost no structures. They cause negligible damage to the structures on the Eastern Shore. These incidents are not typically disruptive to the region.

Heat waves are very likely but generally do not affect the built environment. Heat waves cause critical damages to the poultry industry. These incidents are not typically disruptive to the region.

Fish kills are likely. They cause critical damages to the fishing industry but are not typically disruptive to the region.

Drought is likely but do not generally affect the built environment. Droughts cause critical damages to the water supply for farmers and residents. These events are also typically disruptive to the region causing some loss of individual water supply wells.

Risk Descriptions

At the initial Eastern Shore Hazard Mitigation Planning Committee meeting, members prioritized the hazards based on primary and secondary impacts, probabilities that the event would occur again and cost effective mitigation options. Only four hazards were considered high priority hazards under the criteria. Those hazards that were ranked medium or low priority are not considered in substantial detail since mitigation options either do not exist or the mitigation options are not as cost effective as the high priority mitigation options. On the Eastern Shore of Virginia, mitigating damages from wildfire, ice-snow events, Hazmat Incidences, heatwaves, fish kills or drought do not make economic sense while coastal flooding, stormwater flooding, coastal erosion and high wind events continue to cause extensive disruption and damage.

Chapter

3

Planning Process

The Accomack-Northampton Planning District Commission (PDC) staffed the Eastern Shore Hazard Mitigation Committee. Staff members of the PDC coordinated all the Committee meetings and drafted the plan based on the Committee's work. Staff also reviewed various documents and presented that material to the committee. These documents included local historical books, Army Corp of Engineer Flood Reports of storms that struck the Eastern Shore, applicable sections of the Building Code, FEMA's Coastal Construction Manual, NOAA and USGS data, historical information and technical information available through various government websites such as the National Wildlife Refuge on Assateague Island and the Virginia Department of Emergency Management, local town and county plans, Saxis Erosion Study, and Accomack County's CRS application materials. Staff also listened to local accounts of various hazard events.

The Committee was formed in January 2004 to work on the Hazard Identification and Risk Assessment. Local governments, county and town, appointed members. Other entities such as the Community College and Nature Conservancy were invited to join the Commiittee. The Committee developed the plan materials, reviewed draft documents, identified and prioritized mitigation projects, and approved the final draft document. Preliminary work was presented to the public through press releases and public presentations of the information. A draft document was then complied and submitted to the Virginia Department of Emergency Management and the Federal Emergency Management Agency. The Committee then began work on completing the Plan in January 2005. The Committee's work was presented to the public through press releases. A draft of the entire

plan was prepared and submitted to Virginia Department of Emergency Management and the Federal Emergency Management Agency.

Committee Members

Laura Atwood	Planner, Town of Cape Charles
Sandra Benson	Planner, Northampton Co.
Hollye Carpenter	EMS, Northampton Co.
Mark Cline	Building Official, Northampton Co.
Kathryn Crawford	Long-Range Planner, Northampton Co.
David Fluhart	Building Official, Accomack Co.
Michael Freitas	Public Works Director, Accomack Co.
Cpt. Larry Giddens	Accomack Co. Sheriff's Office
Bryan Horton	Operator in Charge, Town of Onancock
J.W. Jeffries	Public Works Director, Town of Chincoteague
John Johnson	Town Manager, Town of Wachapreague
Jason Loftus	EMS, Accomack Co.
Jim McGowan	Director of Planning, A-NPDC
Sandy Manter	Planner, Accomack Co.
Linda Martin Warner	Assistant Co. Administrator, Accomack Co.
Bobby Mears	Eastern Shore Community College
Lance Metzler	Administrator, Northampton Co.
Glenda Miller	Finance Director, Northampton Co.
Edward Parks	Mayor, Town of Tangier
Bill Reynolds	Town Manager, Town of Tangier
Ernest Rush	EMS, Town of Chincoteague
Joe Scalf	The Nature Conservancy
Douglas Smith	Code Official, Town of Cape Charles
Charles Tull	Mayor, Town of Saxis

Other Participants

Merle Allhouse	Town of Hallwood
Robert Baldwin	Councilman, Town of Belle Haven
Kathryn Crawford	Long-Range Planner, Northampton Co.
John Godwin	Public Safety, Accomack Co.
Chris Isdell	Virginia Department of Transportation
Billie Jo Miles	Public Safety, Accomack Co.
Samantha Pitts	The Nature Conservancy
Upshur Taylor	Town of Saxis

Public outreach efforts. Three articles describing the Eastern Shore Hazard Identification and Risk Assessment were written for the Regional Update for February, April and July 2004 and sent to 603 businesses, local and state government officials and private citizens. One citizen responded to the July article on the release of the first draft of the Eastern Shore Hazard Identification and Risk Assessment.

He had suffered from storm water flooding in the Great Bloxom Flood of 2003. He contributed his experience of the local flooding situation and pictures of the flood for inclusion in the final draft. A booth on flood damage and the Eastern Shore Hazard Identification and Risk Assessment was also presented at the 2004 Watershed Festival at Silver Beach.

Summation of public planning process. The following table documents the efforts made to generate interest, opinion and comments about the Eastern Shore Hazard Identification and Risk Assessment and Hazard Mitigation Plan.

The Public in Accomack County: A public presentation was given at the Accomack Board of Supervisors meeting in September 2004.

The Public in Northampton County: A brief presentation was given on the draft Eastern Shore Hazard Identification to the Northampton County Board of Supervisors. Approximately 80 people were in attendance. A story about the presentation was carried in the Eastern Shore Post, circulation 11,000, on the front page of the July 14, 2004 paper. Another presentation was given to the town council of Cape Charles.

Businesses: The Eastern Shore Chamber of Commerce was asked to appoint a business member to the committee or to send a representative. No representative ever attended the meetings. The Regional Update newsletter is sent to several businesses with interests on the Eastern Shore.

Academia: The Eastern Shore Community College appointed a member to the Eastern Shore Hazard Mitigation Committee.

Non-profit Interests: The Nature Conservancy appointed a member to the Eastern Shore Hazard Mitigation Planning Committee. Representatives of the Nature Conservancy did attend the Sea Level Rise and Coastal Erosion meeting with the EPA and other committee meetings. Twenty-five non-profit interests receive Regional Update, which features articles on the progress of the Eastern Shore Hazard Identification and Risk Assessment.

Neighboring Jurisdictions: Drafts of the Eastern Shore Hazard Mitigation Plan were sent to the planning departments of Somerset County, Maryland and Worcester County, Maryland, the only two Maryland Counties that border Accomack County.

Chapter

4

Coastal Flooding

Hazard. Coastal high water threatens the shoreline several times a year. There are three causes of high water, astronomical high tides, high water from atmospheric events and storm surge. Astronomical tides do not cause dangerous coastal flooding but astronomically high tides in tandem with storm surge or onshore winds can exacerbate coastal flooding.

Astronomical high tides are caused by gravity. All mass of any size creates gravity but in the case of the tides two celestial bodies affect them, the moon and the sun. Gravity is a force that is affected by distance. So the moon, being closer in distance to the earth, has a greater effect than the sun. The moon's gravity pulls the liquid ocean water toward a place on the earth directly below. This bulge of water moves across the earth remaining in place below the moon as the earth rotates causing a high tide. The other tide is the result of a bulge of water on the opposite side of the earth. Here the moon's gravity is weakest and water circulating on the earth will resist the change in direction caused by the earth's rotation. This water tries to flow off the earth creating this bulge. As the earth rotates this bulge remains causing another high tide as each part of the earth passes through it. (Meteorology notes, Prof. Arthur Snoke, Virginia Tech)

The sun creates solar tides in the same manner. Periodically, special astronomical tides will occur that relate to the position of the earth, moon and sun. When the moon is totally dark it is called the new moon. This indicates that the moon is directly in-between the earth and the sun. When the moon is fully visible it is called the full moon. The full moon indicates that the earth is in-between the moon and the sun. Either of these configurations causes the two opposing bulges of water to be larger than usual. The tides generated are called spring tides. The first and third

quarter moons, lit up as half of a circle, are when the moon is at right angles to the earth and the sun. The force of gravity is thus cancelled out causing smaller bulges of water. The tides generated are called neap tides. (Meteorology notes, Prof. Arthur Snoke, Virginia Tech)

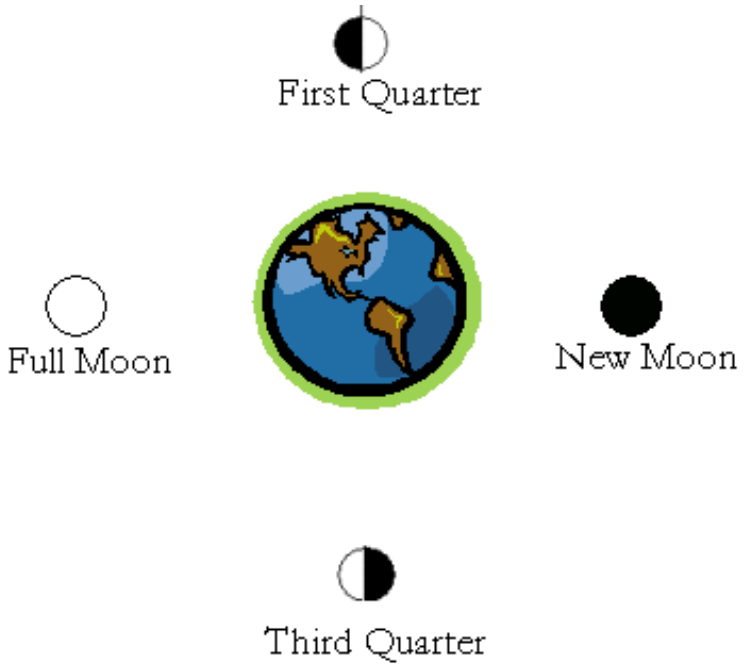


FIGURE 4.1 Phases of the Moon.

Perigee – the point on the elliptical orbit where the Moon is closest to the Earth

Apogee – the point on the elliptical orbit where the Moon is farthest from the Earth

In addition to the earth's rotation under the moon, the moon is orbiting the earth. This orbit is an ellipse and therefore has points where the moon is closer and farther away from the earth. Since gravity is affected by distance this orbit causes other special tides. When the moon is at the perigee, closest to the earth, it causes a larger dome of water than usual on both sides of the earth. The perigean tide is thus a larger tide. Conversely, when the moon is at the apogee, farthest point from the earth, the bulge of water is smaller and the apogean tides lower. When these tides correspond with spring or neap tides extremely high or low tides can occur. (Meteorology notes, Prof. Arthur Snoke, Virginia Tech)

For the purposes of examining the hazard to the Eastern Shore, the high tides are of greatest interest. Spring tides occur about 24 times a year and perigean spring tides occur approximately twice a year. These tides play a

huge role in the damage seen during storms and various atmospheric conditions that cause high water.

> **Note**
>
> The Ash Wednesday storm occurred during a perigean spring tide. Both the new moon and the perigee occurred on March 6th, 1962 the first day of the storm. See the following table for a summary of other storms.

Storm	Phase of the Moon	Perigee/Apogee
September 3, 1821 (The Great September Gust)	First Quarter (Neap Tide)	Apogee
August 23rd, 1933 (The Chesapeake-Potomac Hurricane)	Waxing Crescent – 3 Days from the New Moon (Spring Tide)	In between
October 15, 1954 (Hurricane Hazel)	Waning Gibbous – 3 Days from the Full Moon (Spring Tide)	2 Days after the Perigee
March 6th-8th, 1962 (The Ash Wednesday Storm)	New Moon (Spring Tide)	Perigee
September 15th-16th, 1999 (Hurricane Floyd)	Waxing Crescent – 6 Days from the New Moon and 2 Days to the First Quarter (Neap Tide)	Apogee
September 18th, 2003 (Hurricane Isabel)	Waning Gibbous – 8 Days from the Full Moon and 1 Day to the Third Quarter (Neap Tide)	Apogee

TABLE 4.1 Sample Storms

The magnitude of the tidal change is great. For example at Wachapreague on the seaside, the difference in tides from the lowest tide to the highest tide over the course of the year 2004 is 6.8 feet. The average change over the course of a day is 4.3 feet. It is easy to see from the magnitude of

these numbers that a moderate storm surge occurring with a perigean spring tide and at high tide could cause severe damage while a high storm surge occurring with an apogean neap tide and at low tide could cause low or moderate damage. On the bayside, the magnitudes of the differences are lower but the same effect can still be seen. Onancock on the bayside has a difference of 3.1 feet from the lowest tide to the highest tide in 2004. The average daily change in tides there is 2.0 feet. (Center for Operational Oceanographic Products and Services, NOAA)

PICTURE 4.1 Causeway to Quinby during spring tide. *Photo by Elaine Meil*

While it is clear that great storms can damage with or without the additional water from tides, the lesson of the Ash Wednesday Storm is that when the tides work in tandem with storm surge the resulting damage is catastrophic.

Several types of storm systems also affect the Eastern Shore. These storms include northeasters, tropical storms and hurricanes, Alberta clippers and thunderstorms. Many of these storms are atmospheric lows that have a closed circulation. Not only does the low pressure mean the seas are higher in the column of air but the wind associated with the storms push water ahead of them.

For example, a Category 1 hurricane generally causes 4 to 5 feet of surge. However, the Chesapeake Bay acts to pinch the water and thereby make

the surge grow in height on the bayside. A Category 3 hurricane could cause 9 to 12 feet in surge. These surges would be on top of the tides.

Saffir – Simpson Hurricane Scale

Category 1 – Winds 74–95 mph Surge 4 - 5 ft Some Damage

Category 2 – Winds 96–110 mph Surge 6 - 8 ft Considerable Damage

Category 3 – Winds 111–130 mph Surge 9 - 12 ft Structural Damage

Category 4 – Winds 131–155 mph Surge 13 - 18 ft Curtainwall & Roof Failures

Category 5 – Winds 131 mph + Surge 13 ft + Complete Building Failure

The Base Flood Elevation (BFE) on the seaside of the Eastern Shore is 11 to 13 feet and on the bayside the BFE is usually 7 to 10 feet. The BFE is the elevation of water in the 1% probability base flood event also known as the 100-year event. This BFE is consistent with a Category 2 hurricane or Category 3 hurricane's surge. However, due to the geometry of the Bay a Category 1 hurricane or a tropical storm can cause this amount of surge.

PICTURE 4.2 Causeway to Quinby during Hurricane Isabel. *Photo by David Fluhart*

Broadwater, Virginia

Broadwater, Virginia located on Hog Island was once a village of about 200 persons. The founding of the village occurred after the Revolutionary War. In 1864, there were approximately 10 families on the island constituting 60 people.

Howard Pyle a visitor in 1878 was already noting a "rolling sea of grit", sand dunes that were retreating inland and already overwhelming fences, and trees in the village. While he was there a northeaster blew in, overfilling the marsh.

In the 1897, Cobb's Island, south of Hog Island, had largely been abandoned as a northeaster in 1895 followed by a hurricane in 1896 demolished the resort area there. With this Broadwater became the last village south of Chincoteague on the barrier islands.

The island's population grew in the late 1800s and early 1900s. Wealthy sportsmen from northern cities built hunting lodges and summer residences on the island. President Cleveland came in 1892 and 1893 while he was serving his second term and some of his friends erected a clubhouse on the island.

A visitor to the island in 1906 recorded that there were 42 houses there. In addition, the islanders had built a school, church, hotel and stores. The government built a lighthouse and two Coast Guard stations.

By the 1920s, erosion was seriously threatening the village. It was during this time that a migration of the community began. Buildings were jacked up and floated on barges to the mainland where many can be seen in Oyster and Willis Wharf. By 1930, the sea was wearing at the dune and wood buffer protecting the village. The hurricanes of the 1930s finished the demise of the community. Soon after those storms, astronomical high tides inundated the ground floors of the remaining houses. By 1941, Broadwater had been abandoned.

Within 20 years, the sea was washing over the cemetery initially laid out a mile from the original shoreline. Today, Broadwater lies under the ocean.

There are many parallels between Broadwater and the communities that still exist on the Eastern Shore and the outlying islands. These communities face serious hazard threats.

Damages. Much of the damage from coastal flooding is from hydrodynamic force called velocity flow. This type of flow is known to scour around buildings and to destroy structures in its path. In addition, velocity flow picks up debris and smashes that debris into anything in its way.

FEMA has identified areas where velocity flow from the 100-year flood event would occur. These areas are called V zones. These flows commonly damage or destroy any wall that is struck by this moving water. Current floodplain management ordinances require that in V zones any new structure be built with its lowest horizontal structural element's bottom to be elevated above the Base Flood Elevation. Further, no living space is to be put below the Base Flood Elevation and any enclosures must have breakaway walls.

The debris the velocity flow carries can destroy a structure that is built to flood regulations. This debris commonly includes parts of houses, decks, vehicles, propane or oil tanks, and any other objects that the floodwater picks up. During Hurricane Isabel, 6 ton riprap was swept up beaches and came to rest in front of houses. Smaller riprap actually was swept through broken walls and came to rest inside of structures. If flood borne debris strikes or gets caught against the foundation of a post-FIRM structure, that structure could sustain severe damage or destruction although it is built to floodplain regulations.

FIRM – Flood Insurance Rate Map

Post-FIRM – built after a community has adopted an NFIP acceptable floodplain ordinance

Pre-FIRM – built before a community has adopted an NFIP acceptable floodplain ordinance

Waves are another source of damage to structures in velocity flow areas. When waves break against a structure the tremendous force can damage the walls. Waves commonly destroy decks as waves runup a vertical wall further than they would on a sloped surface. FEMA reports that post storm damage inspections show that "breaking wave loads destroy virtually all wood-frame or unreinforced masonry walls" (Coastal Construction Manual).

Besides V zones the Eastern Shore has a great deal of A zones. A zones are areas where the 100-year flood would inundate but that would not have waves in excess of 3 feet. The Coastal Construction Manual defines two types of A zones although neither area is regulated differently. The following definition applies to most of the A zones on the Eastern Shore.

> "The Coastal A zone is the portion of the Special Flood Hazard Area in which the principal sources of flooding are astronomical tides, storm surges, seiches or tsunamis. Like the flood forces in V zones, those in coastal A zones are highly correlated with coastal winds. Coastal A zones may therefore be subject to wave effects, velocity flows, erosion, scour or combinations of these forces. The forces in coastal A zones are not as severe as those in V zones but are still capable of damaging or destroying buildings on inadequate foundations." – Coastal Construction Manual (FEMA, 2000)

FEMA post storm inspections have shown that coastal A zones are areas of increased damages. The A zone regulation does not take into account the hazards of waves, hydrodynamic flow and erosion. Yet coastal A zones can be subject to all of these hazards during a 100 year flood event. Wall panels that were tested in a wave tank at Oregon State University show standard wood stud wall construction will fail after being struck with several breaking waves averaging 2 feet in height. These size waves can be generated in water that is 2 ½ feet in depth. Breaking waves destroy vertical surfaces by trapping and compressing air against the surface centered at the stillwater level. (Coastal Construction Manual, FEMA)

Some of the coastal A zones may not experience these types of hazards but will suffer from damage from standing water. Common types of direct damage include: waterlogged and corroded building elements, waterlogged furniture, damaged electronic appliances and equipment, damaged tanks from buoyancy forces and contaminated exteriors and interiors from blackwater. In addition, building materials may wick up floodwater to higher areas not directly inundated. (Coastal Construction Manual, FEMA)

Secondary hazards associated with coastal flooding include water that contaminates wells. Commonly, floodwater includes contaminates. When this water level is above the elevation of the air vent to a well the contaminated water flows into the well and renders it unusable until the water is treated and tests clean from bacteria.

