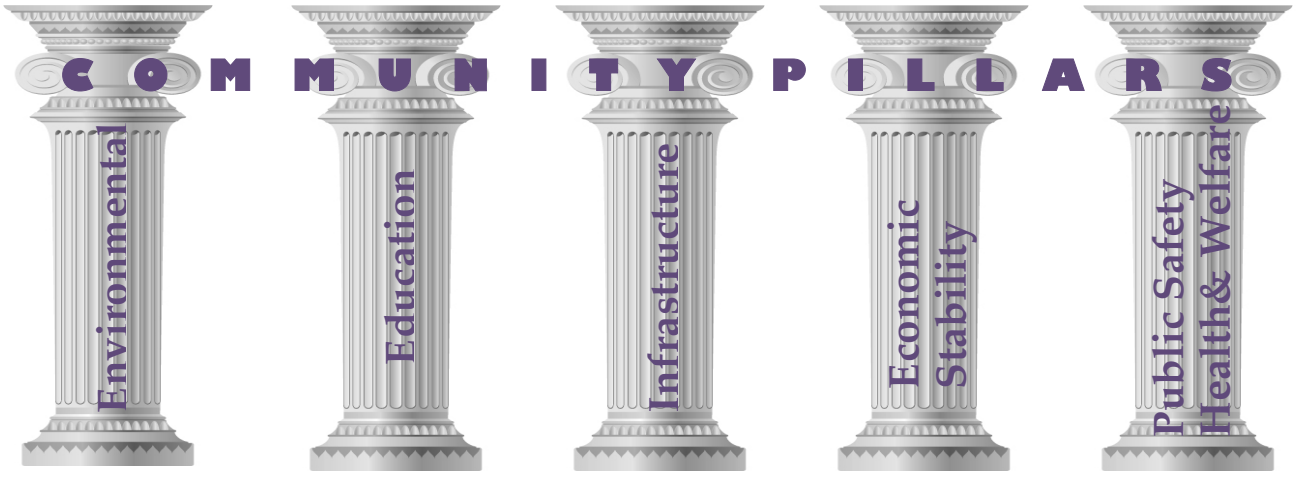
Talbot County, Maryland

Hazard Mitigation & Community Resilience Plan



2017

EXECUTIVE SUMMARY

Hazard Mitigation is sustained action taken to reduce or eliminate the long-term risk to life and property from hazards. Resilience is the capacity of individuals, communities, businesses, institutions, and governments to adapt to changing conditions and to prepare for, withstand, and rapidly recover from disruptions to everyday life, such as hazard events. Through the completion of the *2017 Talbot County Hazard Mitigation and Community Resilience Plan*, Talbot County is poised to further advance resilience via policy, planning, and action by establishing five Pillars to help guide the process and establish the foundation of resiliency planning and implementation. The five Pillars established include:

- Education;
- Public Safety, Health & Welfare;
- Economic Stability;
- Infrastructure; and.
- Environmental.

Talbot County has strong economic ties to the water and tourism and therefore, must address flooding and other risks associated with living near the water. Moderate flooding in these areas can disrupt the economy in these key areas, and catastrophic flooding could permanently affect the economic character and overall quality of life in the county. In addition to enacting ordinances for development within floodplains, Talbot County has been working to address the physical connections of the community and the five pillars. Effective hazard avoidance, mitigation, and resilience efforts that address all five pillars enables Talbot County to thrive.

The *2017 Talbot County Hazard Mitigation and Community Resilience Plan* identified following hazards as to having the greatest impact on Talbot County:

- Coastal Hazards including: Coastal Storms, storm surge, hurricane, tropical storm, and Nor'easters;
- Flood;
- Winter Storm;
- Tornado;
- Thunderstorm;
- Wildfire;
- Drought; and,
- High Wind.

In order to address these hazards and develop mitigation and resiliency strategies, the Talbot County Community Resiliency Stakeholder Committee was formed. The committee assisted in resiliency planning and the development of implementation projects. The Community Resiliency Stakeholder Committee was comprised of the following agencies:

- Department of Emergency Services;
- Eastern Shore Land Conservancy;
- Shore Regional Health;
- Department of Public Works;
- Chesapeake College;
- Public Schools;
- Planning and Zoning;
- Easton Utilities;
- American Microgrid;
- MSFSC;
- TCSO;
- Maryland DNR;
- Municipalities: Easton, Oxford, Queen Anne, St. Michaels, and Trappe;
- MEMA;
- Sea Grant Extension; and
- Mid-Shore Riverkeeper.

This committee will continue to meet bi-annually to review and encourage the implementation of the plan.

In addition, a Core Planning Team was formed to help guide the development of the plan, assess the project timeline, milestones, and establish agenda items for the Community Resilience Stakeholder Committee. The Core Planning Team met throughout the plan development process and was comprised of the following agencies:

- Department of Emergency Services;
- Eastern Shore Land Conservancy;
- Shore Regional Health;
- Department of Public Works;
- Department of Economic Development;
- Chesapeake College;
- Public Schools; and
- Planning and Zoning;

Finally, the *2017 Talbot County Hazard Mitigation and Community Resilience Plan* was not an update of previous plan iterations, however a completely new planning document and process ensure the five pillars and resilience were key components within the plan. Highlights from the plan include:

- Incorporation of a Safe Growth Audit resulting in recommendations for hazard mitigation plan integration with other County and municipal plans and tools. A new section, Appendix G, was added to the plan.
- Inclusion of regional planning groups such as Eastern Shore Climate Adaptation Partnership (ESCAP) and the Eastern Shore Emergency Planners Workgroup provided opportunities to share information, data sources, and best practices.
- Update and expansion of the critical & public facilities geodatabase, including flood depths at lowest adjacent grade and storm surge inundation storm categories was completed.
- Included a new chapter entitled, Chapter 2: County and Municipal Profiles, which included overviews and municipal comprehensive land use and hazard mitigation planning.
- Conducted an impact analysis that addressed how each pillar may be impacted by hazards identified in the plan. At each Community Resilience Stakeholder Committee meeting impacts were identified, discussed, and used for new mitigation and resiliency ideas.
- Conducted an Enhanced Hazus Wind Analysis utilizing user defined data, critical facilities, for Chapter 4: Coastal Hazards.
- Incorporation of FEMA Coast Risk Report was included along with a second Enhanced Hazus Flood Analysis that incorporated user defined data, specifically critical facilities.
- Extensively sought and obtained information and participation from municipalities during the planning process. Chapter 12: Municipal Synopsis and Perspective captures the results of this effort.
- Incorporated a new section, Appendix H: NFIP & CRS, which addresses CRS Section 510 planning requirements.
- Emphasis on natural hazards that are most likely to impact Talbot County now and in the future, providing an opportunity for a focused risk analysis and prioritization of mitigation strategies; and
- Intense effort between Core Planning Team and Community Resiliency Stakeholder Committee stakeholders to maximize opportunities for collaboration and excitement over future hazard mitigation opportunities to ensure the safety of Talbot County's citizens, protection of property, environmental sustainability, community resiliency, and the preservation of cultural and historic resources for future generation.

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Chapter 1:

Introduction

CHAPTER 1: INRODUCTION

Mitigating risks will enable the County and its communities to withstand extreme events more readily. The *2017 Talbot County Hazard Mitigation and Community Resilience Plan* identifies various hazard types, the associated risk and ways to address vulnerability. Hazard mitigation actions identified in the Plan that build resilience include infrastructure and environmental projects, integration of mitigation planning into existing or new County plans and regulations, and targeting public education and outreach efforts to inform residents and visitors of the Talbot County's hazard risks.

The Hazard Mitigation Plan is Talbot County's roadmap to evaluating hazards, identifying resources and capabilities, selecting appropriate actions, and implementing mitigation measures to eliminate or reduce future damage from those hazards.

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

Communities can engage in mitigation efforts both before and after a disaster to become more resilient. This requires addressing not only the physical and environmental impacts of hazards, but also the economic and social impacts.

Resilience
Resilience is the capacity of individuals, communities, businesses, institutions, and governments to adapt to changing conditions and to prepare for, withstand, and rapidly recover from disruptions to everyday life, such as hazard events. Resilience enables communities to adapt to change so that they not only "bounce back" from a disaster, but also "bounce forward" to a safer state.

Mitigation is the foundation of community resilience and touches all facets of a community: how floodplains and natural resources are managed, how a community builds, and where infrastructure and critical facilities are placed.

Talbot County is poised to further advance resilience via policy, planning, and action. To that end, Talbot County has established five Pillars to help guide the process and establish the foundation of resilience planning and implementation. The five Pillars established include:

- Education;
- Public Safety, Health & Welfare;
- Economic Stability;
- Infrastructure Protection; and,
- Environmental & Shoreline Protection.

1. PLANNING REQUIREMENTS

This planning effort is in accordance with the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288), as amended by the Disaster Mitigation Act of 2000, and 44 CFR Part 201-Hazard Mitigation Planning. Presidential Policy Directives 8 & 21 have guided the resilience portion of the plan, as well.

Disaster Mitigation Act of 2000
DMA 2000 (Public Law 106-390) provides the legal basis for FEMA mitigation planning requirements for State, local and Indian Tribal governments.

Presidential Policy Directives 8 & 21
Presidential Policy Directive (PPD) 8: National Preparedness (2011) defines resilience as the ability to "adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies."

Presidential Policy Directive (PPD) 21: National Preparedness (2013) defines resilience as the ability to "prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions."

2. PREVIOUS HAZARD MITIGATION PLANNING

Talbot County has engaged in hazard mitigation planning for over a decade. The previous countywide hazard mitigation plan was completed in 2010 and adopted in 2011. The plan covered Talbot County and its five incorporated communities. Technical assistance was provided throughout the planning process by the Maryland Emergency Management Agency. The plan was reviewed and approved by the Federal Emergency Management Agency in 2011.

Hazards rated as "High" risk identified in the 2011 Plan included winter storms, flooding, tropical storms, wildfire, and other severe storms (including hail, thunderstorm, and lightning). Sixty-two percent of the 2011 mitigation strategies were completed. A detailed mitigation status report has been included in the 2017 Plan.

3. ORGANIZING RESOURCES

A **Core Planning Team** was initially formed to help guide the development of the *Talbot County Hazard Mitigation & Resilience Plan*. The Core Planning team met bi-monthly to assess project timeline, milestones, and establish agenda items for the **Community Resilience Stakeholder Committee.** The purpose of the Community Resilience Stakeholder Committee was to inform and review plan elements as they were developed. Each stakeholder meeting included a plan element work session. The first work session focused on the five community pillars as they related to hazard impacts.

a. Core Planning Team

The Core Planning Team was established to help guide the plan development process. The Core Planning Team establishes the meeting agenda topics for the Resilience Stakeholder Committee.

Members included:

- Jim Bass, Department of Emergency Services;
- Brian Ambrette, Eastern Shore Land Conservancy;
- Michael Boldosser, Shore Regional Health;
- Mark Cohoon, Department of Public Works;
- Paige Tilghman, Economic Development;

- Clay Stamp, Department of Emergency Services;
- Greg Farley, Chesapeake College;
- Gabriel Rose, Talbot County Public Schools; and,
- Martin Sokolich, Planning and Zoning.

The Core Planning Team met throughout the plan development process on the following dates:

- March 15, 2016;
- May 17, 2016;
- July 22, 2016;
- October 6, 2016; and,
- December 19, 2016.

b. Community Resilience Stakeholder Committee

The Community Resilience Stakeholder Committee met throughout the plan development process on the following dates:

- June 16, 2016;
- September 8, 2016; and,
- November 22, 2016.

Members included:

- Jim Bass, Department of Emergency Services;
- Brian Ambrette, Eastern Shore Land Conservancy;
- Michael Boldosser, Shore Regional Health;
- Mark Cohoon, Department of Public Works;
- Martin Sokolich, Planning and Zoning;
- Greg Farley, Chesapeake College;
- Tim Jones, Chesapeake College;
- Gabriel Rose, Talbot County Public Schools;
- Paul Moffett, Easton Utilities;
- Geoff Oxnam, American Microgrid;
- Neoma Rohman, Mid-Shore Food System Coalition;
- Steve Gadow, Talbot County Sheriff's Office;
- Nicole Carlozo, Maryland Department of Natural Resources;
- Mike Mertaugh, Department of Public Works;
- Megan Patrick, Planning and Zoning;
- Jean Weisman, Town of Saint Michaels;
- Bill Hildebrand, Maryland Emergency Management Agency;
- Eric Buehl, Sea Grant Extension;
- Matt Pluta, Mid-shore Riverkeeper;
- Cheryl Lewis, Town of Oxford; and,
- Scott Delude, Town of Oxford.

The Resilience Stakeholder Committee was initially convened and a kick-off meeting was held on **June 16, 2016.** The kick-off meeting included an overview of hazard mitigation and resilience, as well as the plan development process. The second portion of the meeting included a workgroup session. Five workgroups were established; each workgroup was organized under one of the five Talbot County Pillars. Each pillar workgroup listed impacts from their pillars for each of the Talbot county identified hazards.

The second Resilience Stakeholder Committee meeting was held on **September 8, 2016**. The first portion of the meeting included the following presentations:

- Jim Bass, Town of Oxford Vulnerability Assessment;
- Nicole Carlozo, DNR-Coastal Resilience Assessment Results; and,
- Michele King, SP&D-Flood Vulnerability Assessment.

The second portion of the meeting was a workshop. The five workgroups reviewed and commented in results of their group's Hazard Impact Tables. In addition, each workgroup held their separate mitigation & resilience strategy session. At the end of the meeting all five workgroups reported to one another their progress and ideas for full committee discussion and comment.

The third meeting of the Resilience Stakeholder Committee was held on **November 22, 2016.** The meeting agenda included the review of mitigation implementation action worksheets that were developed from the results of the September mitigation & resilience strategy session. Committee members were divided into their five respective Pillar workgroups and were tasked with the review of the mitigation implementation action worksheets. During this time committee members had an opportunity to make any modifications that they deemed necessary. In addition, committee members were requested to add ideas that may be missing. As a result, five new ideas were added.

November 22, 2016
Resilience Stakeholder Committee Meeting

Following the Pillar workgroup review session, each pillar workgroup presented their group's mitigation & resilience ideas to the committee at large. This portion of the meeting provided an opportunity for each Pillar workgroup to hear, comment, and ask questions on all the ideas.

The culminating portion of the meeting was the prioritization of the twenty-three mitigation and resilience implementation actions. The Resilience Stakeholder Committee ranked five mitigation and resilience actions as a "High" priority.

c. Municipal Outreach & Participation

In order to obtain specific information from the municipal perspective, each of the five municipalities were invited to serve on the Hazard Mitigation & Resilience Stakeholder Committee.

In addition, Jim Bass, the County Emergency Management Coordinator met and discussed the municipal hazard mitigation and resiliency packets with municipalities. The packets contained the following handouts for their review and provided an opportunity for municipal information gathering and input:

- Municipal Questionnaire;
- Update of Flood Issues Infrastructure Data Table;
- Municipal Mitigation Capability Assesment Matrix; and,
- Permit Data Update.

Information gathered from the municipal packets and meetings are presented in *Chapter 12: Municipal Synopsis & Perspective*. Mapping products were developed for each Town during the plan development process, in an effort to display important information from the town perspective, rather than county-wide, as is the case in other chapters of the plan. Finally, information from each Town specific to hazards, impacts, issues, and potential mitigation and resilience action items have been included in Chapter 12, as well as, the updated Municipal Mitigation Capability Assessment Matrix.

d. Regional Participation

The Eastern Shore Climate Adaptation Partnership (ESCAP) is a multi-jurisdictional network of staff from local government, state agencies, academic institutions, and nonprofit organizations. The Eastern Shore Climate Adaptation Partnership promotes learning and collaboration among Eastern Shore communities to prepare for changes in weather patterns, flooding, and other environmental conditions. The ESCAP is a venue for partners to provide support, education, technical assistance, and resources to help communities build resilience. Members of the ESCAP have responsibilities in planning, emergency management, public health, public works, climate adaptation and science, floodplain and stormwater management, and education. The ESCAP works to assist communities in reducing climate vulnerabilities and risks; to collect and share information among communities and decision makers; and to educate members, residents, and elected leaders on risks and adaptation strategies. The ESCAP was formed during the same time period as the *Talbot County Hazard Mitigation and Community Resilience Plan* development process. As such, members of ESCAP assisted in the planning process and provided best practices and ideas. In terms of plan implementation, the ESCAP will be integral to ensuring that the actions and strategies outlined within the plan are completed during the next five year planning cycle.

In addition, neighboring jurisdictions were routinely updated and given opportunity to provide feedback throughout the planning process during the Emergency Planners Workgroup meetings. The Emergency Planners Workgroup allows emergency management staff from all ten jurisdictions on Maryland's Eastern Shore (nine counties and the Town of Ocean City) to collaborate on projects and discuss issues facing the emergency management community at local, regional, state, and federal levels. One topic that is regularly discussed at Planners meetings is hazard mitigation plan development and review. During a Workgroup meeting, emergency management staff were informed about the hazard mitigation plan update process occurring in Talbot County. Input from other emergency planners on the Eastern Shore was valuable for the development of the *2017 Talbot County Hazard Mitigation and Community Resilience Plan*.

4. PLANNING PROCESS

In March 2016, Smith Planning and Design (SP&D), was hired by the County to assist in the development of the new Hazard Mitigation and Resilience Plan. The requirements of a local hazard mitigation plan include the development of hazard identification and risk assessment, which leads to the development of a comprehensive mitigation planning strategy for reducing risks to life and property. In addition, the plan requirements include a mitigation strategy section that identifies a range of specific mitigation actions and projects that reduce the risks to new and existing buildings and infrastructure. The mitigation strategy includes an action plan describing how identified mitigation activities will be prioritized, implemented, and administered. In order to meet the plan requirements and integrate resilience planning within the new Plan, county staff, stakeholders, and SP&D worked closely together, meeting monthly throughout the development process.

The plan development process closely followed the planning steps outlined in FEMA's Hazard Mitigation Guidance.

FEMA Local Mitigation Planning Handbook, March 2013
MITIGATION PLANNING TASKS 1-9

TASKS 1-3		
Discuss the process and people needed to complete the remaining mitigation planning and the best ways to document the process in the plan.	**TASK 1**	**Determine the Planning Area and Resources**
	TASK 2	**Build the Planning Team**
	TASK 3	**Create an Outreach Strategy**

TASKS 4-8		
Cover the specific analyses and decisions that need to be completed and recorded in the plan.	**TASK 4**	**Review Community Capabilities**
	TASK 5	**Conduct a Risk & Vulnerability Assessment**
	TASK 6	**Develop a Mitigation Strategy**
	TASK 7	**Keep the Plan Current**
	TASK 8	**Review and Adopt the Plan**

TASK 9		
Provides suggestions and resources for implementing your plan and reduce risk.	**TASK9**	**Create a Safe and Resilient Community**

5. PLAN ORGANIZATION

The organization of the Plan begins with a description of the planning area followed by a listing of hazards identified by both the Core Planning Team and the Resilience Stakeholder Committee as having had or have a potential to impact Talbot County. These hazards have been profiled and assessed for risk and vulnerability in the chapters that follow. Finally, the plan examines current community capabilities and identifies mitigation strategies that may be implemented to mitigate hazards and improve community resilience.

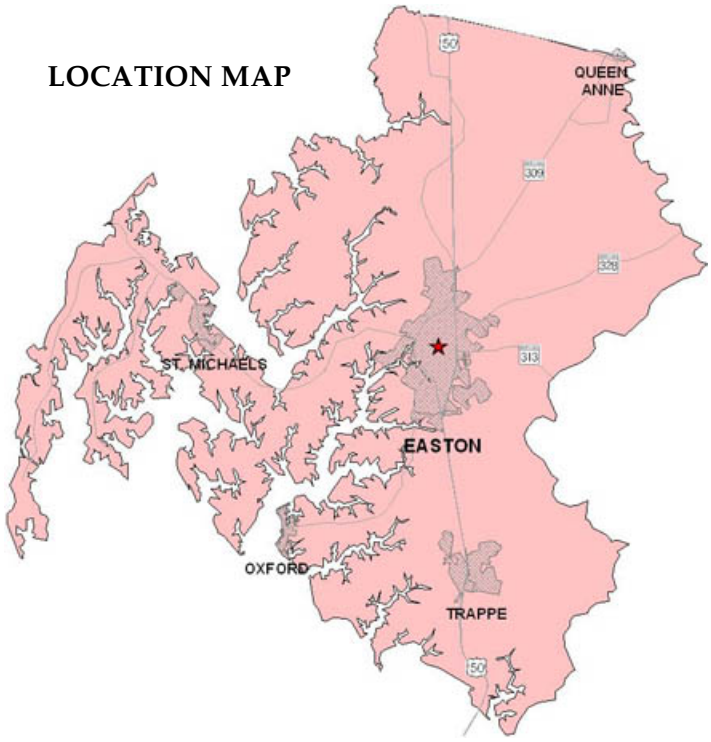
Chapter 2:

County & Municipal Profiles

CHAPTER 2: COUNTY & MUNICIPAL PROFILES

Talbot County is located in Eastern Maryland on the Eastern Shore of the Chesapeake Bay. It is bordered to the north by Queen Anne's County, to the south by Dorchester County, to the west by the Chesapeake Bay, and to the east by Caroline County. The county is mostly rural, but contains some higher-density development and commercial activity in the incorporated communities of Easton, Trappe, and St. Michaels. The county has 254 square miles of land area and a population of 37,782. Some of the major industries in Talbot County include agricultural activities such as soybean, corn, and poultry farming, and maritime activities like seafood processing and harvesting, sailing, and fishing.

LOCATION MAP



Source: Maryland Dept. of Planning

1. POPULATION

Talbot County's population is estimated to be among the lowest in the state, at 37,782 persons (Census, 2010). Between 1900 and 1950 Talbot County's population remained almost unchanged at under 20,000. The 1950s brought the opening of the first Chesapeake Bay Bridge marking the beginning of increased County and regional growth.

POPULATION CHANGE 1950-2010				
Census Year	**Population**	**Increase**	**Percent Change**	**Percent of Annual Change**
1950	19,428			
1960	21,578	2,150	11.1	1.11
1970	23,682	2,104	9.7	.97
1980	25,605	1,923	8.12	.81
1990	30,541	4,936	19.27	1.92
2000	33,812	3,271	10.6	1.07
2010	37,782	3,970	11.71	1.17
Average Annual Growth 1950-2010				**1.175**

Source: U.S. Census Bureau & 2016 Talbot County Comprehensive Plan

Between 1950 and 2010, the population increased from 19,428 to 37,782, an annual growth rate of 1.175 percent.

Easton is considered the County's population center, with a population of 15,947 persons, or 43 percent of the County's population, according to 2010 U.S. Census data.

COUNTY & MUNICIPAL POPULATION DISTRIBUTION, 2010	
Talbot County Population	37,782
Total Municipal Population	18,796
Percent of County	49.7%
Easton	15,945
Oxford	651
Queen Anne (pt.)	94
St. Michaels	1,029
Trappe	1,077
Balance of the County	18,986
Percent of County	**50.3%**

Source: U.S. Census Bureau & 2016 Talbot County Comprehensive Plan

The 2010 median age in Talbot County rose to 47.4 years, up from 43.4 in the 2000 Census. Talbot has the second highest median age among Maryland counties. The statewide median age was 38 years, with just 12.3 percent of the population age 65 or older. Locally, some 8,958 persons, or about 24 percent of the County population, were reported to be age 65 or over.

Talbot County's relatively high median age is a function of a population that is aging in place, in-migration of retirees and out-migration of younger people. The U.S. Census - American Community Survey reports that about one fifth of the County's population is less than 18 years of age. The total male and female population is somewhat evenly distributed through all age groups up to the age of 45, where women become a slightly larger proportion of each age group.

Information obtained from the *Maryland Food System Profile II* was reviewed. The county profile for Talbot County presents data compiled by the Maryland Food System Map Project, at the Johns Hopkins Center for a Livable Future. Notable information includes:

MARYLAND FOOD SYSTEM FOOD PROFILE – TALBOT COUNTY		
DEMOGRAPHICS	**Talbot County**	**Maryland**
Median Household Income, 2010-2014 ACS Five-Year Estimate	$58,495	$74,149
% Non-Hispanic, 2010-2014 ACS Five-Tear Estimate	94.1%	91.2%
% White Alone	78.4%	53.6%
% Black or African American Name	12.6%	29.0%
% Asian Alone	1.5%	5.8%
% Hispanic (any race), 2010-2014 Five-Year Estimate	5.9%	8.8%
% Individuals Below185% of Federal Poverty Level, 2010-2014 ACS Five-Year Estimate; Household of 4=$44,123	23.94%	22.8%
% Individuals Below 200% of Federal Poverty Level, 2010-2014 ACS Five-Year Estimate; Household of 4=$47,700	26.08%	22.8%
FOOD AVAILABILITY-FOOD ACCESS	**Talbot County**	**Maryland**
% Population Living in USDA Food Desert, 2010	23.72%	27.34%
% Population that is Food Insecure, 2013	11.0%	12.8%

Source: Maryland Food System Profile II

USDA described households with very low food security as "food insecure with hunger" and characterized them as households in which one or more people were hungry at times during the year because they could not afford enough food. During a prolonged hazard event, those households that are classified as food insecure are especially vulnerable owing to the fact that they lack the capacity to maintain on-hand food supplies in the event of a disaster incident.

2. CLIMATE

Although Talbot County has a continental climate, temperature fluctuations over the year are moderated by the county's close proximity to the Chesapeake Bay and Atlantic Ocean. Temperatures range from average of 77°F in the summer to an average of 39°F in the winter. In general, the terrain in Talbot County is fairly flat due to its location on the Atlantic Coastal Plain.

3. LAND USE TRENDS

According to the *2016 Talbot County Comprehensive Plan*, Talbot remains by design one of Maryland's sparsely populated rural counties, despite development pressures brought on by regional trends and a growing number of individuals, retirees and small families settling in the area. The County is projected to continue to age with little growth in its work force.

Long-standing land use policies have protected farmland and open space from development and retained the County's rural character. Agriculture remains an important and viable industry in part because fragmentation of farm landscapes has been discouraged. Talbot is a comparatively prosperous County. Though some poverty exists, incomes of most residents are adequate to meet their needs.
According to the Maryland Department of Business and Economic Development, unemployment in the County is nearly equal to the State average. Hospitality businesses, medical services, education and government are important employers.