On the Eastern Shore, several types of older wells are in use. The rarest type is the hand dug well. This well is usually 10 to 12 feet deep and would have initially been used with a bucket. There are also shallow wells, less than 100 feet deep, that have a static water level near the top of the

well and a non-submersible pump that pulls water into a tank. Deeper wells, greater than 100 feet, are designed in much the same way but instead of just a pump located in the top of the well there is a second pipe running down to the static water level capped by a packer with a venturie. These wells do not have an air vent and are not susceptible to floodwaters. The packers were most useful with metal pipes but in the 1970s most well pipes were replaced with PVC and the packers could not easily maintain a seal against this material. These wells also have low pumping rates and are hard to prime if power is lost. (Explanation from Artie Miles, formerly of the Accomack and Northampton Health Department)

Since the 1970s, submersible pumps have been used. The well with this setup needs an air vent. During a flood, water can enter the well through the air vent. Elevating this air vent above the Base Flood Elevation is one of the best ways to avoid contaminated floodwater entering the well. An NFIP flood policy will not cover wells damaged by floods. (Review of the Standard NFIP flood policy)

Septic tanks and septic systems are also not covered under a NFIP flood policy. When a flood is in the area of a septic tank, the water will backflow from the drainfield into the tank causing the cushion of air at the top of the tank to disappear. This means the tank can no longer handle flow from the structure and drainage will fail inside. After the floodwater recedes a small cushion of air will redevelop and it is during this time that sewage can escape the septic tank through the drainfield. This small cushion of air will allow the tank to accept wastewater from the structure but at the level of drainage inside the tank the water is poorer than it usually is. This poor quality water containing sewage can escape into the drainfield. (Explanation from Artie Miles, formerly of the Accomack and Northampton Health Department)

Vulnerability. V Zones are the worst area a structure can be located in a flood. The base flood event in V-zones would still cause property damage regardless of compliance with NFIP requirements. Compliance reduces flood damage. Since homes must have foundations within the moving floodwater the water or flood borne debris can destroy or damage the foundations. For example, a $100,000 one-story home with $65,000 in contents that is built to the minimum floodplain standards,

with no obstruction below the Base Flood Elevation and in compliance with all regulations will still likely receive around $15,000 in damage to the structure and $9,750 in damage to contents in the base flood. The same house with an obstruction for storage but still in compliance with all floodplain regulations would likely receive $24,000 in damage to the structure and $15,600 in damage to the contents. It is important to stress that these homes meet the minimum requirements. For a home not built to these standards the damage would be much greater. (Coastal Construction Manual, FEMA)

According to FEMA, a structure, without obstructions that experienced flooding to the Base Flood Elevation, would require about 15 days before business could resume elsewhere and approximately 70 days before the building could be reoccupied. That same structure, with an obstruction, would require 24 days before business could resume in a different location and approximately 142 days before the building could be reoccupied. (Coastal Construction Manual, FEMA)

It is also important to realize that the base flood is not necessarily the worst flood event that could occur. If the base flood were exceeded by one foot that home in the V-zone without obstruction would then receive about $23,000 in damage to the structure and $14,950 damage to the contents. The home with an obstruction would receive $29,000 in damage to the structure and $18,850 in contents damage. The displacement time of the home, without obstruction, would be 134 days and 182 days for the home with obstruction. (Coastal Construction Manual, FEMA)

Post-FIRM structures, structures built after a community has adopted its floodplain management ordinance, are at more risk when they are located near debris producing areas including areas with pre-FIRM structures and highly engineered structures that channel flow away and towards other property. (Coastal Construction Manual, FEMA)

The Eastern Shore's greatest vulnerability is located in the A zones. Most structures located in the 100-year flood plain are within these areas. Past disasters have affected these areas the greatest. Both counties have elevated homes using the Hazard Mitigation Grant Program and all but one of these elevations has been of an A zone property. The counties have applied to elevate an additional 95 structures with Hurricane Isabel

Hazard Mitigation Grant Program funds. Only 6 of these are located in the V zone while the majority are in an A zone. (Review of HMGP applications)

Coastal A zones also represent increased vulnerability to both Accomack and Northampton County. The NFIP does not recognize the difference between A zones where the source of water is an inland river or an A zone where the source of water is from a bay or ocean. Therefore, the NFIP regulations do not require special construction for coastal A zones. However, structures in these zones are commonly exposed to weaker V zone conditions including waves, scour and velocity flows. Open foundations are not required in these areas. However, waves and debris can still destroy structures there. If a structure is built with a closed foundation that structure can expect to receive more damage if struck with storm surge water than a similar structure with an open foundation.

PICTURE 4.3 Homes in Wachapreague during Hurricane Isabel. These homes are located in an A zone with a Base Flood Elevation that includes a wave height component. *Photo by John Aigner*

While NFIP flood insurance covers some losses associated with flood events several types of property have no available coverage under this program. Although NFIP flood insurance has many exclusions and types of property not covered, some of the more important ones to remember are: wells, septic systems, land, seawalls, bulkheads, piers, wharves, containers, decks, driveways and walks. In addition to these, FEMA's General Property Form, Standard Flood Policy lists several other types of property that will not be covered. Finally, NFIP flood insurance only covers flood damage not coastal erosion, rain damage, wind damage or water spray.

Past disasters have shown that many policyholders while carrying flood insurance for the structure do not purchase flood contents insurance. In Hurricane Floyd, several homes were not structurally damaged to a great degree yet the contents were totally destroyed. (Local oral accounts)

The federal government requires that all improved property in a Special Flood Hazard Area with a federally backed mortgage be covered with flood insurance. Contents coverage in not required unless it is part of the security of the mortgage. Generally, buyers who are confronted with this requirement will obtain flood insurance for the structure but will opt not to buy contents insurance to reduce the cost of closing on the property. After an event occurs, these policyholders learn the consequences of this decision and some express bad feelings toward FEMA.

Although the 100-year base flood is a 1% chance in each year that it will occur, over 30-years, the standard mortgage, a structure in an A or V zone will have a 26% chance of experiencing a 100-year flood. If that same house lasts 70 years, the useful life of most buildings, it has a 50% chance of experiencing a 100-year base flood.

The 50-year flood event has a 45% probability of occurring within its floodplain over the course of a 30-year mortgage and a 76% chance of occurring in 70 years. It is important to understand that a smaller flood such as the 50-year event could damage a structure, especially those built below the Base Flood Elevation.

The 50-year stillwater elevation for V zones ranges from 7.5 – 8.5' on the seaside and 3.8 – 7.4' on the bayside. In addition, the 50-year stillwater depth in Chincoteague Bay ranges from 4.8 – 6.0'.

Over time, buildings become more susceptible to hazards. It is important to maintain coastal structures. Several hazards predominate in the coastal area, corrosion from salty air and wind driven salt spray, termites, moisture, and sun caused weathering. Regular maintenance will lower the risk of flood damage during a storm event. Coastal buildings will also have building components that require replacement. Some of the more frequent repairs that will need to be made are replacing exterior metal every 5 to 10 years, wood pilings will need to be replaced every 25 to 40 years, and exterior equipment will need to be replaced every 8 to 15 years. (Coastal Construction Manual, FEMA)

Sea Level Rise

Eustatic Sea Level- the amount of sea level change over the entire globe

The Shore is experiencing sea level rise. Sea level rise can happen when ice melts, when thermal expansion occurs making the amount of water in the oceans now take up more space, and when the land subsides. This is called relative sea level rise.

The Shore's seaside is experiencing approximately a 2 mm rise in sea level each year and on the bayside a 3 to 3.5 mm water level rise. At 2 mm per year, every century the sea level increases about 8 inches on the seaside and about 12 inches to 14 inches each century on the bayside. Some scientists believe that sea level rise may accelerate over time.

Virginia is the third most threatened state, behind Louisiana and Texas, for damage from sea level rise. In Virginia, Accomack County is the most threatened county and Northampton is the second most threatened county. These two counties account for about 61% of all the threatened land in Virginia. Accomack County has approximately 40 acres each year that are within 3 mm of the tides. Each year, this land is being converted from dry land to wetland. Northampton has approximately half that amount converting each year.

However, sea level rise while continuous is not the primary threat for the peninsula in the short term. A greater threat caused by sea level rise is the magnification of erosion and surge effects from storm events.

Two island communities, Tangier and Saxis, are at greater risk to sea level rise. They already face a severe erosion problem and rising sea level will increase the damage from floods and erosion.

The Flood Insurance Administration, part of FEMA, has commissioned a study on the effects of sea level rise on the NFIP. Given a 1-foot sea level increase by 2100, NFIP premiums in A zones would have to be increased 58% while in V zones they would have to increase 36%. A 3-foot sea level increase by 2100 would cause NFIP premiums to increase by 200% in A zones and 102% in V zones.

Chapter

5

Storm Water Flooding

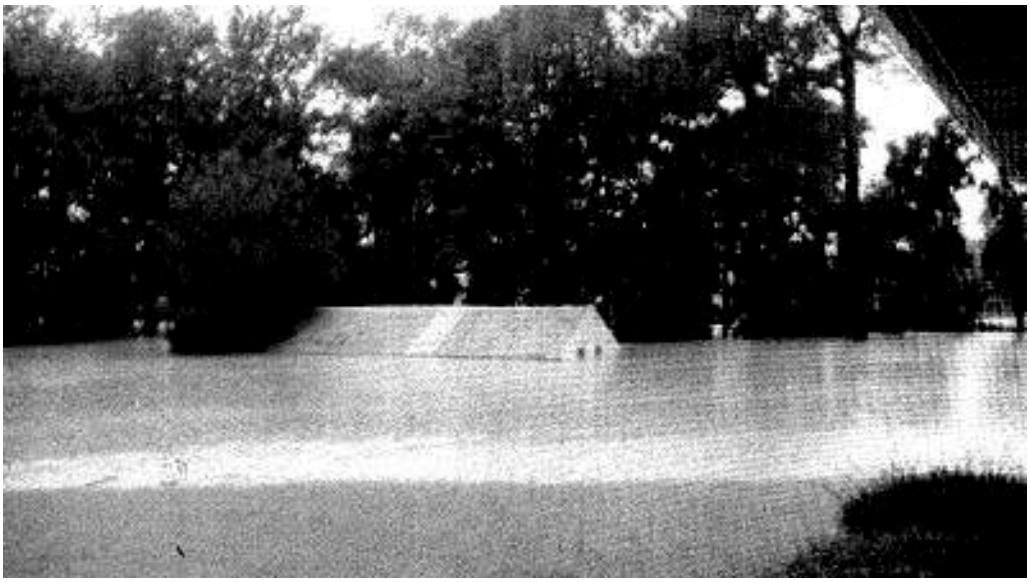
Hazard. Storm water flooding is a separate type of flooding than coastal flooding. On the Eastern Shore it is caused by intense downbursts of rain or from rainwater accumulation in low-lying areas or areas where debris blocks drainage paths. Due to the Eastern Shore's low relief, rainwater either drains into the soil, evaporates or drains overland to the ocean or bay.

The greatest amount of flow in the creeks and streams lags after the peak rainfall. This is due to the various factors that cause the rain to slow down as it flows over the land including land cover and slope.

In specific instances, storm water has accumulated and caused flooding. Bloxom in Accomack County received a flood of this nature on September 3, 2003, just a couple weeks prior to Hurricane Isabel. A heavy rain occurred and water flowed to the railroad tracks, which acted as a dam, back flooding several homes. In addition, farm fields in the area were covered in plastic that potentially acted like a parking lot does in a more urban environment. Although the storm is called the Great Bloxom Flood of 2003, several areas were flooded including Bloxom, Clam, Guilford, Hallwood and Nelsonia.

This particular incident was caused by several conditions. An afternoon rainstorm had already passed through the area. During the height of this storm, motorists on Route 13 had slowed to a crawl, as the rain was too intense to adequately see ahead of them. That evening at least two thunderstorms passed over Accomack County. In a very short period of time, 6 to 8 inches of rain fell. An 8-inch backyard rain gauge was full to overflowing. Ten inches of rain was found in a bucket left outside. Radar

out of Salisbury indicated that the area received about 6 inches during the thunderstorm.



PICTURE 5.1 A structure in the Town of Bloxom on September 3, 2004 the trees in the distance line the railroad. *Photo by Franklin Kreisl*

PICTURE 5.2 Area where the floodwater was dammed against the railroad tracks. The pine in this picture is the same as the lone pine in the previous photo of the flooding. *Photo by Elaine Meil*

In addition, high tide was in and the water could not drain away. The drainage ditch was also scheduled for maintenance but Accomack officials believe that had the maintenance been done it still wouldn't have stopped the areas from flooding. In Bloxom, floodwaters reached a depth of at least 2 feet. In some areas the flooding was greater.

Although there were no estimates of the probability of the storm event, the entire 12-hour period including the initial storms in the afternoon would put this above the 100-year storm event level, which on the Eastern Shore is 7 to 8 inches in 12 hours. Persons who remember the Bloxom storm recall that the larger storm's rainfall occurred over approximately 2 hours, making this storm above the 100-year storm event. The 2-hour 100-year storm on the Eastern Shore is between 4.5 and 5 inches of rain.

Recurrence intervals of rainfall intensity are presented in the following table:

Recurrence Interval	Rainfall (inches)
1-year 24 hour	3.0 - 3.5*
2-year 24 hour	3.5 - 4.0
5-year 24 hour	4.5 - 5.0#
10-year 24 hour	5.0 - 6.0
25-year 24 hour	6.0 - 7.0
50-year 24 hour	7.0 - 8.0
100-year 24 hour	8.0 - 9.0

TABLE 5.1 Recurrence Intervals of 24 hour rainfall totals. *All of the Eastern Shore has this recurrence interval except for the immediate environs around the Town of Saxis. Recurrence Interval: 2.5 – 3.0 #All of the Eastern Shore has this recurrence interval except for the Southeast corner of Northampton County. Recurrence Interval: 5.0 – 5.5

The U.S. Weather Bureau has established what the worst case would be here on the Eastern Shore. The probable maximum 6-hour precipitation event for 10 square miles is 28 to 30 inches.

There are secondary hazards from storm water flow. Generally, intense rainfalls will not only affect the immediate area but will affect other places

downstream. On the Eastern Shore, this is less of a problem then other areas in Virginia that have much larger watersheds. Unlike most places in Virginia and the nation, Accomack and Northampton are not coping with storm water coming from other jurisdictions.

Intense rainfalls also increase the amount of contaminants in the water. Since the increased over land flows run over agricultural land, residential yards, roads and commercial parking lots contaminates are picked up and carried into the streams. Finally, larger overland flows erode streams. If this erosion is severe property damage can ensue.

Storm Potential. Hurricanes represent the greatest threat of catastrophic storm water flooding that can occur on the Eastern Shore. Hurricane Cleo is one such example. Although a very weak storm when she impacted Virginia, a topical storm that weakened to a depression upon landfall in North Carolina, she dropped a record amount of rain. Although her winds speeds were recorded at 25 to 35 mph with gusts in the low 40s she dropped 13.32 inches of rain in Norfolk. She holds the records for heaviest rain, 11.4 inches in 24 hours in the coastal area of Virginia. Her maximum total rainfall in Virginia was in the Back Bay Wildlife Refuge in southern Virginia Beach where 14.09 inches fell.

Other storms have impacted the Eastern Shore or its vicinity. The table following includes descriptions of hurricanes that either impacted the Eastern Shore or represent a potential storm that could impact the Eastern Shore.

September 17, 1876: 8.32 inches of rainfall at Cape Henry in northern Virginia Beach.

August 12-16, 1928: Two tropical depressions move over Virginia bringing heavy rains.

The Chesapeake-Potomac Hurricane, August 23, 1933: Three days after a record-breaking rain of 6.5 inches the storm strikes with more rainfall.

Hurricane Able, August 31, 1952: A very weak storm produces 2 to 3 inches of rain.

Hurricane Barbara, August 14, 1953: Struck as a Category 1 storm in North Carolina, produced record rain on Tangier Island, 10.62 inches and at Onley, 10.43 inches, in Accomack County.

Hurricane Connie, August 12-13, 1955: Norfolk recorded 4.62 inches of rain

Hurricane Diane, August 17, 1955: Five days after Connie another storm moved north over Virginia. In some areas of central and western Virginia, an additional 5 to 10 inches fell. Together Connie and Diane hold the record rainfall for the month of August.

Hurricane Ione, September 19-20, 1955: Weak storm causes southeast Virginia to receive 3 to 4 inches of rain.

Hurricane Gracie, September 30, 1959: Weakened storm moves over southwest Virginia, Norfolk recorded 6.79 inches of rain in 24 hours.

Hurricane Donna, September 12, 1960: Donna was a Category 3 hurricane when its eye passed up the seaside of the Eastern Shore. She generated 4 to 8 inches of rainfall on the Delmarva Peninsula. Many rivers reached record or near record overflow with this storm.

Hurricane Cleo, September 1, 1964: A weak storm that generated massive amounts of rainfall in southeast Virginia. She set rainfall records in Hampton Roads. Although her rainfall amounts decrease in a northerly direction she is an example of the type of storm that could cause overwhelming storm water flooding on the Eastern Shore.

Tropical Storm Doria, August 27, 1971: She moved up the Delmarva Peninsula and caused 3 inches of rain in Norfolk.

Hurricane Gloria, September 27, 1985: She caused 5 to 6 inches of rain across the Eastern Shore, causing storm water flooding.

Hurricane Bonnie, August 27, 1998: She caused 4 to 7 inches of rain in coastal Virginia.

Hurricane Dennis and Hurricane Floyd, September 5th and September 15-16, 1999: Hurricane Dennis caused substantial rain that created serious problems when Hurricane Floyd moved over southeast Virginia two weeks later. Hurricane Floyd caused 10 to 20 inches of rain to fall in southeast Virginia.

TABLE 5.2 Storms that have generated intense rainfall on the Eastern Shore or in the vicinity.

Downbursts of rain from thunderstorms also have the potential to create storm water flooding. The worst downburst in Virginia's history was in Guinea across the Bay from Northampton County. On August 24, 1906, 9.25 inches fell in 40 minutes.

Damages. Flash flooding from storm water can be quite hazardous to humans. Since the conditions develop rapidly people can become

trapped before even realizing they were in danger. During the Great Bloxom Flood of 2003, two people had to be rescued. Floodwater commonly blocks roads in the area. This is quite a dangerous problem since motorists commonly believe that they can ford these areas without knowing whether the water has damaged the road below.

Still water or slow moving water, moving less than 10 ft per second, generates hydrostatic loads on a structure. These loads operate perpendicular to the surface affected. Therefore, water pressure is highest against a structure that has water on one side of it. Dry floodproofing means that a structure must be built to withstand these forces or the water pressure could collapse the structures walls. Floatation is also a potential form of damage with hydrostatic loads. (Coastal Construction Manual, FEMA)

Storm water floods that move faster than 10 ft per second are generating hydrodynamic loads in addition to the hydrostatic loads. These loads can destroy walls, push structures off of foundations, and carry sediment and debris. (Coastal Construction Manual, FEMA)

PICTURE 5.3 Car fording street flooded by surge from Hurricane Isabel. *Photo by David Fluhart*

Vulnerability. In some interior areas of the Shore, the Base Flood Elevation (BFE) is 4 feet. However, the A zones identified are associated with creeks, the ocean or a bay. For example, there is no identified Special Flood Hazard Area in Bloxom. Current FIRM maps miss many areas with storm water flooding issues.

To look at potential losses it is necessary to observe what a flood would do to a structure. A $100,000 one-story structure without a basement and with contents worth $65,000 would suffer approximately $14,000 in building component damage and $13,650 in contents damage in a flood where water reached one foot above the floor joist. One-story commercial structures with one foot of flooding inside would require approximately 9 days to resume business at a different location and 62 days to repair and reoccupy the old location. (Coastal Construction Manual, FEMA)

That same structure with 4 feet of floodwater inside would have about $29,000 in building component damage and $28,275 in contents damage. A business at that location would need approximately 29 days to reopen elsewhere and 182 days to reoccupy the same location. (Coastal Construction Manual, FEMA)

Since so many areas of storm water flooding are unstudied and unmapped, probabilities of the occurrence of certain flood elevations are not really known. Just because a rain event is within a certain probability also does not necessarily correspond to the same flood probability. Since floods are dependent on both rain and other conditions, such as soil moisture, a small isolated low probability rain event might not cause a low probability flood.

There are 139 non-Special Flood Hazard Area NFIP flood policies in Accomack County. This represents 4.2% of all the policies in the county. Northampton County has 93 non-Special Flood Hazard Area NFIP flood policies representing 19.6% of all the policies in the county. This is an indication that there are areas in both counties where property owners feel the need to buy flood insurance although their structure is not in an identified flood zone.

Chapter

6

High Wind

Fujita Scale of Tornado Intensity

F0 – Winds 40–72 mph Gale Tornado

F1 – Winds 73–112 mph Moderate Tornado

F2 – Winds 113–157 mph Significant Tornado

F3 – Winds 158–206 mph Severe Tornado

F4 – Winds 207-260 mph Devastating Tornado

F5 – Winds 261–318 mph Incredible Tornado

F6 – Winds 319 mph + Inconceivable Tornado

Hazard. Sources of high wind are tornados, waterspouts and various coastal storms. The entire Eastern Shore is located in the 110 to 120 mph design wind zone. This means that structures built should be able to withstand 110 mph (Building Code). This is consistent with a strong Category 1 hurricane whose 3 second gusts could be anywhere from 93 to 119 mph.

Tornados have occurred and the largest one documented was an F3 in 1967. This tornado caused 5 injuries and about $25,000 in damage. An F3 tornado has wind speeds ranging from 158 to 206 mph. The most common tornado to strike on the Eastern Shore is the F1 with wind speeds of 73 to 112 mph. (Weather Bureau online data)

Several hurricanes have generated very strong winds in the vicinity of the Eastern Shore. The August 17, 1899 hurricane struck Hatteras with 140 mph gusts before the anemometer there was blown away. The Great Hurricane of September 14, 1944, caused 134 mph winds and gusts of 150 mph at Cape Henry, south of Northampton County. Hurricane Hazel in 1954, whose path took her through the center of Virginia, generated 130 mph gusts in the City of Hampton. Hurricane Donna in 1960 caused gusts at the Chesapeake Light Ship of 138 mph. Hurricane Gloria in 1985 generated sustained winds of 94 mph on the Bay Bridge Tunnel and gusts there of 104 mph. Wallops Island, in northern Accomack County, recorded sustained winds of 72 mph. Hurricane Fran in 1996 and the Twin Northeasters of February 1998 caused significant wind damage on the Shore. (Virginia Hurricanes, VDEM)

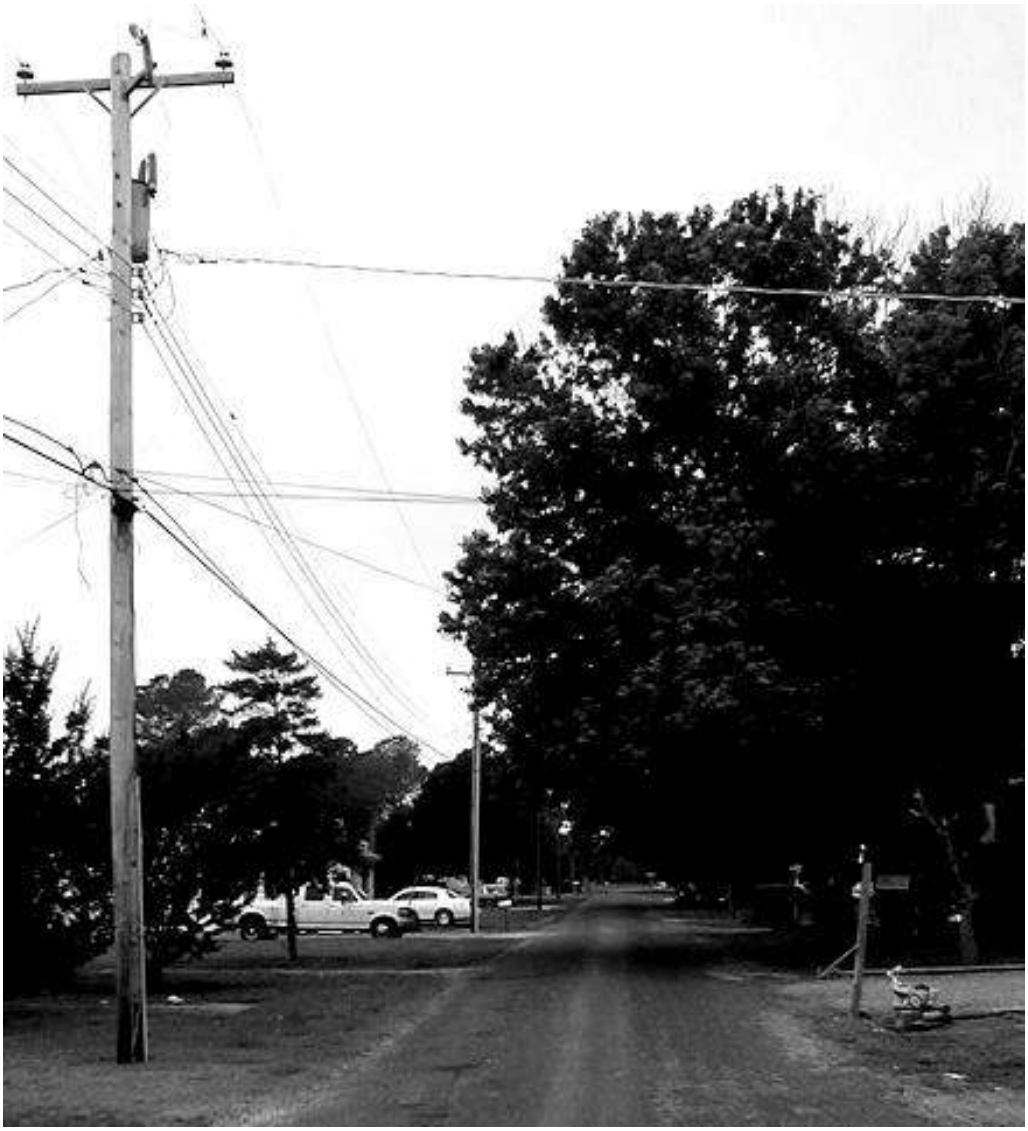
An auxiliary hazard of high wind is salt spray. High winds that pick up salt from the ocean blow this over the Eastern Shore causing crops to be

destroyed and power lines to fail. Hurricane Isabel caused both types of damage. (Local oral accounts)

Damages. High wind events cause progressive failure of structures. Once a buildings envelope has been breached wind will start to enter the building and either pull or push at other parts of the structure. Partially enclosed buildings experience a 30% higher wind pressure than enclosed buildings. Once a building becomes partially enclosed due to wind damage, higher wind pressures cause further damage. (Coastal Construction Manual, FEMA)

A building fails in high winds because the wind speed exceeds the capacity of the structure to hold up. This can happen in two ways, wind speed exceeds the design or construction standards used or windborne debris damages the structure and as a result of increased wind pressure the design or construction standards are surpassed. Wind damage commonly assumes a couple of forms. Roofs can fail, lightweight structures can overturn at the foundation, siding and shingles can be pulled off the building and openings can be blown in. Once a structure's envelope has been penetrated by wind, wind driven rain and debris causes additional damages. (Coastal Construction Manual, FEMA)

Storms that occur when the trees are in full sail also cause tremendous tree damage. Hurricane Isabel was such a storm. Thousands of trees were blown over due to the winds from Isabel and the soaked soil. Many of these trees ended up on houses, auxiliary structures, power lines and vehicles.



PICTURE 6.1 An example of a common streetscape on the Eastern Shore with mature trees, houses, sheds, vehicles and power lines intermingled. *Photo by Elaine Meil*

Vulnerability. The Eastern Shore is in wind Zone II (ASCE7-98). This means that a community shelter in this area would have to be built to withstand 160 mph winds. This shelter could withstand a F2 tornado and a Category 4 hurricane. The building code requires all structures to withstand 110 mph winds, the equivalent of a Category 1 hurricane.

This wind speed is based on the 100-year return frequency. That means that over 70 years a structure would have a 50% chance that the 110 mph

wind speed would be met or exceeded. However, wind speed design builds in a 1.5 safety factor. So a structure should withstand a higher wind speed. (Coastal Construction Manual, FEMA)

At a 110 mph wind speed, the default wind damage to a $100,000 wood frame structure would be approximately $20,000 in damage. A Category 3 hurricane with sustained winds of 111-130 mph would be approximately $50,000 in damage. For a masonry or more heavily engineered structure the damage would be reduced. (Coastal Construction Manual, FEMA)

Siting decisions affect the types of wind speed seen at a building. Ocean promontories generally receive high wind speed due to the topography of the area. A more exposed condition because of lack of vegetation around the structure will open the building up to greater wind speeds. Those structures near open water are exposed to higher winds than structures located more landward. In addition, the height of a structure above the ground affects the wind speeds. The higher a house is located above ground the higher the wind speed will be around the structure. This can be an issue in flood zones since elevation of the building is the primary means of mitigating flood damage. (Coastal Construction Manual, FEMA)

In addition, a structure is only as wind resistant as its smallest component. If a window, door, roof covering, siding or chimney fails the rest of the structure will be subjected to wind pressures that can cause other components to fail even though they perform to their design guidelines. (Coastal Construction Manual, FEMA)

Chapter

7

Coastal Erosion

Hazard. Coastal erosion occurs when coastal land is worn away. Two types of erosion occur, short term and long term. Short-term erosion means that land has been worn away but will come back due to accretion. Long-term erosion is measured over many years with a net deficit.

There are several causes of coastal erosion. Some of these include storms, floods, wind exposure, sea level rise, changes in shoreline features such as inlets, and manmade structures.

Storm induced erosion is rapid and can be the equivalent of decades of long-term erosion. Structures that sit atop unconsolidated bluffs may be damaged or destroyed if the bluff recedes.

Erosion is accelerated by sea level rise. Historic levels of sea level rise are approximately 1 foot a century but experts believe there is a possibility that sea level rise in the next century may be as high as 2 to 7 feet. FEMA Flood Insurance Administration has prepared a report documenting the effects of a 1-foot or 3-foot sea level rise on the NFIP. Unlike other portions of the United States, Accomack and Northampton have a high risk since much of their land is low lying.

Coastal Processes. Waves have a specific waveform. Over the open water waves move in a circular pattern. As the waves move into shallow water, approximately when the depth is less than 50% of the wavelength, the wave's motion flattens out into an ellipse with a horizontal action. Waves tend to converge around points that protrude into the body of water. This is where the highest wave energy is expended. If the shoreline protrusion does not consist of erosion resistance material then the shoreline will erode faster than surrounding areas until the coastline straightens. Plunging breakers are eroding the beach; spilling breakers that

gently run up a beach facilitate sand deposition. (Environmental Geology, Edward Keller)

Wave energy is very powerful. On a 250-mile open coast, waves with a height of 1 meter (3.28 feet) will expend energy equivalent to an average sized nuclear power plant generating electricity at the same time. This energy is expended moving the water and sand around the coastal area. The wave energy is broken down into two components when it strikes the beach, perpendicular and parallel. The parallel component causes the longshore drift and this drift generally moves sand from the beach south. (Environmental Geology, Edward Keller)

Damages. Erosion causes several types of damage. Erosion generally causes damage to foundation elements causing a structure to partially or totally collapse or subside. Erosion in the form of scour or undercutting removes supporting soil from foundation elements. This causes the foundation to fail and other components of the building will fail.

Unlike other types of damage caused by hazards, erosion destroys dry land. Therefore the consequences of this are different from other hazards. In some areas of the Eastern Shore the eroding land means eroding community.

Damages include removal of tax base to the counties and towns, destruction of structures and infrastructure. Accomack County is having about 40 acres convert to wetlands each year from the 2 mm sea level rise and Northampton County about 20 acres are converting to wetlands each year. (Sea Level Rise meeting with the EPA, February 2004)

Vulnerability. Losses due to gradual erosion, storm induced erosion, or bluff recessions are not covered under an NFIP flood policy. The NFIP flood policy does not insure land. (Review of the Standard NFIP policy)

Privately financed erosion control structures or revetments do not usually protect property from storm-induced erosion. FEMA's post storm inspections show that the majority of these structures fail to protect the land or building they were meant to protect. (Coastal Construction Manual, FEMA)

Effective coastal erosion control methods are dependent on an understanding of the littoral cell, usually several tens or hundreds of miles of coastline, and wave climate in that cell. Piecemeal erosion control is ineffective. Most communities do not control the entire coastline in their littoral cell. (Environmental Geology, Edward Keller)

Chapter

8

Accomack County

There are 14 incorporated towns in Accomack. The following information is for the unincorporated areas of Accomack and the incorporated towns of Accomac, Belle Haven, Bloxom, Hallwood, Keller, Melfa, Onley, Painter and Parksley. The information for the other incorporated towns in Accomack are located in later chapters. These towns include Chincoteague, Onancock, Saxis, Tangier and Wachapreague.

History. Accomack County is the northern county on Virginia's Eastern Shore. It was formed from Northampton County in 1662. The original settlement of the county was scattered seaside and creek side plantations and farms. In the late 1600s, towns and villages gradually grew around the courthouse, ports and wharfs that the residents used to ship their goods to Europe. In the mid 1800s, the economy boomed. The coming of the railroad opened up the northern markets to seafood products. Trains carried seafood products north and brought tourists south. The railroad created many new towns up the spine of the county.

Terminology

A zone – areas where the 1% probability flood, 100-year flood, would inundate with waves less than 3 feet.

V zone – areas where the 1% probability flood, 100-year flood, would inundate with waves greater than 3 feet.

NFIP – National Flood Insurance Program

Pre-FIRM – Built before the FIRM(Flood Insurance Rate Map) was adopted by a community

Coastal and Stormwater Flooding. According to the Accomack County Floodplain Management Plan, 61,717 acres, twenty-two percent of all the land, in Accomack County is in the V zone. Sixty-one percent of this land is held in some form of conservation ownership. The three largest landholders are the Commonwealth of Virginia (29,790 acres), the federal government (18,417 acres) and The Nature Conservancy (8,551 acres). Accomack currently has 118 V zone policies in the unincorporated areas of the county. The primary flood impact area is the 64,950 acres in the A zones. Most of the structures located in a flood zone are in this area. Forty-four percent of the county's land lies in a regulated flood zone.

A 100-year event would affect approximately 3,933 structures located in the unincorporated parts of Accomack County and the incorporated areas of Accomac, Bloxom, Belle Haven, Hallwood, Keller, Painter, Parksley, Onley and Melfa. The 100-year flood event would generate an estimated

$109 million in residential losses. It is expected that $76 million of this would be covered by flood insurance.

Local officials identified various areas in the county that have storm water flooding problems. These areas include the intersection of Route 13 and Route 175 in New Church, Horntown Road east of Route 13, Neil Parker Road in Sanford, parts of the Town of Hallwood, parts of the villages of Pastoria and Mappsville, the low lying lands south from Messongo to Chesconnessex, parts of the town of Accomac, Bayside Road between Shields and Craddockville and the Family Dollar store in Onley.

PICTURE 8.1 This building and its parking lot in the Town of Onley frequently is flooded by storm water. As can be seen from the truck in the picture this building was built in a substantial depression. Just visible in the photo is the platform for customers to access the store after a rain. The lot next door, also located in the depression, is for sale. *Photo by Elaine Meil*

NFIP Community Participation. Accomack County has participated in the NFIP since June 1, 1984. Between 1984 till July 2003, Accomack County's unincorporated and incorporated areas have had 525 flood insurance claims and $3,810,884 has been paid for flood damage. The average claim over the entire county is $7,259. The unincorporated areas of the county account for 460 of those flood insurance claims. These claims were for $3,434,634. The average claim is $7,467. These numbers do not include the damages from Hurricane Isabel. As of December 31, 2003, there are currently 25 repetitive flood loss properties within the

county and incorporated towns. Eight properties on this repetitive flood loss list have received $139,098 from flooding caused by Hurricane Isabel.

The Accomack Comprehensive Plan notes that in 1997 the county had only 1,697 NFIP policies and only had $822,901 paid to the county policyholders since the program was adopted. Since 1997, an additional $2,897,983 has been paid out and there are now 3,338 NFIP policies. Much of this was probably related to the damage from Hurricane Floyd in 1999.

Accomack County also participates in the Community Rating System (CRS). The county's current rating is an 8. Residents and businesspersons in the unincorporated areas of the county are eligible for a NFIP policy discount of 10% in the Special Flood Hazard Area and 5% in the non-Special Flood Hazard Area. After Hurricane Floyd 1999 the county adopted a ordinance that requires all structures built or substantially improved to be elevated to a foot above the Base Flood Elevation. This freeboard requirement will protect many structures from a flood greater than the 100-year flood.

Special Flood Hazard Area, Participating Communities. The Town of Belle Haven, partially in Accomack County and Northampton County, has Special Flood Hazard Areas. None of these Special Flood Hazard Areas are V zones. Belle Haven joined the NFIP on February 8, 2001. In the Town of Belle Haven the floodplain is located along Occahannock Creek. The Flood Insurance Study for the town indicates the primary source of flooding comes from coastal storms such as hurricanes and northeasters that force water from the Chesapeake Bay up Occahonnock Creek. The development in the Special Flood Hazard Area is limited. There are approximately 35 parcels with some portion within the A zones. There are approximately 5 buildings within or very near the edge of the flood zones. According to the July 2003 NFIP insurance report, no NFIP polices are in effect within the town and no flood damage claims have been made.

Rescinded Special Flood Hazard Area. Hallwood joined the NFIP on May 1, 2000. Prior to September 28, 2001, when FEMA rescinded the town's FIRM, the Town of Hallwood had an identified floodway from Messongo Creek that has portions of pre-FIRM vacant industrial buildings within it. Several flooding causes were identified in the Flood Insurance Study for Hallwood, flooding is most prevalent in the spring but can be caused by short intense rainfall, heavy rains or lack of adequate drainage. The Flood Insurance Study also noted that the development in the floodplain was moderate with residences and small businesses also located in the former 100-year flood zone. Although no A zones exist in the town the zone designation of the old Special Flood Hazard Areas are now Zone B (shaded Zone X). Zone B denotes the 500-year floodplain. The structures located within these areas have a 6% chance of having a flood meet or exceed the 500-year level over the course of a 30-year mortgage. They have a 13% chance to meet or exceed the 500-year flood over the course of 70 years.

The July 2003 NFIP insurance report shows that there are 6 A zone policies within the town and no claims for flood damage had been made. These 6 policyholders are probably paying more than they should for flood insurance since they are no longer in an A zone. Some of these policyholders may qualify to purchase a preferred risk policy. The average value of a house (not including land) in Hallwood is $37,385. A preferred risk policy of a house without a basement for $50,000 of structure coverage ($500 deductible) and $12,000 of contents coverage ($500 deductible) is approximately $179 a year (www.fema.gov/nfip/prpbroch.shtm, 2003). The same amount of coverage but for a building outside the Special Flood Hazard Area with a basement would have a premium of $204.

FEMA has chosen not to produce a revised FIRM since there are no longer any A zones within the town. Obviously, these will lead to numerous administrative problems, such as these 6 persons being overcharged for A zone policies.

No Special Flood Hazard Area. The Towns of Accomac, Bloxom, Melfa, Onley, Painter, and Parksley, in Accomack County, do not have any identified Special Flood Hazard Areas. None of these towns participate in the NFIP.

County officials did identify stormwater flooding issues in Accomac, Bloxom and Onley. In September 2003, Bloxom was flooded by up to 2 feet of water during a thunderstorm.

NFIP Sanctioned. The Town of Keller, in Accomack County, is a NFIP sanctioned community. NFIP insurance is not available within its corporate limits. The town itself is not proximate to the bay or the sea. One creek is identified, on the FEMA Flood Boundary map, running through the town called Frogstool Branch. In addition, two intermittent streams also run into the stream.

HMGP Participation. The County of Accomack has participated in the Hazard Mitigation Grant Program in the past. After Hurricane Floyd in 1999, the county received a 28 home elevation project. Those homes that were elevated were located in the unincorporated portions of the county and the Town of Tangier. After Hurricane Isabel, Accomack County submitted a HMGP application to elevate another 20 homes.

PICTURE 8.2 The county elevated this home using Hazard Mitigation Grant Program money. *Photos by David Fluhart*

High Wind Events. The windborne debris hazard area extends one mile inland from the shorelines. There are approximately 301 structures in this

area. Assuming, a 110 mph (3 sec gust) event, which is the 100-year event, the unincorporated areas of Accomack County could expect approximately $2.1 million in wind related damages. In addition, three incorporated towns also lie in the windborne debris hazard area, Tangier, Saxis and Chincoteague.

Coastal Erosion. The County has approximately 27 structures in danger of erosion damage should erosion occur on the shorelines near those structures. These structures are located on the seaside and bayside in the unincorporated areas of Accomack. Together these represent $2.5 million in potential damage. The county has Resource Protection Areas, required by the Chesapeake Bay Act, on the bayside of the county only. This 100-foot buffer protects some new development from being exposed to erosion in the near future.

The Accomack County Shoreline Situation Report shows that approximately 16 miles of Accomack's bay shore is eroding (VIMS, 2002). In addition, 24 miles has some form of erosion control structure. Approximately 87.4 miles of the bay shoreline is developed. Seventy-nine miles is developed as residential.

Accomack's Comprehensive Plan identifies following areas of critical or severe erosion.

Sluitkill Neck between Pungoteague Creek and Matchotank Creek is an area of critical erosion. The area consists the marshes around Tarkill Creek and three islands, Parkers Island, Scarborough Island and Finneys Island. This area is located in between Cashville and Crockett Town.

Parkers Marsh near South Chesconessex is an area of severe erosion. This area is just north of Sluitkill Neck. This area includes the built up area at Crystal Beach.

Scarborough Neck is located in southern Accomack across from Northampton County on Occohannock Creek. The land has severe erosion losing 5 feet per year.

Freeschool Marsh is located behind the Town of Saxis. Most of this marsh is a wildlife refuge.

Other Local Hazards. Besides the previously identified hazards county officials also identified other hazards that could impact the county. US Route 13 runs across the county and the local public safety department identified this corridor as a potential threat for Hazmat incidences. It is unknown what hazardous material passes through the county on this route. Other hazmat incidences could also occur within the county at bulk fuel sites or within the shipping lanes just off the coast of the county.