4. MUNICIPAL OVERVIEWS

The following community overview provides perspective on the individual communities within Talbot County.

a. Town of Easton

The Town of Easton is located on the Tred Avon River in the central part of Talbot County. In 2010, the city had a population of 15,945. Easton is the largest incorporated community in Talbot County and also acts as the county seat. U.S. Highway 50 is the major highway going through the town and connects it to other urban centers on Maryland's Eastern Shore. Easton has a dense and historic downtown with a large number of shops, restaurants, government buildings, and other businesses, which makes it an important center for commercial activity and tourism in Talbot County. *Source: U.S. Census Bureau, 2010; Town of Easton Comprehensive Plan, 2010*

b. Town of Oxford

The Town of Oxford is located in Southwestern Talbot County where the Tred Avon River meets the Chesapeake Bay. In 2010, Oxford had a population of 651. The primary road going through the town is State Route 333, which connects it to the

Town of Easton. The town's location on the Chesapeake Bay makes it a local center for maritime activity in Talbot County, and it attracts visitors and tourists who seek a quiet and charming small town away from the larger urban centers in the region. *Source: U.S. Census Bureau, 2010; Town of Oxford Comprehensive Plan, 2010*

c. Town of Queen Anne

The Town of Queen Anne is located in Northeastern Talbot County on Tuckahoe Creek. It is a multi-county community that is split between Queen Anne's and Talbot County. The major roads going through the Queen Anne include State Routes 303, 309, and 404, which all converge near the center of town. The town of Hillsboro, in Caroline County, is located adjacent to Queen Anne on the opposite side of Tuckahoe Creek. *Source: U.S. Census Bureau, 2010*

d. Town of St. Michaels

The Town of St. Michaels is located in Western Talbot County on the Miles River, which flows into the Chesapeake Bay. In 2010, St. Michaels had a population of 1,029. The primary road going through the town is State Route 33, which connects it to the Town of Easton and other urban centers on Maryland's Eastern Shore. For most of its history, the economy of St. Michaels was focused around the shipbuilding and seafood processing industries. In recent years, tourism has become a major industry in St. Michaels because of the town offers a wide variety of maritime activities for visitors and has vibrant waterfront and downtown areas. St. Michaels is also home to the Chesapeake Bay Maritime Museum. *Source: U.S. Census Bureau, 2010; St. Michaels Business Association, 2016*

e. Town of Trappe

The Town of Trappe is located in Southeastern Talbot County near La Trappe Creek. In 2010, Trappe had a population of 1,077. The primary road going through the town is U.S. Highway 50, which connects it to the City of Cambridge to the south and the Town of Easton to the north. Trappe was founded sometime between 1750 and 1760, although the Maryland General Assembly did not officially incorporate the town until 1856. *Source: U.S. Census Bureau, 2010; Town of Trappe Comprehensive Plan, 2010*

5. COMPREHENSIVE PLANNING AND HAZARD MITIGATION

a. Talbot County Comprehensive Plan

The *2010 Talbot County Comprehensive Plan* was recently updated and adopted by the County Council on June 7, 2016, effective August 8, 2016.

The comprehensive planning process determines community goals, aspirations, development, and preservation. The Comprehensive Plan guides public policy for many complex issues including land use, transportation, extension of utilities and public services, preservation, use, and protection of natural resources, development, tourism, and community design, among many others. The Comprehensive Plan covers the entire County and addresses a broad range of topics and long-term goals. As declared in its Vision Statement, "The primary goal of Talbot County's Comprehensive Plan is to promote a high quality of life, to preserve the rural character of our County and to protect the health, safety and well-being of its citizens, in a resilient community."

The updated Talbot County Comprehensive Plan contains a section on Hazard Mitigation Plan on pages 4-4 thru 4-7 and integrates goals, objectives, and implementation priorities from the Hazard Mitigation Plan into the new Comprehensive Plan. Furthermore, the Plan contains information on Coastal and Climate Hazards, Sea Level Rise Projections, and Community Resilience.

Municipalities that exercise planning and zoning authority within Talbot County include:

- Easton;
- St. Michaels;
- Oxford; and,
- Trappe.

b. St. Michaels Comprehensive Plan

The St. Michaels Comprehensive Plan was adopted on October 28, 2015. The Plan includes some elements that can easily be integrated and/or displays plan integration principals such as: Environmental Resources and Sensitive Areas, Water Resources, and Climate Resilience. Excerpts from the Chapter 14: Climate Resilience states:

The Town of St. Michaels recognizes the challenges associated with being a coastal community on the east coast with low sea level, high water tables and hurricane risks. The Town has experienced numerous weather related events that have debilitated the basic functions of the Town including Hurricane Isabel and Sandy. Namely flooding associated with heavy storm events and high tides in the past, the Town has taken many preventative measures to reduce flooding including duckbills in some storm drains that terminate in areas of high tide.

St. Michaels has also adopted Code requirements in the floodplain for additional freeboard venting. The ***Town has also partnered with Talbot County to adopt a Hazard Mitigation Plan*** *and evacuation route for the Bay hundred area.*

Vision statement from Chapter 14: Climate Resilience:
St. Michaels shall evaluate vulnerabilities in the Town and look for opportunities to reduce risk associated with climate change, energy consumption and sea level rise.

c. The Town of Easton Comprehensive Plan

The *2010 Easton Comprehensive Plan* establishes Town policies relative to the most desirable development patterns for Easton and environs. It identifies in both narrative and graphic form proposed areas for living and working activities and related services that are required to assure a quality environment for all residents. Implementation proposals are included as methods for coordinating public and private development activities, which together will influence Town development form and function. Attention is also given to the Towns' role in the development of Talbot County.

The Plan details impacts that contribute to changes in the Town's identity, one of which includes, *impacts to public safety, especially during severe storms and catastrophic storm events.* Noted within the Town's Plan:

The fairly extensive system of Environmental Protection regulations already in place including Easton's Critical Area Program, Forest Conservation Ordinance, Floodplain Ordinance and Storm Water Management Ordinance provide a high level of protection to a number of sensitive areas, including those identified by the Growth Act.

The following are discussed in detail within the Sensitive Areas Element of the Plan:

- Streams and Their Buffers;
- 100-Year Floodplain;
- Steep Slopes (along rivers and streams); and,
- Agriculture and Forest Land.

Goals and objectives within the plan include directing future development away from sensitive areas and encouraging new and innovative stormwater runoff techniques.

d. The Town of Oxford Comprehensive Plan

The *2010 Town of Oxford Comprehensive Plan* includes a Sensitive Areas Element and discusses the following:

- 100-Year Floodplain;
- Streams and Stream Buffers;
- Nontidal Wetlands;
- Critical Areas; and,
- Waterways.

According to the Oxford's Plan much of the existing Town is located in the 100 year flood zone identified on the federal flood maps. Oxford is a historic waterfront town that was settled along the waterfront in the late 1600's. It has weathered its historic location for 300+ years. Significant portions of the Town experience flooding during heavy storms characterized by unusually high tides. To ameliorate flooding of low-lying areas with the 10 to 20 year storm, the Town has installed tide gates in two locations near the entrance of Town to facilitate control of tidal flooding

and dewatering of excessive rainfall. The tide gates are located at Pier Street, near the U.S. Post Office on Banks Street, and at the Causeway.

The areas of tidal wetlands in Town adjacent to Bachelor Point Road have been protected with covenants against future development and are classified under the most restrictive critical area classification (Resource Conservation Area or RCA) and the most restrictive Town zoning classification, which is WSWC Wildlife Sanctuary/Wildlife Conservation Zoning District.

For all new commercial or residential construction, the Town has mandated compliance with federal flood elevation requirements.

e. The Town of Trappe Comprehensive Plan

The *2010 Town of Trappe Comprehensive Plan* includes a Sensitive Areas Element and discusses the following:

- Streams and Stream Buffers;
- Nontidal Wetlands; and,
- Critical Areas.

Storms drains and flooding issues are discussed within the Plan. The following is an excerpt from the April 2010 Plan, page 8:

Trappe's storm drains consist of roadside ditches and pipe culverts that convey stream water runoff into streams that drain to La Trappe Creek and Miles Creek. Inadequate drainage exists due to dependence on other government agencies to maintain their systems. The Town of Trappe requires all developers to pay for, and implement acceptable stormwater management techniques. The crossings under U.S. Route 50 have been inadequate to handle several storms, resulting in flooding of lawns and low-lying properties. That situation was improved by cleaning the ditch on the East side of Route 50. In addition, other areas of Town are subject to periodic flooding, especially Harrison Circle.

Chapter 3:

Hazard Identification & Risk

CHAPTER 3: HAZARD IDENTIFICATION & RISK

Talbot County has identified and prioritized eight hazard types during the 2017 planning process. These hazards include:

1. **Coastal Hazards**
   - Tropical Storms/Hurricanes
   - Nor'easters
   - Shoreline Erosion
   - Sea Level Rise
2. **Flood**
   - Coastal/Tidal
   - Riverine
3. **High Wind**
   - Synoptic-Scale Winds
   - Thunderstorm Winds
4. **Winter Storm**
   - Snow
   - Freezing Rain
   - Sleet
   - Extreme Cold
5. **Tornado**
6. **Thunderstorm**
   - Hail
   - Lightning
7. **Drought**
8. **Extreme Heat**

Coastal hazards and flood have been identified as Talbot County's "*High Risk*" hazards and are highlighted in purple.

Chapters 4 thru 9 within Section 2 have been organized by hazard type and include profiles, risk, and vulnerability.

1. HAZARDS DEFINED

The following eight identified hazards have been defined.

a. Coastal Hazards

Coastal hazards take many forms ranging from storm systems like **tropical storms, hurricanes, and Nor'easters** that can cause storm surge inundation, heavy precipitation that may lead to flash flooding, and exacerbation of **shoreline erosion** to long-term hazards such as **sea level rise.** Therefore coastal hazards are to include, if applicable, **coastal storms, storm surge, hurricane, tropical storm, Nor'easter, sea level rise and shoreline erosion.**

b. Flood

The National Weather Service defines **coastal or tidal flooding** as the inundation of land areas along the coast caused by waters over and above normal tidal action that may originate from the ocean front, back bays, sounds, or other bodies of water. **Coastal/tidal flooding** is typically the result of storm surge, wind-driven waves, and heavy rainfall produced by hurricanes and tropical storms during the summer and fall and Nor'easters during the winter and spring.

Urban flooding occurs where there has been development within **floodplains.** Urbanization increases the magnitude and frequency of flooding by increasing impermeable surfaces, increasing the speed of drainage collection, and overwhelming sewer systems.

c. High Wind

Wind is the motion of air past a given point caused by a difference in pressure from one place to another. The effects can include blowing debris, interruptions in

elevated power and communications utilities and intensified effects of winter weather. Two basic types of damaging wind events other than tropical systems affect Maryland: **synoptic-scale winds and thunderstorm winds**. Synoptic-scale winds are high winds that occur typically with cold frontal passages or Nor'easters. Downbursts cause the high winds in a thunderstorm.

d. Winter Storm

Winter Storm- Winter weather can take many forms including **snow, freezing rain, sleet and extreme cold** that may occur singly or in combination. Some of the most significant winter storms that affect Maryland are known as **"Nor'easters"** because they are accompanied by strong northeast winds.

e. Tornado

Tornado- A tornado is a violently rotating funnel-shaped column of air that extends from a thunderstorm cloud toward the ground. Tornadoes can touch the ground with winds of over 300 mph. While relatively short-lived, tornadoes are intensely focused and are one of natures most violent storms.

f. Thunderstorm

Thunderstorms are usually high intensity storms of short duration originating in a warm moist air mass that either is forced to rise by mountainous terrain or by colliding with a cooler dense air mass. The process of convection in the atmosphere brings about the release of moisture from the warm air mass as it rises, cools and condenses. This condensation proceeds until most of the moisture in the air mass has been precipitated. Since the motion of the air is nearly vertical, and attains high velocities, rainfall is intense and generally concentrated over a small area in a short time frame. Thunderstorms can be 10-15 miles in diameter and normally last 20-30 minutes.

g. Drought

Droughts are periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or stream flow. Although maintaining water supplies for human use is an important aspect of drought management, drought can also have many other dramatic and detrimental effects on the environment and wildfire.

h. Extreme Heat

Temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as **extreme heat**. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground.

2. CRITICAL AND PUBLIC FACILITIES

In order to assess the current risk and vulnerability of the community, an inventory of critical and public facilities in the County was performed. Critical and public facilities are those facilities that warrant special attention in preparing for a disaster and/or are of vital importance in maintaining the functioning of the community.

Data was obtained from the Mark Cohoon, Talbot County GIS Manager, and Maryland PropertyView to aid in the development of the 2017 Talbot County Critical and Public Facilities database. Various listings were reviewed and cross-referenced in order to develop the finalized database for the 2017 Plan. Listings reviewed and utilized included:

- 2011 Critical & Public Facilities Listing Talbot County Hazard Mitigation Plan;
- County GIS Manager's Critical Facility Database-2016; and,
- 2016 State of Maryland Essential Facility Database.

Additional attribute columns were added to the database during the plan planning process and included:

- Designated between Critical and Public Facility Type;
- Flood Depth; and,
- Facilities built in 1965 or prior.

3. CRITICAL AND PUBLIC FACILITIES DATA COMPILATION

The inventory of critical and public facilities for the *2017 Talbot County Hazard Mitigation and Community Resilience Plan* has been compiled as listed in the table below. The detailed critical and public facility database has been included in Appendix A: Critical & Public Facility Database.

CRITICAL AND PUBLIC FACILITY DATA COMPILATION			
Facility Category	**Facility Type**	**Total Facilities per Type**	**Total Facilities per Category**
County Owned	Airport	1	28
	Community Center	1	
	Dock	8	
	Housing Authority	1	
	Library	2	
	Museum	3	
	Office	4	
	Parks and Recreation	6	
	Plane Hangar	2	
Education	Public	9	26
	Private	10	
	Community	3	
	Special Needs	4	
Emergency	EOC	1	18
	EMS Station	1	
	Fire Station	8	
	Police Station	8	
Medical	Assisted Living	4	103
	Hospital & Urgent Care	5	
	Nursing Home	3	
	Office	81	
	Retirement Center	3	

	Senior Housing	4	
	Special Needs	3	
Miscellaneous	Marina	19	22
	Storage Yard	3	
Municipal	Housing Authority	10	33
	Office	4	
	Parks and Recreation	3	
	Public Works	9	
	Community Center	1	
	Library	1	
	Museum	5	
Utility	Electric	9	83
	Gas	1	
	Gas & Oil	11	
	Pumping Station	8	
	Substation	6	
	Telephone	8	
	Tower	23	
	Water Tower	8	
	Water Treatment Plant	2	
	Wastewater Treatment Plant	7	
TOTALS		**313**	**313**

Source: Appendix A: Critical & Public Facility Database

The number of critical facilities total 56 and those designated as public facilities total 257. Of the 313 facilities listed within the database, 46 facilities are within floodprone areas. In addition, 57 facilities were built in or prior to 1965. This dataset was used throughout the various hazard vulnerability assessments within the Plan.

Chapter 4:

Coastal Hazards

CHAPTER 4: COASTAL HAZARDS

Coastal hazards take many forms ranging from storm systems like **tropical storms, hurricanes and Nor'easters** that can cause storm surge inundation, heavy precipitation that may lead to flash flooding, and exacerbation of **shoreline erosion** to long-term hazards such as **sea level rise.** Therefore coastal hazards are to include, if applicable, **coastal storms, storm surge, hurricane, tropical storm, Nor'easter, sea level rise and shoreline erosion.**

Talbot County has withstood damaging storms in its recent history, including Hurricane Isabel in 2003. The hurricane caused record-breaking tide and a storm surge of 6.88 feet. Peak winds reached 58 mph and 2.97 inches of rain was recorded in St. Michaels. Nor'easters are also a common occurrence in Talbot County. A Nor'easter impacted Tilghman Island in 1962 and resulted in high tides that were four feet above normal flood stage. Additionally winds up to 70 mph were recorded. Another Nor'easter on January 25, 2000 brought between 12 and 16 inches of snow to the county.

1. COASTAL HAZARD IMPACTS

The Community Resilience Stakeholder Committee held a workshop on June 16, 2016. During the workshop, stakeholders were divided into five groups. These five groups represented each of the Talbot County Community Pillars. Participants were provided with hazard descriptions and blank hazard impacts worksheets. Each of the five groups were then asked to discuss hazard impacts from their community perspective and associated Community Pillar perspective. Results were reviewed and finalized during the Community Resilience Stakeholder Committee workshop held on September 8, 2016. The following table provides impacts from Coastal Hazards to Talbot County per Community Pillar.

Hazard Impact Table	
Coastal Hazards	
Health, Safety, and Welfare	– Economic development → impacts tourism and real estate (tax income). – Environmental – impacts silt and runoff into bay. – Early warning system, evacuation, and holdouts.
Economic Stability	– Increased threat (rise is perceived) would have a negative impact on property values and all related industries. – Destruction of infrastructure would have long-term impacts on tourism and economic development. – Damage to structures could force long-term closures and business interruptions. Lack of work/no salaries. – Limit access of emergency response to residential and business areas. – Sea-level rise will impact loan real estate values over time and limit land use. – Sea-level rise will negatively impact businesses located directly on shorelines, especially our marinas and boat builders. – Increased insurance costs for business operations.

Education	– Renewable energy, distributed locally is vital to resilience – Opportunity?? Education – K-12, College/University, and Professional – can this be an economic driver? Infrastructure (Wind & Water): – Power failure. – Damage to facilities (over Category 1 Storms). – Facilities are used as emergency shelters. – EHS: full sized generator can run 2-3 days of continuous operation (lights & A/C). Transportation: – TCPS might need to use buses to move residents (up to 3500 persons at a time). Interruptions in service: – No school on hurricane days Chesapeake College: – Worries re: glass/structures – Generators on approximately 2 buildings: battery back-up coming for kitchen/student center.
Infrastructure	– Roads and bridges → submerged → evacuation impact. – Roads and bridges → damaged → (long-term) closures. – Communication – wind related O.H. impacts. – Power – wind related "overhead impacts" O.H. line impacts. – Water – by virtue of power loss. – Sewer – direct flooding impacts (Tilghman Plant) and power loss.
Environmental	– Hurricanes can cause crab populations to move to different parts of the bay impacting fisheries – Impacts to septic systems, underground storage tank; water and soil contamination – Loss of existing shorelines (bulkheads and living shorelines) – Loss of submerged aquatic vegetation; loss of crab/fish habitat – Loss of land mass, edge erosion (habitat and wave protection) Sea Level Rise – Increased debris/marine debris – Decreased effectiveness of stormwater management infrastructure – Loss of cropland near shoreline – Loss of wetland habitat – Saltwater intrusion into groundwater (irrigation sources) Climate Change – Stronger Hurricanes-increased storm surge

Source: Talbot County Community Resilience Stakeholder Committee

2. PROBABILITY OF FUTURE COASTAL HAZARDS

According to the *2014 National Climate Assessment Overview* regional impacts for the Northeast Region are as follows:

COMMUNITIES ARE AFFECTED BY HEAT WAVES, MORE EXTREME PRECIPITATION EVENTS, AND COASTAL FLOODING DUE TO SEA LEVEL RISE AND STORM SURGE. COASTAL LIFELINES, SUCH AS WATER SUPPLY INFRASTRUCTURE AND EVACUATION ROUTES, ARE INCREASINGLY VULNERABLE TO HIGHER SEA LEVELS AND STORM SURGES, INLAND FLOODING AND OTHER CLIMATE-RELATED CHANGES.

Maryland's tidal waters have increased by one foot over the last 100 years and are expected to increase from 1.4 to 2.1 feet by 2050 and from 2.1 to 5.7 feet by the end of this century. Maryland's sea level rise is higher than other parts of the world due to land subsidence (gradual sinking of the earth's surface) from postglacial rebound (the rise of land masses which were once depressed by a glacier), and groundwater extraction. Inundation of tidal waters over low-lying coastal areas is already occurring. Sea level rise may also cause salt water intrusion into fresh water aquifers.

Boesch, D.F., L.P. Atkinson, W.C. Boicourt, J.D. Boon, D.R. Cahoon, R. A. Dalrymple, T. Ezer, B.P. Horton, Z.P. Johnson, R.E. Kopp, M. Li, R.H. Moss, A. Parris, C.K., Sommerfield. 2013. Updating Maryland's Sea Level Rise Projections. Special Report of the Scientific and Technical Working Group to the Maryland Climate Change Commission, 22 pp. University of Maryland Center for Environmental Sciences, Cambridge, MD

Climate change may potentially cause higher storm tides, which are the cumulative flooding effect of long-term sea level rise and the temporary storm surge caused by coastal storm. Talbot County acknowledges the likelihood of the increasing risks and vulnerability from coastal hazards. Through the development and implementation of the *2017 Talbot County Hazard Mitigation and Community Resilience Plan*, planning consideration for both today and tomorrow are evidenced.

3. HURRICANE & TROPICAL STORMS RISK & VULNERABILITY

Hurricane, tropical storm, and tropical depression are all examples of a tropical cyclone. The categories and associated characteristics are as follows:

- Hurricane: maximum sustained surface wind speed exceeds 73 mph;
- Tropical Storm: maximum sustained surface wind speed from 39-73 mph; and,
- Tropical Depression: maximum sustained wind speed is less than 39 mph.

Tropical cyclones, a general term for tropical storms and hurricanes, are low pressure systems that usually form over the tropics, referred to as "cyclones" due to their rotation. Tropical cyclones are among the most powerful and destructive meteorological systems on earth. In terms of impact, high winds, heavy rain, lightning, tornados, hail, and storm surge are all associated with tropical cyclones. In addition, as tropical cyclones move inland, they can cause severe flooding, downed trees and power lines, and structural damage.

Hurricanes are rated for intensity by using the Saffir-Simpson Scale, which provides an estimate of the potential damage that a hurricane may cause. This scale is based upon both wind speed and surface pressure. Scale categories range from category one to five, with category one having winds from 74-95 mph and pressure greater than 980 mb, while a category five hurricane may have winds in excess of 157 mph and pressure of less than 920 mbar. The table below depicts the five categories of hurricane strength.

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

Source: National Hurricane Center, 2012

Hurricane and tropical storm risk and vulnerability assessed for Talbot County included the following variables:

a. **Population Vulnerability**- Calculated as a percent of the total population within Maryland per jurisdiction.

b. **Injuries & Deaths**-As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

c. **Property & Crop Damage**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

d. **Geographic Extent**-Calculated using SLOSH Model Storm Surge Hurricane Categories 1-4 inundation areas and divided by overall County square miles.

e. **Events**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data 3/13/1993 thru 12/31/2015 for hurricane storm, surge/tide, tropical storm, coastal flood and depression.

Note: Reported information from the National Center for Environmental Information (NCEI)-Storm Event data for Coastal Hazards included the following NCEI categories: Hurricane Storm, Surge/Tide, Tropical Storm, Coastal Flood, and Tropical Depression. The timeframes covered by the NCEI data used is from 3/13/1993 thru 12/31/2015.

Coastal Hazard Risk Assessment Data Table						
Population Vulnerability	***Injuries & Deaths***		***Property & Crop Damage***		***Geographic Extent***	***Events***
0.63	Yes	No	2.068M	0	115 sq mi within storm surge area % County in risk area= 42%	Total 11 Annualized-.48

Source: 2016 State of Maryland Hazard Mitigation Plan and NCEI Storm Event Database

A **storm surge** is the rise in water level above the regular high tide caused by a severe storm such as a hurricane or northeaster. These storms bring rain and heavy wind, which drives larger waves and can blow water up the Chesapeake Bay, thus causing the rivers to rise. Storm surges can create extensive storm damage, erosion, and inundation of low-lying coastal areas.

Hurricane events occurring within Talbot County from reported information within the National Center for Environmental Information (NCEI)-Storm Event data.

4. PROBABILITY OF FUTURE HURRICANE & TROPICAL STORMS

Climate change causes storm surges, higher sea levels, and more intense storms. Talbot County acknowledges the likelihood of the increasing risks and vulnerability from hurricane and tropical storm hazard events. Through the development and implementation of the *2017 Talbot County Hazard Mitigation and Resilience Plan*, planning consideration for both today and tomorrow are evidenced.

The following table indicates that three major hurricane and tropical storm events have occurred from 2003-2017. An average number 0.23 hurricane and tropical storm events occur per year. Data presented below was obtained through the National Centers for Environmental Information-Storm Events Database.

Hurricane/Tropical Storm Event Narrative		
Date	**Event Narrative**	**Property Damage**
September 18 to September 19, 2003	**Tropical Storm Isabel caused a record breaking tide and storm surge up the Chesapeake Bay, heavy rain and strong power outage producing winds. Isabel made landfall as a hurricane near Drum Inlet, North Carolina around 100 p.m. EDT on the 18th and weakened as it tracked farther inland. At one time in its life cycle, it was a powerful Category 5 hurricane when it was north of the Leewood Islands. Isabel's track took it west of the bay and was able to funnel water into the bay.. A record breaking high tide of 7.91 feet above mean lower low water was observed at Tolchester Beach (Kent County). The surge was 6.88 feet. Tidal flooding problems began after Midnight EDT on the 19th and continued throughout the day on the 19th. The surge was so strong that it negated the normal tide cycle in the bay. Evacuations occurred near the bay. Most of the damage was caused by the tidal**	1M

	flooding, although four homes were damaged by fallen trees. **The heavy rain did not coincide with the tidal flooding and occurred mainly from the afternoon of the 18th into the early morning of the 19th. There were no reports of stream related flooding due to the heavy rain. Because the heaviest rain with tropical systems often falls west of its storm track, the region was spared heavier rain. On the other hand, the strongest winds are often on the right side of the storm track. Winds gusted up to 58 mph in the bay and caused numerous trees, tree limbs and power lines to be knocked down. Peak wind gusts included 58 mph in Cambridge (Dorchester County), 55 mph at the Baltimore-Washington International Airport and 44 mph in Tolchester Beach. Storm totals included 3.40 inches in Federalsburg (Caroline County), 3.13 inches in Denton (Caroline County), 2.97 inches in Saint Michaels (Talbot County), 2.14 inches in Stevensville (Queen Anne's County) and 2.03 inches at the Conowingo Dam (Cecil County).**	
September 6, 2008	**Tropical Storm Hanna brought heavy rain, strong winds and some tidal flooding to the Eastern Shore during the day and into the evening of the 6th. Rain moved into the region during the morning, fell heavy at times from the late morning into the afternoon and ended during the evening. The strongest winds occurred during the morning and afternoon with peak gusts as high as 56 mph. Siding was ripped from a restaurant in Tilghman (Talbot County). About 10,000 homes and businesses lost power on the Delmarva Peninsula. All power was restored by the 7th. Tidal flooding occurred during the early evening as the surge averaged two to three feet and affected mainly Talbot and Caroline Counties. Many planned activities were cancelled. The Maryland Department of Natural Resources suspended camping at all of the Eastern Shore State Parks. Chesapeake College was closed.** **A limited state of emergency was declared because of Hanna. The persistent strong winds knocked down several weak trees and limbs. This caused scattered power outages and a few road closures. The tidal surge peaked prior to the high tide during the late afternoon and evening of the 6th. In Talbot County, in Oxford, Pier Street was flooded. The water was over the docks and bulkheads at Knapps Narrow. In St. Michaels, the tide reached into the parking lot of a restaurant off of Mill Street. Patrons were ferried in and out of the restaurant by pick-up truck. Southeast of Saint Michael's, the tide covered the deck of a restaurant off of Mulberry Street and totally closed North Harbour Road. In Easton, the Easton Point Marina became an island off of Port Street.** **Peak wind gusts included 56 mph in Tilghman (Talbot County), and precipitation totals were 1.20 inches in Easton (Talbot County).** **The tide at Cambridge (Dorchester County) peaked at 4.36 feet above mean lower low water at 736 p.m. EDT on the 6th. Minor tidal flooding starts at 3.5 feet above mean lower low water and moderate tidal flooding starts at 4.5 feet above mean lower low water.**	1M
August 27 to August 28, 2011	**Hurricane Irene produced heavy flooding rain, tropical storm force wind gusts and caused one wind related death across the Eastern Shore. Preliminary damage estimates were around three million dollars and approximately 85,000 homes and businesses lost power.**	250K

	Power was not fully restored until September 1st. The combination of heavy rain and wind closed numerous roadways across the Eastern Shore and downed thousands of trees. Some schools were unable to open on Monday August 29th. There was a temporary ban on harvesting shellfish along Chesapeake Bay because of the excessive runoff. Some tomato, corn, watermelon and cantaloupe crops were destroyed. It was estimated that 30,000 chickens were also killed by the effects of Irene. **Tropical storm force wind gusts overspread the Eastern Shore during the afternoon and early evening of the 27th and persisted into the afternoon of the 28th. Peak wind gusts averaged 50 to 60 mph. The strongest winds associated with Irene occurred at two distinct times. The first surge occurred during bands of heavier rain during the evening and late night of the 27th. The second peak occurred during the late morning and early afternoon of the 28th when skies were clearing and deeper mixing of the atmosphere brought stronger winds to the ground. The rain associated with Irene overspread the Eastern Shore between 7 a.m. EDT and Noon EDT on the 27th, fell at its heaviest from the late afternoon of the 27th into the early morning of the 28th and ended around Noon EDT on the 28th. Event precipitation totals averaged 6 to 12 inches and caused widespread field and roadway flooding. Because the flash flooding and flooding blended into one, all flooding related county entries were combined into one under flood events.** **On August 25, Maryland Governor Martin O'Malley declared a state of emergency in preparation for Irene. The Chesapeake Bay Bridge was closed to vehicular traffic. About seventy-percent of all Delmarva Power customers lost power. In Kent County, multiple parts of Maryland State Routes 20 and 445 were closed. In all twenty-seven roadways were closed by downed trees. In Talbot County, debris closed Maryland State Route 662C. About 100 properties and 50 roadways and bridges were damaged by the flooding and wind.**	

Source: National Centers for Environmental Information-Storm Event Database

5. CRITICAL AND PUBLIC FACILITIES STORM SURGE VULNERABILITY

In terms of associated impacts, high winds, heavy rain, lightning, tornados, hail, and storm surge are all associated with hurricanes. Although high winds and excessive amounts of precipitation are common and cause tremendous damage, the most serious effect of hurricanes is coastal destruction caused by wind, storm waves, or surge. Several techniques are utilized to model storm surge including one technique involving the use of the National Weather Service's (NWS) Sea, Lake and Overland Surges from Hurricanes (SLOSH) model. This model is used to predict storm surge heights based on hurricane categories. The classification of the surge inundation area is based on the hurricane category causing the flooding. As the category of the storm increases, more land area will become inundated. Storm surge is a major component of nor'easter storms along the East Coast of the U.S. since winds are moving in a north and/or eastward position. These winds move across the ocean towards the shore and form large waves.

Storm surge data utilized for analysis reflects areas with a risk of storm tide flooding from hurricanes, based on potential storm tide heights calculated by the National

Weather Service's SLOSH Model. The SLOSH Basin used for mapping was Chesapeake Bay (CP5), released in 2014. This data was prepared by the U.S. Army Corps of Engineers, Baltimore District, Planning Division in January 2016. SLOSH storm tide elevations used for the mapping were based on the Maximum of Maximums (MOM) SLOSH output dataset. The MOM output elevations represent the highest calculated storm tide values based on thousands of SLOSH simulations using different combinations of approach direction, forward speed, landfall point, astronomical tide, and intensity (Category 1 through Category 4). Categories 1 through 4 refer to the Saffir-Simpson scale of hurricane intensity. The mapping does not reflect the expected storm tide flooding for every hurricane, or for any one particular type of hurricane. Instead the data depicts an overall footprint of the area that has some risk of storm tide flooding from hurricanes, based on the MOM output dataset.

Using the critical and public facility database developed as part of the 2017 planning process, those facilities within storm surge areas, hurricane categories 1 thru 4, are displayed below.

Hurricane Category 1-4 – Critical And Public Facilities Database			
Hurricane Category 1			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
County Owned	Dock	N/A	Point Road
County Owned	Dock	N/A	Windy Hill Road
County Owned	Dock	N/A	Matthewstown Road
County Owned	Dock	N/A	Claiborne Landing Road
Municipal-St. Michaels	Museum	Chesapeake Bay Maritime	Maritime Museum Road
Emergency	Fire Department	Oxford VFD	300 Oxford Road
Emergency	Police Station	US Coast Guard	904 S Morris Street
Medical	Assisted Living	Sunrise Assisted Living	6670 Cedar Point Road
Miscellaneous	Marina	Bates Marine Basin	106 Richardson Street
Miscellaneous	Marina	Campbell Town Creek Boat Yard	107 Myrtle Avenue
Miscellaneous	Marina	Cutts and Case Shipyard	Tilghman Street
Miscellaneous	Marina	Easton Point Marina	975 Port Street
Miscellaneous	Marina	Lowes Wharf Marina	21651 Lowes Wharf Road
Miscellaneous	Marina	Mears Yacht Haven	500 E Strand Street
Miscellaneous	Marina	Oak Creek Marina	7419 Back Street
Miscellaneous	Marina	Oxford Boatyard Yacht Sales	407 Strand Street
Miscellaneous	Marina	Oxford Yacht Agency (OYA)	317 S Morris Street
Miscellaneous	Marina	Pier Street Marina	104 W Pier Street
Miscellaneous	Marina	Severn Marine Services	Chicken Point Road

Miscellaneous	Marina	Tilghman on Chesapeake	21610 Island Club Road
Miscellaneous	Marina	N/A	21764 Camper Circle
Municipal-Oxford	Community Center	Grace Community Church	Oxford Road
Municipal-Oxford	Parks and Recreation	Oxford tennis courts	Oxford Road
Municipal-St. Michaels	Museum	Chesapeake Bay Maritime	213 N Talbot Street
Utility	Electric	Delmarva Power & Light	Canton Street
Utility	Gas/Oil	Pep Up Inc./Russ Oil Co	956 Port Street
Utility	Gas/Oil	McMahan Oil Company	930 Port Street
Utility	Telephone	Verizon	Oxford Road
Utility	Tower	Tred Avon Yacht Club	102 W The Strand Street
Utility	Water Tower	Oxford Water Tower	400 Tilghman Street
Hurricane Category 2			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
County Owned	Parks and Recreation	Talbot County basketball court	5536 Public Landing Road
Education	School	US Naval Research Lab Tilghman	4642 Black Walnut Point Road
Emergency	Fire Department	St. Michaels VFD	1001 S Talbot Street
Medical	Hospital	Robert J. Patterson MD	800 S Talbot Street
Miscellaneous	Marina	Bachelor Point Yacht Company	Bachelor Point Road
Miscellaneous	Marina	Dickerson Harbor	3831 Trappe Landing Road
Miscellaneous	Marina	Knapps Marina	6176 Tilghman Island Road
Miscellaneous	Marina	Wye Landing	12498 Wye Landing Lane
Miscellaneous	Storage Yard	Tidewater Canvas	Talbot Street
Municipal-Easton	Public Works	Easton Pump Station	Washington Street
Municipal-St. Michaels	Museum	St. Mary's Square Museum	409 St Mary’s Square
Municipal-St. Michaels	Office	Town of St. Michaels	300 Mill Street
Municipal-St. Michaels	Public Works	Commissioners of St. Michaels	301 Mill Street
Utility	Electric	Delmarva Power Substation	129 Grace Street
Utility	Electric	Choptank Electric	6901 Schoolhouse Lane

Utility	Electric	Easton Utilities Cable	405 Bay Street
Utility	Gas/Oil	Delmarva Oil Inc.	900 Port Street
Utility	Pumping Station	Pumping Station #2	25940 Royal Oak Road
Utility	Pumping Station	Pumping Station #3	6020 Bellevue Road
Utility	Telephone	Verizon	111 E Chew Avenue
Utility	Tower	Verizon	108 Woodside Avenue
Utility	Tower	N/A	7869 Bozman Neavitt Road
Utility	Water Tower	St. Michaels Water Tower	106 Woodside Avenue
Utility	Water Tower	Town of Oxford	103 JL Thompson Drive
Utility	WWTP	Town of Oxford	103 JL Thompson Drive
Hurricane Category 3			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
County Owned	Library	Talbot County Library in St. Michaels	106 Fremont Street
Education	Private School	Calhoon MEBA Engineering	27050 Saint Michaels Road
Education	Public School	St Michaels High School	200 Seymour Avenue
Education	Public School	St. Michaels Elementary/Middle	100 Seymour Avenue
Education	Public School	Tilghman Elementary School	21374 Foster Avenue
Emergency	Fire Department	Tilghman VFD	5979 N Main Street
Emergency	Police Station	St Michaels Police Department	100 Fremont Street
Emergency	Police Station	Oxford Police	101 Market Street
Municipal-Oxford	Library	Oxford Library	Market Street
Municipal-Oxford	Museum	Oxford Museum Inc.	Morris Street
Municipal-St. Michaels	Housing Authority	St. Michaels Housing Authority	300 N Talbot Street
Municipal-St. Michaels	Housing Authority	St. Michaels Housing Authority	North Avenue
Municipal-St. Michaels	Housing Authority	Storage	Talbot Street
Municipal-St. Michaels	Public Works	St. Michaels Town Shop	Glory Avenue
Utility	Gas/Oil	United Shoregas	929 S Talbot Street

Utility	Pumping Station	Pumping Station #1	25730 Royal Oak Road
Utility	Pumping Station	Peachblossom Pumping Station	7606 Oxford Road
Utility	Substation	Delmarva Power Substation	8289 Old Bloomfield Road
Utility	Substation	Delmarva Substation Bozman	23931 St Michaels Road
Utility	Telephone	Verizon	5932 Tilghman Island Road
Utility	Tower	Delmarva Power & Light	26985 St Michaels Road
Utility	Tower	Verizon	26709 Oxford Road
Utility	WWTP	St Michaels WWTP	929 Calvert Avenue
Utility	WWTP	Tilghman Island WWTP	21345 Seth Avenue
Hurricane Category 4			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
County Owned	Parks and Recreation	N/A	St Michaels Road
Education	Public School	Easton Elementary	307 Glenwood Avenue
Education	Special Needs	Benedictine School Vacation Retreat Home	9018 High Banks Terrace
Medical	Office	N/A	218 Bay Street
Medical	Retirement Center	Candle Light Cove	106 W Earle Avenue
Miscellaneous	Storage Yard	Marina Mart	12214 Ocean Gateway
Miscellaneous	Storage Yard	Talbot River Tours	846 Point Road
Municipal-Easton	Public Works	Easton Utilities	219 N Washington Street
Municipal-Easton	Public Works	Easton contains building	Washington Street
Municipal-Easton	Public Works	Easton garage	220 Port Street
Utility	Electric	Easton Utilities	450 Glenwood Avenue
Utility	Gas/Oil	Southern States Petroleum	801 Port Street
Utility	Pumping Station	Pumping Station	9345 Unionville Road
Utility	Tower	Mid Atlantic Communication	9855 Wades Point Road
Utility	Water Tower	St Michaels Water Tower	N Talbot Street
Utility	WTP	Martingham Utilities Cooperative	24490 Deepwater Point Drive
Utility	WWTP	Easton Waste Treatment	30770 North Dover Road

Source: 2017 Talbot County Critical and Public Facility Database
The SLOSH Basin used for mapping was Chesapeake Bay (CP5), released in 2014. This data was prepared by the U.S. Army Corps of Engineers, Baltimore District, Planning Division in January 2016. SLOSH storm tide elevations used for the mapping were based on the Maximum of Maximums (MOM) SLOSH output dataset.

As the category of storm increases, more land will become inundated with floodwater. Category 1 and 2 hurricanes have historically impacted Maryland. Those facilities listed under the labels Hurricane Category 1 and Hurricane Category 2 are more likely to be impacted by storm surge.

6. HURRICANE WIND RISK & VULNERABILITY

The FEMA Hazus Hurricane Model was utilized to conduct an Enhanced Hazus Analysis on Hurricane Wind for Talbot County. The Hurricane Model allows practitioners to estimate the economic and social losses from hurricane winds. The information provided by the model will assist state and local officials in evaluating, planning for, and mitigating the effects of hurricane winds. The Hurricane Model provides practitioners and policy makers with a tool to help reduce wind damage, reduce disaster payments, and make wise use of the nation's emergency management resources.

Although the software offers users the opportunity to prepare comprehensive loss estimates, it should be recognized that, even with state-of-the-art techniques, uncertainties are inherent in any such estimation methodology. The next major hurricane to affect Talbot County may be quite different than any "scenario hurricane" anticipated as part of a hurricane loss estimation study. Hence, the results of a scenario analysis should not be looked upon as a *prediction* but rather as an indication of what the future may hold.

Hazus provides different levels of analysis based on the level of effort and expertise employed by the user. Users can improve the accuracy of Hazus loss estimates by furnishing more detailed data about their community, or engineering expertise on the building inventory. An Enhanced Hazus analysis provides a more accurate loss estimates due to the inclusion of detailed information on local hazard conditions and/or by replacing the national default inventories with more accurate local inventories of buildings, essential facilities and other infrastructure. The Enhanced Hazus Analysis, conducted by Smith Planning and Design, utilize integrated user-supplied data in order to yield more accurate loss estimates and risk assessments for the *2017 Talbot County Hazard Mitigation & Resilience Plan*.

Essential facility input parameters were updated utilizing the 2017 Critical and Public Facility Database developed during the planning process. The attribute tables attached to the shapefiles were edited to included additional and updated data to the existing tables. The additional and updated data was obtained from the 2013 Maryland Property View Database for Talbot County. Examples of data extracted from the 2013 Maryland Property View Database included: building stories, year built, structure value and square footage.

The table below illustrates the discrepancy between the Hazus default data and the County data utilized in this Enhanced Hazus Analysis. As shown, the accuracy of results are increased by utilizing County data and running the Enhanced Hazus Analysis.

Hazus Default Data versus County Data		
Critical Facility Type	HAZUS Default Data	County Data Utilized for Enhanced HAZUS Analysis
Fire stations/EMS	5	7
Police Stations	4	8
Schools	12	14
EOC	0	1
Medical	1	1

Source: 2016 Talbot County Enhanced Hazus Hurricane Wind Analysis

Using the Enhanced Hazus Hurricane Wind Analysis, a historical storm analysis was initially modeled. In 2003, Hurricane Isabel impacted Maryland significantly and was a Presidenital Declared disaster on September 19, 2003. Individual and public assistance was provided in Talbot County. Considering the severity of damage and impact Hurricane Isabel had on Talbot County, this storm was utilized as the base storm for the Enhanced Hazus Huricane Wind Analysis. However, modifications to the storm track were made to increase the impact to Talbot County in the user defined storm analysis. These modifications included: alterations to the coordinates so the hurricane track was in closer proximity to Talbot County and the severity of the storm was increased from a Tropical Storm to a Category One. Peak wind gusts for tropical storms are 55 mph, while peak gusts for the Category One storm are 95 mph. The following map depicts the modified Hurricane Isabel storm track used in the analysis and associated peak wind gusts.

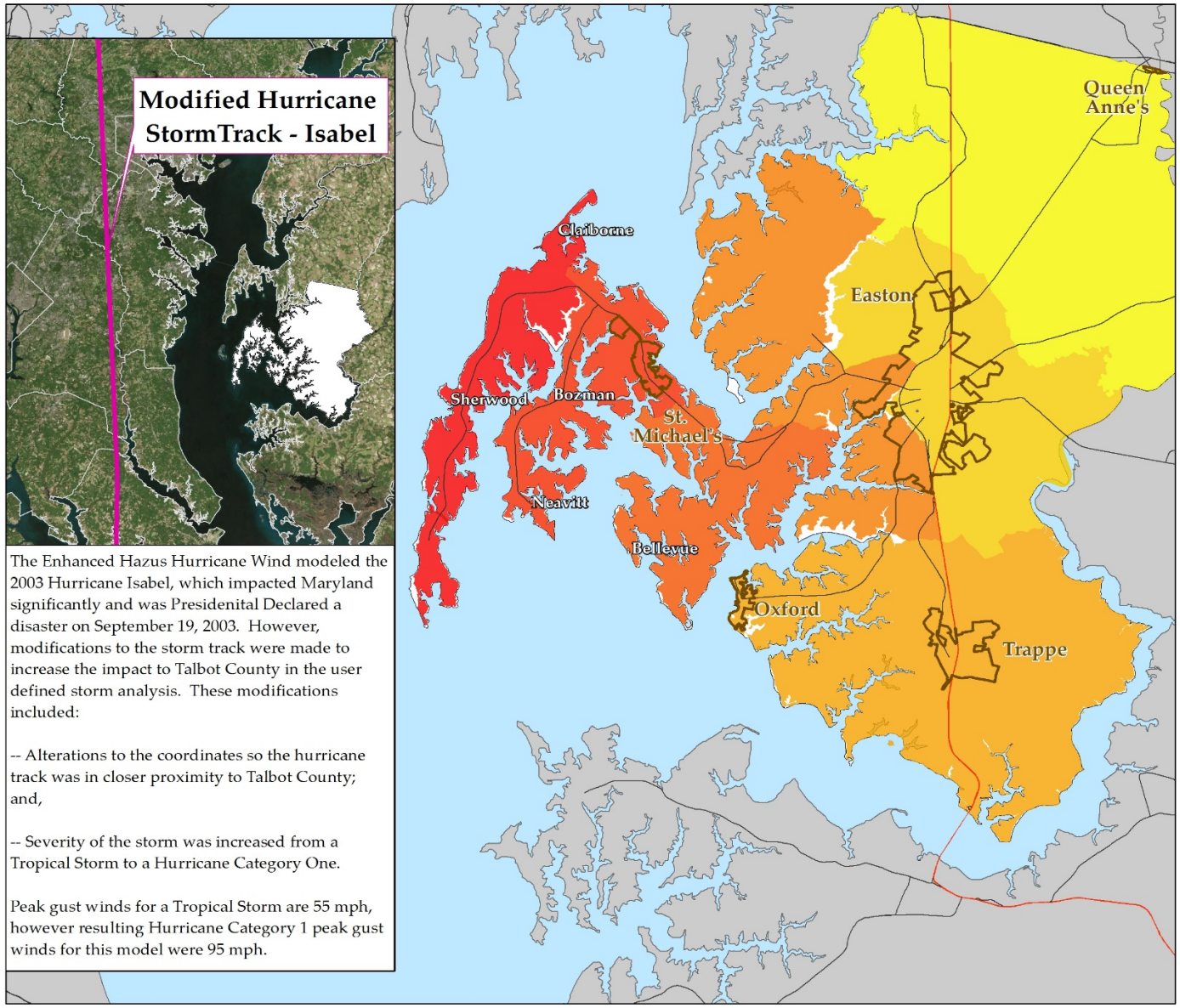
Hazus Hurricane Wind Model - 2003 Isabel Modified

The Enhanced Hazus Hurricane Wind modeled the 2003 Hurricane Isabel, which impacted Maryland significantly and was Presidenital Declared a disaster on September 19, 2003. However, modifications to the storm track were made to increase the impact to Talbot County in the user defined storm analysis. These modifications included:

-- Alterations to the coordinates so the hurricane track was in closer proximity to Talbot County; and,

-- Severity of the storm was increased from a Tropical Storm to a Hurricane Category One.

Peak gust winds for a Tropical Storm are 55 mph, however resulting Hurricane Category 1 peak gust winds for this model were 95 mph.



Legend

Wind Speeds - Peak Gust (mph)

- *82.00*
- *82.01 - 84.00*
- *84.01 - 85.00*
- *85.01 - 86.00*
- *86.01 - 92.00*
- *92.01 - 93.00*
- *93.01 - 95.00*
- *Modified Hurricane StormTrack - Isabel*
- *Municipalities*
- *Maryland Routes*
- *US Routes*
- *Talbot County*
- *Maryland Counties*

Data Sources:

FEMA Hazus Hurricane Model; Talbot County Department of Planning & Zoning; Maryland DNR Chesapeake & Coastal Services; http://data.imap.maryland.gov/

0 0.5 1 2 3 4 Miles

In Talbot County, the current building code for wind is 110 mph. Structures built prior to this building code are most vulnerable to hurricane wind events. According to the enhanced Hazus analysis results for the modified hurricane event, one essential facility would be affected by this event, the UM Shore Medical Center. There is a probability of the structure sustaining less than 5% percent severe damage. This structure was constructed in 1981 and is comprised of 5 building stories.

Results for the Enhanced Hazus Analysis determined residential structures would be affected by a hurricane storm track of this magnitude more so than other occupancy types such as commercial or industrial. Also, wood as a building material is more susceptible to damage than masonry, concrete or steel. Furthermore, the model estimates that four (4) households will be displaced due to the hurricane.

In terms of debris, the model estimates that a total of 88,264 tons of debris will be generated. If debris tonnage is converted to an estimated number of truckloads, it will require 3,530 truckloads (@25 tons/truck) to remove the debris generated by the hurricane. In addition, 11,672 tons of debris is eligible tree debris, which could be chopped and/or chipped.

There are over 35,000 buildings in the County with an estimated replacement value of $11,170 million dollars. The economic loss for this event is $13.7 million with 98% of this loss consisting of residential occupancy loss.

Hazus Hurricane Wind estimates that approximately 2 residential structures will be severely damaged due to wind during an event such as this and 97 moderately damaged. A total of 1,240 residential structures and 49 commercial structures are expected to experience minor building damage; Appendix C – Hazus Hurricane Wind Report, page 6. The following table details the total estimated loss specific to wind for Talbot County if a hurricane event of this magnitude occurred.

Building-Related Economic Loss Estimations	
Building Type	**Loss Estimations**
Residential	$54,216,990.00
Commercial	$763,580.00
Industrial	$227,690.00
Other	$229,570.00
Total	**$55,437,830.00**

Source: 2016 Talbot County Enhanced Hazus Hurricane Wind Analysis

7. NOR'EASTER RISK & VULNERABILITY

According to the National Oceanic and Atmospheric Administration (NOAA), a Nor'easter is a cyclonic storm that moves along the east coast of North America. It's called "nor'easter" because the winds over coastal areas blow from a northeasterly direction.

Nor'easters may occur any time of the year, but are most frequent and strongest between September and April. These storms usually develop between Georgia and New Jersey within 100 miles of the coastline and generally move north or northeastward.

Nor'easters typically become most intense near New England and the Canadian Maritime Provinces. In addition to heavy snow and rain, nor'easters can bring gale force winds greater than 58 miles per hour. These storms can produce rough seas, coastal flooding, and beach erosion.

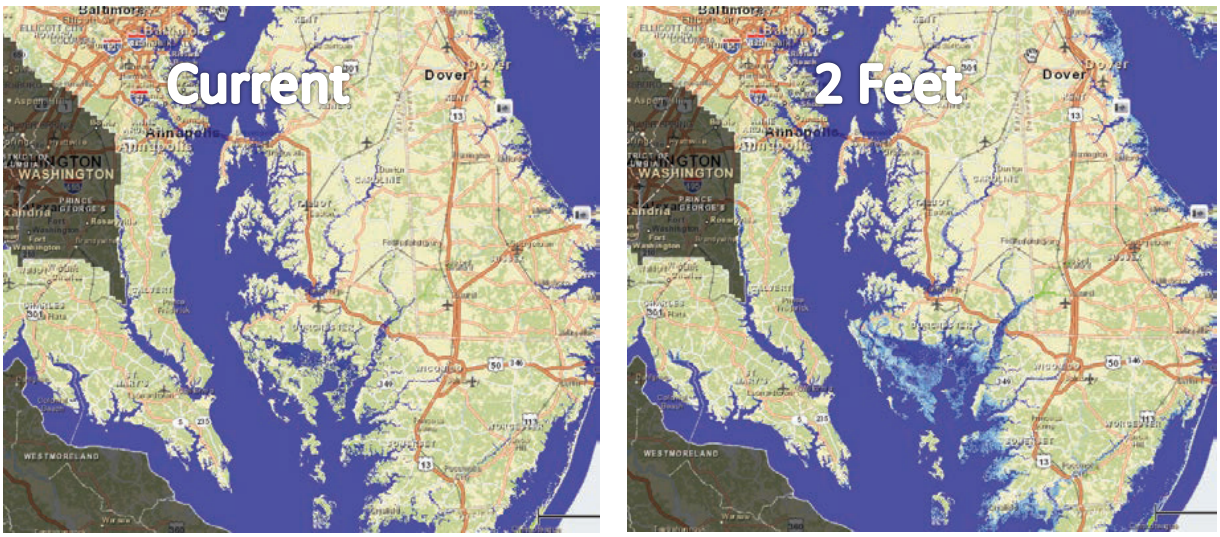
The East Coast of North America provides an ideal breeding ground for nor'easters. During winter, the polar jet stream transports cold Arctic air southward across the plains of Canada and the U.S., and eastward toward the Atlantic Ocean, as warm air from the Gulf of Mexico and the Atlantic tries to move northward. The warm waters of the Gulf Stream help keep the coastal waters relatively mild during the winter, which in turn helps warm the cold winter air over the water. This difference in temperature between the warm air over the water and cold Arctic air over the land is the area where Nor'easters are born.