The Eastern Shore has a large poultry industry and during disasters there can be large chicken kills. Although the processing plants are equipped to handle the disposal of large numbers of dead chickens, economically this is very damaging to the county. In a very similar circumstance, disease can also wipe out this industry or cause great economic loss. Over the winter avian flu struck the area, the government quarantined several chicken farms, and prohibited the gathering of chicken farmers to prevent the spread of the disease. There were also requirements to decontaminate delivery truck wheels and restrictions on use of chicken manure.

Disease also is another threat to the residents of the county. In particular, disease spread via mosquito such as West Nile Virus poses a threat to the county. Since much of the county is wetland and has very low slope there is an abundance of still water and consequently an abundance of mosquitoes. In northern Accomack, there is a Mosquito Creek, Little Mosquito Creek and Mosquito Point. The county also conducts a mosquito-spraying program in Greenbackville just north of this area. Besides Greenbackville the county has no other mosquito control. Some of the towns have mosquito control this includes Chincoteague, Parksley, Accomac and Onancock. In the past Saxis used to spray but the spraying may have killed crabs and so the town no longer sprays. Tangier also does not spray for the same reason. Yet both mayors indicated that mosquitoes are a major problem in both towns.

Critical Facilities. County officials identified all the critical facilities within the county. These are scattered throughout the county. Of particular concern are those lying in flood zones.

Five of fifteen stations are located in a flood zone, Greenbackville Volunteer Fire Department, Chincoteague Volunteer Fire Company, Saxis Volunteer Fire Company, Wachapreague Volunteer Fire Company

and Tangier Volunteer Fire Company. Four of these stations are serving towns. After Hurricane Isabel the Towns of Saxis and Wachapreague applied for HMGP money to retrofit or relocate the fire station. Both of these projects were not funded due to lack of documented damage.

There are four schools located in the flood zones, Chincoteague Elementary, Chincoteague High, Tangier Combined and Pungoteague Elementary.

Two health centers are also located in the flood zone, Chincoteague Health Center and Tangier Community Health Center.

In addition, there are three bulk storage sites in the flood zone, one in Chincoteague, Tangier and Onancock. There is also propane storage on Chincoteague and the Chincoteague electric substation, both in the community's flood zones.

Most other critical facilities would be affected by wind damage and manmade damage. Many of the local government buildings are located in and around the county seat. In Isabel, some bricks from the bell tower on the courthouse were knocked off causing some damage.

Virginia maintains several offices in and around the Town of Accomac and Town of Onancock.

Besides local and state government and private enterprise, three military installations are located in the county, NASA's Goddard Flight Facility, Aegis training center and a National Guard Armory.

Review.

1997 Accomack County Comprehensive Plan. The Plan addresses two hazards, coastal erosion and storms. The county has identified two actions to address these concerns. Prepare a shoreline management plan that outlines areas with erosion problems, adjacent land use and best means to control the problem. The county has also adopted a policy of directing development away from critically eroding shorelines. Other policies also affect these two concerns including policies to encourage new development to locate on suitable soils, encourage open space presevation

and conservation of barrier islands, marsh land, forested areas and creek corridors.

Trends. Accomack is growing and some development is occurring near the shorelines. There are 300 to 400 new homes near Greenbackville. Other waterside development included Captains Cove near Atlantic, Schooner Bay and Nandua Shores north of the Town of Onancock. There is a new waterfront subdivision in Quinby. Various homes in Wachapreague and Onancock are being remodeled. There are also waterfront homes being built around the Country Club. Prices are also climbing in all the island communities and people are moving into these areas and remodeling or rebuilding homes in these areas. In general, the property at risk to flooding is increasing but with the NFIP requirements this development is generally able to withstand the 100-year flood inundation in its vicinity.

In the past, there may have been up to 20 homes on Cedar Island. Over time this number has been dwindling. The entire island is in the Coastal Barrier Resource Area. Along with other restrictions, flood insurance cannot be purchased. The Nature Conservancy recently burned one of the homes down and another was shipped off the island. There were also reports of two being destroyed in Hurricane Isabel. Currently, it is not very clear exactly how many homes remain on the island but in the future it is expected that gradually the homes that remain will be moved or destroyed.

Findings.

1. Thirty-nine percent of all V zone land is held in private hands, approximately 24,000 acres.

2. During a 100-year flood event there are approximately 3,933 structures that could be affected. Coastal flooding is the greatest threat to the county.

3. Many areas of stormwater flooding are not identified by the current FIRMs.

4. The Town of Hallwood no longer has any areas located in the 100-year floodplain but residents are still paying for A zone polices.

5. Three towns, Accomac, Bloxom and Onley do not participate in the NFIP but have stormwater flooding issues. Residents and business owners in these areas cannot currently purchase flood insurance.

6. The Town of Keller is a sanctioned community under the NFIP.

7. During a 100-year wind event there are approximately 301 structures that would be in the worst areas damaged.

8. Most of the worse coastal erosion in Accomack County is on the bay shoreline. This area has 87.4 miles of developed shoreline. There are approximately 27 structures that would be destroyed in the next erosion event at that site.

9. The county has identified three additional hazards. Two of these chicken kills and mosquito borne disease could both be aggravated after a flood disaster.

Chapter

9

Town of Chincoteague

History. Chincoteague is a barrier island that formed approximately 2,000 to 4,000 years ago. The island is crisscrossed with dunes that run in a northeast-southwest direction. The Accomack County Soil Survey shows that there are nine types of soil on Chincoteague. Several landforms are associated with these soils, tidal salt marshes, dunes, beaches, intermingled dunes and marshes, coastal upland or floodplain, and fill.

Coastal and Storm water Flooding. The Flood Insurance Study for Chincoteague identifies the greatest threat of flood inundation comes from hurricanes and northeasters.

Terminology

A zone – areas where the 1% probability flood, 100-year flood, would inundate with waves less than 3 feet.

V zone – areas where the 1% probability flood, 100-year flood, would inundate with waves greater than 3 feet.

NFIP – National Flood Insurance Program

Pre-FIRM – Built before the FIRM(Flood Insurance Rate Map) was adopted by a community

Almost the entire town is located in an A zone, only a slim slice of the southern shore of the town is located in a V zone. The Flood Insurance Study for Chincoteague includes a wave analysis. The town's A zones then are likely coastal A zones where waves under 3 feet can be expected in the 100-year flood. This poses additional risk than ordinary A zones. Homes are not required to have open foundations. Small waves can damage the foundations of homes elevated according to the requirements of the NFIP.

All structures on the island are at high risk to coastal flooding. However, some structures are at greater risk to flood damage due to the way they were constructed. An estimate of pre-FIRM residences for Chincoteague is 2,016. There are approximately 609 additional residences built before the wave analysis. Some of these structures should be classified as pre-FIRM since they were built in the unincorporated areas of Accomack County prior to 1984 and annexed into the town in 1989. Prior to 1984, structures were built to the stillwater elevations. The Flood Insurance Supplemental Study shows that wave crest increases the Base Flood

Elevation by 0.8 to 1.1 feet. All pre-FIRM and pre wave analysis structures are at greater risk of flood damage than post-FIRM structures built after June 1984.

Two commercial districts are located on the island, along Maddox Boulevard and the original downtown area on Main Street. Both of these areas are located in A zones and for the most part lie below 5 feet in elevation. In December 2000, there were 1,029 business licenses within the town (2002 Chincoteague Comprehensive Plan). Many of these licenses may be for businesses being run out of their owner's home. Only 149 business establishments employing 755 persons show up in the 2001 County Business Patterns zip code data for Chincoteague.

The V zone Base Flood Elevation on the island is 10 feet. The A zone Base Flood Elevations range from 7 to 9 feet. In the event of a 100-year flood, private residential property owners would suffer an estimated $107.9 million in structural and contents damage.

The town has 530 NFIP policies that would reduce the amount of loss. Depending on the distribution of the NFIP polices, these should provide a portion of the cost of repair. Purchasing NFIP contents insurance is not usually required unless the contents are being used to secure a loan. However, NFIP building insurance is a requirement to receive a mortgage on the property. For this reason most of the covered losses will be for repair of existing buildings and will not be for replacement of personal property. Assuming a normal distribution, the expected covered structural loss would be about $7 million. This would leave $46 million in uncovered residential structural loss.

In the past, floods that have covered the entire island such as the 1933 hurricane and the Ash Wednesday Storm have garnered federal assistance. However, there is no guarantee that the President would declare a disaster. If a federal disaster was declared, than some Federal Disaster Assistance would become available. Federal Disaster Assistance is very limited and would not cover the entire structural loss. The average housing assistance in medium sized states, such as Virginia, is $1,675 per home (CFR-Emergency Management and Assistance, 2002). This housing assistance can include lodging reimbursement, rental assistance, home repair or home replacement. There are 2,068 households in

Chincoteague (Census 2000). If all of these households applied and received the average assistance, the total federal assistance that might be available for repair of the homes would be $3.5 million, far short of the needed $46 million.

There is also some limited Federal Disaster Assistance for personal property such as loss of clothing, household items, et cetera and other necessary costs such as cleanup. For medium sized states, the average amount of this assistance is $2,106 (CFR-Emergency Management and Assistance, 2002). If all the households received the average assistance the total assistance that might be available for contents replacement would be $4.4 million, far short of the needed $55.3 million.

The 2000 Census shows that there are approximately 542 houses with a mortgage and these homes are valued at approximately $85,317,500. The July 2003 NFIP insurance report shows that there are 530 policies for $57,295,800. It appears that most of the flood insurance policies are on mortgaged houses and that as mortgages are paid off owners are dropping their flood insurance. It also appears that those policies are not covering all the losses that would occur in the 100-year flood.

In addition, it appears that few businesses have flood insurance and those that may have flood insurance likely only insure the structure and not the contents. Depending on depth of flooding, the displacement time for a one story commercial structure could be anywhere from 62 days (flood 1 foot above floor) to 302 days (flood 8 feet above floor).

Chincoteague is heavily dependent on the tourist industry. Many visitors come to enjoy Assateague Seashore National Park and the small coastal town atmosphere. In the 1950s, the tourist accommodations included rooming houses and small hotels (2002 Chincoteague Comprehensive Plan). Today the island can accommodate 11,000 overnight visitors (2002 Chincoteague Comprehensive Plan).

PICTURE 9.1 Lifeguard station on Assateague Island. *Photo by Elaine Meil*

There is an increased risk of economic losses since a spring northeaster could cause a functional shut down of tourist related businesses during the summer tourist season. A late summer hurricane could also cause the tourist season to be shorter than usual and also cause functional losses. The following table illustrates the top five types of businesses establishments located on Chincoteague.

Rank	Code	Name	No. of Establishments
1	721110	Hotels (excluding casino hotels) & Motels	17
2	722110	Full-service Restaurants	11
3	233210	Single-family Housing Construction	6
4	722213	Snack & Non-alcoholic Beverage Bars	5
	445120	Convenience Stores	4
5	721211	RV Parks & Campgrounds	4
	813110	Religious Organizations	4

TABLE 9.1 Top five types of businesses located on Chincoteague (2001 Zip Code Business Patterns).

NFIP Community Participation. The Town joined the NFIP on March 1, 1977. Wave height analysis wasn't included for the town until June, 1984. Accomack County also joined the NFIP at this time. Approximately, twenty-five percent of the existing town has had floodplain regulation from 1977 while the remainder of the town was cared for by Accomack County from 1984 to 1989.

Currently, Chincoteague has two FIRMs. The 1984 FIRM shows the old town boundaries and the 1992 FIRM shows the rest of Chincoteague Island. In 1989, the Town of Chincoteague annexed the remainder of Chincoteague Island and as a result both the 1984 FIRM and 1992 FIRM are incorrect in showing the town's boundaries.

According to the July 2003 NFIP insurance report, Chincoteague has had 21 flood claims since 1978 with an average claim of $2,878. The town currently participates in the Community Rating System (CRS) and has a rating of 8. Residents and businesspersons within one of the town's flood zones are eligible to receive a 10% discount off of their NFIP policy.

HMGP Participation. The Town has not participated in the HMGP.

High Wind Events. ASCE 7-98 defines the Wind Borne Debris Hazard Area as within 1 mile of the coast where basic wind speed is equal to or greater than 110 mph (3 sec gust). Chincoteague is within the 110-120 mph range. The coast of Assateague Island and Wallops Island generally are further than 1 mile from Chincoteague. The southern tip of Chincoteague is the only place that falls near or within this zone. There are two mobile home parks in this area. There are approximately 180 units in the park most threatened worth approximately $6.8 million. Assuming, a 110 mph (3 sec gust) event, which is the 100-year event in hurricane prone areas, Chincoteague could expect that most of these mobile homes would be a complete loss.

PICTURE 9.2 Mobile Home Park on the southern tip of Chincoteague Island. *Photo by Elaine Meil*

Coastal Erosion. Currently, the town is not experiencing a great deal of shoreline erosion. The island, located in Chincoteague Bay behind Assateague Island, is not exposed to the harsher wave climate of the Chesapeake Bay or Atlantic Ocean. However, areas surrounding the community do experience moderate to severe erosion. Approximately, 11.2% of the island's shoreline is hardened with bulkheads or riprap. Most of this is along commercial areas and privately owned land. Approximately 15 structures are located close to the shoreline with little buffer if erosion were to occur at that location. In a couple of locations, the southern end of Main Street comes within feet of the shoreline.

Other Local Hazards. Recently, a tanker carrying ethanol exploded and sunk off of the coast near Chincoteague. Although the ethanol evaporated and the fuel oil slick moved out into the ocean the committee realized that in certain conditions an accident of this nature could damage the area's beaches. This is a concern for the town since so much of its economy is related to tourism with the major draw for the area the National Seashore on Assateague Island. An event of this nature could affect the economy for years. Lightening is also a concern especially during the annual Pony Penning event each third week in July. This event attracts tens of thousands of people to the pony swim, pony auction and fireman's carnival. During 2004, while thousands were attending the events a thunderstorm passed through and caught many out in the open.

Critical Facilities. Town officials evaluated the hazards that have or could affect Chincoteague's critical facilities. All of the critical facilities are located in hazard areas including the town's firehouse.

PICTURE 9.3 Firehouse on Chincoteague Island. *Photo by Elaine Meil*

The following table lists the critical facilities and their importance to the town.

Facility	Hazards	No. of People Affected	Loss Potential	Relocation Potential	Retrofit Potential
Chincoteague Municipal Complex	Wind, Manmade	4,000+	Major Disruption	No	Yes
Chincoteague Fire Station	Flooding, Wind, Manmade	4,000+	Major Disruption	Yes	No
Chincoteague Ports & Bridges	Wind, Flooding, Manmade	4,000+	Devastating	No	No
Conectiv Power Delivery Substation	Wind, Flooding, Manmade, Loss of Power	4,000+	Devastating		
Chincoteague Water Distribution	Wind, Flooding, Fire, Loss of Power, Manmade	4,000+	Devastating	No	No
Emergency Medical Centers	Wind, Flooding, Fire, Loss of Power	4,000+	Major Disruption	Yes	Yes
Banks	Wind, Flooding, Fire, Loss of Power, Manmade	3,000+	Devastating	No	Yes

Hotels, Motels, Restaurants, Convention Center	Wind, Flooding, Fire, Loss of Power, Manmade	12,000+	Devastating	No	Yes

Review.

2002 Chincoteague Comprehensive Plan. The Comprehensive Plan addresses hazards in several areas. The plan has identified four hazards, three naturally occurring; flooding, wind, erosion and one manmade; fire. One of the major problems is with storm water flooding. The town has identified that drainage after storms are one of the major concerns. Most of the vacant lands remaining are areas where the island's drainage occurs. The Town discourages filling in open drainage ditches. Some water stands in the ditches until the tide goes down.

Town of Chincoteague, Drainage Maintenance Program. The Town's Code requires local property owners to maintain the drainage ways on their land. Owners must keep these areas clear of natural or manmade material or substance. Allowing this debris to remain constitutes a misdemeanor with each day a separate offense. The Director of Public Works is responsible for conducting two inspections of certain drainage ways prior to northeaster and hurricane season.

Trends. Chincoteague is currently experiencing a large amount of townhouse development. Several hundred townhouses have already been permitted and will be built in the next several years. There are three major campgrounds, one small campground and one agricultural area located on the island. These constitute the only remaining undeveloped land. Two large campgrounds, located on the water, are up for sale. Potential damages are increasing in the town. Some commercial properties are being converted to residential housing. Many new structures are being built using easily erodible fill. Future storms will reveal if contractors built these homes footers to a sufficient depth to withstand flood forces.

Findings.

1. The Town lies wholly in the Special Flood Hazard Area. A small number of structures are exposed to potential erosion issues and 11.2% of the island is hardened to avoid erosion. Storm water drainage is also a significant issue on the island.

2. Approximately 2,016 pre-FIRM buildings are vulnerable to damage or destruction in a 100-year flood event.

3. Post-FIRM buildings built with solid walls in A zones with wave heights could be damaged or destroyed, although in compliance with the NFIP regulations.

4. The 100-year flood event is estimated to cause $108 million in direct damage. Federal Disaster Assistance, if received, estimated at $7.8 million would not cover the damage.

5. NFIP flood insurance only covers approximately 13.4% of the houses at risk. NFIP policies and mortgages are almost equal and it appears that people are dropping flood insurance as they pay off their mortgages.

6. The 530 flood insurance policies do not appear to cover contents or the entire value of structures that are in the risk areas.

7. Chincoteague is dependent on the tourist industry. A spring northeaster, causing a 100-year flooding event, could cause tremendous economic problems if the tourism industry was partially shut down thru the summer season. A July or August hurricane could also damage the industry if it caused the tourist season to be shorter than usual. Few businesses appear to have flood insurance. So in addition to functional shut downs of 62 to 302 days while buildings are repaired, many businesses will have to rely on loans or savings to repair their structures and replace their contents or inventories.

8. The water distribution system is dependent on power on both the island and mainland. Without power, water cannot be pumped to the island and fire suppression is a concern. There are no dry hydrants on the island since they do not work well in the salt water environment. The town is dependent on residual pressure in the water tanks and Mutual Aid from other fire companies to combat fire during power outages.

9. The potential damages are increasing due to new development on the island.

Chapter
10

Town of Saxis

History. Saxis Island juts into Pocomoke Sound and is separated from the rest of Accomack County by Freeschool Marsh. The community that exists on the island began as a single farmstead. By 1800, four families inhabited the island. The community grew in size throughout the 1800s and was incorporated in 1959 (Saxis Town Plan, 1997). The current community has 101 families with a total population of 337 (Census 2000).

Coastal and Storm Water Flooding. The Flood Insurance Study (FIS) for Saxis identifies that the greatest threat of flood inundation comes from hurricanes. The August 1933 hurricane, September 1936 hurricane, Hurricane Hazel 1954 and Hurricane Donna 1960 all caused flooding in the town (Saxis FIS, 1982). Since this study the town has also had flooding in Hurricane Floyd 1999 and Hurricane Isabel 2003. The town's mayor also indicated that a Hatteras Low, a northeaster that forms rapidly near Cape Hatteras in North Carolina, has potential to strike the town before adequate preparations are made.

Terminology

A zone – areas where the 1% probability flood, 100-year flood, would inundate with waves less than 3 feet.

V zone – areas where the 1% probability flood, 100-year flood, would inundate with waves greater than 3 feet.

NFIP – National Flood Insurance Program

Pre-FIRM – Built before the FIRM(Flood Insurance Rate Map) was adopted by a community

Substantial portions of the town lie within a Special Flood Hazard Area. The Town of Saxis has several VE zones with Base Flood Elevations ranging from 8 to 10 feet. Most of the structures lie within an A zone, with Base Flood Elevations ranging from 7 to 8 feet. In addition to the Special Flood Hazard Areas, the town has B zones and C zones. A significant number of the houses that lie outside the Special Flood Hazard Area are within the B zones, the 500-year floodplain.

Approximately 160 houses, 82% of all homes, lie in a Special Flood Hazard Area. The Flood Insurance Study for the town notes that the development within the floodplain is extensive and includes numerous family dwellings, small businesses and seafood related industries. The

Base Flood Elevations within the town include wave heights on top of the stillwater flood heights. This is an indicator that the A zones in Saxis are coastal A zones where waves under 3 feet can be expected. Structures built to the current NFIP standards may suffer increased damage from waves that would not effect a non-coastal A zone.

Saxis' primary economic base is the fisheries industry (Saxis Town Plan, 1997). There are 130 workers over the age of 16 that live within the town (Census 2000). Twenty, 15%, work within the town while the rest travel outside of the town, including watermen, for their employment (Census 2000). Eighteen percent are employed in the agriculture, forestry, fishing and hunting, and mining industries. Seventeen, 13%, are self-employed and probably represent working watermen that work out of and live within the community (Census 2000). Approximately, 64 commercial fishing craft berth within the town's harbor (Saxis Town Plan, 1997). Individuals that live in Saxis, northern Accomack County, Maryland and Tangier own these craft.