8. SEA LEVEL RISE RISK

A report on sea level rise recommends that the State of Maryland should plan for a rise in sea level of as much as 2 feet by 2050. Led by the University of Maryland Center for Environmental Science, the report was prepared by a panel of scientific experts in response to Governor Martin O'Malley's Executive Order on Climate Change and "Coast Smart" Construction. The projections are based on an assessment of the latest climate change science and federal guidelines.

"The State of Maryland is committed to taking the necessary actions to adapt to the rising sea and guard against the impacts of extreme storms," said Governor Martin O'Malley. "In doing so, we must stay abreast of the latest climate science to ensure that we have a sound understanding of our vulnerability and are making informed decisions about how best to protect our land, infrastructure, and most importantly, the citizens of Maryland."

Maryland has 3,100 miles of tidal shoreline and low-lying rural and urban lands that will be impacted. The experts' best estimate for the amount of sea level rise in 2050 is 1.4 feet. It is unlikely to be less than 0.9 feet or greater than 2.1 feet. Their best estimate for sea level rise by 2100 is 3.7 feet. They concluded that it is unlikely to be less than 2.1 feet or more than 5.7 feet based on current scientific understanding.



Sea-level rise map showing land inundation under current conditions (left), under 2 feet of sea-level rise (right). Boesch, D.F., L.P. Atkinson, W.C. Boicourt, J.D. Boon, D.R. Cahoon, R.A. Dalrymple, T. Ezer, B.P. Horton, Z.P. Johnson, R.E. Kopp, M. Li, R.H. Moss, A. Parris, C.K. Sommerfield. 2013. Updating Maryland's Sea-level Rise Projections. Special Report of the Scientific and Technical Working Group to the Maryland Climate Change Commission, 22 pp. University of Maryland Center for Environmental Science, Cambridge, MD.

9. CRITICAL AND PUBLIC FACILITIES SEA LEVEL RISE VULNERABILITY

In an effort to assess sea level rise vulnerability, critical and public facilities were intersected with sea level rise inundation areas using the Sea Level Rise Vulnerability GIS data layer found within Maryland iMaps. This layer displays inundation areas for Maryland's coastal counties in the event of sea level rise. The data was derived from high-resolution topographic data (LiDAR) for use in identifying areas vulnerable to inundation and flooding. The table below indicates critical and public facilities within the 0-2 feet, 2-5 feet, and 5-10 feet sea level rise inundation areas.

Sea Level Rise: 0-2 feet Inundation			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
County Owned	Dock	County Owned Dock	Claiborne Landing, Claiborne
County Owned	Dock	County Owned Dock	Matthewstown Road, Easton
Municipal-Oxford	Dock	Oxford Dock	Strand Street, Oxford
Utility	Tower	Gateway Marina	Ocean Gateway, Trappe

Sea Level Rise: 2-5 feet Inundation			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
County Owned	Dock	County Owned Dock	7381 Tilghman Island Road, Tilghman
County Owned	Dock	County Owned Dock	Point Road, Easton
County Owned	Dock	County Owned Dock	St. Michaels Road, Newcomb
County Owned	Dock	County Owned Dock	Windy Hill Road, Trappe
County Owned	Dock	County Owned Dock	Wye Landing Lane, Wye Mills
Miscellaneous	Marina	Marina	21764 Camper Circle, Tilghman
Miscellaneous	Marina	Campbell Town Creek Boat Yard	107 Myrtle Avenue, Oxford
Miscellaneous	Marina	Easton Point Marina	975 Port Street, Easton
Miscellaneous	Marina	Hinckley Yacht Services	202 Bank Street, Oxford
Miscellaneous	Marina	Lowes Wharf Marina	21651 Lowes Wharf Road, Sherwood
Miscellaneous	Marina	Mears Yacht Haven	500 E Strand Street, Oxford
Miscellaneous	Marina	Oxford Yacht Agency	317 S Morris Street, Oxford
Miscellaneous	Marina	Pier Street Marina	104 W Pier Street, Oxford
Miscellaneous	Marina	Severn Marine Services	Chicken Point Road, Tilghman
Municipal-Easton	Public Works	Easton Public Works	Washington Street, Easton
Municipal-Oxford	Parks and Recreation	Oxford - tennis courts	Oxford Road, Oxford
Municipal-St. Michaels	Museum	Chesapeake Bay Maritime	213 North Talbot Street, St. Michaels
Utility	Electric	Easton Utilities Cable	405 Bay Street, Easton
Utility	Gas/Oil	Delmarva Oil Inc.	900 Port Street, Easton
Utility	Gas/Oil	McMahan Oil Company	930 Port Street, Easton
Utility	Gas/Oil	Pep Up Inc./Russ Oil Co.	956 Port Street, Easton
Utility	Telephone	Verizon	Oxford Road, Oxford
Utility	Tower	Tred Avon Yacht Club	102 W Strand Street, Oxford
Utility	Water Tower	Oxford Water Tower	400 Tilghman Street, Oxford
Sea Level Rise: 5-10 feet Inundation			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
County Owned	Parks and Recreation	Basketball court	5536 Public Landing Road, Royal Oak
Education	Public School	Tilghman Elementary	21374 Foster Avenue,

		School	Tilghman
Education	School	US Naval Research Lab	4642 Black Walnut Point Road, Tilghman
Emergency	Fire Department	Oxford VFD	300 Oxford Road, Oxford
Emergency	Fire Department	St. Michaels VFD	1001 S Talbot Street, St. Michaels
Emergency	Fire Department	Tilghman VFD	5979 N Main Street, Tilghman
Emergency	Police Station	Oxford Police Department	101 Market Street, Oxford
Emergency	Police Station	St Michaels Police Department	100 Fremont Street, St. Michaels
Emergency	Police Station	US Coast Guard	904 S Morris Street, Oxford
Medical	Office	Robert J. Patterson MD	800 S Talbot Street, St. Michaels
Miscellaneous	Marina	Bachelor Point Yacht Company	Bachelor Point Road, Oxford
Miscellaneous	Marina	Bates Marine Basin	106 Richardson Street, Oxford
Miscellaneous	Marina	Cutts and Case Shipyard	Tilghman Street, Oxford
Miscellaneous	Marina	Dickerson Harbor	3831 Trappe Landing Road, Trappe
Miscellaneous	Marina	Knapps Marina	6176 Tilghman Island Road, Tilghman
Miscellaneous	Marina	Oak Creek Marina	7419 Back Street, Newcomb
Miscellaneous	Marina	Oxford Boatyard Yacht Sales	407 Strand Street, Oxford
Miscellaneous	Marina	Tilghman on Chesapeake	21610 Island Club Road, Tilghman
Miscellaneous	Marina	Wye Landing	12498 Wye Landing Lane, Wye Mills
Miscellaneous	Storage Yard	Tidewater Canvas	Talbot Street, St. Michaels
Municipal-Oxford	Community Center	Grace Community Church	Oxford Road, Oxford
Municipal-Oxford	Library	Oxford Library	Market Street, Oxford
Municipal-Oxford	Museum	Oxford Museum Inc.	Morris Street, Oxford
Municipal-St. Michaels	Museum	St. Mary's Square Museum	409 St Mary's Square, St. Michaels
Municipal-St. Michaels	Office	Town of St. Michaels Office	300 Mill Street, St. Michaels
Municipal-St. Michaels	Public Works	Commissioners of St. Michaels	301 Mill Street, St. Michaels

Utility	Electric	Choptank Electric	6901 Schoolhouse Lane, Royal Oaks
Utility	Electric	Delmarva Power & Light	Canton Street, St. Michaels
Utility	Electric	Delmarva Power Substation	129 Grace Street, St. Michaels
Utility	Electric	Easton Utilities Cable	405 Bay Street, Easton
Utility	Gas/Oil	United Shoregas	929 S Talbot Street, St. Michaels
Utility	Pumping Station	Pumping Station #1	25730 Royal Oak Road, Newcomb
Utility	Pumping Station	Pumping Station #2	25940 Royal Oak Road, Royal Oaks
Utility	Pumping Station	Pumping Station #3	6020 Bellevue Road, Royal Oaks
Utility	Telephone	Verizon	111 E Chew Avenue, St. Michaels
Utility	Telephone	Verizon	5932 Tilghman Island Road, Tilghman
Utility	Tower	Verizon	108 Woodside Avenue, St. Michaels
Utility	Tower	Verizon	26709 Oxford Road, Oxford
Utility	Tower	N/A	7869 Bozman Neavitt Road, Bozman
Utility	Water Tower	St. Michaels Water Tower	106 Woodside Avenue, St. Michaels
Utility	Water Tower	Town of Oxford	103 JL Thompson Drive, Oxford
Utility	WWTP	St Michaels WWTP	929 Calvert Avenue, St. Michaels
Utility	WWTP	Tilghman Island WWTP	21345 Seth Avenue, Tilghman
Utility	WWTP	Town of Oxford WWTP	103 JL Thompson Drive, Oxford

Sources: 2017 Talbot County Critical and Public Facilities Database & Sea Level Rise Vulnerability GIS data layer found within Maryland iMAPS.

10. SHORELINE EROSION RISK & VULNERABILITY

Shoreline erosion is caused by many variables, such as storm surges of higher than normal tides, and wind driven waves; sea level rise, which causes higher tides than in decades past; boat wake; as well as upland runoff from rain storms. Shoreline erosion can threaten the integrity of existing structures, roads and utilities and has adverse impacts to water quality and wildlife habitat.

Shorelines in Tidewater Maryland have already changed significantly over the last two centuries, moving inland as a result of erosion and other changes. Talbot County's most notable feature is its extensive and irregular shoreline formed by numerous rivers,

creeks and coves. Principal waterways in the county include the shoreline of the Chesapeake Bay, the Choptank River, and the Tuckahoe River. Talbot's land and waterways form a unique mixture of tidal waters, streams, farmlands and forests. The traditional lifestyle of Talbot County has long centered on farming, seafood and maritime industries. The *Chesapeake Bay Critical Area Plan* adopted by the county contains strict environmental protection for shoreline areas. Approximately 38 percent of county land is designated as critical area.

Land within the **Critical Area** is categorized by its predominant use and the intensity of its development. This system allows local governments to focus new development toward existing developed areas and permits some infill of similar density. It also allows them to designate natural resources areas for habitat protection and for forestry, agriculture and other resource utilization activities. Each classification or category poses different challenges for land managers attempting to achieve the goals of the Critical Area Law and so the specific management programs for each differ. But the intention of each of the programs remains consistent -- to protect the Chesapeake Bay from the ill effects of human activities.
Source: Maryland Department of Natural Resources-Critical Areas Commission

Updated shoreline erosion rate data was requested during the 2017 planning process and provided by Andrew Roach of the U.S. Army Corps of Engineers, Baltimore District. According to the U.S. Army Corps of Engineers, Planning Division, the erosion categories have been changed and due to different mapping techniques, the measured shorelines have changed. The Virginia Institute of Marine Science produces the updated shorelines and erosion rates based on Maryland Geological Survey data.

Using a series of recent shorelines (1986-1995), the Maryland Geological Survey produced a recent shoreline coded with erosion rates. The shoreline was updated by the Center for Coastal Resources Management, Virginia Institute of Marine Science to reflect the current status (2002-2006) of shoreline protection ("protected category") and improve on the shoreline segments previously classified as "unknown" or "no data".

TALBOT SHORELINE EROSION		
Talbot County	**Average Erosion Rate (ft/yr)**	**Shoreline Length (Miles)**
Accretion	0.5	34
Protected	0	175
No Change	0	179
Slight	-1	195
Low	-3	9
Moderate	-6	4
High	-11	1
Unknown	0 or -1	0
		Total: 597

Source: Army Corps of Engineers, Baltimore District

11. CRITICAL & PUBLIC FACILITIES SHORELINE EROSION VULNERABILITY

In order to assess the vulnerability of critical and public facilities to shoreline erosion, facilities were mapped in conjunction with high and very high shoreline erosion rate areas. Theses areas were extracted using the following data source:

DATA SOURCE: MD iMAPS

Maryland Shoreline Hazard Index Layer Description: Each point in Coastal Resilience Assessment Shoreline Points represents a 250 meter segment of the Maryland coast, including Atlantic, Chesapeake Bay and Coastal Bay shorelines. The Natural Capital Project's Coastal Vulnerability model was used to calculate a Shoreline Hazard Index, representing the relative exposure of each segment to storm-induced erosion and flooding. Inputs to the model included 6 physical variables (geomorphology, elevation, sea level rise, wave power, storm surge height and erosion rates) and 5 habitat types (forest, marsh, dune, oyster reef and underwater grass). Two scenarios of the model were run: one scenario incorporating the protective role of all existing coastal habitats and the other scenario simulating the complete loss of habitats. The difference between the two scenarios indicates the potential magnitude of coastal hazard reduction by habitats at each location. Model results were integrated with MD DNR's Community Flood Risk Areas (March, 2016) in order to highlight areas where hazard reduction by habitats is most likely to benefit at-risk coastal communities. This dataset was produced under award number NA13NOS4190136 from the Office of Ocean and Coastal Resource Management (OCRM), National Oceanic and Atmospheric Administration (NOAA) through the Maryland Department of Natural Resources Chesapeake and Coastal Services (CCS). The statements, finding and recommendations are those of the authors and do not necessarily reflect the views of NOAA or the U.S. Department of Commerce. The Natural Capital Project (NatCap), CCS and The Nature Conservancy (TNC) all contributed to the production of this dataset.

As shown on the *Shoreline Erosion Rates: High and Very High* map on the following page, the Tilghman Island area has the highest concentration of "very high and high" erosion areas and critical and public facilities. The closest facility on Tilghman Island to a "high" erosion area is the wastewater treatment plant. Additional facilities on Tilghman Island include:

- ✓ County Owned Dock;
- ✓ Tilghman Elementary School;
- ✓ Tilghman Volunteer Fire Department;
- ✓ Knapps Marina;
- ✓ Severn Marine Services;
- ✓ Tilghman on Chesapeake Marina;
- ✓ Marina;
- ✓ Verizon Telephone; and,
- ✓ Tilghman Wastewater Treatment Plant.

Shoreline Erosion Rates: High & Very High

Critical and Public Facilities within close proximity of **high** and **very high** erosion rate areas:

- County Owned Dock
- Tilghman Elementary School
- Tilghman VFD
- Knapps Marina
- Severn Marine Services
- Tilghman on Chesapeake Marina
- Marina
- Verizon Telephone
- Tilghman WWTP

Note: High and very high erosion areas were determined by Maryland DNR Chesapeake & Coastal Services: Maryland Coastal Resiliency Assessment - Shoreline Hazard Index.

12. COASTAL HAZARDS CONCLUSION

Through the identification and understanding of coastal risks, Talbot County has taken an important step to becoming more resilient. Communicating the hazard risk information compiled within this plan to residents, businesses, and institutional members of the community so that they fully understand is a crucial next step.

Conclusions from the five Talbot County Community Pillars have been summarized below.

a. Health, Safety, and Welfare

Essential facilities types as identified by FEMA Hazus Technical Manual includes the following:

- ✓ Emergency Operations Center;
- ✓ Education;
- ✓ Fire;
- ✓ Police; and,
- ✓ Medical.

Essential facilities within coastal hazard risk areas, such as hurricane, are particularly at-risk. These facilities are essential and their continued operations and high level of functionality are vital to the health, safety, and welfare of the community. Essential facilities within hurricane categories 1-4 are listed on the table below.

Essential Facilities within Hurricane Category 1			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Emergency	Fire Department	St. Michaels VFD	1001 S Talbot Street
Medical	Office	Robert J. Patterson MD	800 S Talbot Street
Essential Facilities within Hurricane Category 2			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Education	School	US Naval Research Lab Tilghman	4642 Black Walnut Point Road
Essential Facilities within Hurricane Category 3			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Education	Private School	Calhoon MEBA Engineering	27050 Saint Michaels Road
Education	Public School	St Michaels High School	200 Seymour Avenue
Education	Public School	St. Michaels Elementary/Middle	100 Seymour Avenue
Education	Public School	Tilghman Elementary School	21374 Foster Avenue
Emergency	Fire Department	Tilghman VFD	5979 N Main Street
Emergency	Police Station	St Michaels Police Dept.	100 Fremont Street
Emergency	Police Station	Oxford Police	101 Market Street

Essential Facilities within Hurricane Category 4			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Education	Public School	Easton Elementary	307 Glenwood Avenue
Education	Special Needs	Benedictine School Vacation Retreat Home	9018 High Banks Terrace
Medical	Office	Affiliated with Shore Regional Health	218 Bay Street
Medical	Retirement Center	Candle Light Cove	106 W Earle Avenue

Source: 2017 Talbot County Critical and Public Facility Database
The SLOSH Basin used for mapping was Chesapeake Bay (CP5), released in 2014. This data was prepared by the U.S. Army Corps of Engineers, Baltimore District, Planning Division in January 2016. SLOSH storm tide elevations used for the mapping were based on the Maximum of Maximums (MOM) SLOSH output dataset.

The results of the Enhanced Hazus Hurricane Wind Analysis conducted as part of Hazard Mitigation Plan Update indicates that a total of 88,264 tons of debris will be generated. If debris tonnage is converted to an estimated number of truckloads, it will require 3,530 truckloads (@25 tons/truck) to remove the debris generated by the hurricane. In addition, 11,672 tons of debris is eligible tree debris, which could be chopped and/or chipped. This information may be used to inform the County Debris Management Plan.

b. Economic Stability

The increased threat of sea level rise may have a negative impact on property values and all related industries, thereby undermining the economic stability of the community. According to the sea level rise data and the 2017 Talbot County Critical Facilities Database, facilities impacted by a 0-2 feet sea level rise are minimal. However, sea level rise exceeding two feet, specifically 2-5 feet affects (24) facilities, including public utilities. In order for the community to remain resilient, utilities must remain and/or quickly come back on-line prior, during, and following a disaster incident. Mitigation of these facilities for sea level rise, coastal flood, and hurricanes are of vital importance to the economic stability of the Talbot County. The following table lists those facilities at-risk to Sea Level Rise.

Sea Level Rise: 0-2 feet Inundation			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
County Owned	Dock	County Owned Dock	Claiborne Landing, Claiborne
County Owned	Dock	County Owned Dock	Matthewstown Road, Easton
Municipal-Oxford	Dock	Oxford Dock	Strand Street, Oxford
Utility	Tower	Gateway Marina	Ocean Gateway, Trappe
Sea Level Rise: 2-5 feet Inundation			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
County Owned	Dock	County Owned Dock	7381 Tilghman Island Road, Tilghman
County	Dock	County Owned Dock	Point Road, Easton

Owned			
County Owned	Dock	County Owned Dock	St. Michaels Road, Newcomb
County Owned	Dock	County Owned Dock	Windy Hill Road, Trappe
County Owned	Dock	County Owned Dock	Wye Landing Lane, Wye Mills
Miscellaneous	Marina	Marina	21764 Camper Circle, Tilghman
Miscellaneous	Marina	Campbell Town Creek Boat Yard	107 Myrtle Avenue, Oxford
Miscellaneous	Marina	Easton Point Marina	975 Port Street, Easton
Miscellaneous	Marina	Hinckley Yacht Services	202 Bank Street, Oxford
Miscellaneous	Marina	Lowes Wharf Marina	21651 Lowes Wharf Road, Sherwood
Miscellaneous	Marina	Mears Yacht Haven	500 E Strand Street, Oxford
Miscellaneous	Marina	Oxford Yacht Agency	317 S Morris Street, Oxford
Miscellaneous	Marina	Pier Street Marina	104 W Pier Street, Oxford
Miscellaneous	Marina	Severn Marine Services	Chicken Point Road, Tilghman
Municipal-Easton	Public Works	Easton Public Works	Washington Street, Easton
Municipal-Oxford	Parks and Recreation	Oxford - tennis courts	Oxford Road, Oxford
Municipal-St. Michaels	Museum	Chesapeake Bay Maritime	213 North Talbot Street, St. Michaels
Utility	Electric	Easton Utilities Cable	405 Bay Street, Easton
Utility	Gas/Oil	Delmarva Oil Inc.	900 Port Street, Easton
Utility	Gas/Oil	McMahan Oil Company	930 Port Street, Easton
Utility	Gas/Oil	Pep Up Inc./Russ Oil Co.	956 Port Street, Easton
Utility	Telephone	Verizon	Oxford Road, Oxford
Utility	Tower	Tred Avon Yacht Club	102 W Strand Street, Oxford
Utility	Water Tower	Oxford Water Tower	400 Tilghman Street, Oxford

Sources: 2017 Talbot County Critical and Public Facilities Database & Sea Level Rise Vulnerability GIS data layer found within Maryland iMAPS.

c. Education

Education facilities at-risk to Hurricanes are listed on the table below.

Education Facilities within Hurricane Category 1			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
NONE			
Essential Facilities within Hurricane Category 2			
Facility Type	**Facility Detail**	**Facility Name**	**Address**

Education	School	US Naval Research Lab Tilghman	4642 Black Walnut Point Road
Education Facilities within Hurricane Category 3			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Education	Private School	Calhoon MEBA Engineering	27050 Saint Michaels Road
Education	Public School	St Michaels High School	200 Seymour Avenue
Education	Public School	St. Michaels Elementary/Middle	100 Seymour Avenue
Education	Public School	Tilghman Elementary School	21374 Foster Avenue
Education Facilities within Hurricane Category 4			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Education	Public School	Easton Elementary	307 Glenwood Avenue
Education	Special Needs	Benedictine School Vacation Retreat Home	9018 High Banks Terrace

Source: 2017 Talbot County Critical and Public Facility Database
The SLOSH Basin used for mapping was Chesapeake Bay (CP5), released in 2014. This data was prepared by the U.S. Army Corps of Engineers, Baltimore District, Planning Division in January 2016. SLOSH storm tide elevations used for the mapping were based on the Maximum of Maximums (MOM) SLOSH output dataset.

Education facilities at-risk to sea level rise are listed on the table below.

Sea Level Rise: 0-2 feet Inundation			
NONE			
Sea Level Rise: 2-5 feet Inundation			
NONE			
Sea Level Rise: 5-10 feet Inundation			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Education	Public School	Tilghman Elementary School	21374 Foster Avenue, Tilghman
Education	School	US Naval Research Lab	4642 Black Walnut Point Road, Tilghman

Sources: 2017 Talbot County Critical and Public Facilities Database & Sea Level Rise Vulnerability GIS data layer found within Maryland iMAPS.

Both the US Naval Research Lab Tilghman and the Tilghman Elementary School are at risk to both hurricane and sea level rise.

d. Infrastructure

The continued functionality of the transportation network within any community is an essential component to community resilience and safety. In particular, roadways in and around essential facilities are a priority. Those facilities, such as police, fire/rescue, and other emergency services must be functionally. Especially access road to and from essential facilities, these roads are vital to the continued operations of emergency services.

In addition, facilities that support the community, such as public utilities should be considered for hazard mitigation as appropriate and resilience. The following table lists those facilities at-risk to Hurricane Categories 1-4. Finally, those facilities shaded purple are also within the sea level rise inundation area of 2-5 feet.

Utilities within Hurricane Category 1			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Utility	Electric	Delmarva Power & Light	Canton Street
Utility	Gas/Oil	Pep Up Inc./Russ Oil Co	956 Port Street
Utility	Gas/Oil	McMahan Oil Company	930 Port Street
Utility	Telephone	Verizon	Oxford Road
Utility	Tower	Tred Avon Yacht Club	102 W The Strand Street
Utility	Water Tower	Oxford Water Tower	400 Tilghman Street
Public Works & Utilities within Hurricane Category 2			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Municipal-Easton	Public Works	Easton pump station	Washington Street
Municipal-St. Michaels	Public Works	Commissioners of St. Michaels	301 Mill Street
Utility	Electric	Delmarva Power Substation	129 Grace Street
Utility	Electric	Choptank Electric	6901 Schoolhouse Lane
Utility	Electric	Easton Utilities Cable	405 Bay Street
Utility	Gas/Oil	Delmarva Oil Inc.	900 Port Street
Utility	Pumping Station	Pumping Station #2	25940 Royal Oak Road
Utility	Pumping Station	Pumping Station #3	6020 Bellevue Road
Utility	Telephone	Verizon	111 E Chew Avenue
Utility	Tower	Verizon	108 Woodside Avenue
Utility	Tower	N/A	7869 Bozman Neavitt Road
Utility	Water Tower	St. Michaels Water Tower	106 Woodside Avenue
Utility	Water Tower	Town of Oxford	103 JL Thompson Drive
Utility	WWTP	Town of Oxford	103 JL Thompson Drive

Public Works & Utilities within Hurricane Category 3			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Municipal-St. Michaels	Public Works	St. Michaels Town Shop	Glory Avenue
Utility	Gas/Oil	United Shoregas	929 S Talbot Street
Utility	Pumping Station	Pumping Station #1	25730 Royal Oak Road
Utility	Pumping Station	Peachblossom Pumping Station	7606 Oxford Road
Utility	Substation	Delmarva Power	8289 Old Bloomfield Road

		Substation	
Utility	Substation	Delmarva Substation Bozman	23931 St Michaels Road
Utility	Telephone	Verizon	5932 Tilghman Island Road
Utility	Tower	Delmarva Power & Light	26985 St Michaels Road
Utility	Tower	Verizon	26709 Oxford Road
Utility	WWTP	St Michaels WWTP	929 Calvert Avenue
Utility	WWTP	Tilghman Island WWTP	21345 Seth Avenue
Utility	Telephone	Verizon	5932 Tilghman Island Road
Essential Facilities within Hurricane Category 4			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Municipal-Easton	Public Works	Easton Utilities	219 N Washington Street
Municipal-Easton	Public Works	Easton pump station	Washington Street
Municipal-Easton	Public Works	Easton garage	220 Port Street
Utility	Electric	Easton Utilities	450 Glenwood Avenue
Utility	Gas/Oil	Southern States Petroleum	801 Port Street
Utility	Pumping Station	Pumping Station	9345 Unionville Road
Utility	Tower	Mid Atlantic Communication	9855 Wades Point Road
Utility	Water Tower	St Michaels Water Tower	N Talbot Street
Utility	WTP	Martingham Utilities Cooperative	24490 Deepwater Point Drive
Utility	WWTP	Easton Waste Treatment	30770 North Dover Road

Sources: 2017 Talbot County Critical and Public Facility Database
The SLOSH Basin used for mapping was Chesapeake Bay (CP5), released in 2014. This data was prepared by the U.S. Army Corps of Engineers, Baltimore District, Planning Division in January 2016. SLOSH storm tide elevations used for the mapping were based on the Maximum of Maximums (MOM) SLOSH output dataset. Sea Level Rise Vulnerability GIS data layer found within Maryland iMAPS.

e. Environment

Where appropriate increase the amount of shoreline miles that are protected from shoreline erosion, environmental resilience for communities will improve. Data currently indicates that 175 miles of the total 597 total miles of shoreline or 29% of the shoreline in Talbot County is protected.

Shoreline Erosion Rates		
Talbot County	**Average Erosion Rate (ft/yr)**	**Shoreline Length (Miles)**
Accretion	0.5	34
Protected	0	175
No Change	0	179
Slight	-1	195
Low	-3	9
Moderate	-6	4
High	-11	1
Unknown	0 or -1	0
		Total: 597

Source: Army Corps of Engineers, Baltimore District

Maryland information on shoreline erosion protection and control measures is available for distribution.

SHORE EROSION CONTROL GUIDELINES FOR WATERFRONT PROERTY OWNERS, 2ND EDITION, MARYLAND DEPARTMENT OF THE ENVIRONMENT, DECEMBER 2008

This guidebook was originally developed by the Maryland Department of Natural Resources, Water Resources Administration, Tidal Wetlands Division, to assist waterfront property owners in understanding the various methods of shore erosion control and assist them in selecting the method most appropriate for their property. The Tidal Wetlands Division is now part of the Maryland Department of the Environment, Water Management Administration. This second edition provides updated guidance on technical approaches and regulatory procedures to assist waterfront property owners.
The appropriate shore erosion control method should be selected by considering the degree of erosion control needed, environmental impacts and cost.

- ✓ Non-Structural Practices ("Living Shorelines")
  Non-structural stabilization including beach nourishment, slope grading and planting, and marsh establishment, with or without additional protection elements.
- ✓ Sand Containment Structures
- ✓ Structural Practices:
  - Shoreline revetments;
  - Offshore breakwaters; and,
  - Jetties/Groins.

These recommendations are consistent with the provisions of Maryland's Chesapeake and Coastal Bays Critical Area Protection Program which encourages the use of nonstructural shore protection measures in order to conserve and protect plant, fish and wildlife habitat.

Chapter 5:

Flood

CHAPTER 5: FLOOD

Flooding can be categorized as **flash, riverine and coastal** in Maryland. Flash flooding results from a combination of rainfall intensity and duration, and is further influenced by local topography and the ground's capacity to hold water. Riverine flooding is caused by persistent moderate or heavy rain over one or more days, sometimes combined with snowmelt, causing a river to slowly rise and overflow its banks. Coastal flooding occurs when normally dry, low-lying land is flooded by seawater. The extent of coastal flooding is a function of the elevation inland floodwaters penetrate which is controlled by the topography of the coastal land exposed to flooding.

Talbot County is crisscrossed with waterways. The county has approximately 600 miles of shoreline, more than any county in the United States. Talbot County is bordered by the Chesapeake Bay to the west, the Choptank River to the east and south, and the Tuckahoe River to the east. Other major tributaries include the Wye, Miles, Choptank, and Tred Avon Rivers as well as the Harris and Broad Creeks.

HAZARD-something that may cause harm.

RISK-the likelihood of harm, the chance, high, medium, low, that a hazard will cause harm.

VULNERABILITY-potential for loss.

1. FLOOD HAZARD IMPACTS

The Community Resilience Stakeholder Committee held a workshop on June 16, 2016. During the workshop, stakeholders were divided into five groups. These five groups represented each of the Talbot County Community Pillars. Participants were provided with hazard descriptions and blank hazard impacts worksheets. Each of the five groups were then asked to discuss hazard impacts from their community perspective and associated Community Pillar perspective. Results were reviewed and finalized during the Community Resilience Stakeholder Committee workshop held on September 8, 2016. The following table provides impacts from Coastal Hazards to Talbot County per Community Pillar.

Hazard Impact Table	
Flood	
Health, Safety, and Welfare	– Economic development → impacts tourism and real estate (tax income). – Environmental – impacts silt and runoff into bay. – Early warning system, evacuation, and holdouts. – Long Term Issues: Disease, contamination, health issues, economic development, and property damage. – Short Term Issues: Access to critical populations and critical facilities. Twenty-five percent food insecure. Problems with drinking water.
Economic Stability	– Increased threat (rise is perceived) would have a negative impact on property values and all related industries. – Destruction of infrastructure would have long-term impacts on tourism and economic development. – Damage to structures could force long-term closures and business

	interruptions. Lack of work/no salaries. – Limit access of emergency response to residential and business areas. – Sea-level rise will impact loan real estate values over time and limit land use. – Sea-level rise will negatively impact businesses located directly on shorelines, especially our marinas and boat builders. – Increased insurance costs for business operations.
Education	– Renewable energy, distributed locally is vital to resilience? – Opportunity?? Education – K-12, College/University, and Professional – can this be an economic driver? Infrastructure (Wind & Water): – Power failure. – Damage to facilities (over Gateway I Storms). – Facilities are used as emergency shelters. – EHS: full sized generator can run 2-3 days of continuous operation (lights & A/C). Transportation: – TCPS might need to use buses to move residents (up to 3500 persons at a time). Interruptions in service: – No school on hurricane days Chesapeake College: – Worries re: glass/structures – Generators on approximately 2 buildings: battery back-up coming for kitchen/student center.
Infrastructure	– Roads and bridges → submerged → evacuation impact. – Roads and bridges → damaged → (long-term) closures. – Communication – wind related O.H. impacts. – Power – wind related "overhead impacts" O.H. line impacts. – Water – by virtue of power loss. – Sewer – direct flooding impacts (Tilghman Plant) and power loss.
Environmental	– Pollutants from fertilizers entering waterways during flood events. – Impervious surfaces exacerbates flooding. – Stormwater management and use of best practices/retrofits – Areas for protection - flood, erosion, and habitat – Erosion, sedimentation, nutrient inputs/transport, pollution discharge from non Combined Sewer Overflow (CSO) communities – Failed water systems – Damaged storage tanks, septic systems (old/undocumented) – Saltwater inundation damages to habitat and vice versa too much fresh water in saltwater habitats Climate Change – Increased precipitation

	– Increased stream channel erosion – Stormwater best management practices may become inadequate – Changes in water temperatures & salinity

Source: Talbot County Community Resilience Stakeholder Committee

2. PROBABILITY OF FUTURE FLOOD HAZARD EVENTS

Climate change causes storm surges, higher sea levels, and more intense storms. Talbot County acknowledges the likelihood of the increasing risks and vulnerability from flood hazard events. Through the development and implementation of the *2017 Talbot County Hazard Mitigation and Resilience Plan*, planning consideration for both today and tomorrow are evidenced.

The following table indicates that eight coastal flood and flood events have occurred from 1996-2017. On average number 0.4 coastal flood events occur per year. Data presented below was obtained through the National Centers for Environmental Information-Storm Events Database.

Coastal Flood & Flood Event Narrative	
September 6 to September 7, 1996	**The remnants of Hurricane Fran moved through West Virginia on the 6th reaching northwest Pennsylvania the morning of the 7th. The strong south to southeast winds accompanying it caused tidal flooding along Chesapeake Bay. Flooding also extended inland along tidal sections of rivers and creeks that drain into the bay. The tide gage at Tolchester Beach in Kent County reached 4.8 feet above mean low water. This was a tidal departure of 2 to 2.5 feet above normal.** **In Talbot County, flooding was reported in St. Michael's. Flooding in Oxford was reported as the worst since Hurricane Hazel in 1954. Town Creek spilled over as did the Tred Avon River. Waterfront restaurants and homes in low lying areas were flooded. Many persons were encouraged to evacuate to the second floor of their establishments. Bank Street was closed. A few people were evacuated. In Easton, the Easton Point Marina parking lot was flooded with two feet of water.**
January 28, 1998	**An intense northeaster pounded the Maryland Eastern Shore with heavy rain, strong winds and some minor tidal flooding on the 28th. Heavy rain moved into the southern part of the Maryland Eastern Shore shortly after midnight on the 28th and continued through the early afternoon. By 130 p.m. In Talbot County, several roads had considerable flooding and a culvert was washed out from another roadway. Storm totals ranged from around 1 inch in Cecil County to around 3.5 inches in southern parts of Caroline and Talbot Counties. In Talbot County, bay flooding in some yards was reported in Oxford. Also in Oxford, one lane of Maryland State Route 333 was totally submerged near the causeway. Field flooding was reported in Saint Michaels and on Tilghman Island.** **Strong winds increased during the day on the 28th and became their strongest between 10 a.m. and 2 p.m. EST. Peak gusts reached between 45 and 55 mph. The strong winds and heavy rain were able to push over some weak trees and power lines across the Eastern Shore. In Caroline County most roads were littered with tree limbs. A peak wind gust of 47 mph was recorded in Preston. There were downed trees and morning power outages in Talbot County. In all about 1,000 Eastern Shore residents lost power. But, no major injuries were reported.**
February 4 to February 6, 1998	**In Talbot County, flooding was reported along low lying areas of Neavitt, Oxford, Saint Michaels and Unionville during the afternoon of the 4th. Roadway flooding was also reported in Trappe. A few roads were closed and minor outages were reported because of the downed trees. The heavy rain might have also damaged the 275,000 acres of winter wheat planted across the lower Eastern Shore, especially if precipitation continues above normal**

	for the rest of the winter.
June 15, 2007	**An up the Chesapeake Bay flow coupled with spring tides associated with the new moon produced areas of minor tidal flooding in Talbot County the night of the 14th. The high tide in Cambridge (Dorchester County) reached 3.7 feet above mean lower low water. Minor tidal flooding begins at 3.5 feet above mean lower low water.**
August 28, 2011	**Flooding rains forced the closure of sections of Maryland State Routes 565A, 329, 328 and 33. The combination of flooding and tropical storm winds damaged 100 properties and 50 roadways and bridges Roadway damage alone was estimated at $750,000. Event rainfall totals included 11.50 inches in Beechwood, 10.68 inches in North Easton, 9.75 inches in Easton, 9.48 inches in Papermill Pond, 9.40 in Bellevue and 9.12 inches in Trappe. Reported property damage totaled 1 Million.**
August 29, 2012	**The heavy rain that fell across Talbot County not only caused poor drainage flooding, but exacerbated the tidal flooding along the Chesapeake Bay. Nearly two dozen roadways were flooded and closed. Event precipitation totals included 12.49 inches in Easton, 9.60 inches in Trappe and 5.00 inches in Cordova. Reported property damage totaled 1 Million.**
October 29, 2012	**Post Tropical Storm Sandy caused an initial estimate of $5 million dollars in damage in the Eastern Shore of Maryland. Most of the damages were due to flooding caused by excessive rainfall, as up to 13 inches of rain were reported, and due to the high winds, which caused trees and wires to come down across the state. Delmarva Power, which serves portions of the eastern shore counties, reported over 30,000 households without power during the peak of the storm. The majority of residents had power returned by the morning of the 30th. Hundreds of roads were closed due to numerous downed trees and flooding. No direct deaths were reported on the Eastern Shore of Maryland due to the storm.** **Prior to Sandy's arrival, Governor Martin O'Malley declared a State of Emergency for Maryland. No mandatory evacuations were ordered prior to or during the storm on the Eastern Shore. The Chesapeake Bay Bridge was closed due to high winds just before 3 p.m. on the 29th and remained closed through about 9 a.m. on the 30th. The state also closed the Millard E. Tydings Memorial Bridge, where Interstate 95 crosses the Susquehanna River. Swift water rescue teams from South Carolina were on standby throughout the storm and thankfully were not utilized. The storm surge was 3 to 3.5 feet. The region was spared higher surges as Sandy made landfall in New Jersey and the winds prior to landfall pushed water down the Chesapeake Bay. Minor tidal flooding also occurred at Tolchester Beach during the subsequent afternoon high tide cycle on the 30th. Heavy rains fell across the area as Sandy approached and then moved through the region.** **Peak wind gusts included 60 mph in Tolchester Beach (Kent County), 59 mph in Bay City (Queen Anne's County), 55 mph in Royal Oak (Talbot County), 53 mph at the Stevensville Airport (Queen Anne's County), 48 mph at the Easton Airport (Talbot County), 47 mph in Colora (Cecil County) and 41 mph near Jumptown (Caroline County).**
December 21, 2012	**A deep low-pressure system tracked across the Lower Great Lakes northeastward into the St. Lawrence Valley from the evening of the 20th into the daytime of the 21st. Its associated strong cold front swept eastward through the Mid Atlantic region and across Maryland during the early morning of the 21st. In addition, a secondary area of low pressure formed along the frontal boundary, west of Delaware Bay, and deepened rapidly. The approaching cold front and the deepening secondary low pressure produced a strong southeasterly flow during the early morning on the 21st that resulted in peak wind gusts of around 45 mph across the Eastern Shore and knocked over weak tree limbs and wires. In addition, the significant southeast flow allowed water to pile up into Chesapeake Bay. Once the winds shifted to the west, the higher tidal departures shifted to the Eastern Shore and producing moderate tidal flooding in Queen Anne's, Talbot and Caroline Counties and minor tidal flooding in Kent and Cecil Counties at the time of high tide during the daytime of the 21st. Moderate to heavy rain also fell across the Eastern Shore, with storm totals ranging between 1 to 2 inches.** **Minor to moderate tidal flooding occurred in the Chesapeake Bay during the morning and**

	afternoon high tide cycle on the 21st. High tide in Cambridge (Dorchester County) reached 4.70 feet above mean lower low water. Moderate tidal flooding starts at 4.5 feet above mean lower low water. High tide at Tolchester Beach reached 4.17 feet above mean lower low water. Minor tidal flooding starts at 3.5 feet above mean lower low water.

Source: National Centers for Environmental Information-Storm Events Database

3. FLOOD RISK

Flood risk and vulnerability assessed for Talbot County within the *2016 State of Maryland Hazard Mitigation Plan* included the following variables:

a. **Population Vulnerability**- Calculated as a percent of the total population in Maryland per County.

b. **Injuries & Deaths**-As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

c. **Property & Crop Damage**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

d. **Geographic Extent**-Information obtained from Talbot County Coastal Flood Risk Report, published by the Federal Emergency Management Agency in September, 2016.

e. **Events**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

Note: Reported information from the National Center for Environmental Information (NCEI)-Storm Event data for coastal Floods and flood events.

Flood Hazard Risk Assessment Data Table						
Population Vulnerability	***Injuries & Deaths***		***Property & Crop Damage***		***Geographic Extent***	***Events***
0.6298	Yes	No	10.052m	0	30%	11 Total
						Annualized-0.47826087

Source: 2016 State of Maryland Hazard Mitigation Plan

4. REVISED COUNTY FLOOD INSURANCE RATE MAPS

In April of 2015 FEMA delivered preliminary Flood Insurance Rate Maps (FIRMs) to Talbot County, initiating the process of adopting new flood zone designations and base flood elevations. A successful public meeting was held on June 11, 2015 in St. Michaels. Approximately 80 residents attended the meeting for purposes of viewing the new maps and asking questions. The FIRM maps were made effective in July 20, 2016.

a. Changes Since Last FIRM

Special Flood Hazard Area (SFHA) boundaries within Talbot County were updated due to new engineering analysis performed. The updated modeling produced new flood zone areas and new base flood elevations in some areas and leveraged recently

developed LIDAR-based topographic data. A comparison between previous effective FIRM and new provides a summary of increases, decreases, and the net change of the SFHA's, Floodways, and Coastal High Hazard Areas (CHHAs) for the County.

Changes Since the Last FIRM Data Table-Talbot County Unincorporated Areas				
Area of Study	*Total Area (square miles)*	*Increase (square miles)*	*Decrease (square miles)*	*Net Change (square miles)*
Within SFHA	67.8	5.6	25.5	-19.9
Within Floodway	<0.1	0	<0.1	>0.1
Within CHHA (Zones VE or V)	13.0	4.7	4.9	-0.1

Source: 2016 Talbot County Flood Risk Assessment Report

b. FEMA Flood Zones

Digital Flood Insurance Rate Map (DFIRM) contains flood inundation areas that are depicted as flood zones. Flood zones include: Zones A, AE, VE, and X.

FEMA DESIGNATED FLOOD ZONES	
Flood Zone	**Description**
SFHA-High Risk Areas	
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
VE	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AO	River or stream flood hazard area, and areas with a 1-percent or greater chance of swallow flooding each year, usually in the form of sheet flow, with an average depth raging from 1-3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage.
Minimum Risk Areas	
X	Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100-year flood. Average flood depths derived from detailed analyses are shown within these zones.

Source: FEMA Flood Zones

5. NATIONAL FLOOD INSURANCE PROGRAM

Talbot County has undertaken a number of mitigation actions related to floods. The County and its incorporated municipalities all participate in the NFIP. Talbot County has created several brochures to inform community members on ways to reduce flood risk and helps eligible county residents receive flood insurance premium discounts. Brochures provided in the Talbot County website include the following:

COMMUNITY RATING SYSTEM (CRS)

The NFIP's CRS program encourages floodplain management activities that exceed minimum NFIP requirements in exchange for countywide reduction in flood insurance premiums. CRS is a voluntary program that provides reductions on flood insurance premiums of up to 45 percent for participating municipalities who go beyond minimum floodplain management requirements and provide extra protection from flooding.

- **Flood Safety;**
- **Flood FAQs;**
- **Flood Insurance Program;**
- **Build Responsibly; and,**
- **Community Rating System.**

Effective October 1, 2014, Talbot County's unincorporated areas were confirmed as Class 8 in the National Flood Insurance Program's CRS. All qualifying flood insurance policies issued or renewed on or after October 1, 2014 for properties in Talbot County's unincorporated areas located in a special flood hazard area receive a 10 percent discount. Properties not located in the special flood hazard area receive a 5 percent discount. As of January 31, 2014, there were 1,902 flood insurance policies in the affected area. Property coverage amounted to $567,049,600 with annual premiums totaling $1,531,037. The discount saves homeowners $108,702 per year. This translates into $114 in saving for each policy holder in the "A" flood zones and $73 for those eligible policy holders outside the "A"zone. Talbot County policyholders have filed 393 claims totaling $7,704,365 since 1978.

Considering the amount of flood insurance policies and the number of claims that have been reported, identifying areas of repetitive loss within a community is a good indicator to use in determining areas of high flood damage vulnerability. While flood damage is not necessarily limited to these areas, repetitive loss data provides location indicators for areas where structures are experiencing recurring and costly flooding damage.

FEMA defines a repetitive loss property as:

- A property for which two or more claims of more than $1,000 have been paid by the NFIP within a ten-year period since 1978;
- A property that has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or

- A property for which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

As part of the update process, the repetitive loss listing for Talbot County was obtained from the Maryland NFIP Coordinating Office. As of June 30, 2016, there are twenty-four (24) repetitive loss properties located within Talbot County; five (5) commercial, one (1) condo, and eighteen (18) single-family structures. There are no severe repetitive loss structures located within Talbot County.

6. TALBOT COUNTY FLOOD RISK MAP APPLICATION

As a part of a proactive strategy to communicate about flood risk and engage the general public, the County is leveraging its investment in Geographic Information Systems (GIS) to add an interactive web map application dedicated to flood risk. This capability will enable individual property owners, local planners, developers, surveyors, insurance agents, and real estate agents to gain access to information that is otherwise difficult to find and then be able to evaluate and discuss flood vulnerability.

The content of the flood risk web map application includes:

- Elevation Certificates (after 2000);
- Stormwater flow patterns (both yellow and black depending on background color);
- Watersheds;
- Effective FEMA floodplains;
- Prior FEMA floodplains;
- Storm surge (from Army Corps of Engineers Evacuation Study 2006);
- Road closures due to previous storms;
- Elevation color ramps (LiDAR data 2003); and,
- Elevation spot shots.

The website was prepared by Talbot County under award number NA14NOS4190125 from the Office of Ocean and Coastal Resource Management (OCRM), National Oceanic and Atmospheric Administration (NOAA), through the Maryland Department of Natural Resources Chesapeake and Coastal Service. The statements, findings, conclusions and recommendations are those of the author(s) and do not necessarily reflect the views of NOAA or the U.S. Department of Commerce.

7. ELEVATION CERTIFICATES

Talbot County keeps elevation information on file in the Permits Department. Available information has been imported into the County website and may be accessed as follows:

- Click on this link to open a map of Elevation Certificates,
- Zoom in on the area of your property, Click on the symbol closest to your location, if there are several on your street,
- A printable Elevation Certificate will pop up. Check the address and if it is the correct certificate, print a copy of your records,
- You may need to try more than one certificate if there are several in your vicinity.

8. FLOOD VULNERABILITY & LOSS ESTIMATIONS

Data can be leveraged to identify and measure vulnerability by including local building information (i.e. building type) and intersecting with flood zones. Flood losses were estimated using the FEMA's flood loss estimating tool, Hazus. Hazus is a nationally-applicable and standardized risk assessment tool that estimates potential losses. In addition to FEMA flood zones, flood depth grids were used within the analysis. The flood depth grids communicate the flood depth as a function of the difference between calculated water surface elevation and the ground. Depth grids form the basis for the refined flood risk assessment as shown on the table below and are used to calculate potential flood losses.

COASTAL FLOOD DEPTH GRIDS

Coastal flood depth girds are created for areas where dominant wave hazard is overland wave propagation. The grid depicts the difference in wave crest elevation, or base flood elevation, and the ground. Coastal areas will typically only receive a depth grid for the 1-percent-annual-chance (base) flood for which overland wave propagation results are produced.

The refined study presented herein utilized Hazus Version 3.1 to calculate coastal flood losses for the 1-percent-annual-chance flood event. These losses are expressed in dollar amounts. Flood loss estimates include:

- Residential Asset Loss: all classes of residential structures including single family, multi-family, manufactured housing, group housing, and nursing homes.
- Commercial Asset Loss: all classes of building including retail, wholesale, repair. Professional services, banks, hospitals, entertainment, and parking facilities.
- Other Asset Losses: losses for facilities categorized as industrial, agriculture, religious, government, and educational.
- Business Disruption: this includes losses associated with the inability to operate a business due to the damaged sustained during the flood event. Losses include inventory, income, rental income, wage, and direct output losses, as well as relocation costs.

Talbot County-Total Unincorporated Area Estimated Potential Refined Flood Losses

Type	*Inventory Estimated Value*	*% of Total*	*1% (100-yr) Dollar Losses*
Residential Building & Contents	$303,400,000	89%	$18,700.000
Commercial Building & Contents	$32,100,00	9%	$7,000,000
Other Building & Contents	$5,200,000	2%	$900,000
Total Building & Contents	$340,700,000	100%	$26,600,000
Business Disruption	N/A	N/A	$1,600,000

Total	$340,700,000	N/A	$28,200,000

Losses are shown rounded to the nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000
Source: 2016 Talbot County Flood Risk Report

a. Town of Easton

Data provided below only includes areas in the Town of Easton. The National 2010 AAL Study Data was completed using Hazus (Version 2.1) General Building Stock (GBS) inventory data (2000 census) and resulting losses from the FEMA National 2010 Average Annualized Loss (AAL) Study.

Town of Easton Estimated Potential Flood Losses National 2010 AAL Study Losses			
Type	***Inventory Estimated Value***	***% of Total***	***1% (100-yr) Dollar Losses***
Residential Building & Contents	$701,000,000	43%	$700,000
Commercial Building & Contents	$698,100,000	43%	$700,000
Other Building & Contents	$224,000,000	14%	$200,000
Total Building & Contents	$1,623,100,000	100%	$1,600,000
Business Disruption	N/A	N/A	$50,000
Total	**$1,623,100,000**	**N/A**	**$1,650,000**

Losses are shown rounded to the nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000
Source: 2016 Talbot County Flood Risk Report

b. Town of Oxford

Data provided below only includes areas in the Town of Oxford. The refined study presented herein utilized Hazus Version 3.1 to calculate coastal flood losses for the 1-percent-annual-chance flood event. These losses are expressed in dollar amounts.

Town of Oxford Estimated Potential Refined Flood Losses			
Type	***Inventory Estimated Value***	***% of Total***	***1% (100-yr) Dollar Losses***
Residential Building & Contents	$62,500,000	81%	$2,900,000
Commercial Building & Contents	$12,100,000	16%	$1,100,000
Other Building & Contents	$2,200,000	3%	$30,000
Total Building & Contents	$78,700,000	100%	$4,100,000
Business Disruption	N/A	N/A	$900,000

Total	$76,700,000	N/A	$5,000,000

Losses are shown rounded to the nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000
Source: 2016 Talbot County Flood Risk Report

c. Town of Queen Anne

Data provided below only includes areas in the Town of Queen Anne. The National 2010 AAL Study Data was completed using Hazus (Version 2.1) General Building Stock (GBS) inventory data (2000 census) and resulting losses from the FEMA National 2010 Average Annualized Loss (AAL) Study.

Town of Queen Anne Estimated Potential Flood Losses National 2010 AAL Study Losses			
Type	***Inventory Estimated Value***	***% of Total***	***1% (100-yr) Dollar Losses***
Residential Building & Contents	$5,100,000	98%	$90,000
Commercial Building & Contents	$100,000	2%	$0
Other Building & Contents	$0	0%	$0
Total Building & Contents	$5,200,000	100%	$4,100,000
Business Disruption	N/A	N/A	$0
Total	**$5,200,000**	**N/A**	**$90,000**

Losses are shown rounded to the nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000
Source: 2016 Talbot County Flood Risk Report

d. Town of St. Michaels

Data provided below only includes areas in the Town of St. Michaels. The refined study presented herein utilized Hazus Version 3.1 to calculate coastal flood losses for the 1-percent-annual-chance flood event. These losses are expressed in dollar amounts.

Town of St. Michaels Estimated Potential Refined Flood Losses			
Type	***Inventory Estimated Value***	***% of Total***	***1% (100-yr) Dollar Losses***
Residential Building & Contents	$15,200,000	49%	$1,500,000
Commercial Building & Contents	$13,200,000	42%	$4,900,000
Other Building & Contents	$2,600,000	8%	$900,000
Total Building & Contents	$31,1700,000	100%	$7,200,000

Business Disruption	N/A	N/A	$100,000
Total	**$31,100,000**	**N/A**	**$7,400,000**

Losses are shown rounded to the nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000
Source: 2016 Talbot County Flood Risk Report

e. Town of Trappe

Data provided below only includes areas in the Town of Trappe. The National 2010 AAL Study Data was completed using Hazus (Version 2.1) General Building Stock (GBS) inventory data (2000 census) and resulting losses from the FEMA National 2010 Average Annualized Loss (AAL) Study.