PICTURE 10.1 The harbor at Saxis. *Photo by Elaine Meil*

In the surrounding Census Block Group, including Saxis and the villages of Sanford and Messongo, there are a total of 56 people who work in the agriculture, forestry, fishing and hunting and mining industry. Of these 43 are self-employed. Not all of these represent the fishing industry, as a few farms are located in the mainland areas within the block group.

The harbor at Saxis is a local hub of economic activity. A disastrous flood in Saxis would adversely affect the town and surrounding area. Worker productivity would be cut drastically since many persons live and work within the 100-year floodplain. Many employment activities also occur through small businesses. FEMA notes that small businesses are particularly vulnerable after a disaster with some 30% not surviving (Planning for Post Disaster Recovery and Reconstruction, 1998).

The fisheries industry is based around the southern end of Saxis near the harbor. This area is classified as an Intensely Developed Area (IDA) according to the requirements of the Chesapeake Bay Preservation Act. It is also zoned commercial-waterfront (C-W). This area is intended to provide space for activities and services relating to the seafood industry (Saxis Zoning Ordinance, 1993). This area lies in a regulated flood zone.

PICTURE 10.2 Fisheries businesses located in the Intensely Developed Area (IDA) in Saxis. *Photo by Elaine Meil*

A small commercial area is located in the center of the town on Saxis Road. This area lies in Zones A, B and C. The majority of the area does not lie in a Special Flood Hazard Area.

In the event of a 100-year flood, private residential property owners would suffer an estimated $2.5 million in structural and contents damage.

The town has 44 NFIP policies, 28% of structures in the Special Flood Hazard Areas (NFIP Flood Insurance Report, 2003). These would reduce the amount of loss. The Flood Insurance Administration should provide a portion of the cost of replacing contents and repairing structures. Assuming a normal distribution, the expected covered structural and contents loss would be $700,000. This would leave $1.8 million in uncovered residential loss.

There is no guarantee that a 100-year flood in Saxis would be declared a Presidential Disaster. However if one was declared and all households in the Special Flood Hazard Area applied for and received the average Federal Disaster Assistance, the town's residents might receive approximately $600,000 in assistance leaving $1.2 million in loss for the residents to absorb.

The 2000 Census shows that there are 35 houses with a mortgage and these homes are worth $2,410,000. The town has 44 NFIP policies all within the Special Flood Hazard Area. These policies cover $2,778,500. The policies in place appear to cover the value of the structures only. This may indicate that contents insurance has not been purchased or that some policies do not have enough coverage to cover a total structural loss while others carry some contents insurance.

Storm water flooding also occurs in the town. During heavy rains the town's roads are often flooded (Saxis Town Plan, 1997). The town's drains empty directly onto the shore and often become clogged with sand from tides. Ditches in the town are also commonly filled with debris. The town also contends with tidal influence on the drainage system. When tides are high the storm water remains in the ditches until the tide goes out.

NFIP Community Participation. The Town joined the NFIP on November 17, 1982. According to the July 2003 NFIP insurance report, Saxis has had 13 flood insurance claims since the town joined. The average claim was settled for $6,244.

HMGP Participation. The Town has not participated in the HMGP. The town recently applied for HMGP funding for elevation of houses after Hurricane Isabel. FEMA has not been able to fund these projects

because the modest homes of Saxis' working watermen are not valued highly enough to protect them from further flood damage.

High Wind Events. The entire town is located in the wind borne debris hazard area. This area extends 1-mile inland. Assuming, a 110 mph (3 sec gust) event, which is the 100-year event, Saxis could expect approximately $800,000 in wind damages.

Coastal Erosion. The town recognizes that it has serious erosion. The town has been working to resolve the erosion problem since 1972. The average long term rate for Saxis 9,000 ft long shoreline is 4.9 feet per year (Saxis Town Plan, 1997). The town believes that it is possible that the erosion rate has increased. The town is only 1,590 feet wide at the widest point. With every bit of erosion the town's flood hazard also increases. There are approximately 9 structures in Saxis that are located close to the shoreline with little buffer if erosion were to occur in the immediate vicinity of these structures. They represent approximately $400,000 in damage.

Saxis is actually the most viable site in the immediate vicinity of the town. It is the highest point of land for approximately 4.4 miles. Both the villages of Sanford and Messongo located inland are lower in elevation than Saxis. Sanford is 2.6 miles from Saxis and Messongo is 4 miles from Saxis. The town serves these areas with its fire station.

Other Local Hazards. Since many people rely on the fisheries industry, fish kills and the declining health of the Chesapeake Bay impact the town. In July 1999, a fish kill near Saxis caused 500,000 young-of-the-year menhaden to be affected. The cause of this fish kill was low dissolved oxygen in the water linked to the prolonged drought Virginia was experiencing at the time. These fish kills represent a threat to the livelihood of residents in Saxis and northern Accomack County.

Critical Facilities. Town officials evaluated the hazards that have or could affect Saxis' critical facilities. The Town's office and fire station are located in the 100-year floodplain. When floodwaters come up, the town's equipment is moved to the Methodist Church located on the highest point of land in the town.

The following table lists the critical facilities and their relative importance to the town.

Facility	Hazards	No. of People Affected	Loss Potential	Relocation Potential	Retrofit Potential
Saxis Volunteer Fire Company	Tidal Flooding	2,000	Devastating	Yes	Yes
Saxis United Methodist Church		300	Devastating	No	No

PICTURE 10.3 Saxis' firehouse and town office located in a flood zone. *Photo by Elaine Meil*

PICTURE 10.4 Saxis Methodist Church, used to store town's fire equipment during a flood. *Photo by Elaine Meil*

Review.

1997 Saxis Town Plan. The Town Plan identifies various hazards that affect the community. Of particular concern is shoreline erosion. The shoreline's erosion rate is 4.9 feet per year. This has been a major concern of the town since 1972. Although a report was prepared by the Army Corp of Engineers documenting the need for an erosion control structure or beach nourishment. The town has not been able to fund this project on their own. The town is also susceptible to flooding from both rainstorms and bay water. Finally, other hazards are noted including: potential water pollution from boats, failing septic systems, aboveground storage tanks and underground storage tanks, saltwater intrusion in the potable water wells and contamination from failing septic systems of this source of water.

1993 Town Zoning Ordinance of the Town of Saxis, Virginia. The ordinance regulates areas that are impacted by the identified hazards in the following ways. The town has set up a Chesapeake Bay Preservation Area Overlay District around its tidal wetlands and shoreline. This overlay district consists of a Resource Protection Area (RPA), a Resource Management Area (RMA) and an Intensely Developed Area (IDA). The RPA area is a 100 foot vegetated buffer surrounding the sensitive areas along with tidal wetlands, nontidal wetlands and tidal shores. The RPA area only allows water-dependent uses or redevelopment. The buffer area can be reduced to 50 foot if certain conditions are met. The IDA is located around the harbor and redevelopment in this area may be exempt from the RPA buffer area. Two of the zoning districts allow hazard control structures by right. The Parks and Open Space District (POS) is located immediately around the harbor, the town's parcel where the Army Corp of Engineers places dredge material, and most of the shoreline north of this site. The POS district allows erosion control structures by right. The Commercial, General District (C-G) located in the center of town allows drainage, erosion and flood control devices by right.

1997 Saxis Subdivision Ordinance. The ordinance states that land within the 100-year floodplain shall not be subdivided in such a way as to provide sites for residential occupancy. The subdivider must submit a map of the extent of the 100-year floodplain and the RPA and demonstrate that there

is an adequate buildable area outside of the RPA and completely free of the danger of floodwaters.

Trends. Mayor Tull of the Town of Saxis indicated that, in general, land prices are increasing in the town. Much of Saxis is built out but there are a small amount of new houses being built. There are at this time 3 homes being built in the town and another going to be built. However, most development in town is related to remodeling and building additions to older structures. The reason for this is the need not to touch the existing septic system thereby triggering a requirement to put in an expensive alternative system. Mayor Tull also indicated that there is an influx of new residents purchasing the older houses. This presents two issues as regards mitigation. Hazard related damages are expected to increase in this area since structures are increasing in area and value. The other issue is the potential new residents may be unaware of the impact of hazards in the town. Of particular concern is the need to evacuate long before it becomes a necessity in town due to Sanford flooding before Saxis. Mayor Tull noted that some native residents may not take precautions either.

Findings.

1. The community appears to have coastal A zones where structures built to NFIP requirements can still suffer flood damage in the 100-year flood.

2. Only 28% of structures in the Special Flood Hazard Areas have flood insurance.

3. Flood insurance coverage numbers indicate that people are buying structure insurance but not contents insurance.

4. Some storm water flooding issues are related to debris clogging up ditches and drains.

5. Locally, Saxis provides services to the surrounding area and serves as an economic center in northern Accomack County. The town of Saxis is threatened with erosion although the highest location in the area. The loss of the harbor, fire station and causeway would adversely impact the entire area including Saxis, Sanford and Messongo.

6. The town's office and fire station are located in the 100-year flood plain and has been flooded in the past.

7. The town's residents and FEMA need to document damages sufficiently so that the various flood prone homes can receive mitigation assistance.

8. Structures are being built in the local hazard areas and older structures are being added to and remodeled thereby increasing property at risk.

9. New residents may be unaware of the local hazards and need to be educated on the precautions they need to take in the event of a disaster.

Chapter
11

Town of Tangier

History. The Town of Tangier is located on an island in the Chesapeake Bay. Tangier was first settled in 1686 as a farming community. The island at that time was much larger and had woodlands. The community on the island is very resilient, surviving an invasion by the British in 1812 and occupation till 1815, a cholera epidemic in 1866 that caused the island to be evacuated and quarantined for a year and numerous storms that inundated the island with flood waters. One of these storms, the August 1933 storm, covered the entire island with flood water up to the second story of some buildings. After this flood receded some 500 people, a little over a third of the residents at that time, left the island for good.

Terminology

A zone – areas where the 1% probability flood, 100-year flood, would inundate with waves less than 3 feet.

V zone – areas where the 1% probability flood, 100-year flood, would inundate with waves greater than 3 feet.

NFIP – National Flood Insurance Program

Pre-FIRM – Built before the FIRM(Flood Insurance Rate Map) was adopted by a community

Coastal and Storm Water Flooding. The Flood Insurance Study (FIS) for Tangier identifies that the greatest threat of flood inundation comes from hurricanes and northeasters. Development within the Special Flood Hazard Area is extensive and includes numerous wood frame houses and commercial buildings (Tangier FIS). The stillwater flood elevation is 4.1 feet and the 100-year wave crest elevation is 6.3 feet. This indicates that the A flood zones in the town are coastal A zones where waves less than 3 feet high can be expected.

Approximately 235 houses, 86% of all houses, are located in an A zone. The Base Flood Elevation ranges from 4 to 5 feet in these zones. Most of the island is below 4 feet in elevation. The entire island does not lie in the Special Flood Hazard Area, however, much of the remaining land is within the 500-year flood plain. Some structures are built in these areas.

The most vulnerable areas include North Main Street, past the school, on Mailboat Harbor, the south end of Canton Road, South Main Street and homes on West Ridge Road near Big Gut. Mayor Parks estimates that

there are 47 homes that are affected by high tides. In a 100-year storm these homes are the most vulnerable to damage.

Sixty-two percent of the island's workers are employed in the seafood industry (Census 2000). The primary harvest is Atlantic blue crab (Tangier Town Plan, 2001). Tangier watermen also harvest clams and oysters. Seventy percent of the island's workers are employed on the island (Census 2000). Large disasters such as a 100-year flood will cut drastically into the town's profits, the incomes of the residents and the productivity of the workers at the same time making it necessary for the residents to arrange and pay for the repair of damaged homes. Unlike other communities where construction companies are available, Tangier has only 12 individuals employed in construction (2000 Census) and most construction materials need to be shipped to the island.

Hurricane Isabel, although not reaching the Base Flood Elevation, almost wiped out the crabbing industry on Tangier. Some crab houses were completely washed away while other listed into the water. Approximately 34 crab houses, 40%, were destroyed or significantly damaged of an approximate 85 crab houses. These crab houses were located in the southeast of Mailboat Harbor. This was the area where the winds and surge were coming from. Since these buildings are over water they are not eligible for NFIP flood insurance. These crab houses cost approximately $25-$30 per square foot to rebuild. Commonly, crab houses run 12 x 12 to 16 x 20. Other watermen sustained losses when their crab pots and crab floats were washed away. These were not insignificant losses since one float costs approximately $100 and a crab pot runs about $20-$25. A waterman may have 700 crab pots and 30 floats. Each of these crab-processing businesses generates annual sales of $18,000 to $25,000. Crab season runs from April to November with much of the harvest time corresponding to hurricane season.

PICTURE 11.1 Crab houses on Tangier damaged during Hurricane Isabel. *Left Photo by George Roarty, Right Photo by Chesapeake Fire Department*

Besides the crabbing industry there is also smaller tourism industry. There are 79 businesses on Tangier in addition to the seafood industry, of which, 30 are related to the tourism industry. The tourism industry is primarily located around Mailboat Harbor and south along Main Street.

Tangier has an estimated $4 million in residential flood losses in the event of a 100-year flood. It is expected that $500,000 of this loss would be covered by flood insurance.

The island is susceptible to poor drainage due to high water and has localized ponding after storms. Currently, there is no stormwater management on Tangier (Tangier Town Plan, 2001). In particular, stormwater carries pollutants into the wetlands and damages the nurseries of marine life that the town's economy depends on.

PICTURE 11.2 Flood water ponding around homes on Tangier after Hurricane Isabel. *Photo by Deborah Mills*

NFIP Community Participation. The Town joined the NFIP on October 15, 1982. According to the July 2003 NFIP insurance report, the town has had 23 flood insurance claims. The average claim is $8,438.

The 2000 Census shows that there are 72 houses with a mortgage and these homes are worth $5,777,500. The town has 88 flood insurance polices of which 27% are not within the Special Flood Hazard Area. These policies cover $5,123,000. The average coverage is less than the average value of the houses on Tangier and suggests that people are not carrying contents insurance or that some persons are not fully insuring the value of their homes.

Coastal Barrier Resource Act (CBRA) lands exist within the town. They are located in the southeast corner of the town. CBRA lands also lie outside the town limits but up to the corporate boundaries to the south and to the east. After November 16, 1990, flood insurance cannot be purchased from the federal government for any new development or

substantial improvement of an existing structure on these lands. Besides the prohibition on purchase of flood insurance other federal monies cannot be expended in this area including; disaster assistance, Community Block Development Grants (CDBG), flood control projects, construction of new federal highways and beach nourishment projects.

HMGP Participation. The town has not managed a HMGP grant. Accomack County has used the HMGP to elevate 3 homes on Tangier. Under Disaster Recovery Initiative money from Hurricane Floyd, the Planning District Commission also elevated 6 houses. The town and PDC are currently resubmitting an application to elevate 13 homes.

High Wind Events. The entire town is located in the wind borne debris hazard area. This area extends 1-mile inland. Assuming, a 110 mph (3 sec gust) event, which is the 100-year event, Tangier could expect approximately $1.6 million in wind damages.

Coastal Erosion. The island has a severe erosion problem. In 1713, grants show that there were approximately 1,170 acres of land. In 1813, a garrison of 1,200 to 1,500 British redcoats and the island's population existed on the island. The 1900 Census showed that the island had 1,064 people and at the time of the 1933 hurricanes the island had a population 1,300 to 1,400. Today the island has been reduced in size to approximately 500 acres. From 1967 to 1978, Tangier has experienced erosion of 14 to 21 feet (Tangier Town Plan, 2001). One of the ridges, called Canaan, had a roadway until 1923 that connected it with the remaining three developed ridges. Canaan is now separated from Tangier by Tangier Creek.

A seawall has been built to stabilize the western shoreline of the island. Shoreline erosion was so great on the western side of the island it was threatening to damage the airport runway. The erosion was from wind driven waves and ice sheets. The seawall has prevented further erosion from occurring in this area.

Erosion is aggravating the flooding and wind problems on the island. As the land wears away flood heights get larger and less protection is afforded to the community.

Currently, the Army Corp of Engineers, Congressman Schrock and the town of Tangier are working on two projects to protect the town from further erosion. The breakwater/jetty project will protect the mouth of Tangier Creek from further erosion. The other project is to construct several breakwaters for a proposed aquatic ecosystem restoration, this will protect the island from further erosion and provide habitat, approximately 400 acres, for submerged aquatic vegetation (SAV), which in turn will provide more nursery habitat for the Atlantic blue crab and other aquatic life (Congressman Schrock Visit to Tangier Island, 2003).

Other Local Hazards. Tangier has various other local hazards. Unlike other places on the Eastern Shore winter weather can be devastating to the community. At some times the entire island is surrounded with ice. Without boat access, supplies on Tangier become thin. In the past supplies had to be flown to the island and dropped into the marsh for the population to collect to prevent starvation. Since the airport has been built some of these problems have been alleviated. In 1977, 20-foot piles of ice collected on the western side of the island causing extensive erosion and damaged the airport runway. Since then a break water structure has been built to protect the airport from water and ice. This has controlled Tangier's vulnerability to erosion at this site.

There have been four epidemics on the island. In 1866, a cholera epidemic swept the island. Numerous people died and were quickly buried in their front yards without a marker. The entire island economy was destroyed when the people put down their livestock and evacuated the island. They were unable to return until the following year. In the 1870s, the island was struck with tuberculosis and measles and in the 1880s the island was swept with smallpox.

Fire suppression is also a problem if the water supply loses power. The water tank holds approximately one day's water supply and without power from the A&N station there is no means to pump additional water. There are generators at the Tangier substation but overhead wires supply current to the island and these can come down in high wind events. This substation also powers Smith Island to the north.

PICTURE 11.3 Tangier in February 2003, a coast guard cutter came later to break up the ice and deliver the mail. *Photo by John Aigner*

Salt spray and salt air also cause damage to local building materials. Over time mortar disintegrates in the air, leaving block foundations essentially dry stacked. The blocks themselves crumble over time when exposed to the salt air.

Critical Facilities. The following table lists the critical facilities and their relative importance to the town.

Facility	Hazards	No. of People Affected	Loss Potential	Relocation Potential	Retrofit Potential
Tangier Town Office	Wind	630	Devastating	No	Yes
Tangier Airport	Flooding	630	Major Disruption	No	Yes
Tangier Sewage Plant	Flooding, Wind	630	Major Disruption	No	Yes
Tangier Fire & Rescue Department	Flooding, Wind	630	Devastating	No	Yes
ANEC (power station)	Flooding, Wind	630	Devastating	No	Yes

Tangier Health Center	Flooding, Wind	630	Major Disruption	No	Yes
Tangier Combine School	Flooding, Wind	630	Major Disruption	No	Yes

Review.

2001 Tangier Town Plan. The Town Plan identifies various hazards that affect the community. Although flooding and winds have always caused damage to the community, erosion is the greatest threat to its long term existence. The town maps show that on the southern hook there are approximately 24 subdivided lots outside the town limits. These are located in CBRS lands and in the Resource Protection Area (RPA). The town is actively working to solve the erosion problem on the island.

Trends. Much of Tangier is built out and so most buildings are remodels or demolition and rebuilds. Mayor Parks indicated that most new homes are ranchers that are replacing two story Victorian homes. This presents a risk of increased damage to contents if a flood greater than the 100-year flood occurs.

Findings.

1. The A zones in the town are likely subject to waves less than 3 feet high and therefore houses built to NFIP standards could still be damaged during a flooding event.

2. Flooding disasters have an extremely adverse effect on the island's economy and could potentially wipe it out completely.

3. By its nature, the primary industry on the island cannot obtain flood insurance. This will prolong the recovery period needed.

4. There are a significant number of residents who are uninsured or underinsured from residential flood losses.

5. Erosion is the island's greatest threat and is also aggravating the flooding that occurs on the island.

Chapter
12

Town of Wachapreague

History. Wachapreague was originally an Indian fishing village. It wasn't until early 1800s that a town settlement developed. In 1825, the town's wharf was used to ship goods to other American cities (Wachapreague Town Plan, 1983). In the late 1800s, a fish oil and fertilizer company located in the town and two hotels were opened.

Coastal and Storm Water Flooding. The Flood Insurance Study (FIS) for Wachapreague identifies that the greatest threat of flood inundation comes from northeasters and hurricanes.

Terminology

A zone – areas where the 1% probability flood, 100-year flood, would inundate with waves less than 3 feet.

V zone – areas where the 1% probability flood, 100-year flood, would inundate with waves greater than 3 feet.