Town of Trappe Estimated Potential Flood Losses National 2010 AAL Study Losses			
Type	***Inventory Estimated Value***	***% of Total***	***1% (100-yr) Dollar Losses***
Residential Building & Contents	$56,500,000	71%	< $10,000
Commercial Building & Contents	$18,300,000	23%	< $10,000
Other Building & Contents	$4,500,000	6%	< $10,000
Total Building & Contents	$5,200,000	100%	< $10,000
Business Disruption	N/A	N/A	N/A
Total	**$79,300,000**	**N/A**	**< $10,000**

Losses are shown rounded to the nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000
Source: 2016 Talbot County Flood Risk Report

9. CRITICAL AND PUBLIC FACILITIES VULNERABILITY

Critical and public facilities within flood prone areas have been identified and categorized under the associated FEMA flood zones. Facilities within FEMA flood zones total 46, and are categorized as follows: Zone A contains (1) facility, and Zone AE contains the remaining (31) facilities.

CRITICAL AND PUBLIC FACILITIES WITHIN FEMA FLOOD ZONES			
Zone A			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Utility	Pumping Station	Chapel East Pump Station	9076 Chapel Road, Easton
Zone AE			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
County Owned	Dock	County Owned Dock	7381 Tilghman Island Road, Tilghman
County	Dock	County Owned Dock	Claiborne Landing, Claiborne

Owned			
County Owned	Dock	County Owned Dock	Point Road, Easton
County Owned	Dock	County Owned Dock	Windy Hill Road, Trappe
County Owned	Dock	County Owned Dock	Skipton Landing Road, Cordova
County Owned	Dock	County Owned Dock	Matthewstown Road, Easton
County Owned	Dock	County Owned Dock	Route 33
County Owned	Dock	County Owned Dock	Wye Landing Lane, Wye Mills
Emergency	Fire Department	Oxford VFD	300 Oxford Road, Oxford
Emergency	Police Station	US Coast Guard	904 S Morris Street,
Miscellaneous	Marina	Marina	21764 Camper Circle, Tilghman
Miscellaneous	Marina	Bates Marine Basin	106 Richardson Street, Oxford
Miscellaneous	Marina	Campbell Town Creek Boat Yard	107 Myrtle Avenue, Oxford
Miscellaneous	Marina	Easton Point Marina	975 Port Street, Easton
Miscellaneous	Marina	Higgins Yacht Yard	Carpenter Street, St. Michaels
Miscellaneous	Marina	Hinckley Yacht Services	202 Bank Street, Oxford
Miscellaneous	Marina	Lowes Wharf Marina	21651 Lowes Wharf Road, Sherwood
Miscellaneous	Marina	Oxford Boatyard Yacht Sales	407 Strand Street, Oxford
Miscellaneous	Marina	Oxford Yacht Agency	317 S Morris Street, Oxford
Miscellaneous	Marina	Pier Street Marina	104 W Pier Street, Oxford
Miscellaneous	Marina	Severn Marine Services	Chicken Point Road, Tilghman
Municipal-Easton	Public Works	Easton Public Works facility	Washington Street, Easton
Municipal-Oxford	Parks and Recreation	Oxford - tennis courts	Oxford Road, Oxford
Municipal-Oxford	Dock	Oxford Dock	Strand Street, Oxford
Municipal-St. Michaels	Museum	Chesapeake Bay Maritime	213 North Talbot Street, St. Michaels
Utility	Electric	Easton Utilities Cable	405 Bay Street, Easton
Utility	Gas/Oil	Pep Up Inc./Russ Oil Company	956 Port Street, Easton

Utility	Gas/Oil	McMahan Oil Company	930 Port Street, Easton
Utility	Telephone	Verizon	Oxford Road, Oxford
Utility	Tower	Gateway Marina	Ocean Gateway
Utility	Tower	Tred Avon Yacht Club	102 W Strand Street, Oxford
Utility	Water Tower	Oxford Water Tower	400 Tilghman Street, Oxford

Source: 2017 Talbot County Critical & Public Facility Database and Effective DFIRM

10. FLOOD HAZARDS CONCLUSION

Through the identification and understanding of coastal risks, Talbot County has taken an important step to becoming more resilient. Communicating the hazard risk information compiled within this plan to residents, businesses, and institutional members of the community so that they fully understand is a crucial next step.

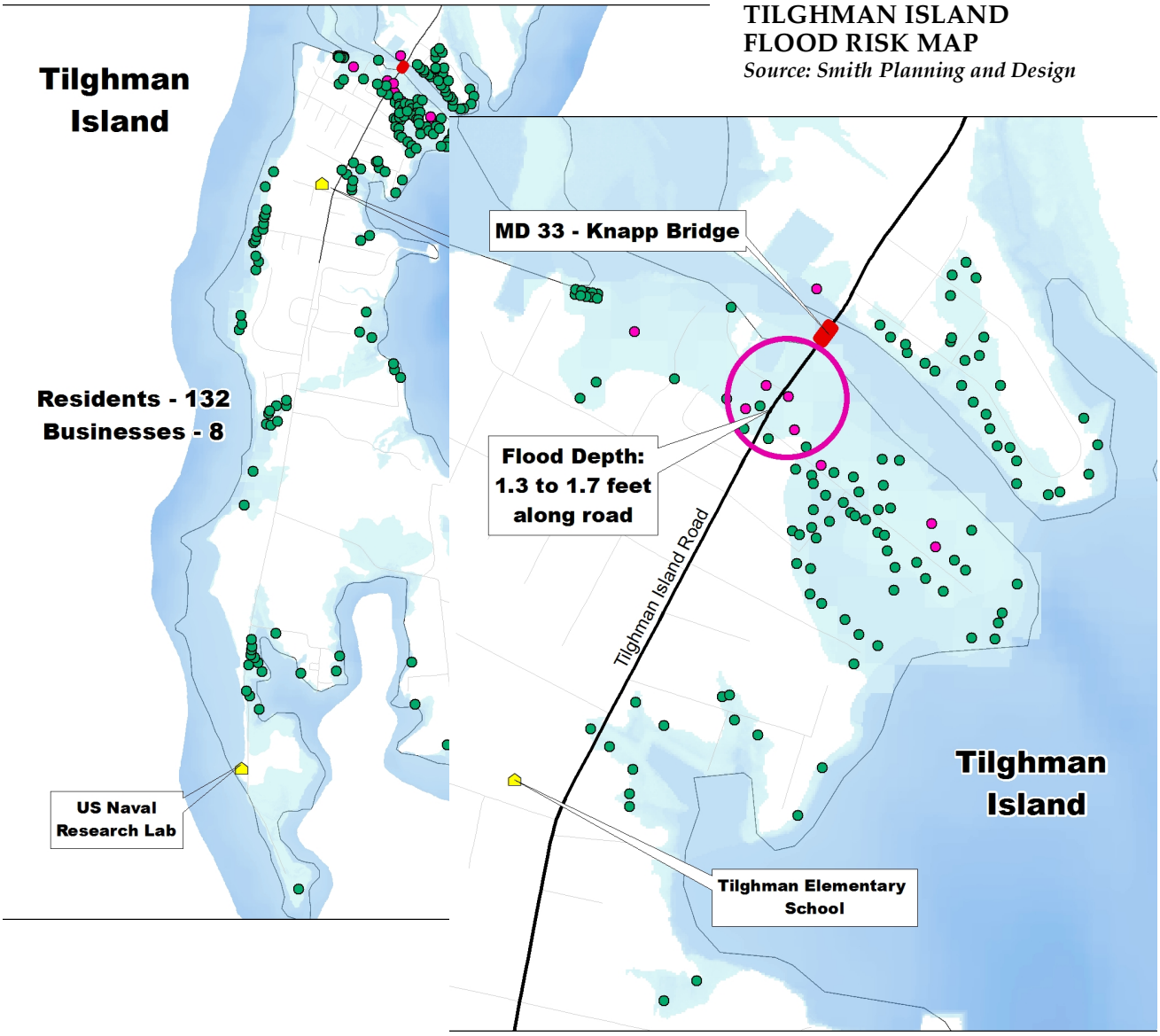
Using FEMA Flood Zones, high-risk areas include: Oxford, St. Michaels, Tilghman Island, and the areas of Royal Oak, Sherwood, Bozman, and Whitman.

In particular, Tilghman Island area is rated as a high hazard area and is located in Evacuation Zone 1.

- Evacuation Zone 1 includes 132 Residential Structures with a total estimated loss of $2,346,542, based upon property improvement value within Maryland PropertyView database.
- Evacuation Zone 1 includes 8 Commercial Structures with a total estimated loss of $248,559, based upon property improvement value within Maryland PropertyView database.

- There is a school within this area: Tilghman Island Elementary School and the US Naval Research Lab.

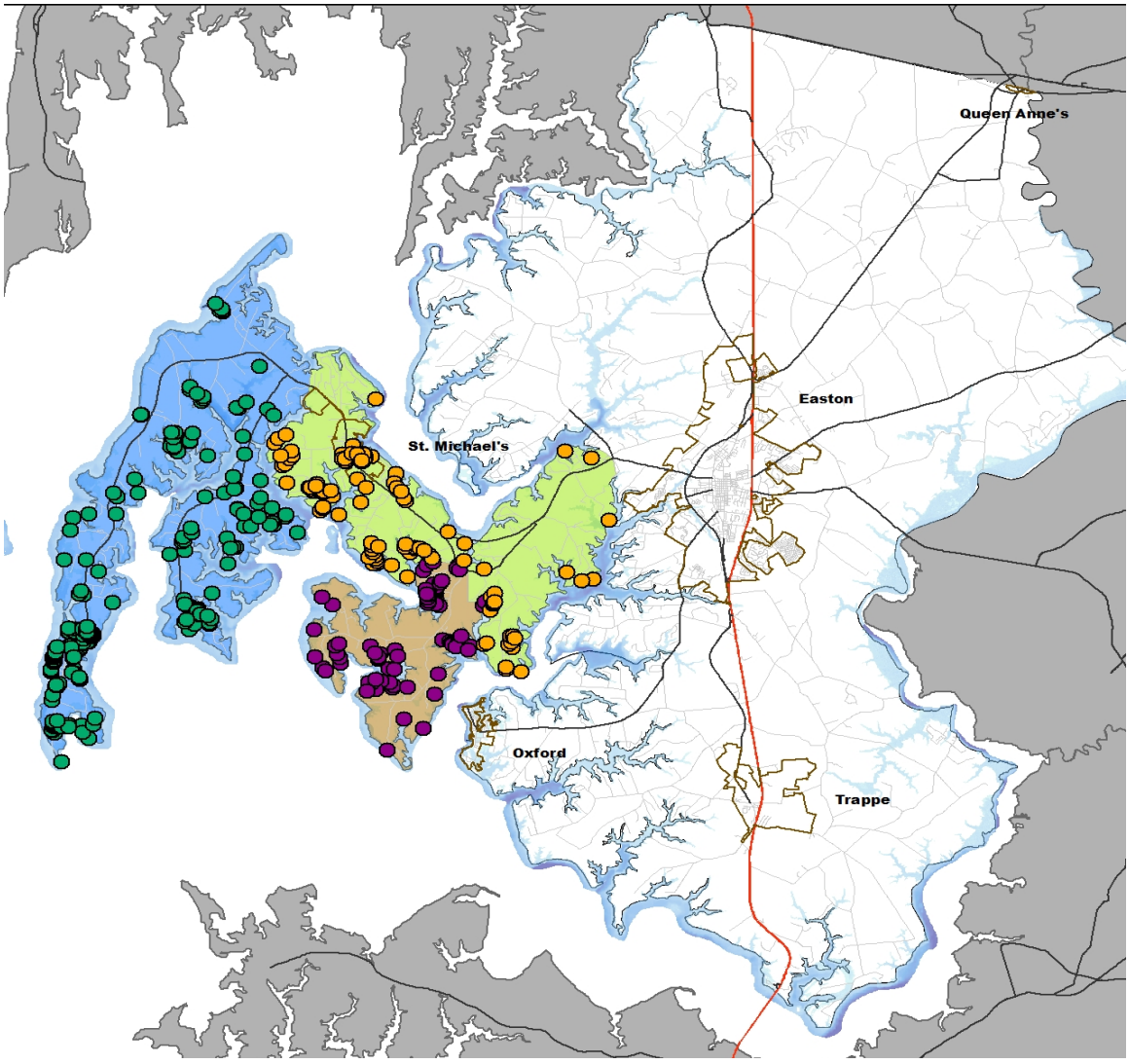
TILGHMAN ISLAND
FLOOD RISK MAP
Source: Smith Planning and Design



Conclusions from the five Talbot County Community Pillars have been summarized below.

a. Health, Safety and Welfare

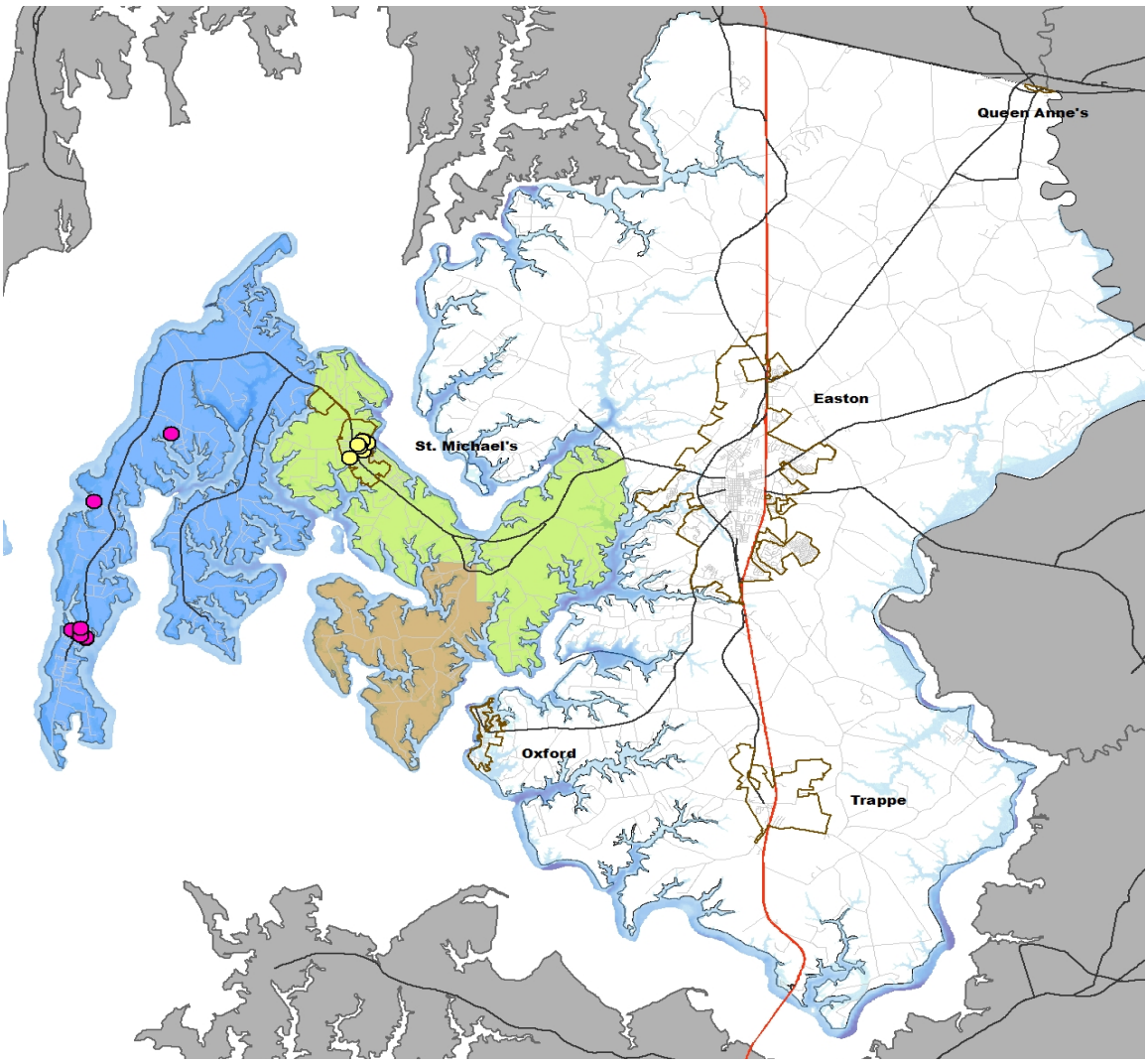
Evacuation Zone 1 contains 282 Residential Structures.
Evacuation Zone 2 Contains 73 Residential Structures.
Evacuation Zone 3 Contains 136 Residential Structures.



EVACUATION ZONES & FLOOD RISK MAP 1
Source: Smith Planning and Design

b. Economic Stability

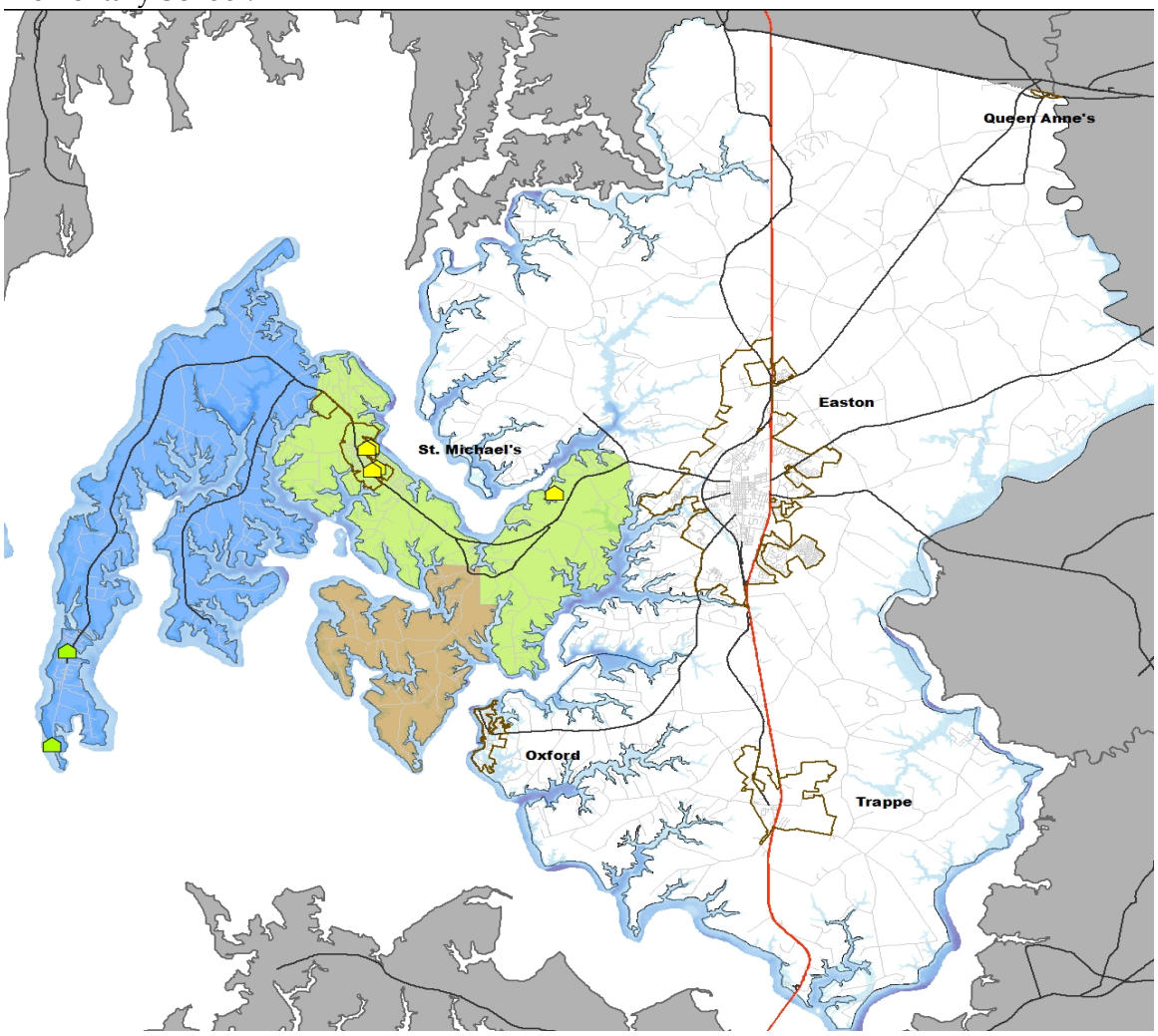
Evacuation Zone 1 contains 11 Commercial Structures.
Evacuation Zone 2 Contains 0 Commercial Structures.
Evacuation Zone 3 Contains 6 Commercial Structures.



EVACUATION ZONES & FLOOD RISK MAP 2
Source: Smith Planning and Design

c. Education

Evacuation Zone 1 contains the US Naval Research Lab and Tilghman Elementary School. Evacuation Zone 3 contains St. Michaels High School and St. Michaels Middle and Elementary School.

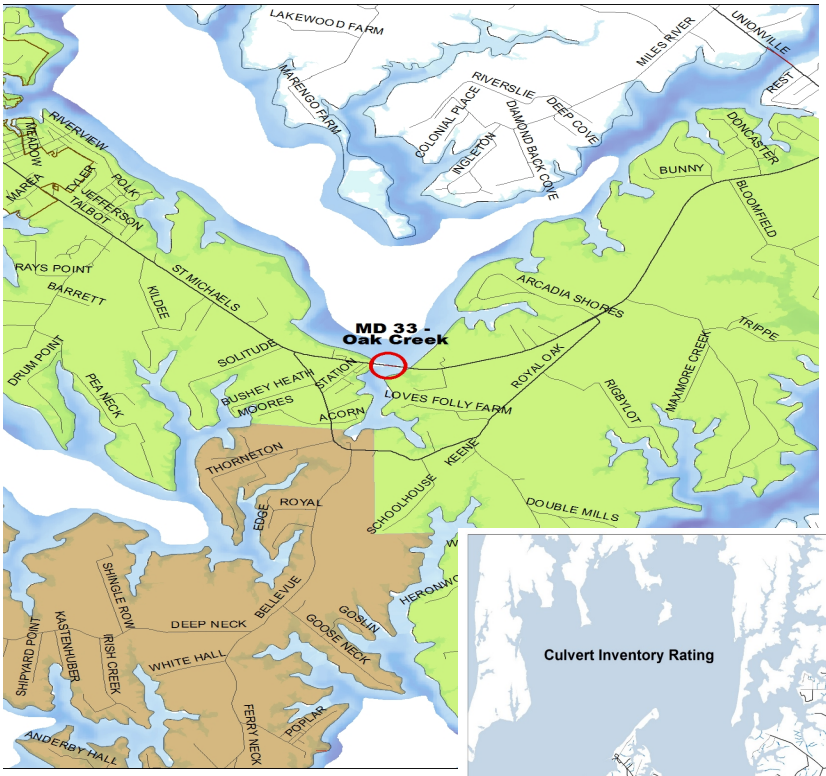


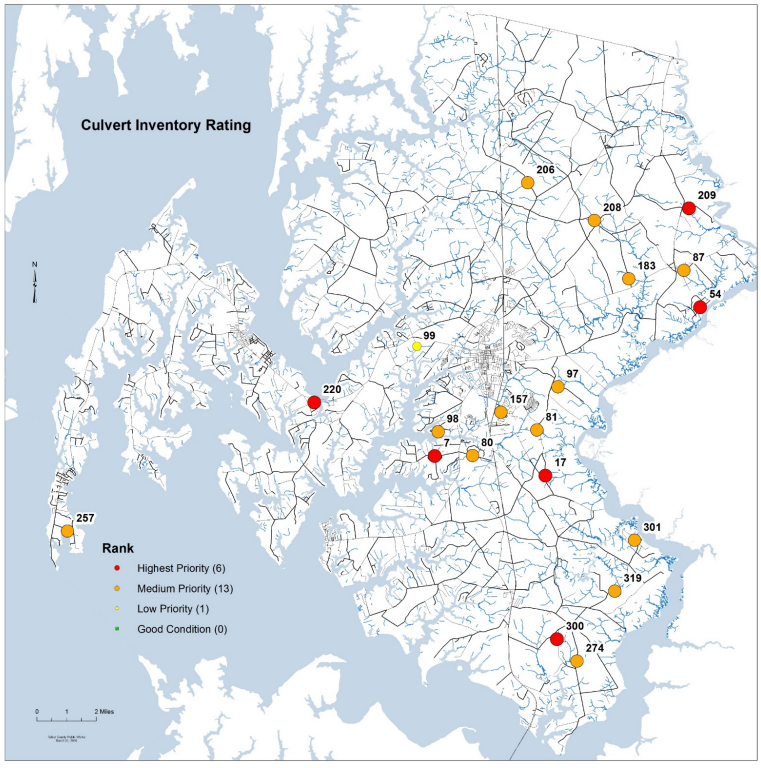
EVACUATION ZONES & FLOOD RISK MAP 3
Source: Smith Planning and Design

d. Infrastructure

Evacuation Zone 3 contains MD 33 Oak Creek Bridge, which has a flood depth of 9.1 feet according to Depth Grid Data.

The County Culvert Assessment indicates that there are 20 "High Priority" culverts in need of repair and/or replacement. Problems include:
Severe rust/corrosion of pipe, upper end is totally corroded and collapsed. Severe erosion of upper side embankment undercutting road. Embankment is very narrow. Lower side not as bad, invert rusted with holes, minor undercutting of headwall. Cannot see through to other side.

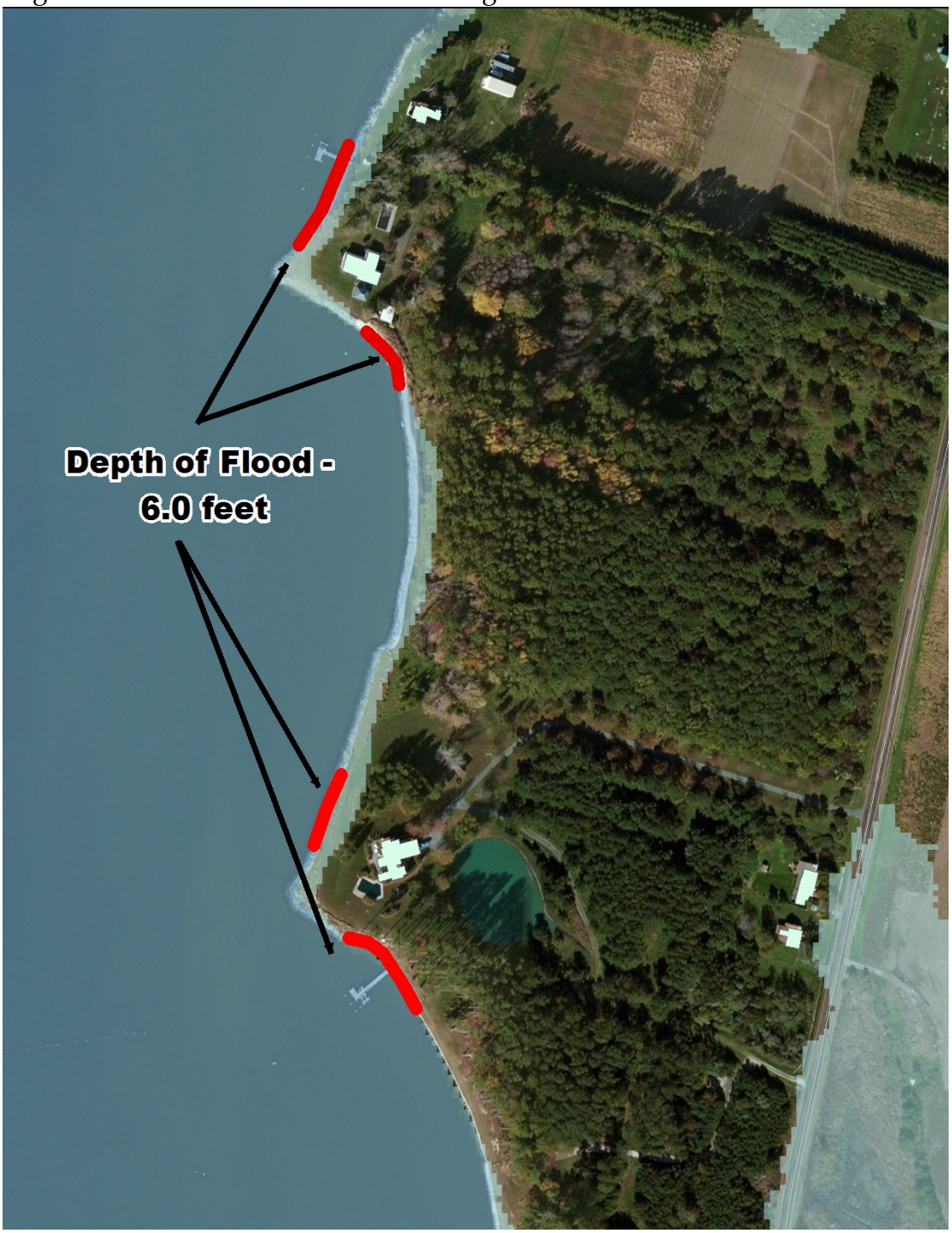




EVACUATION ZONES & FLOOD RISK MAP 4
Source: Smith Planning and Design

e. **Environmental**

High erosion rate areas are found on Tilghman Island.



Source: Smith Planning and Design

Chapter 6:

Winter Storm

CHAPTER 6: WINTER STORM

Winter weather can take many forms including snow, freezing rain, sleet and extreme cold. Some of the most significant winter storms that affect Maryland are known as "Nor'easters" because they are accompanied by strong northeast winds.

Heavy Snowstorm: Accumulations of four inches or more in a six-hour period; or six inches or more in a 12-hour period. The most common impacts are traffic accidents, interruptions in power supply and communications; and the failure of inadequately designed and/or maintained roofing systems.

Sleet Storm: Significant accumulations of solid pellets that form from the freezing of raindrops or partially melted snowflakes, resulting in slippery surfaces and posing hazards to pedestrians and motorists.

Ice Storm: Significant accumulations of rain or drizzle freezing on objects such as trees, power lines and roadways, causing slippery surfaces and damage from the sheer weight of ice accumulation.

Blizzard: Wind velocity of 35 miles per hour or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile, prevailing over an extended period of time.

Severe Blizzard: Wind velocity of 45 miles an hour or more, temperatures of 10 degrees or lower, a high density of blowing snow with visibility frequently measured in inches, prevailing over an extended period of time.

Dangerously cold temperatures in the teens and single digits pose a hazard risk and are often associated with winter weather. Some of the major threats include:

Wind Chill: a measure of what the temperature ***feels*** like when accounting for the wind speed. As the wind increases, more heat is removed from your body by the wind.

Frostbite: results from prolonged exposure to very cold air. The freezing of body tissue causes injury. Extremities such as fingers and toes are most susceptible to frostbite.

Hypothermia: similar to frostbite, this occurs when the body has been exposed to prolonged cold. The onset of hypothermia occurs when the body temperature drops below 95°F.

1. WINTER STORM IMPACTS

The Community Resilience Stakeholder Committee held a workshop on June 16, 2016. During the workshop, stakeholders were divided into five groups. These five groups represented each of the Talbot County Community Pillars. Participants were provided with hazard descriptions and blank hazard impacts worksheets. Each of the five groups were then asked to discuss hazard impacts from their community perspective

and associated Community Pillar perspective. Results were reviewed and finalized during the Community Resilience Stakeholder Committee workshop held on September 8, 2016. The following table provides impacts from flooding to Talbot County per Community Pillar.

Hazard Impact Table	
Winter Storm	
Health, Safety, and Welfare	– Impacts transportation & access, burst pipes, and environmental exposure. Long-term: – Community stability, shelter, and warming.
Economic Stability	– Power outages lead to business closures. – Road closures prohibit employee's ability to work. – Storms would limit tourism, impacting a major economic driver.
Education	TCPS and Chesapeake College: – Extreme cold → water in pipes freeze. – Closures – no people/no body heat – Heavy snow – skylights, roofs (auditoriums and gymnasiums). o Snow removal is custodial work on sidewalks. If roads are closed or hard to drive, school can't clear walkways resulting in closures. – Interruptions in service – can lead to lost educational/instructional time.
Infrastructure	– Roads and bridges – loss of use until snow/ice is removed. – Communication – ice and wind related O.H. Line Impacts. – Power - ice and wind related O.H. Line Impacts.
Environmental	– Danger to animals and livestock. Snow – Excessive use of de-icer chemicals and traction aids Freezing Rain/Sleet – Tree/vegetation damage from ice storms, stream blockages, and flooding Extreme Cold – Vegetation, habitat, and wildlife population loss – Oysters die off – Increased power usage…air pollution and climate change concerns Climate Change – Increased water content of storms

Source: Talbot County Community Resilience Stakeholder Committee

Snow and winter storms are not uncommon in Talbot County. Two notable severe winter storm events affected Talbot County February of 2010. The first event began on 5 February 2010 and ended with a second event beginning 9 February and ended on 11 February 2010. These events resulted in a total snowfall accumulation of 28 inches on

the ground. A state of emergency was declared on February 5th prompting the closure or roads and activation of the National Guard to assist paramedics. On 6 May 2010, President Obama issued a disaster declaration for the State of Maryland.

Winter Storm Jonas was the fourth most powerful snowstorm to hit the Northeast in at least 66 years, according to the National Oceanic and Atmospheric Administration. At least fifty people died in the storm, a quarter of a million customers lost power, and countless vehicular accidents were reported. While the State of Maryland was issued a Presidential Disaster Declaration, Talbot County was one of the five jurisdictions not included in the disaster declaration.

2. PROBABILITY OF FUTURE WINTER STORM HAZARD EVENTS

According to Climate Communication Science and Outreach at: https://www.climate communication.org, climate change is fueling an increase in the intensity and snowfall of winter storms. The atmosphere now holds more moisture, and that in turn drives heavier than normal precipitation, including heavier snowfall in the appropriate conditions. Planning for existing and potentially more extreme winter weather conditions makes good sense. Undertaking preparedness campaigns, as well as infrastructure and utilities upgrades and preparedness initiatives will strengthen Talbot County's resilience.

3. WINTER STORM RISK

Winter storm risk and vulnerability assessed for Talbot County included the following variables:

a. **Population Vulnerability**- Calculated as a percent of the total population in Maryland per jurisdiction.

b. **Injuries & Deaths**-As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

c. **Property & Crop Damage**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

d. **Geographic Extent**-Information obtained using average snowfall totals for each Maryland jurisdiction.

Coastal Hazard Risk Assessment Data Table						
Population Vulnerability	***Injuries & Deaths***		***Property & Crop Damage***		***Geographic Extent***	***Events***
.63	No	Yes 2 Deaths	$400K	0	1-Low	121 Total Annualized-5.26

Source: 2016 State of Maryland Hazard Mitigation Plan and NCEI Storm Event Database

Note: Reported information from the National Center for Environmental Information (NCEI)-Storm Event data for Winter Storm included the following NCEI categories: blizzard, heavy snow, ice storm, sleet/freezing rain, winter storm, winter weather, freezing fog, cold/wind chill, extreme cold/wind chill, and frost/freeze. The timeframes covered by the NCEI data used is from 1/9/1993 thru 12/31/2015.

e. **Events**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

Talbot County owns and maintains approximately 380 miles of public roads and 9 bridges. The Maryland State Highway Administration has about 130 miles of roads and 6 bridges in Talbot County. There are over 360 privately owned and maintained roads in Talbot County.

The entire general building stock inventory in Talbot County is exposed and vulnerable to the winter storm hazard. In general, structural impacts include damage to roofs and building frames, rather than building content. Current modeling tools are not available to estimate specific losses for this hazard.

The table below provides percent damages that could result from winter storm conditions on the County's total general building stock (structure only). The following represent conservative estimates for losses associated with severe winter storm events.

General Building Stock Exposure (Structures Only) and Estimates Losses from Winter Storm Hazard				
Census Tract	***Total (All Occupancies)***	***1% Damage Loss Estimates***	***5% Damage Loss Estimates***	***10% Damage Loss Estimates***
Talbot County (Unincorporated Areas)	**$3,204,976,000**	$32,049,760	$160,248,800	$320,497,600
Easton	**$2,707,213,000**	$27,072,130	$135,360,650	$270,721,300
St. Michaels	**$241,108,000**	$2,411,080	$12,055,400	$24,110,800
Trappe	**$123,103,000**	$1,231,030	$6,155,150	$12,310,300
Oxford	**$200,799,000**	$2,007,990	$10,039,950	$20,079,900
Queen Anne's	**$11,782,000**	$117,820	$589,100	$1,178,200

Source: HAZUS-MH 3.1- Valuation of general building stock
Note: RV Replacement Value

4. WINTER STORM CRITICAL AND PUBLIC FACILITIES VULNERABILITY

Vulnerability to the effects of winter storms on buildings depends on the age of the building (and the building code in effect or lack of building code at the time of construction), type of construction, and condition of the structure (how well it has been maintained).

Before acceptance of the International Building Code as a national code, multiple building codes were used throughout the United States. The Building Officials Code Administrators (BOCA) was used on the East Coast. Drifting loads were first incorporated into BOCA in 1975. Unbalanced roof snow loads were not introduced in UBC until 1988. Only relatively recently have drifting and sliding snow loads been

addressed in building codes. A building constructed 40 years ago may not have been designed for snow loads as they are understood today.

Snow: According to C.A. Gooch, "Heavy Snow Loads", the weight of 1 foot of fresh snow ranges from 3 pounds per square foot for light, dry snow to 21 pounds per square foot for wet, heavy snow.

Ice: One inch of ice weighs a little less than 5 pounds per square foot, and 1 foot of ice weighs approximately 57 pounds per square foot. Ice weighs significantly more than heavy, wet snow per inch depth.

The following excerpt has been included from Talbot County Building Code, Chapter 16 Structural Design.

*1608.1.2 Ground Snow Loads. The ground snow loads to be used in determining the **design snow loads** for roofs are given in Figure 1608.2 for the contiguous United States and all Talbot County ground snow load shall be based on the upper limit of 30 lb./sq. ft.*

The following critical and public facilities were built prior to 1965 and may be at a higher risk due to age of construction and lack of building codes in effect at the time of construction.

Critical & Public Facilities Constructed 1965 or Prior			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
County Owned	Museum	Historical Society of Talbot	29 S Washington Street, Easton
County Owned	Museum	Longwoods School	11308 Longwoods Road, Easton
County Owned	Office	Talbot County Courthouse	11 N Washington Street, Easton
County Owned	Office	Talbot County Government Building	142 N Harrison Street, Easton
County Owned	Office	Talbot County Government Offices	215 Bay Street, Easton
Education	Private School	Cummings Nancy Riding	27990 Oxford Road, Easton
Education	Public School	Chapel District Elementary	11430 Cordova Road, Cordova
Education	Public School	Easton Elementary	305 Glenwood Avenue, Easton
Education	Public School	Easton High	720 Mecklenburg Avenue, Easton
Education	Public School	Easton Middle	201 Peachblossom Road, Easton
Education	Public School	Tilghman Elementary	21374 Foster Avenue,

		School	Tilghman
Education	Public School	White Marsh Elementary School	4322 Lovers Lane, Trappe
Emergency	Fire Department	Easton VFD	315 Aurora Park Drive, Easton
Emergency	Fire Department	Oxford VFD	300 Oxford Road, Oxford
Emergency	Police Station	Maryland State Police	7053 Ocean Gateway, Easton
Emergency	Police Station	Oxford Police	101 Market Street, Oxford
Emergency	Police Station	Trappe Police	4011 Powell Avenue, Trappe
Emergency	Police Station	US Coast Guard	904 S Morris Street, Oxford
Medical	Hospital	Robert J. Patterson MD	800 S Talbot Street, St. Michaels
Medical	Nursing Home	The Pines Genesis Elder Care	610 Dutchmans Lane, Easton
Medical	Office	Adam Wienstien, MD	7969 Ocean Gateway, Easton
Medical	Office	Dental Choice	400 Dutchmans Lane, Easton
Medical	Office	Dr. Mehrizi Ali	719 Goldsborough Street, Easton
Medical	Office	Dr. Periz Detrich	140 S Washington Street, Easton
Medical	Office	Mid Shore Surgical Eye	8420 Ocean Gateway, Easton
Medical	Office	Periodontist	218 Bay Street, Easton
Medical	Senior Housing	The Dixon House Inc.	108 N Higgins Street, Easton
Medical	Special Needs	Deaf Independent Living	13 Wrightson Avenue, Easton
Medical	Special Needs	Deaf Independent Living	8784 Black Dog Alley, Easton
Miscellaneous	Marina	Mears Yacht Haven	500 E Strand Street, Oxford
Miscellaneous	Marina	Oxford Boatyard Yacht Sales	407 Strand Street, Oxford
Miscellaneous	Marina	Pier Street Marina	104 W Pier Street, Oxford
Miscellaneous	Marina	Severn Marine Services	Chicken Point Road, Tilghman
Miscellaneous	Storage Yard	Marina Mart	12214 Ocean Gateway, Easton
Municipal-	Housing Authority	Easton Residence	323 South Street, Easton

Easton			
Municipal-Easton	Office	Chesapeake Wildlife Heritage	Goldsboro Street, Easton
Municipal-Oxford	Community Center	Grace Community Church	Oxford Road, Oxford
Municipal-Oxford	Library	Oxford Library	Market Street, Oxford
Municipal-Oxford	Museum	Oxford Museum Inc.	Morris Street, Oxford
Municipal-St. Michaels	Museum	Chesapeake Bay Maritime	Maritime Museum Road, St. Michaels
Municipal-St. Michaels	Museum	J Intern	103 Fremont Street, St. Michaels
Municipal-St. Michaels	Museum	St. Mary's Square Museum	409 St Mary's Square, St. Michaels
Municipal-St. Michaels	Office	Town of St. Michaels	300 Mill Street, St. Michaels
Municipal-St. Michaels	Public Works	St. Michaels Town Shop	Glory Avenue, St. Michaels
Utility	Gas/Oil	Delmarva Oil Inc.	900 Port Street, Easton
Utility	Gas/Oil	McMahan Oil Company	930 Port Street, Easton
Utility	Gas/Oil	Meintzer Brothers Petroleum	400 S Aurora Street, Easton
Utility	Gas/Oil	Pep Up Inc./Russ Oil Co	956 Port Street, Easton
Utility	Gas/Oil	Sharp Energy Inc.	9387 Ocean Gateway, Easton
Utility	Gas/Oil	Suburban Propane	1080 N Washington Street, Easton
Utility	Gas/Oil	Tri Gas and Oil Company	407 Brookletts Avenue, Easton
Utility	Gas/Oil	Tri Gas and Oil Company	9253 Ocean Gateway, Easton
Utility	Gas/Oil	United Shoregas	929 S Talbot Street, St. Michaels
Utility	Tower	American Towers Inc.	30530 Matthewstown Road, Easton
Utility	Tower	Cellular One	11780 Longwoods Road, Easton
Utility	Tower	Cellular One	402 Brookletts Avenue, Easton
Utility	Tower	Dover Radion Page	2987 Ocean Gateway, Trappe

Utility	Tower	Falcon Cable Trappe Tower	29415 Tarbutton Mill Road, Trappe
Utility	Tower	Verizon	Landing Neck Road, Easton
Utility	Tower	WCEI Radio	306 Port Street, Easton
Utility	Tower	Wye Tree Experts Inc.	12721 Ocean Gateway, Cordova

Source: 2017 Talbot County Critical and Public Facility Database

In addition, severe winter storm activities pose a significant threat to unprotected or exposed lifeline systems. Generally, commercial power networks are very susceptible to interruption from lightning strikes, high winds, ice conditions, and hail.

5. SNOW EMERGENCY PLAN

Talbot County implements the countywide snow emergency plan during hazardous winter weather incidents. If a snow emergency is declared, the law requires certain precautions including:

- Prohibited parking on roads and streets designated as snow emergency routes; and,
- The use of snow tires and/or chains.

These requirements are in effect until the snow emergency is lifted.

6. WINTER STORM CONCLUSION

Conclusions from the five Talbot County Community Pillars have been summarized below.

a. Health, Safety, and Welfare

Exploring potential preparedness measures and seasonal hazard specific public outreach campaigns are useful endeavors in improving community resilience. Winter weather conditions can quickly become dangerous due to winter storms and extreme cold. Driving in winter conditions proves challenging due to reduced tire traction on roads from snow and ice and poor visibility from blowing snow. Outreach that includes driving safety tips may prove helpful. An example has been provided below:

Slow down – Fog, black ice, slush or snow-covered roads can make driving dangerous. Drive slowly and leave plenty of distance between vehicles.

Get winter tires – Traction is the key to good movement, turning and stopping on wet, slushy or icy surfaces. Check tires and tire pressure at least once a month when tires are cold and remember that tire air pressure decreases in colder weather. Winter tires provide additional traction in colder weather.

Top-up windshield fluid - Fill up on winter washer fluid and replace wiper blades that streak. Make sure there is enough windshield washer fluid in the reservoir and that it is rated in the -40C temperature range. Carry an extra jug in the vehicle.

Keep the gas tank topped up - When driving in bad weather, think caution, plan ahead and make sure you have enough fuel. Keep the fuel tank at least half full.

See and be seen - clear all snow from the hood, roof, windows and lights. Clear all windows of fog or ice. If visibility becomes poor, find a place to safely pull off the road as soon as possible.

Get an emergency car kit – Have the appropriate safety and emergency winter equipment always stored in your car. The basic emergency kit for cars should include the following items:

- Food – that won't spoil, such as energy bars
- Water – in plastic bottles so they won't break if frozen (change every six months)
- Blanket
- Extra clothing and shoes
- First aid kit – with seatbelt cutter
- Small shovel, scraper and snowbrush
- Candle in a deep can and matches
- Crank flashlight
- Whistle – in case you need to attract attention
- Roadmaps
- Copy of your emergency plan

Also keep these inside your trunk:

- Sand, salt or cat litter (non clumping)
- Antifreeze/windshield washer fluid
- Tow rope
- Jumper cables
- Fire extinguisher
- Warning light or road flares

Additional outreach efforts include public notification and warning. Efforts to make the public aware of available information and tools that may assist them in planning and storm preparation should be maximized. The Maryland Transportation Department offers information and tools for citizens on-line.

The Maryland Transportation Authority issues both traffic advisories and emergency alerts. Severe weather information is available and may be accessed using live traffic cameras. The Maryland Department of Transportation (MDOT) offers live traffic camera feed via their website. There are 37 traffic cameras stationed within the Eastern Shore Region of Maryland. Finally weather station information is also available through the MDOT website. Air temperature, precipitation type, wind speed, wind gust, wind direction, and pavement temperature are available in real-time

CHART stands for **Coordinated Highways Action Response Team**. The CHART program is Maryland's entry into the Intelligent Transportation System (ITS) arena. This program started in the mid-1980s as the "Reach the Beach" initiative, focused on improving travel to and from Maryland's eastern shore.

The program is directed by the CHART Board, which consists of senior technical and operational personnel. This comprehensive and advanced traffic management system is enhanced by a newly constructed state-of-the-art command and control center called the Statewide Operations Center (SOC).

from the website. The weather station located at Route 50 and Route 301 is especially informative for Talbot County.

b. Economic Stability

According to FEMA, most buildings are not at risk of snow-induced failure. More often than not, attempting to remove snow from a roof is more hazardous than beneficial, posing a risk to both personnel and the roofing structure. However, snow accumulation in excess of building design conditions can result in more than a temporary loss of electrical power and inaccessible roads. Buildings may be vulnerable to structural failure and possible collapse if basic preventative steps are not taken in advance of a snow event.

Structural failure due to roof snow loads may be linked to several possible causes, including but not limited to the following:

- Actual snow load significantly exceeds design snow load;
- Drifting and sliding snow conditions;
- Deficient workmanship;
- Insufficient operation and maintenance;
- Improper design;
- Inadequate drainage design; and,
- Insufficient design; in older buildings, insufficient design is often related to inadequate snow load design criteria in the building code in effect when the building was designed.

Business should access their facility(s) construction and maintenance to mitigate winter storm related issues and improve resilience. Business disruption may be avoided through mitigation and resilience planning and action implementation.

c. Education

Interruptions in services and an impaired transportation network can lead to lost educational instructional time. In addition, educational facilities built prior to modern building codes may be at a higher risk to winter storms, especially those that do not meet the design snow loads within the Talbot County Building Code. There are seven schools that were built in or prior to 1965.

Education Facilities Constructed 1965 or Prior			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Education	Private School	**Cummings Nancy Riding**	27990 Oxford Road, Easton
Education	Public School	**Chapel District Elementary**	11430 Cordova Road, Cordova
Education	Public School	**Easton Elementary**	305 Glenwood Avenue, Easton
Education	Public School	**Easton High**	720 Mecklenburg Avenue, Easton
Education	Public School	**Easton Middle**	201 Peachblossom Road, Easton

Education	Public School	**Tilghman Elementary School**	21374 Foster Avenue, Tilghman
Education	Public School	**White Marsh Elementary School**	4322 Lovers Lane, Trappe

Source: 2017 Talbot County Critical and Public Facility Database

Facilities with flat roofs may be considered vulnerable, as well. Low slope roofs retain snow more so than pitched roofs. However, roof pitches as low as 10 degrees have been observed to shed snow.

d. Infrastructure

In addition to problems associated with transportation, utilities, such as communication towers are also at risk to winter storm events. Communication towers and/or shelter-accessory structures at tower sites built in or prior to 1965 include:

Communication Towers Constructed 1965 or Prior			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Utility	Tower	**American Towers Inc.**	30530 Matthewstown Road, Easton
Utility	Tower	**Cellular One**	11780 Longwoods Road, Easton
Utility	Tower	**Cellular One**	402 Brookletts Avenue, Easton
Utility	Tower	**Dover Radion Page**	2987 Ocean Gateway, Trappe
Utility	Tower	**Falcon Cable Trappe Tower**	29415 Tarbutton Mill Road, Trappe
Utility	Tower	**Verizon**	Landing Neck Road, Easton
Utility	Tower	**WCEI Radio**	306 Port Street, Easton
Utility	Tower	**Wye Tree Experts Inc.**	12721 Ocean Gateway, Cordova

Source: 2017 Talbot County Critical and Public Facility Database

e. Environmental

Blizzards not only pose a danger to the health of people, blizzards also threaten the environment, including the health of local plants and animals.

Temperatures quickly drop below zero during a blizzard, especially with the wind chill. Ice and winds cause trees to fall and plants to die. The Environmental Protection Agency says that such storms have the potential to cause significant damage to entire forests, which then release carbon during decay. The excess carbon causes an imbalance in the local ecosystem, which impacts other plants and wildlife. When other plants and flora are killed during a blizzard, their lack of availability also impacts the food supply for local animals and wildlife.

For instance, the oyster population within the Chesapeake Bay is less than 1% of what it once was in Maryland. Oyster protection is especially important owing to the radically diminished population. Water temperature affects oyster viability. Temperature: optimum for larvae is 68-90.5o F (20-32.5oC), for adults 68-86oF (20-30oC); adults can tolerate 35.6-96.8oF (2-36oC) and up to 120.2oF (49oC) for short periods. Larvae can grow in water as cold as 63.5oF (17.5oC).

In addition, whether blizzards result in flooding or not, they blanket the land with heavy precipitation that is drawn up into the atmosphere as a result of evaporation. In each case, whether it is the snow from the blizzard or the water from the resulting flood, blizzards can contribute to heavy accumulation of water vapor in the atmosphere. That can lead to greater rainfall throughout the rest of the year (on a continental scale), including heavy storms. Those storms can raise water levels and impact plant and animal populations, depending on their severity.

Chapter 7:

Tornado

CHAPTER 7: TORNADO

Tornado- A tornado is a violently rotating funnel-shaped column of air that extends from a thunderstorm cloud toward the ground. Tornadoes can touch the ground with winds of over 300 mph. While relatively short-lived, tornadoes are intensely focused and are one of natures most violent storms.

According to the National Severe Storms Laboratory, whenever and wherever conditions are right, tornadoes are possible. In the U.S. they are most common in the central plains of North America, east of the Rocky Mountains and west of the Appalachian Mountains. They occur mostly during the spring and summer; the tornado season comes early in the south and later in the north because spring comes later in the year as one moves northward. They usually occur during the late afternoon and early evening. However, they have been known to occur in every state in the United States, on any day of the year, and at any hour. Approximately 1,200 tornado events occur within the United States each year.

Source: National Weather Service-Posted 12:59 PM July 28, 2016

1. TORNADO IMPACTS

The Community Resilience Stakeholder Committee held a workshop on June 16, 2016. During the workshop, stakeholders were divided into five groups. These five groups represented each of the Talbot County Community Pillars. Participants were provided with hazard descriptions and black hazard impacts worksheets. Each of the five groups were then asked to discuss hazard impacts from their community perspective and associated Community Pillar perspective. Results were reviewed and finalized during the Community Resilience Stakeholder Committee workshop held on September 8, 2016. The following table provides impacts from Tornado events to Talbot County per Community Pillar.