NFIP – National Flood Insurance Program

Pre-FIRM – Built before the FIRM(Flood Insurance Rate Map) was adopted by a community

The Town of Wachapreague has several V zones within the corporate limits the Base Flood Elevation's range from 11 to 13 feet. The 1982 FIRM shows approximately 20 structures within those zones.

There are approximately 210 structures within the 100-year floodplain. According to the 2000 Census, 211, 92%, of all houses were built prior to the town adopting the NFIP ordinance. In the event of a 100-year flood it is expected that the town will have $7.4 million in building and content loss. Ninety-five of these buildings have flood insurance.

There are the remains of a Works Progress Administration earthen protection dike along Wachapreague Inlet. This was built in summer 1934 in response to the previous year's hurricanes. It has not been maintained and no longer provides much protection from floodwaters. The remains of it can be seen just across from Wachapreague Inlet. Small trees dot the top of it.

The town's fire hall is located in the floodplain as is the commercial center. Wachapreague's economy is based on the businesses centered on the waterfront. There are six main docking facilities located there:

Wachapreague Town Marina, Wachapreague Seaside Marina, Island House Dock, Fisherman's Lodge, Coast Guard Dock and the clam house. Most other businesses are located close to Atlantic Avenue. This flood prone area represents most of the commercial activity that occurs in the town.

PICTURE 12.1 Surge during Hurricane Isabel taken from the Wachapreague Fire Department. *Photo by David Fluhart*

The town is divided into three drainage sheds. One of these runs along the waterfront and expands to include most of the southern portion of the town. Storm water in this area drains onto Atlantic Avenue and is caught by storm sewers and diverted into Wachapreague Channel and Finney Creek (Wachapreague Town Plan, 1983). The second drainage basin includes most of the remainder of the town and lies just behind the waterfront drainage basin. This basin has the largest amount of development within it. The lowest point is the intersection of Riverview Avenue and Lee Street. It is in this area that water will sit until it drains into the soil or evaporates. Portions of a third basin are within the town. The area affected is western pieces of town centered on Main Street. The

water from this area drains west out of the town. The land south of the ball field holds surface water.

The table below lists the types of business establishments that are within the town.

Name	No. of Establishments
Plumbing, heating & AC contractor	1
Hotel, Motel, Tourist Home	5
Campground	1
Art Studios	2
Stores	3
Scenic & sightseeing water	1
Landscaping services	1
Marinas & Docks	6
Seafood Processing	1
Gas Station	1
Other – Home Based	2
Full service restaurants	2

TABLE 12.1 Types of businesses located in Wachapreague.

PICTURE 12.2 Wachapreague Waterfront Commercial Area. *Photo by Elaine Meil*

NFIP Community Participation. The Town joined the NFIP on September 2, 1982. The Town has 5 V zone NFIP policies and 90 A zone policies. There are also 7 policies for structures that are not located in the 100-year floodplain and may be areas with a storm water flooding problem. Since the town joined the program there have been 8 flood insurance claims with an average payout of $5,072.

Most of the town lies in the 100-year flood plain with the remainder lying in the 500-year floodplain. The town has 35 mortgages and 95 Special Flood Hazard Area policies. This indicates that a significant number of residents believe they have a flood problem and are actively trying to protect themselves.

The average insurance amount per policy is $119,686 while the average value of houses in the town is $83,614. This may indicate that many of these policyholders do carry contents insurance along with their structure insurance. In general, it seems that a significant number of residents and businesses are seeking ways to reduce their flood damage.

HMGP Participation. The town recently applied for funding from Hurricane Isabel to elevate homes that had been flooded and acquire the flood prone firehouse. Both of these projects are pending. One of the reasons for this is it seems that there was not enough documented damages.

High Wind Events. No parts of town lie in the wind borne debris hazard area. This area extends 1-mile inland from the barrier islands. The town lies in the 110-120 mph design wind zone. (Building Code)

Most of the residential areas are older and have mature trees in and around the homes. During a high wind event falling branches or trees may damage some structures. In Hurricane Floyd 1999, several trees came down in the wind.

Coastal Erosion. No structures appeared to be at immediate risk to coastal erosion.

Other Local Hazards. The town has four tall structures in the town that are vulnerable to lightening, the ferris wheel at the carnival grounds, two churches and the Masonic Lodge.

Critical Facilities. The following table lists the critical facilities and their relative importance to the town.

Facility	Hazards	No. of People Affected	Loss Potential	Relocation Potential	Retrofit Potential
Coast Guard Station (Wachapreague)	Flooding, Wind	Boaters on the Seaside	Devastating	No	No
Fire Station/EMS	Flooding	1000+	Devastating	Yes	Maybe
Churches	Flooding, Wind, Lightening	Parishioners	Inconvenience	No	Maybe
Wachapreague Inlet Commercial Area	Flooding, Wind	100+	Devastating	No	No
VIMS Offices and Dock	Flooding, Wind	6-8	Devastating	No	Maybe
50' Coast Guard Cutter and two smaller vessels	Flooding, Wind	Boaters on the Seaside	Inconvenience	No	No
Carnival Grounds	Flooding, Wind, Lightening	Supports the fire station, 1000+	Major Disruption	No	No
Masonic Lodge	Flooding, Lightening	Members	Inconvenience	Yes	Yes

Review.

1983 Wachapreague Town Plan. The Town Plan identifies two hazards, storm water flooding and coastal flooding. The town has identified a goal to correct the storm water drainage by pursuing the following projects, obtaining an easement and digging a deep ditch to run through parts of the Riverview-Lee drainage basin. Minor ditches would be required to drain water from the west Main basin to either Atlantic Avenue or into the state road ditches. The town also would like to repair and improve the Wachapreague Channel dike.

1946 Wachapreague Town Charter. The town has several powers that bear on the hazards identified. Power 21 allows the town to compel the abatement and removal of all nuisances including that all lands, lots and other premises within the town be kept clean, sanitary and free from stagnant water, weeds, filthy unsightly deposits, snow and ice. Power 25 allows the town to provide for safe construction of houses and a building code. Power 35 authorizes the town to fill, raise or drain any lands where stagnant water has accumulated at the cost of the owner unless the town

has caused the problem or natural causes beyond the control of the owner has occurred.

Trends. Much of the town has already been developed. There remaining undeveloped lots are gradually being filled up with new buildings. A large parcel still remains on Atlantic Avenue where the historic Wachapreague Hotel used to be located. Currently, no development is taking place at that location.

Findings.

1. There are approximately 20 structures in the V zone.

2. Most structures in the town are in the 100-year floodplain. The 100-year flood is the greatest threat to the town.

3. Ninety-two percent of all homes were built before the NFIP building code requirements were adopted. After a 100-year event there will be significant damage and many structures may trigger the substantial damage regulation that requires the structures to be elevated above the base flood elevation. Not all structures at risk are insured and those that are insured will not likely receive enough money to comply with these requirements. Currently, Increased Cost of Compliance insurance is included in NFIP flood insurance but the maximum amount is $30,000. This will in most cases not be enough to comply with elevating the older homes in Wachapreague.

4. The local fire station that responds to Wachapreague and the surrounding area is located in the floodplain very close to the waterfront. The firehouse does not require a 100-year flood to have water in the building. Its lack of elevation means much less significant events imperil the residents of Wachapreague and surrounding areas of Accomack County. The fire house is a cinderblock building that holds up fairly well in floodwaters. This is a major problem since FEMA's Benefit Cost Analysis is solely based on damage to structures and does not take into account the importance of the structure. During flood conditions and in the recovery period, it is more important to

Terminology

Substantial Damage - damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

have a safe, working fire station then elevating or purchasing a single house, approximately the equivalent in project cost. Yet the Benefit Cost Analysis will make the house look better on paper aiding a single family versus the entire community. It is a failure not to take into account all benefits in the Benefit Cost Analysis.

5. Wachapreague's entire commercial area is located in the flood zone and does not require a 100-year flood to suffer damages.

6. The town has noted several storm water flooding problems in the town limits.

7. Several Wachapreague residents are proactively trying to protect themselves from flood damage by purchasing flood insurance even though it is not mandatory. These persons make good candidates for other measures to reduce their flood risk.

8. As could be seen in Hurricane Isabel, mature trees and strong sustained wind can cause massive destruction. Wachapreague, not in the direct path of Isabel, may also be in line for extensive damage from falling branches and trees in a strong wind event. Since so many buildings are in the flood plain in Wachapreague it is likely that fallen trees will substantially damage structures. If a tree damages a house in this manner then owners will have to meet the NFIP's elevation requirement and usually homeowner's policies will not cover this expense.

9. One large parcel located in the V and A zones is undeveloped. It is located at Atlantic Avenue and Main Street and was once the site to the historic Wachapreague Hotel before it burned. This land could be developed in the future increasing the town's risk of damage during flooding.

Chapter
13

Town of Onancock

History. The town's port was founded to collect tax on tobacco and other products exported from Accomack County. In 1680, the Act of Cohabitation set aside 50 acres at the head of Onancock Creek for development of a town center. This area was called Port Scarburgh but was quickly changed to Onancock. Accomack's county seat was located here until 1693 when a new courthouse was built in the nearby town of Accomac. The town was a major port on the Eastern Shore allowing access to Baltimore's markets. The town declined after the railroad was built further inland. Today the town is a residential center, service area and small active port with 99 business establishments, many in its old downtown (2001 Zip Code Business Patterns).

Terminology

A zone – areas where the 1% probability flood, 100-year flood, would inundate with waves less than 3 feet.

V zone – areas where the 1% probability flood, 100-year flood, would inundate with waves greater than 3 feet.

NFIP – National Flood Insurance Program

Pre-FIRM – Built before the FIRM(Flood Insurance Rate Map) was adopted by a community

Coastal and Storm Water Flooding. The Flood Insurance Study (FIS) for Onancock identifies that the greatest threat of flood inundation comes from hurricanes and northeasters. Development within the floodplain is minimal (Onancock FIS). The town is located inland from the Chesapeake Bay. Onancock Creek, North Branch and Titlow Creek border the town on three sides. In addition, Joynes Branch bisects the town creating a northern and southern section.

According to the 1979 FIRM, the Town of Onancock does not have any identified V zones. The town, however, does have A zones. Approximately 5 structures are located in the flood zone. During a 100-year flood event it is expected that these would receive $82,000 in damages. Only three are covered by flood insurance.

An additional seven carry flood insurance but are not located in a flood zone. This may indicate some stormwater flooding issues within the town.

The town also has two facilities that are affected by flooding, the wastewater treatment plant and the Onancock Learning Center. Bagwell Oil, a bulk storage facility, is also located in the floodplain. The wastewater treatment plant and the bulk storage facility could contaminate Onancock Creek and North Branch and to a lesser extent the Chesapeake Bay if they failed during a flood event.

NFIP Community Participation. The Town joined the NFIP on December 15, 1981. According to the July 2003 NFIP insurance report, the town has had no flood insurance claims since it joined the program.

PICTURE 13.1 The fence in the distance is the Onancock Wastewater Treatment Plant. The home to the side of the picture has recently been elevated to the Base Flood Elevation. *Photo by Elaine Meil*

HMGP Participation. The town has never participated in the HMGP program.

High Wind Events. The town is not located in the wind borne debris hazard area. However, most of the residential areas have mature trees. High winds could damage trees within the town and this might lead to some damage to houses and outbuildings.

Coastal Erosion. Although there is some erosion risk around Onancock, no structures located in the town appear to be vulnerable to coastal erosion at this time.

Other Local Hazards. Due to the existence of two bulk oil storage facilities, there is a potential for a Hazmat incident to cause damage to Onancock Creek, North Branch and the existing homes on King Street and commercial buildings on Market Street and Onancock Wharf. There are also houses located on the creek outside of the town's boundaries that could be damaged by an incident at one of the facilities.

Critical Facilities. The following table lists the critical facilities and their relative importance to the town.

Facility	Hazards	No. of People Affected	Loss Potential	Relocation Potential	Retrofit Potential
Town Office	Wind		Major Disruption		
National Guard Armory	Wind				
Fire Station	Wind		Major Disruption		
Wastewater Treatment Plant	Flooding	Entire Town and properties on Onancock Creek	Devastating	Yes	
Telephone Company Exchange Building	Wind	Entire Eastern Shore	Major Disruption	No	
Water Supply	Loss of Power	1,500	Major Disruption		
Bagwell Oil, Davis Oil	Wind, Flooding, Manmade		Major Disruption	Yes	Yes
Onancock Learning Center	Wind, Flooding	Students	Inconvenience	No	Yes

Review.

1999 Onancock Town Plan. The Town Plan identifies the 100-year flood plains. The plan does not identify any other hazards. Onancock has not identified any specific goals relating to flooding. There are goals relating to preservation of open space, improvement of Onancock harbor, improvement of the wastewater treatment facility, upgrade of the water lines to meet State mandates and fire protection, continued enforcement

of the Resource Protection Areas within the Town and options for managing storm water runoff.

Trends. Much of Onancock is built up. Areas to the east and south are open with some agriculture still being practiced within the town. Homes are being built just outside of Onancock proper in the surrounding land. Within the town, property prices are increasing and infill development is occurring. The downtown commercial area has several new stores and restaurants in preexisting buildings.

Findings.

1. The greatest threat to the town is the secondary effects of flooding. A 100-year flood would directly impact 5 structures within the town and cause $82,000 in damages. Secondary impacts could include the failure of the town's wastewater treatment plant and potential damage to the bulk oil storage facilities located on Onancock Harbor and King Street.

2. Residential areas are older with many mature trees in and around the homes and churches in the town. During a storm wind event, branches and trees may come down causing secondary wind damage.

3. Currently, the town cannot supply water for long when power is lost. The town relies on residual pressure in their tank and Mutual Aid from surrounding fire companies for fire suppression in such an event.

Chapter

14

Northampton County

There are 6 incorporated towns in Northampton. The following information is for the unincorporated areas of Northampton and the incorporated towns of Cheriton, Eastville, Exmore and Nassawadox. The information for the other incorporated towns is located in other chapters. The town of Belle Haven is partially located in both Accomack and Northampton County and the information for this town is presented in the Accomack County chapter. The town of Cape Charles' information is located in a later chapter.

Terminology

A zone – areas where the 1% probability flood, 100-year flood, would inundate with waves less than 3 feet.

V zone – areas where the 1% probability flood, 100-year flood, would inundate with waves greater than 3 feet.

NFIP – National Flood Insurance Program

Pre-FIRM – Built before the FIRM(Flood Insurance Rate Map) was adopted by a community

History. Northampton County is located on the southern tip of the Delmarva Peninsula. It is separated from the mainland by the mouth of the Chesapeake Bay. The English first settled Northampton County in 1614. At that time, a salt works was erected on Smith Island and a settlement grew up on Old Plantation Creek near the present Town of Cape Charles. At first, this area was very isolated but in the 1620s the population started to grow. A census of the county, which included both present day counties, showed that 51 people lived there. Many were attracted from the Western Shore by the pleasant environment and friendly Indians. The Eastern Shore played a prominent role in Bacon's Rebellion providing refuge to Governor Berkeley when he was fleeing Nathaniel Bacon. The present county seat in Eastville was founded in 1680 when a courthouse was erected there. Northampton has the oldest continuous court records in the country and is one of the oldest counties in the entire nation.

Coastal and Storm Water Flooding. The Flood Insurance Study for Northampton County indicates that the greatest threat of flooding comes from northeasters and hurricanes. The Study also indicates that the Atlantic shoreline has had recorded floods of up to 9 feet and the bay shoreline has had floods up to 7.2 feet. The 100-year stillwater depth for the county is 8 to 9.8 feet, with a maximum wave height crest of 12-15 feet. Generally the 12-foot wave crest is on the bayside and the higher 15-foot wave crest on the seaside.

Local officials identified areas of coastal and storm water flooding in the county. The following list gives a brief description of the areas with the problems.

Town of Cape Charles, nuisance flooding issues

Town of Exmore, Main Street between Route 13 and Business Route 13, driveways, septic systems and crawlspaces flood

Village of Willis Wharf

Village of Silver Beach, homes receive flood damage

Battle Point on Occohannock Neck

Bayford Road, the road floods from Bayford to Kellam Field

Village of Treherneville, standing water near Route 13, undeveloped at this time however in dry times the area dries up and could be sold for development during this time.

Town of Eastville, William Hughes Apartments have a storm water pond that does not dry up

Village of Oyster, flooding in homes

Village of Machipongo, roads impenetrable during rain storms, homes flooded

Town of Cheriton, storm water on Mill Street

Village of Cheapside, between Arlington and Route 13 septic systems flooded

Village of Pat Town, storm water flooding

Village of Townsend, swampy area floods during rains

Village of Townsend, Magotha area, Ocean Cove Seafood building destroyed, approximately 5 employees. Eighty year old building that withstood the August, 1933 hurricane destroyed during Hurricane Isabel

Village of Hare Valley, ebb tide, storm water flooding with debris

Village of Red Bank

The 100-year flood event would affect 820 structures within the flood plain. This event would generate an estimated $16.8 million in structure and contents losses. Two hundred and thirteen, 26%, are insured. Approximately 20% of all policies are not located in a Special Flood Hazard Area and probably indicate areas of storm water flooding.

NFIP Community Participation. The county joined the NFIP program September 11, 1976. A wave analysis was added in 1982. Prior to this time homes were built to standards based on the stillwater elevation. The new wave crest elevation is a 4-5 foot increase. The county has a total of 474 NFIP policies according to the July 2003 NFIP insurance report. Likely this number will increase due to Hurricane Isabel and the amount of households that will receive a Group Flood Insurance Policy out of their federal disaster assistance. These policies only cover up to $25,000 in damage for three years and do not fully insure all losses a structure may sustain. The purpose is to reduce the federal disaster assistance paid out in the next disaster.

The county has had 30 NFIP claims from 1978 to July 2003 averaging $3,471. In all, the county has had a total of $104,131 paid in NFIP claims. Northampton County has 2 repetitive flood loss properties. These properties received $29,799.52 for damage from the Hurricane Isabel event.

Special Flood Hazard Area, Participating Communities. The Town of Belle Haven has identified flood zones. The Town of Belle Haven mostly lies in Accomack County and for a more detailed description of the flood risk see the Accomack County chapter.

No Special Flood Hazard Area, Participating Communities. The Town of Exmore has no identified Special Flood Hazard Area. The town joined the NFIP February 8, 2001. The town has one NFIP policy. Storm water flooding problems do exist in the town.

No Special Flood Hazard Area, Non-Participating Communities. The Towns of Cheriton, Eastville and Nassawadox have no identified Special Flood

Hazard Area and do not participate in the NFIP. Both Cheriton and Eastville have identified storm water flooding problems. Residents and business owners in those areas cannot purchase flood insurance.

HMGP Participation. The County used a HMGP grant under Hurricane Floyd to elevate 2 homes in Battle Point and one in Oyster. The County and the Planning District Commission have applied for a grant under Hurricane Isabel HMGP money to elevate additional homes in the Village of Oyster.

High Wind Events. The County has a great deal of shoreline and 1,296 structures are located in the wind borne debris hazard area. This area extends one mile inland from the shore. A 100-year wind event could generate $8.4 million in damages. There are 936 buildings on the bayside and the average value of these is higher than the seaside structures. Most of the damage, $6.7 million, would be on the bayside of the county. Cape Charles losses are also on the bayside increasing the damage to this side of the county.

Some towns located in the county have been settled for hundreds of years and have mature trees located in and around the structures. During a strong wind event, such as a hurricane, structures could be damaged or destroyed from falling branches and trees.

The developed areas in south Northampton also have a greater chance of damage during wind events since most of the strongest winds will strike this area. During the Hurricane Isabel event, trees on Fisherman's Island and just north on the peninsula, were burned from blown salt with little likelihood that they will survive. Months after the event, the evergreens in this area are still brown. It appears that whole stands of trees that remain standing were killed by the event. These same trees served as protection to inland areas. In addition, large amounts of crops were damaged in the hurricane for the same reason.

Coastal Erosion. Several areas in the county have a severe erosion problem. The 2001 Northampton County Comprehensive Plan identifies three places with critical erosion problems.

Tankards Beach, located on Savage Neck, developed. This beach lost 40 feet in Hurricane Isabel.

Smith's Beach, located on Savage Neck, developed. This beach is north of Tankards. There is one large parcel that makes up the beach but has numerous cottages with long term leases on it. Another portion of the property was subdivided and that development appears on hold.

Silver Beach, located on Occahannock Neck, heavily developed

Other shorelines on the bay shore are also eroding at lesser rates. The county has a total of 344 structures, representing $43 million in potential loss, located within the 100 foot buffer required by the Chesapeake Bay Preservation Act. Northampton County enforces these requirements on the seaside in addition to the bayside. Seventy-two of structures lie within 50 feet of the shoreline.

Other Local Hazards. Southern Northampton residents are now tied to Virginia Beach. A significant disruption of the traffic on the Chesapeake Bay Bridge Tunnel would cause several problems for residents. In the past, when there was only one bridge a barge damaged the bridge and shut it down for several weeks. Today, there are two bridges but the tunnels are still shared. Just after they were put in place the northeaster of 1962 damaged one of them. Recently, Hurricane Isabel damaged and caused the closure of an older tunnel in Hampton Roads. There is potential that a storm could damage the bridge and tunnels or even destroy parts of it. This would be a significant disruption for Northampton County residents.

PICTURE 14.1 Chesapeake Bay Bridge Tunnel, the only southern road link to the Eastern Shore. *Photo by Chesapeake Bay Bridge Tunnel Commission*

Due to massive tree devastation, the southern tip of Northampton County may be subject to wildfires in the future.

Critical Facilities. The county and towns have several critical facilities. Many of these are centered in Eastville, the county seat.

PICTURE 14.2 Water tower for the town of Eastville. *Photo by Elaine Meil*

The following table lists the critical facilities and their relative importance to the county.

Facility	Hazards	No. of People Affected	Loss Potential	Relocation Potential	Retrofit Potential
County Courthouse Complex	Wind	Entire County	Devastating	No	Yes
Emergency Operation Center	Wind	Entire County	Devastating	No	Yes
Fire/EMS	Wind	Entire County	Devastating	No	Yes
Law Enforcement Facilities	Wind	Entire County	Devastating	No	Yes
Kellam Field and other airports			Inconvenience		
Chesapeake Bay Bridge Tunnel	Wind, Flooding	Entire Eastern Shore	Devastating	No	No
Shore Memorial Hospital	Wind		Devastating	No	Maybe
VORTAC Beacon	Wind, Flooding, Coastal Erosion, Manmade	Transcontinental air traffic			
Schools	Wind, Flooding			Yes	Yes
Exmore Water Tower	Wind	Town of Exmore	Devastating		
Eastville Water Tower	Wind	Town of Eastville	Devastating		
Oyster, Willis Wharf Harbors	Flood, Wind				

Review.

2001 Northampton County Comprehensive Plan. The plan identifies three natural conditions, coastal erosion, flooding and Carolina bays. Carolina bays are geomorphic features that are bowl like depressions where storm water accumulates. Most of these are found up the spine of the County. Several goals and actions relate to hazard reduction including preserving sand formations, beaches, primary and secondary dunes, and shorelines, maintain existing forestland as a buffer against erosion and ensure that critical and unique environmental areas are protected and preserved.

Trends. The southern portion of the County is being subdivided. Many northern lots on the water were also plated before the Bay Act was passed. These areas are experiencing steady growth. The Public Service Authority is proposing to add a sewer system to the spine of the county in the north near Route 13 connecting structures in the Towns of Exmore and Nassawadox and potentially including the village of Birdsnest. In general, the waterfront is developing.

Findings.

1. The greatest threat to the northern portion of Northampton is flooding and erosion. The southern portion is threatened by a flooding and wind event.

2. The southern tip of Northampton has the most risk due to its position in relation to the Atlantic Ocean and Chesapeake. It is also rapidly growing. Should Hampton Roads receive a direct strike from a hurricane, southern Northampton can expect major even catastrophic damage.

3. A strong wind event would be the most far-reaching event that Northampton could experience. Many more homes lie in the wind debris hazard area than Special Flood Hazard Area or erosion hazard area.

4. Established neighborhoods in the County are at great risk to damage in a wind event not from the wind but from wind damaged trees.

5. Three hundred and forty-four homes lie within 100 feet of the shoreline. These homes are vulnerable to coastal erosion and are also the homes that will likely receive some of the worst flooding.

6. Northampton County's vulnerability is increasing. Many of the homes being built are on the waterfront and therefore lie in the Special Flood Hazard Area and the wind borne debris hazard area. The Chesapeake Bay Preservation Act does decrease the number of structures vulnerable to coastal erosion in the next event. However, each storm is putting more homes at risk to coastal erosion.

7. Massive tree damage occurred in southern Northampton County during Hurricane Isabel 2003. These areas will be more vulnerable to wildfire in the future.

8. The Chesapeake Bay Bridge Tunnel is increasing in importance to the county and many more residents today are tied to Virginia Beach then were in the past.

9. Due to the pattern of development in the county, a bayside focused disaster would be worse than a similar seaside disaster.

Chapter
15

Town of Cape Charles

History. The Town of Cape Charles is located in southern Northampton County on the Chesapeake Bay. The town was created in 1884 as a planned community at the southern terminus of the railroad. The town was incorporated in 1886. In the 1920s, the area to the west of the town on the Bay was incorporated into the town. This area is called the Sea Cottage Addition. An interesting note to this is its relationship to the storm history of the Eastern Shore. When the town was originally laid out the area closest to the Bay was not included. During that time a large number of storms were striking the Shore. It was during this time that settlements on the barrier islands were being abandoned. In the early 1900s, the Eastern Shore entered a quiet time, storm wise, and it is during this time that the Sea Cottage Addition was added to the town. In 1990, the entire southern and northern portions of the neck that Cape Charles is located on were annexed into the town. All of this land had belonged to Brown and Root and is now being developed as a Planned Unit Development.

Coastal and Storm Water Flooding. The Flood Insurance Study identifies that the greatest threat of flood inundation comes from hurricanes and northeasters. The Flood Insurance Study was completed in 1982 and does not include the recent annexation of the southern portion of the town. Two-thirds of the old town are under 8 feet in elevation. The stillwater elevation of the 100-year flood is 8 feet and the wave crest elevation is 12 feet. In 1935, a wooden bulkhead was constructed to protect the town from surge water. Many times this bulkhead had to be refurbished or repaired. Dunes now protect the old town from smaller floods while large flood heights can still inundate the area.

There are 449 structures within the Special Flood Hazard Area. The 100-year event would generate $31.1 million in structure and content damages.

According to the July 2003 NFIP insurance report, the town has only 168 flood insurance policies in the flood zones. It appears that a 100-year flood event in the town will have $25.5 million in uninsured damage. The new annexed portion of the town also receives flooding. A great deal of the land is located in the 500-year flood plain with some portions in the 100-year flood plain.

The Corp of Engineers also studied Cape Charles' flood problems. The May 1970 Flood Plain Information, Coastal Flooding Cape Charles shows that the stillwater elevation in the 100-year event would be 8 feet in agreement with the Flood Insurance Study. The Corp has also defined the Standard Project Tidal Flood. This flood is the largest flood that can be expected from the most severe combination of meteorological and hydrological conditions that are considered reasonably characteristic of the geographical region involved, excluding extremely rare combinations. In other words, the Standard Project Tidal Flood is the most reasonable large event. First a Standard Project Hurricane was developed that had a central pressure of 27.6 inches and wind speeds of 112 miles per hour moving 52 miles in a west-northwest direction. This is a weak Category 3 hurricane just slightly stronger than Hurricanes Floyd and Isabel as they struck land in North Carolina. In Cape Charles, this storm would produce a stillwater elevation of 12 feet. According to the Coastal Construction Manual, this water depth can generate waves up to 9.4 feet high (0.78 x 12 feet) over the stillwater elevation. This does not mean that a greater storm could not occur it just defines the most reasonable large event.

Terminology

A zone – areas where the 1% probability flood, 100-year flood, would inundate with waves less than 3 feet.

V zone – areas where the 1% probability flood, 100-year flood, would inundate with waves greater than 3 feet.

NFIP – National Flood Insurance Program

Pre-FIRM – Built before the FIRM(Flood Insurance Rate Map) was adopted by a community

Almost all of the commercial area of Cape Charles is located within the 100-year flood plain. Besides direct damage most of these buildings would be damaged in a 100-year event causing other indirect damage such as lost income to employees. According to the 2001 Zip Code Business Patterns data, the town has 71 business establishments that employ 768 people. Many of these workers probably do not live in town. The 2000 Census shows that only 176 residents of the town also work within the town.

NFIP Community Participation. The Town joined the NFIP on February 2, 1983. The July 2003 NFIP insurance report shows that the town has 183 policies. Fifteen of these are not in the Special Flood Hazard Area and

may indicate persons who have storm water flooding issues. Since the town joined the NFIP there have been 6 flood insurance claims averaging $2,825.

According to the 2000 Census, there are only 93 mortgages within the town. Some persons have purchased flood insurance even though it is not mandatory. However, only 41% of those structures at risk are insured.

The town's FIRM does not show the correct incorporated boundaries and the county's FIRM updated after the town annexed land into the town limits also does not show the correct boundaries of the town.

HMGP Participation. The town has not participated in the HMGP.

High Wind Events. Portions of the town are located in the wind borne debris hazard area. This area extends 1-mile inland. There are 687 structures in this area. Assuming, a 110 mph (3 sec gust) event, which is the 100-year event, Cape Charles could expect approximately $8.3 million in wind damages.

In addition to direct wind damage, much of the old town has mature trees that are a potential secondary hazard to the structures in that area. As seen during Hurricane Isabel and other high wind events structures are vulnerable to being crushed by large trees that come down.

Massive tree damage could potentially damage structures in the old town that could trigger the NFIP requirement to elevate structures above the Base Flood Elevation. Cape Charles building stock in this area is larger historic homes some of the most expensive to elevate. There could be cases where the cost of elevating these structures would be more than demolition and construction of a new building.

Coastal Erosion. The town has 20 structures within 100 feet of the shoreline. This represents approximately $5.6 million in damages. Four of those structures are located within 50 feet of the shoreline. Bay Shore Concrete has some structures in this area. Since this is a large parcel it inflates the average of the value of the structures lying within the potential erosion area. During Hurricane Isabel, portions of lots in the northern section of the town were eroded. The developer and owners of the lots

are working on a project to place riprap or other erosion control structures there to protect the area so that homes can be built.

FEMA's post-storm inspections show that most privately funded erosion control structures fail during storm events. FEMA notes in the Coastal Construction Manual that some communities choose to distinguish between erosion control structures that protect existing development and those that are constructed to create a buildable area on an otherwise unbuildable site. Buildings destroyed by erosion are not covered under a NFIP flood insurance policy.

Other Local Hazards. One other local hazard is the lack of accessibility. There are two roads leading into the area. Accidents have closed the main road leaving only one route accessible across a high bridge. Both roads have mature trees lining them that could also close the road in a wind event. The developer of the southern portion of the town wants to close one of the roads but must reopen another access point. This indicates a potential solution to the problem if the new road is designed to improve the egress from the town.

Critical Facilities. The town has one critical area of great importance. The original sections of town are listed on the National Register of Historic Places. A flood or wind event could damage this area. Its boundaries are Bay Avenue to the west, the Railroad to the south, Fig Avenue to the east and Washington Street to the north.

The following table lists the critical facilities and their relative importance to the town.

Facility	Hazards	No. of People Affected	Loss Potential	Relocation Potential	Retrofit Potential
Volunteer Fire Department/Municipal Building	Fire, Wind, Flooding	entire town	Devastating	No	No
Museum	Fire, Wind, Flooding		Inconvenience	No	No
Medical Center	Wind, Flooding	entire town	Inconvenience		
Wastewater Treatment Plant	Wind, Flooding	entire town	Devastating	No	No
Water Treatment Plant & Tower	Wind, Flooding	entire town	Devastating	No	No

Harbor & Coast Guard station	Wind, Flooding		Major Disruption	No	No
Religious Sites (Potential Post Disaster Works)	Fire, Wind, Flooding	entire town	Major Disruption	No	No
Law Enforcement Facility	Fire, Wind, Flooding	entire town	Major Disruption	No	No

PICTURE 15.1 Bay Avenue the western Boundary of the Cape Charles Historic Area. This is also part of the Sea Cottage Addition and will be one of the first to feel the brunt of any flooding. *Photo by Elaine Meil.*

Review.

1999 Cape Charles Town Plan. The Town Plan identifies the 100-year flood plain and some coastal erosion issues. Several goals identified for other reasons than flooding or erosion could potentially include some mitigation options or deal with recovery issues. The list below describes some of these goals.

Public acquisition of additional land in the vicinity of the harbor.

Ensure adequate enforcement of building maintenance codes of the Town and state.

Eliminate storm water from sanitary sewer collection system.

Identify funding sources and options for renovation and/or replacement of community facilities, Cape Charles School and Municipal Building.

Expand and improve public harbor and marina facilities including bulkhead replacement

Maintain and improve the public beach through beach restoration activities.

Continue to enforce the Chesapeake Bay Preservation Area Overlay District.

Implement the use of storm water Best Management Practices within the town's Chesapeake Bay Preservation Overlay District

Locate development away from sensitive environmental features.

Build offshore breakwater or parallel breakwaters at the north end of the public beach to work in conjunction with existing storm water outfall.

Place beach sand along the mid to northern half of the public beach in the area of severe erosion as part of the breakwater project.

Raise the channel jetty to mean high water at the shoreward end and place a small spur on the north side to prevent sand losses through the jetty.

Pursue funding from Corp of Engineers and Department of Conservation and Recreation to carry out shoreline erosion strategies.

Expand and protect the Town's tree cover through the development of an ordinance that would establish standards for tree preservation and planting.

Discourage the demolition of historically significant buildings. Consider the adoption of a demolition ordinance to protect buildings in the commercial area.

Promote harbor-related land uses in the Cape Charles harbor area. Discourage uses that do not require waterfront locations in the harbor area.

Develop and improve public waterfront harbor properties to enhance their recreation and economic potential and to magnify the attraction of Cape Charles as a tourist destination.

Limit the height and intensity of new development along the waterfront areas to preserve visual access and the natural beauty of the waterfront for the broader public.

Develop a long-range master plan for the harbor area.

Protect special environments and open spaces from incompatible development by limiting the type and intensity of land development in those areas.

Encourage acquisition of special environments by public agencies or nonprofit conservancy organizations for the purposes of preservation.

Public acquisition of waterfront lands especially in the vicinity of the beach and northern Chesapeake Bay shoreline.

Review and refine regulations of the PUD zoning designation.

Site planning should be responsive to natural features and ecological considerations, such as topography, woodlands, wetlands, stream buffers and storm drainage.

Study the impact of a new entrance into town.

Trends. The town has three areas of new development. The northern portion of town is being developed. This area is subject to flooding, high wind and there are indications that erosion will be a problem in this area. The southern portion of the town is also undergoing development. This area has some flooding and erosion problems. However, the vast majority of this area lies outside the 100-year floodplain. A high wind event is probably the most devastating natural hazard that could affect this large area. The same development corporation is developing both of these areas. These two areas are expected to add an additional 3,000

residential units to the town. The other area of new development is the Sea Cottage Addition. One person owned numerous lots there and now these lots are being developed. This is the area of most risk to coastal flooding and also could suffer direct damage from high winds.

PICTURE 15.2 Lots for sale on Bay Avenue. *Photo by Elaine Meil.*

Findings.

1. The Sea Cottage Addition was added to the town during a quiet storm time.

2. The town is protected from low level flooding due to dunes but these will not be effective in a 100-year flood. There may be a false sense of security in the town about flooding.

3. The 100-year flood would cause incredible losses in the town. Four hundred and forty-nine buildings would be flooded and many of the 768 people employed in town would unemployed temporarily.

4. The most reasonable worst-case scenario for the town is a hurricane very similar to 2 storms that have occurred in the

vicinity in the last 5 years, Hurricanes Floyd and Isabel. A storm of this nature would be worse than the 100-year flood.

5. Fifty-nine percent of structures at risk to flooding do not have flood insurance.

6. During a disaster historic buildings could be destroyed. Others might be heavily damaged and be demolished after the event by owners who cannot afford to bring these homes up to the building code.

7. Property owners are not heeding the warning of Hurricane Isabel's recent flooding and erosion. They are going ahead with plans to construct homes in the risk areas. In some cases, these homes cannot be insured from the damage that could destroy them.

8. Should a hurricane approach it may be impossible to evacuate the town due to limited egress. A blocked road or even both roads could preclude persons in hazard areas from taking refuge outside the town.

9. All critical facilities are subject to flooding and high wind.

10. The town's vulnerability is increasing. New development is going in hazardous areas.

Chapter
16

Strategies Development

The Eastern Shore Hazard Mitigation Committee met in November 2004 to discuss the mitigation plan. At that time, members determined the Committee's vision of the Eastern Shore during and after a natural hazard event.

Vision Statement

As a result of planning and mitigation actions, damage and disruption will be minimized during natural hazard events. Federal and state agencies cooperate with the local government and guide necessary resources to the governments for recovery activities. To the extent possible, residents will be self-sufficient and will have taken responsibility for their own economic and physical protection. Infrastructure smoothly functions throughout the event and the recovery period following.

Goal Development

The Committee's goals were informed by several sources of information listed below.

- Eastern Shore Hazard Identification and Risk Assessment (ESHIRA) Findings
- Previous Products from ESHIRA development
- Lessons of Hurricane Floyd, 1999

- Lessons of other Natural Hazard Events such as Hurricane Isabel, 2003, the Twin Northeasters, 1998, and the winter storms, 2004-2005, ongoing while plan goals were being developed

- Current Initiatives such as the regional Eastern Shore Preparedness Coalition

Identified Issues

Several issues confront the Eastern Shore in a time of disaster. Representatives from the localities identified several issues. These are included below.

The Eastern Shore Hazard Identification and Risk Assessment showed that not all residences at risk to flooding have a flood insurance policy on them. In addition, those residences that have a policy do not appear to have contents coverage. The most common type of residential flood damage on the Eastern Shore is contents damage.

The Eastern Shore Hazard Identification and Risk Assessment identified numerous areas, such as parts of Bloxom, where storm water flooding occurs. It is not clearly understood what the problem is at all of these sites, and the lack of information hinders drainage and stormwater management projects.

There is a shortage of shelter space during natural hazard events due to a lack of manpower to safely operate the shelters.

After the natural hazard event, the counties limited staff are overwhelmed by administrative requirements for the disaster.

Goals & Projects

The Eastern Shore Hazard Mitigation Committee identified the following goals to work toward.

LOCAL GOVERNMENTS GUIDE A SMOOTH MITIGATION PROGRAM.

RESIDENTS, BUSINESSES AND LOCAL GOVERNMENTS PROMOTE MINIMAL COMMUNITY DISRUPTION THROUGH RESIDENTIAL AND COMMERCIAL MITIGATION ACTIVITIES.

RESIDENTS ARE SELF SUFFICIENT AND TAKE RESPONSIBILITY FOR MANAGING THEIR OWN RISK.

LOCAL INFRASTRUCTURE WILL CONTINOUSLY FUNCTION DURING AND AFTER A NATURAL HAZARD EVENT.

LOCAL GOVERNMENTS MAKE SPECIAL EFFORTS TO REACH SPECIAL NEEDS POPULATIONS.

Adoption

Adoption Resolutions of this plan are presented behind the political subdivision's plan section.

Regional Projects

The Hazard Mitigation Committee agreed on several regional projects. They are listed below and are included in each locality's mitigation plan.

Description of Projects	Start Timeline	Responsible Department/Person
Produce Responder Bilingual Cards with English on back. An example of the type of message to be included is "Do not drink the water."	2006	Health Department and the Eastern Shore Disaster Preparedness Coalition
Set a regional compatibility standard for emergency communications	2006	Eastern Shore Disaster Preparedness Coalition
Obtain more changeable warning signs	2006	VDOT
Upgrade communications systems and provide for backup in the event of a communication failure	2009	Eastern Shore Disaster Preparedness Coalition
Obtain funding for a generator Hookup for the Eastern Shore Community College	After a natural hazard event	Eastern Shore Community College

Chapter 17

Accomack County

Accomack County is the largest county with respect to area on the Eastern Shore of Virginia. It is also the most populated. There are 14 towns within the county. These towns include: Accomac, the majority of Belle Haven, Bloxom, Chincoteague, Hallwood, Keller, Melfa, Onancock, Onley, Painter, Parksley, Saxis, Tangier and Wachapreague. The Town of Chincoteague's projects are found in its own plan section. The other towns were invited to contribute to the Eastern Shore of Virginia Hazard Identification and Risk Assessment (ESHIRA) and Eastern Shore of Virginia Hazard Mitigation Plan. Representatives from several towns did participate in the ESHIRA development.

Project Prioritization

The Committee has ranked the various projects and actions, according to the project's unique elements and the county's risk assessment, and assigned a start date for that project to be considered. The Committee suggested a wide range of projects, they discussed the costs and benefits and removed projects that did not make sense for the locality, and ranked all the projects. The project lists were prepared according to their suggestions and at the March 1, 2005 Committee meeting the members voted that the project list should be included in the Plan. Higher ranked projects have the earliest start dates. The Director of Emergency Management, County Administrator and the Coordinator of Emergency Management will consider economic costs and the benefits of the various projects and present that information to the Board when the time comes to act.

Plan Maintenance

The Director of Public Safety will review the Hazard Mitigation Plan every year prior to the July 1 deadline for the Local Capability Readiness Assessment (LCAR). The Director will evaluate the plan and review progress made during the previous years on the goals and projects in the plan for all of Accomack County and the incorporated towns within the County. The Director will use the LCAR criteria for hazard mitigation to evaluate the hazard mitigation program. Progress will be reflected in the LCAR. The Director will also recommend any revisions to the Board of Supervisors. By July 1, 2010, the Director will assemble a Committee or represent Accomack County on a Committee to update the plan. Towns will have an opportunity to be represented on the Committee. The Committee will work to complete the updates by the fifth year anniversary of the adoption of the plan. During the plan maintenance process, the community will have opportunity, through advertised public hearings, to comment on plan revisions and updates prior to the Board of Supervisors approving them.

Accomack County and the incorporated Towns have a Comprehensive Plan. The Director of Public Safety will provide input and plan materials to the planning group responsible for updating the Comprehensive Plan and any other relevant planning efforts. During updates of the Comprehensive Plan and other relevant planning efforts, the Hazard Mitigation Plan will be reviewed and appropriate material incorporated into the updates.

Identified Mitigation Projects

LOCAL GOVERNMENTS GUIDE A SMOOTH MITIGATION PROGRAM.

Strategy: Train county staff for mitigation duties.

Description of Projects	Start Timeline	Responsible Department/Person
Produce Responder Bilingual Cards with English on back. An example of the type of message to be included is "Do not drink the water."	2006	Health Department and the Eastern Shore Disaster Preparedness Coalition
Set a regional compatibility standard for emergency communications	2006	Eastern Shore Disaster Preparedness Coalition
Obtain more changeable warning signs	2006	VDOT

Upgrade communications systems and provide for backup in the event of a communication failure	2009	Eastern Shore Disaster Preparedness Coalition
Obtain funding for a generator Hookup for the Eastern Shore Community College	After a natural hazard event	Eastern Shore Community College
Research allowed reimbursement under a Presidentially Declared Disaster and offer to train staff to take on emergency response tasks for pay during disaster events	2007	Accomack County Administration
Offer county staff free CERT training during office hours in the late afternoon or early morning with the employees using personal time one Saturday to complete the training.	2007	Accomack County Administration
Institute a recruitment program for volunteer firefighters. Publicize details on how to volunteer on the county website.	2007	Accomack County Administration
Send a letter to the Town of Keller Council recommending the Town join the National Flood Insurance Program so that federal mitigation funds can become available for use within the flood zones in the town in case of disaster.	2007	Accomack County Building
Send letters to Town Councils of Accomac, Bloxom, Melfa, Onley, Painter, and Parksley advising the Towns that joining the National Flood Insurance Program will allow residents with stormwater flooding problems to purchase flood insurance.	2007	Accomack County Building

RESIDENTS, BUSINESSES AND LOCAL GOVERNMENT PROMOTE MINIMAL COMMUNITY DISRUPTION THROUGH RESIDENTIAL AND COMMERCIAL MITIGATION ACTIVITIES.

Strategy: Reduce damages from flooding.

Strategy: Reduce damages from non-flooding natural disasters if that type of event occurs.

Description of Projects	Start Timeline	Responsible Department/Person
Formalize and maintain the Residential Mitigation Project Waiting List	2006	Accomack County Building
Amend the future land use map and zoning ordinance to direct high density development away from critically eroding shorelines identified as high erosion areas (loss of greater than one foot per year) in VIM'S Shoreline Situation Report for Accomack County.	Ongoing	Accomack County Planning

Develop programs to encourage conservation of barrier islands, marsh land, forested areas, and creek corridors. When consistent with habitat conservation goals, alternatives to fee-simple ownership, such as conservation easements or lease-back agreements should be encouraged to keep property on the tax rolls and in productive use.	Ongoing	Accomack County Administration
Manage a Residential Elevation and Mitigation Project, using benefit-cost analysis provided by FEMA to target structures at risk to flooding.	When Hazard Mitigation Grant Program funds become available	Accomack-Northampton Planning District Commission
Relocate the Saxis Town Office and Firehouse to a safer location within the Town.	After a natural hazard event	Town of Saxis
Replace the undersized box culverts in the Town of Hallwood	After a natural hazard event	Town of Hallwood
Replace the undersized box culverts in the Town of Bloxom	After a natural hazard event	Town of Bloxom
Once the Town of Keller becomes a member of the National Flood Insurance Program, apply for funding to lower the existing culvert causing flooding.	After a natural hazard event	Town of Keller
In the Town of Belle Haven, dig ditches along King Street near the ESO to improve drainage.	2008	Virginia Department of Transportation, Accomack County Public Works
Drainage Survey of Nelsonia, north of Fisher Corner and Route 13	2008	Accomack County Public Works
Produce a comprehensive drainage plan that identifies specific projects to improve drainage.	2008	Accomack County Public Works
After any presidential declared disaster, manage Residential and Commercial Mitigation Projects that address the most critical damage that has occurred.	After a natural hazard event	Accomack County Building

RESIDENTS ARE SELF SUFFICIENT AND TAKE RESPONSIBILITY FOR MANAGING THEIR OWN RISK.

Strategy: Educate the public about natural hazards and what is expected of them in an event.

Strategy: Educate the public about their responsibility in reducing and insuring their own risks.

Description of Projects	Start Timeline	Responsible Department/Person
Send out information encouraging residents to purchase contents and structure flood insurance to all homes and businesses located in the county's regulated flood zones.	Yearly	Accomack County Public Safety
Investigate the potential for an increased CRS rating to reduce flood insurance premiums.	2007	Accomack County Planning

Put out an education brochure on tree plantings and benefits from burying property power lines. Consider using the information developed by the Virginia Department of Emergency Management for Hurricane Isabel	2007	Accomack County Public Safety
Annual Press Release about Preparedness	Yearly	Accomack County Public Safety
Create a Surge Inundation Map and identify evacuation zones and the nearest shelter for distribution on the county's website and in local schools and libraries	2006	Accomack County Public Safety

LOCAL INFRASTRUCTURE WILL CONTINOUSLY FUNCTION DURING AND AFTER A NATURAL HAZARD EVENT.

Strategy: Maintain safe traffic flow in case of wide scale power loss.

Strategy: Maintain emergency fire service functions in case of wide scale power loss.

Description of Projects	Start Timeline	Responsible Department/Person
After consultation with the Hazard Mitigation Planning Committee, that included input from the Accomack Sheriff's Office, the following traffic lights should be retrofitted to have backup power installed in order of importance: 1. Four Corners Traffic Light (Rt. 13 and Rt. 179), T's Corner Traffic Light (Rt. 13 and Rt. 175), Traffic Light on Chincoteague Road (Rt. 175) 2. Rt. 13 and Rt. 176 in Parksley 3. Rt. 13 and Rt. 187 in Nelsonia 4. Rt. 13 and Rt. 626 in Melfa 5. Rt. 13 and Rt. 182 in Painter	2007	VDOT
Have all the Accomack County Fire Stations wired for generator hookup.	When disaster funding becomes available	Accomack County Public Safety

LOCAL GOVERNMENTS MAKE SPECIAL EFFORTS TO REACH SPECIAL NEEDS POPULATIONS.

Strategy: Reach out to migrant workers to ensure their safety while maintaining shelter space for a voluntary or mandatory evacuation.

Strategy: Institute an arrangement providing evacuees from Tangier Island transportation to shelters.

Description of Projects	Start Timeline	Responsible Department/Person
All public buildings that are slated for renovation or construction will be evaluated for designation of Red Cross Shelter or refuge of last resort status	Ongoing	Accomack Public Safety
Coordinate with Town staffs to man town shelters	2007	Accomack County Administration
Investigate a paid reservist program to man up to 7 emergency shelters.	2008	Accomack County Administration
Produce county specific emergency information in Spanish	2007	Accomack County Administration, Accomack County Public Safety
Approach local growers thru the Migrant Council to ask for tax-deductible donations to support and offset sheltering costs for migrants during natural disasters.	2008	Accomack County Administration
Approach local growers thru the Migrant Council to educate them about appropriate measures to take when a disaster is threatening the area while migrants are working.	2007	Accomack County Administration
Provide busing for evacuated Tangiermen from Crisfield, Maryland to shelters in Somerset County or bring them to Accomack County shelters. Prepare Tangier residents before any storms on where and how this system will work.	2006	Accomack County Public Safety

Chapter 18

Northampton County

Northampton County is the southern most county on the Eastern Shore of Virginia. There are 6 towns within the county. These towns include: parts of Belle Haven, Cape Charles, Cheriton, Eastville, Exmore and Nassawadox. The towns were invited to contribute to the Eastern Shore of Virginia Hazard Identification and Risk Assessment (ESHIRA) and Eastern Shore of Virginia Hazard Mitigation Plan. Representatives from Cape Charles did participate in the ESHIRA development.

Project Prioritization

The Committee has ranked the various projects and actions, according to the project's unique elements and the county's risk assessment, and assigned a start date for that project to be considered. The Committee suggested a wide range of projects, they discussed the costs and benefits and removed projects that did not make sense for the locality, and ranked all the projects. The project lists were prepared according to their suggestions and at the March 1, 2005 Committee meeting the members voted that the project list should be included in the Plan. Higher ranked projects have the earliest start dates. The Director of Emergency Services, County Administrator and the Coordinator of Emergency Services will consider economic costs and the benefits of the various projects and present that information to the Board.

Plan Maintenance

The Coordinator of Emergency Services will review the Hazard Mitigation Plan every year prior to the July 1 deadline for the Local Capability Readiness Assessment (LCAR). The Coordinator will evaluate the plan and review progress made during the previous years on the goals and projects in the plan. The Coordinator will use the LCAR criteria for hazard mitigation to evaluate the hazard mitigation program. Progress will be reflected in the LCAR. The Coordinator will also recommend any revisions to the Board of Supervisors. By July 1, 2010, the Coordinator will assemble a Committee or represent Northampton County on a Committee to update the plan. Towns will also have an opportunity to participate in the Plan update. The Committee will work to complete the updates by the fifth year anniversary of the adoption of the plan. During the plan maintenance process, the community will have opportunity, through advertised public hearings, to comment on plan revisions and updates prior to the Board of Supervisors approving them.

Northampton County and the incorporated Towns have a Comprehensive Plan. The Coordinator of Emergency Services will provide input and plan materials to the planning group responsible for updating the County Comprehensive Plan and any other relevant planning efforts, such as the Town's comprehensive planning. During updates of the Comprehensive Plan and other relevant planning efforts, the Hazard Mitigation Plan will be reviewed and appropriate material incorporated into the updates.

Identified Mitigation Projects

LOCAL GOVERNMENTS GUIDE A SMOOTH MITIGATION PROGRAM.

Strategy: Increase the capacity of Northampton mitigation program through training and coordination with federal, state and local governments.

Description of Projects	Start Timeline	Responsible Department/Person
Produce Responder Bilingual Cards with English on back. An example of the type of message to be included is "Do not drink the water."	2006	Health Department and the Eastern Shore Disaster Preparedness Coalition
Set a regional compatibility standard for emergency	2006	Eastern Shore Disaster

communications		Preparedness Coalition
Obtain more changeable warning signs	2006	VDOT
Upgrade communications systems and provide for backup in the event of a communication failure	2009	Eastern Shore Disaster Preparedness Coalition
Obtain funding for a generator Hookup for the Eastern Shore Community College	After a natural hazard event	Eastern Shore Community College
Hire a Public Safety Director	2007	Northampton County Administration
Recommend that the Town of Cape Charles identify potential shelter locations within the town in case the town becomes isolated during an emergency.	2006	Northampton Emergency Services Coordinator
Create a formal waiting list of residential and commercial projects for the Hazard Mitigation Grant Program.	2006	Northampton County Administration
Prepare a letter and package of information to encourage the towns without identified floodzones (Nassawadox, Eastville, Cheriton) to join the National Flood Insurance Program allowing residents with stormwater flooding problems to purchase flood insurance.	2007	Northampton Planning & Zoning
Offer county staff free CERT training during office hours in the late afternoon or early morning with the employees giving up one Saturday to complete the training.	2007	Northampton County Administration
Institute a recruitment program for volunteer firefighters. Publicize details on how to volunteer on the county website.	2007	Northampton County Administration

RESIDENTS, BUSINESSES AND LOCAL GOVERNMENT PROMOTE MINIMAL COMMUNITY DISRUPTION THROUGH RESIDENTIAL AND COMMERCIAL MITIGATION ACTIVITIES.

Strategy: Retrofit housing to reduce risk of coastal flooding.

Strategy: Protect new housing by reducing the risk of damage from natural hazards.

Strategy: Retrofit commercial and residential structures to reduce risk of the most critical natural hazard damage.

Description of Projects	Start Timeline	Responsible Department/Person
Conduct a drainage survey of Cheapside	2007	Northampton Planning & Zoning
The Town of Exmore has expressed interest in solving their drainage issues in their downtown. Produce a drainage and stormwater study of the Town of Exmore's flooding issues in downtown.	2006	Mayor of Exmore/Town Manager
Conduct a drainage survey of areas East and South of Eastville and the town of Eastville	2008	Northampton Planning & Zoning

Conduct a drainage survey of countywide drainage issues	2009	Northampton Planning & Zoning
Install storm shutters to withstand hurricane winds on the EOC building.	2009	Northampton Emergency Services Coordinator
Maintain a Conservation Preservation Zoning District encompassing coastal areas.	Ongoing	Northampton County Administration
Enforce the primary dune ordinance.	Ongoing	Northampton Planning & Zoning
Consider incentives in the zoning ordinance for developers who reserve land or take other measures to preserve both primary and secondary sand dunes.	Ongoing	Northampton Planning & Zoning
Enforce buffer zone widths set forth in the zoning ordinance along the bayside and seaside waterfront.	Ongoing	Northampton Planning & Zoning
Manage a Residential Mitigation Project	When funding becomes available after a natural hazard event	Northampton Emergency Services Coordinator
After any presidential declared disaster, manage Residential and Commercial Mitigation Projects that address the most critical damage that has occurred.	After a natural hazard event	Northampton Emergency Services Director

RESIDENTS ARE SELF SUFFICIENT AND TAKE RESPONSIBILITY FOR MANAGING THEIR OWN RISK.

Strategy: Increase resident preparedness in the county.

Strategy: Educate residents about flood insurance available and encourage participation in the National Flood Insurance Program.

Description of Projects	Start Timeline	Responsible Department/Person
Send out information encouraging residents to purchase contents and structure flood insurance to all homes and businesses located in the county's regulated flood zones.	Yearly	Northampton County Planning
Investigate whether Northampton should pursue a better CRS rating to reduce flood insurance premiums in the county.	2008	Northampton County Administration
Provide preparedness information on the county's website.	2007	Northampton County Emergency Services Coordinator

LOCAL INFRASTRUCTURE WILL CONTINOUSLY FUNCTION DURING AND AFTER A NATURAL HAZARD EVENT.

Strategy: Maintain traffic flow after a natural hazard event.

Description of Projects	Start Timeline	Responsible Department/Person
Retrofit three lights for backup power to facilitate traffic	2009	VDOT

movement during a large power outage. 1. The light serving the hospital at Rogers Drive (Rt. 606) and Route 13 in Nassawadox 2. A light at the following intersections, Rt. 13 and Rt. 178 in Belle Haven 3. The light at Stone Road (Rt. 184) and Route 13 serving the Town of Cape Charles		

Chapter 19

Town of Chincoteague

The Town of Chincoteague, located on Chincoteague Island, lies off of the northeast coast of Accomack County. Known as a gateway to Assateague National Seashore and the Chincoteague Wildlife Refuge, the annual Pony Penning, and the famous native pony, Misty of Chincoteague, the island has become a popular tourist destination.

Project Prioritization

The Committee has ranked the various projects and actions, according to the project's unique elements and the Town's risk assessment, and assigned a start date for that project to be considered. The Committee suggested a wide range of projects, they discussed the costs and benefits and removed projects that did not make sense for the locality, and ranked all the projects. The project lists were prepared according to their suggestions and at the March 1, 2005 Committee meeting the members voted that the project list should be included in the Plan. Higher ranked projects have the earliest start dates. The Director of Emergency Management and the Town Manager will consider economic costs and the benefits of the various projects and present that information to the Council.

Plan Maintenance

The Coordinator of Emergency Management will review the Hazard Mitigation Plan every year prior to the July 1 deadline for the Local Capability Readiness Assessment (LCAR). The Coordinator will evaluate the plan and review progress made during the previous years on the goals

and projects in the plan. The Coordinator will use the LCAR criteria for hazard mitigation to evaluate the town's hazard mitigation program. Progress will be reflected in the LCAR. The Coordinator will also recommend any revisions to the Town Council. By July 1, 2010, the Coordinator will assemble a Committee or represent the Town of Chincoteague on a Committee to update the plan. The Committee will work to complete the updates by the fifth year anniversary of the adoption of the plan. During the plan maintenance process, the community will have opportunity, through advertised public hearings, to comment on plan revisions and updates prior to the Town Council approving them.

The Town of Chincoteague has a Town Plan. The Coordinator of Emergency Management will provide input and plan materials to the planning group responsible for updating the Town Plan and any other relevant planning efforts. During updates of the Town Plan and other relevant planning efforts, the Hazard Mitigation Plan will be reviewed and appropriate material incorporated into the updates.

Identified Mitigation Projects

LOCAL GOVERNMENTS GUIDE A SMOOTH MITIGATION PROGRAM.

Strategy: Ensure emergency management and government operations can continue in case of island over wash.

Description of Projects	Start Timeline	Responsible Department/Person
Produce Responder Bilingual Cards with English on back. An example of the type of message to be included is "Do not drink the water."	2006	Health Department and the Eastern Shore Disaster Preparedness Coalition
Set a regional compatibility standard for emergency communications	2006	Eastern Shore Disaster Preparedness Coalition
Obtain more changeable warning signs	2006	VDOT
Upgrade communications systems and provide for backup in the event of a communication failure	2009	Eastern Shore Disaster Preparedness Coalition
Obtain funding for a generator Hookup for the Eastern Shore Community College	After a natural hazard event	Eastern Shore Community College
Investigate potential tertiary locations for a Chincoteague Emergency Operation Center located off the island and in northern Accomack County	2009	Emergency Services Coordinator

RESIDENTS, BUSINESSES AND LOCAL GOVERNMENT PROMOTE MINIMAL COMMUNITY DISRUPTION THROUGH RESIDENTIAL AND COMMERCIAL MITIGATION ACTIVITIES.

Strategy: Retrofit the causeway and bridge to maintain connection to the mainland.

Strategy: Retrofit existing primary housing to withstand a 100-year flood event.

Strategy: Take advantage of any mitigation funds available after a natural hazard event to retrofit commercial and residential structures to withstand flooding or other hazard events.

Description of Projects	Start Timeline	Responsible Department/Person
Increase the safety of residents and visitors on the island by replacing the existing bridge.	2006	Virginia Department of Transportation
Investigate the possibility of shoulders or enlarging pull offs on the causeway to aid traffic control during evacuations.	2008	Virginia Department of Transportation
Manage a home elevation project on Chincoteague. Using a cost-benefit analysis, focus on reducing risk to the most vulnerable primary housing.	After a natural hazard event	Chincoteague Building & Zoning
Use hazard mitigation funds to retrofit commercial and residential structures.	After a natural hazard event	Chincoteague Building & Zoning
Protect new construction by continuing to enforce the building code provisions protecting structures from flooding and wind events.	Ongoing	Chincoteague Building & Zoning

RESIDENTS ARE SELF SUFFICIENT AND TAKE RESPONSIBILITY FOR MANAGING THEIR OWN RISK.

Strategy: Increase residential knowledge about the benefits of flood insurance from the National Flood Insurance Program.

Description of Projects	Start Timeline	Responsible Department/Person
Start a public information campaign on the benefits of flood insurance with a focus on Chincoteague's local needs.	2007	Chincoteague Administration

LOCAL INFRASTRUCTURE WILL CONTINOUSLY FUNCTION DURING AND AFTER A NATURAL HAZARD EVENT.

Strategy: Ensure adequate water resources will be available in the event of power loss at the water tower.

Description of Projects	Start Timeline	Responsible Department/Person
Obtain and install a generator on the high rise water tower in the Town	2008	Chincoteague Public Works

LOCAL GOVERNMENTS MAKE SPECIAL EFFORTS TO REACH SPECIAL NEEDS POPULATIONS.

Strategy: Identify locations of visitor lodging.

Description of Projects	Start Timeline	Responsible Department/Person
Identify and map tourist lodging for use in emergency management planning and in the Town's EOC during natural hazard events.	2008	Chincoteague Administration

Appendix

1

Location and Hazard Maps