Hazard Impact Table	
Tornado	
Health, Safety, and Welfare	– Injury – Access to emergency care. – Infrastructure damage. – Public safety radio knocked out. – Boats, especially Waterman community affected.
Economic Stability	– Property damage – Infrastructure damage could negatively impact ability to do business. – Extensive damage to specific town centers. St. Michaels and Easton could adversely impact the overall business environments with a single storm. – Major employers and manufacturers who require raw material inputs and energy to produce product would be impacted. Also, businesses with chemicals.
Education	– Unavoidable risk. Can't be forecasted accurately. – Building damage/property damage. – Data loss. – Risk of injury/death. – Hazmat/environmental release of stored materials. – Loss of electricity. – Broken gas lines. Transportation: – Even if school unaffected, roads affected can mean students remain on campus – highest risk = remove schools like Tilghman
Infrastructure	– Communication – wind related O.H. line impacts. – Power - wind related O.H. line impacts.
Environmental	– Fuel spills from above ground tanks. – Wastewater treatment plant → contamination to surrounding areas if facility is damaged. – Debris fields/marine debris →hazards to divers and boaters. – Damage to water quality BMP's. – Coastal habitat loss/damage.

Source: Talbot County Community Resilience Stakeholder Committee

2. PROBABILITY OF FUTURE TORNADO EVENTS

Seasonal patterns are relevant to tornadoes. Thunderstorms form when warm, moist air collides with cooler, drier air. Since these masses tend to come together during the transition from summer to winter, most thunderstorms and resulting **tornadoes** occur during the spring (April through June) and fall (October through December). Warning time for tornadoes is minimal and ranges from no warning time to 30 minutes.

Notable tornados that occurred with the State of Maryland include:

JUN 28, 1879 4:45 pm 0 dead 20 injured
About fifty buildings were unroofed in downtown Baltimore.
AUG 21, 1888 2:45 pm 0 dead 15 injured
A "grand spectacle" of four waterspouts near Jacobson overturned boats and moved ashore.
AUG 21, 1888 3:30 pm 11 dead 40 injured
A tornado moved east-northeast near Still Pond, Kent County, killing 10 people in a cannery.
NOV 9, 1926 2:35 pm 17 dead 65 injured
Most of the deaths (14) occurred at a small school outside La Plata, Charles County.
NOV 17, 1927 2:20 pm 0 dead 15 injured
After hitting Alexandria and D.C., the funnel tore apart a dozen homes in Hyattsville.
JLY 22, 1928 5:30 pm 1 dead 1 injured
A cottage was destroyed along the Potomac River in Charles County.
MAY 2, 1929 7:30 pm 2 dead 8 injured
A couple was killed as their farmhouse was destroyed west of Frederick.
MAY 2, 1929 9:30 pm 4 dead 4 injured
A home was destroyed, killing three people near Laytonsville, in Montgomery County.
AUG 19, 1939 0:15 AM 1 dead 20 injured
A hurricane-generated tornado crossed the 10-mile-wide mouth of the Potomac River estuary.
JUN 23, 1944 6:11 pm 3 dead 25 injured
Deadly tornado that crossed Pennsylvania hit Oakland, Garrett County; seven homes were destroyed.
JUN 23, 1944 11:15 pm 2 dead 33 injured
Thirteen homes were destroyed at Cambridge, Dorchester County.
MAY 19, 1967 8:15 pm 1 dead 0 injured
East of Loch Lynn Heights, Garrett County, a small frame house was picked up and thrown 100 yards.
JUN 29, 1980 3:30 pm 0 dead 11 injured
A trailer park near the Aberdeen Reservation was ripped apart.
MAY 8, 1984 5:05 pm 1 dead 6 injured
A tornado destroyed a large chicken house near Hurlock, Dorchester County. One worker was killed.
OCT 18, 1990 3:30 pm 0 dead 59 injured
One of three Maryland tornadoes hit Reisterstown, Baltimore County; 50 homes were torn apart.

The following table indicates that five tornado events have occurred from 1967-2017. On average number 0.10 tornado events occur per year. Data presented below was obtained through the National Centers for Environmental Information-Storm Events Database.

Tornado Storm Event Narrative		
Date	**Event Narrative**	**Property Damage**
July 28, 1967	**Tornado touched down on a farm, destroying one farm building and damaging two others, then moved on a line SSW to NNE to Bozman and inflicted damage along this narrow path. No one saw a funnel as it struck so quickly. Hail to the size of ice cubes was also reported. Many trees were twisted and broken off.**	25K
May 6, 1975	**F1 Tornado. No write up available**	25K
June 27, 1978	**Small tornado, moving SW to NE, was sighted between Bozman and Neavitt. It first struck a boathouse where it picked up the roof, turned it on a 35 degree angle and also tore out the front. It then cleared a house and touched down again 200 yards away where it ripped a porch from a horse barn and shredded a tree into "toothpicks".**	25K
May 18, 1995	**A strong (F2) tornado touched down along the eastern shore of Chesapeake Bay just south of Cordova in the Kittys Corner area at 1430 EST. The tornado destroyed two homes and damaged about ten other structures, mostly in the Cordova area. In the Cordova area the tornado destroyed two chicken houses at the Dunmore Heath Farms and killed about 40,000 birds. The tornado blew a house 30 feet from its foundation. A two-story barn was twisted and destroyed. The roof of another barn was carried one mile and landed near the Fairview Church of the Brethren. The tornado tossed a car 30 feet and twisted trees and telephone poles along Chapel Road.** **The tornado proceeded through an unpopulated area of eastern Talbot and Southwest Caroline County. It crossed into Caroline County about four miles south of Hillsboro along the Tuckahoe Creek. The tornado lifted in Martinak State Park, just south of Denton. Before lifting, it snapped and twisted more than 100 trees in the park. Several persons within the park avoided injury by clinging to trees or hiding in phone booths. About 1,800 homes lost power in the two counties. No serious injuries were reported.**	0
July 15, 2000	**A thunderstorm produced several funnel clouds over Chesapeake Bay and its tributaries around Talbot County. Two of the funnels became waterspouts on the Miles River near Newcomb and Oak Creek. The waterspouts were captured on video. One briefly came inland as a weak (F0) tornado. The tornado carried a swing chair and wrapped it around one tree, tossed a rowboat, knocked down an outhouse and knocked down a couple of trees. No serious injuries were reported. The same parent thunderstorm dropped hail as large as quarters from Royal Oak to Easton and caused wind damage to one store in the Easton Plaza. Heavy rain fell again on Saint Michaels and caused roadway flooding and flooded one basement.**	1K

Source: National Centers for Environmental Information-Storm Event Database

In addition to tornado events listed within the NCEI Storm Event Database, three Funnel Cloud Events from 1950-2017 were included.

Funnel Cloud Event Narrative		
Date	**Event Narrative**	**Property Damage**
April 28, 2002	**The strength of the LaPlata (Charles County) Tornado was evident across Easton and Talbot County. The same tornadic thunderstorm passed across Dorchester County. The outflow from the thunderstorm and tornado dropped cancelled checks, assessment documents, bank documents, tax documents and teller receipts from LaPlata across Federalsburg (Caroline County), Oxford (Talbot County) and Easton (Talbot County). Federalsburg is 66 miles east of LaPlata.**	0
May 18, 2011	**The deep counterclockwise circulation around a low pressure system that extended well upward into the atmosphere over the southern Appalachians helped cause a funnel cloud to form in Talbot County. A funnel cloud was spotted over Island Creek south of Oxford. It did not touch down and no damage was reported.**	0
July 28, 2016	**A cold frontal boundary moved southward into the region. This led to the development of afternoon showers and thunderstorms. Some of thunderstorms became severe with locally heavy rainfall as well. A funnel cloud was observed at the Easton Airport. A funnel cloud was observed at 9148 Centreville road. A photo of a funnel cloud was taken by a COOP observer.**	0

Source: National Centers for Environmental Information-Storm Event Database

Finally, one Water Spout event was included within the NCEI Storm Event Database for Talbot County.

Water Spout Event Narrative		
Date	**Event Narrative**	**Property Damage**
July 15, 2000	**A thunderstorm produced several funnel clouds over Chesapeake Bay and its tributaries around Talbot County. Two of the funnels became waterspouts on the Miles River near Newcomb and Oak Creek. The waterspouts were captured on video. One briefly came inland as a weak (F0) tornado. The tornado carried a swing chair and wrapped it around one tree, tossed a rowboat, knocked down an outhouse and knocked down a couple of trees. No serious injuries were reported. The same parent thunderstorm dropped hail as large as quarters from Royal Oak to Easton and caused wind damage to one store in the Easton Plaza. Heavy rain fell again on Saint Michaels and caused roadway flooding and flooded one basement.**	0

Source: National Centers for Environmental Information-Storm Event Database

Climate change may exacerbate storm surges, higher sea levels, and more intense storms. Talbot County acknowledges the likelihood of the increasing risks and vulnerability from natural hazards. Through the development and implementation of the *2017 Talbot County Hazard Mitigation and Community Resilience Plan*, planning consideration for both today and tomorrow are evidenced.

3. TORNADO RISK

Tornado risk and vulnerability assessed for Talbot County included the following variables:

a. **Population Vulnerability**- Calculated as a percent of the total population in Maryland per jurisdiction.

b. **Injuries & Deaths**-As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

c. **Property & Crop Damage**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

d. **Geographic Extent**-Information obtained using intensity and frequency of tornado events using a ranking of low to high per Maryland jurisdiction.

e. **Events**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

Note: Reported information from the National Center for Environmental Information (NCEI)-Storm Event data for tornado included the following NCEI categories: funnel cloud, tornado, and waterspout. The timeframes covered by the NCEI data used is from 8/11/1950 thru 12/31/2015.

Coastal Hazard Risk Assessment Data Table						
Population Vulnerability	***Injuries & Deaths***		***Property & Crop Damage***		***Geographic Extent***	***Events***
.63	No	No	$76K	0	Low	9 Total Annualized-.14

Source: 2016 State of Maryland Hazard Mitigation Plan

Tornadoes in Talbot County during the past fifty years have been classified as low intensity and have caused minimal damage. In fact since 1967, only five tornado events have occurred totaling less than $76,000 in damages according to NCEI Storm Events Database.

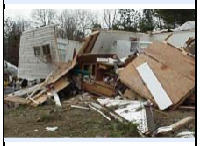
Tornadoes often cross jurisdictional boundaries, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted.

A tornado is given a Fujita rating of 0-5, based on the most intense damage along its path. Wind velocities necessary to produce center damage are often associated with the Fujita category, but that practice is often misleading.

The Fujita wind estimates are based upon the expected damage to a well-built residential structure. Poorly built structures can suffer significant structural damage under lesser winds than the Fujita Scale might suggest. Commercial properties may or may not experience the same failures under high wind speeds as a residence. Thus, the Fujita scale is largely a residential scale, with much more care required in assessment after wind damage to a commercial structure. A wider range of construction techniques

and materials can be found in a building section classified as commercial. For example, a concrete/steel reinforced building is much more durable than a typical community convenience store, yet both may be considered commercial in city land use/appraisal data sets.

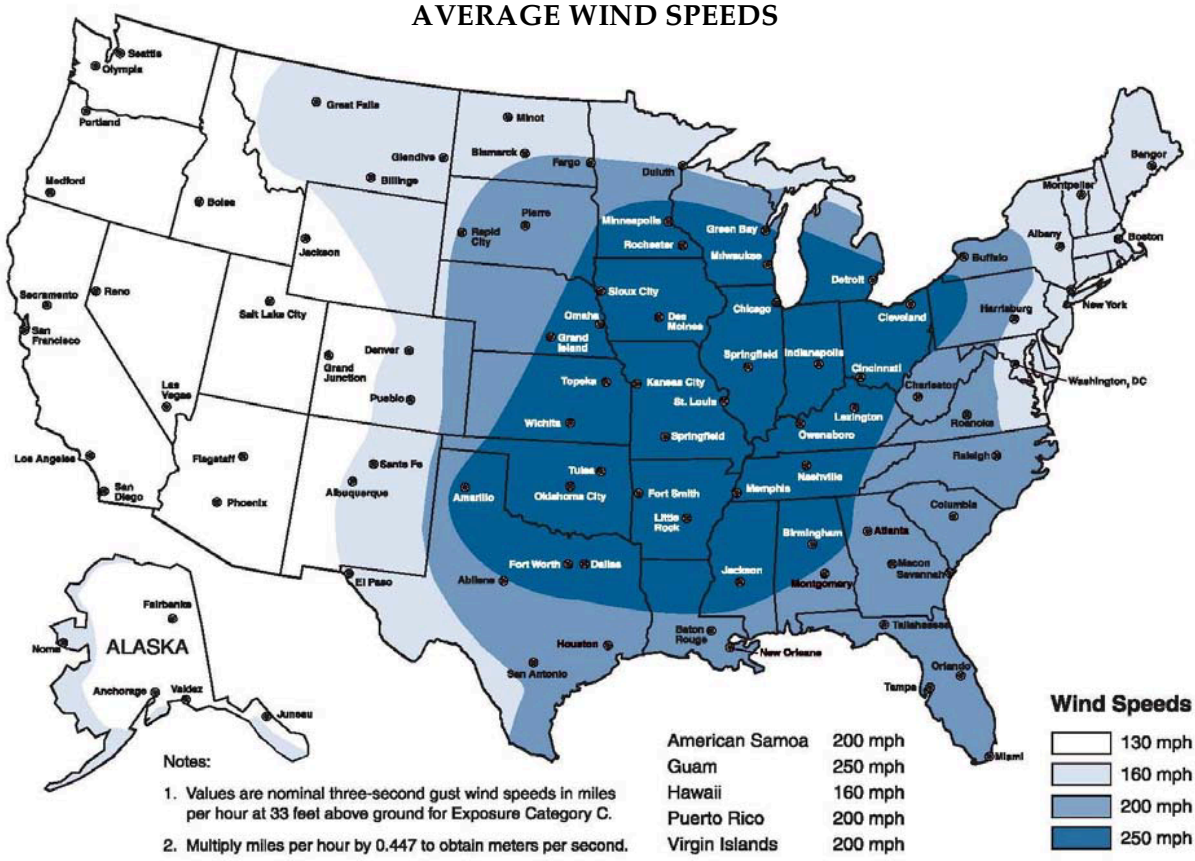
Since February 2007, the Fujita scale has been replaced by the **Enhanced Fujita scale**, which retains the same basic design as its predecessor with six strength categories. The newer scale reflects more refined assessments of tornado damage surveys, standardization, and damage consideration to a wider range of structures.

Enhanced Fujita Scale				
Storm Category	**Damage Level**	**3 Second Gust (Mph)**	**Description Of Damages**	**Photo Example**
EF0	Gale	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.	
EF1	Weak	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages might be destroyed.	
EF2	Strong	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.	
EF3	Severe	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.	
EF4	Devastating	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	
EF5	Incredible	200+	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.	

Source: http://www.tornadoproject.com/fscale/fscale.htm

The average wind speeds for the State of Maryland indicate that average wind speed is 160 mph for most of the State, including Talbot County.

AVERAGE WIND SPEEDS



Source: Federal Emergency Management Agency (FEMA). Design and Construction Guidance for Safe Rooms, FEMA 361, 2008.

Manufactured homes are especially at-risk and vulnerable to tornado damage. Proper stabilization measures must be in-place to mitigate tornado impacts. Hyde Park is a large manufactured homes park in Talbot County. Tie-down enforcement for all new and retrofits of existing manufactured homes should be employed as a tornado mitigation measure. Specific language for mobile homes are found within Chapter 190: Zoning, Subdivision, and Land Development Article V: Development Standards. Talbot County code states that "mobile home units shall be placed on a permanent foundation, securely anchored and provided with skirting of a suitable material. In addition, every manufactured home, together with all enclosed extensions or structural additions shall be installed upon an approved tie-down system and shall be securely anchored thereto so as to prevent the home from shifting or overturning. The undercarriage of every manufactured home shall be suitably hidden by some form of opaque skirting."

4. TORNADO VULNERABILITY & LOSS ESTIMATIONS

There are no standard loss estimations models or tables for tornadoes currently, thereby making it very difficult to calculate actual losses.

The entire general building stock inventory in Talbot County is exposed and vulnerable to the tornado hazard. In general, structural impacts include damage to roofs and building frames, rather than building content. Current modeling tools are not available to estimate specific losses for this hazard.

The table below provides percent damages that could result from tornado incidents on the County's total general building stock (structure only). The following represent conservative estimates for losses associated with severe winter storm events.

General Building Stock Exposure (Structures Only) and Estimates Losses from High Wind Hazard				
Census Tract	***Total (All Occupancies)***	***1% Damage Loss Estimates***	***5% Damage Loss Estimates***	***10% Damage Loss Estimates***
Talbot County (Unincorporated Areas)	**$3,204,976,000**	$32,049,760	$160,248,800	$320,497,600
Easton	**$2,707,213,000**	$27,072,130	$135,360,650	$270,721,300
St. Michaels	**$241,108,000**	$2,411,080	$12,055,400	$24,110,800
Trappe	**$123,103,000**	$1,231,030	$6,155,150	$12,310,300
Oxford	**$200,799,000**	$2,007,990	$10,039,950	$20,079,900
Queen Anne's	**$11,782,000**	$117,820	$589,100	$1,178,200

Source: HAZUS-MH 3.1- Valuation of general building stock
Note: RV Replacement Value

5. TORNADO CRITICAL AND PUBLIC FACILITIES VULNERABILITY

Vulnerability to the effects of tornado events on buildings depends on the age of the building (and the building code in effect or lack of building code at the time of construction), type of construction, and condition of the structure (how well it has been maintained).

The following excerpt has been included from Talbot County Building Code, Chapter 16 Structural Design.

1609.3 Basic Wind Speed. The basic wind speed, in miles per hour, for the determination of the wind loads are given in Figure 1609 or by ASCE 7 Figure 6-1 when using the provisions of ASCE 7. Basic wind speeds determined by the local jurisdiction shall be in accordance with Section 6.5.4 of the ASCE 7 with the default basic wind speed being the upper limit of 100 mph as shown in figure 1609.

The following critical and public facilities were built prior to 1965 and may be at a higher risk due to age of construction and lack of building codes in effect at the time of construction.

Critical & Public Facilities Constructed 1965 or Prior			
Facility Type	Facility Detail	Facility Name	Address
County Owned	Museum	Historical Society of Talbot	29 S Washington Street, Easton
County Owned	Museum	Longwoods School	11308 Longwoods Road, Easton
County Owned	Office	Talbot County Courthouse	11 N Washington Street, Easton
County Owned	Office	Talbot County Government Building	142 N Harrison Street, Easton
County Owned	Office	Talbot County Government Offices	215 Bay Street, Easton
Education	Public School	Chapel District Elementary	11430 Cordova Road, Cordova
Education	Public School	Easton Elementary	305 Glenwood Avenue, Easton
Education	Public School	Easton High	720 Mecklenburg Avenue, Easton
Education	Public School	Easton Middle	201 Peachblossom Road, Easton
Education	Public School	Tilghman Elementary School	21374 Foster Avenue, Tilghman
Education	Public School	White Marsh Elementary School	4322 Lovers Lane, Trappe
Emergency	Fire Department	Easton VFD	315 Aurora Park Drive, Easton
Emergency	Fire Department	Oxford VFD	300 Oxford Road, Oxford
Emergency	Police Station	Maryland State Police	7053 Ocean Gateway, Easton
Emergency	Police Station	Oxford Police	101 Market Street, Oxford
Emergency	Police Station	Trappe Police	4011 Powell Avenue, Trappe
Emergency	Police Station	US Coast Guard	904 S Morris Street, Oxford
Medical	Office	Robert J. Patterson MD	800 S Talbot Street, St. Michaels
Medical	Nursing Home	The Pines Genesis Elder Care	610 Dutchmans Lane, Easton
Medical	Office	Adam Wienstien, MD	7969 Ocean Gateway, Easton
Medical	Office	Dental Choice	400 Dutchmans Lane, Easton

Medical	Office	Dr. Mehrizi Ali	719 Goldsborough Street, Easton
Medical	Office	Dr. Periz Detrich	140 S Washington Street, Easton
Medical	Office	Mid Shore Surgical Eye	8420 Ocean Gateway, Easton
Medical	Office	Periodontist	218 Bay Street, Easton
Medical	Senior Housing	The Dixon House Inc.	108 N Higgins Street, Easton
Medical	Special Needs	Deaf Independent Living	13 Wrightson Avenue, Easton
Medical	Special Needs	Deaf Independent Living	8784 Black Dog Alley, Easton
Miscellaneous	Marina	Mears Yacht Haven	500 E Strand Street, Oxford
Miscellaneous	Marina	Oxford Boatyard Yacht Sales	407 Strand Street, Oxford
Miscellaneous	Marina	Pier Street Marina	104 W Pier Street, Oxford
Miscellaneous	Marina	Severn Marine Services	Chicken Point Road, Tilghman
Miscellaneous	Storage Yard	Marina Mart	12214 Ocean Gateway, Easton
Municipal-Easton	Housing Authority	Easton Residence	323 South Street, Easton
Municipal-Easton	Office	Chesapeake Wildlife Heritage	Goldsboro Street, Easton
Municipal-Oxford	Community Center	Grace Community Church	Oxford Road, Oxford
Municipal-Oxford	Library	Oxford Library	Market Street, Oxford
Municipal-Oxford	Museum	Oxford Museum Inc.	Morris Street, Oxford
Municipal-St. Michaels	Museum	St. Mary's Square Museum	409 St Mary's Square, St. Michaels
Municipal-St. Michaels	Office	Town of St. Michaels	300 Mill Street, St. Michaels
Municipal-St. Michaels	Public Works	St. Michaels Town Shop	Glory Avenue, St. Michaels
Utility	Gas/Oil	Delmarva Oil Inc.	900 Port Street, Easton
Utility	Gas/Oil	McMahan Oil Company	930 Port Street, Easton
Utility	Gas/Oil	Meintzer Brothers Petroleum	400 S Aurora Street, Easton

Utility	Gas/Oil	Pep Up Inc./Russ Oil Co	956 Port Street, Easton
Utility	Gas/Oil	Sharp Energy Inc.	9387 Ocean Gateway, Easton
Utility	Gas/Oil	Suburban Propane	1080 N Washington Street, Easton
Utility	Gas/Oil	Tri Gas and Oil Company	407 Brookletts Avenue, Easton
Utility	Gas/Oil	Tri Gas and Oil Company	9253 Ocean Gateway, Easton
Utility	Gas/Oil	United Shoregas	929 S Talbot Street, St. Michaels
Utility	Tower	American Towers Inc.	30530 Matthewstown Road, Easton
Utility	Tower	Cellular One	11780 Longwoods Road, Easton
Utility	Tower	Cellular One	402 Brookletts Avenue, Easton
Utility	Tower	Dover Radion Page	2987 Ocean Gateway, Trappe
Utility	Tower	Falcon Cable Trappe Tower	29415 Tarbutton Mill Road, Trappe
Utility	Tower	Verizon	Landing Neck Road, Easton
Utility	Tower	WCEI Radio	306 Port Street, Easton
Utility	Tower	Wye Tree Experts Inc.	12721 Ocean Gateway, Cordova

Source: 2017 Talbot County Critical and Public Facility Database

In addition, designated shelter locations should be assessed for wind speed strength to ensure that they are appropriate locations and will withstand wind speeds generated by tornados.

6. TORNADO CONCLUSION

Through the identification and understanding of tornado risk, Talbot County has taken an important step to becoming more resilient. Communicating the hazard risk information compiled within this plan to residents, businesses, and institutional members of the community so that they fully understand is a crucial next step.

Conclusions from the five Talbot County Community Pillars have been summarized below.

a. Health, Safety, and Welfare

Essential Facilities, such as fire and police facilities that were built prior to 1965 may be more susceptible to wind damage. These facilities should be evaluated for wind load and vulnerability, and retrofitted accordingly to mitigate wind damage.

Facilities include: Easton VFD, Oxford VFD, Trappe Police Department, Oxford Police Department, MSP Barracks, and the US Coast Guard facility.

b. Economic Stability

Wind damages oftentimes lead to long periods of business interruption. Power outages, debris cleanup, and damage repair may take days, if not weeks. The faster a business can reopen their doors following a disaster event, the better. Business continuity planning is integral to mitigating long periods of business interruption, which results in a more resilient community.

c. Education

Interruptions in services and an impaired transportation network can lead to lost educational instructional time. In addition, educational facilities built prior to modern building codes may be at a higher risk to tornado events, especially those that do not meet the design wind speeds of 100 mph within the Talbot County Building Code. There are seven schools that were built in or prior to 1965.

Education Facilities Constructed 1965 or Prior			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Education	Public School	**Chapel District Elementary**	11430 Cordova Road, Cordova
Education	Public School	**Easton Elementary**	305 Glenwood Avenue, Easton
Education	Public School	**Easton High**	720 Mecklenburg Avenue, Easton
Education	Public School	**Easton Middle**	201 Peachblossom Road, Easton
Education	Public School	**Tilghman Elementary School**	21374 Foster Avenue, Tilghman
Education	Public School	**White Marsh Elementary School**	4322 Lovers Lane, Trappe

Source: 2017 Talbot County Critical and Public Facility Database

d. Infrastructure

High wind speeds impact infrastructure, specifically communications and utilities. Mass power outages affect facilities and utilities. In addition, downed trees and power lines on roadways negatively impact the communities' ability to quickly return to normal operations following a tornado event.

e. Environmental

Damages from high wind events, such as a tornado, oftentimes impact fuel tanks causing contamination. Tornados can easily pick above ground storage tanks off their blocks or foundations and throw them hundreds of feet away. A best practice is the installation of underground storage tanks. Also, utilization of a propane tank dome is the first line of defense against damage that can be caused to tank fittings installed under the dome. Without a protective dome, tank fittings are subject to damage and possible breakage by falling debris, heavy materials, or large tree limbs.

Chapter 8:

High Wind & Thunderstorm

CHAPTER 8: HIGH WIND & THUNDERSTORM

High Wind- Wind is the motion of air past a given point caused by a difference in pressure from one place to another. The effects can include blowing debris, interruptions in elevated power and communications utilities and intensified effects of winter weather. Two basic types of damaging wind events other than tropical systems affect Maryland: **synoptic-scale winds and thunderstorm winds**. Synoptic-scale winds are high winds that occur typically with cold frontal passages or Nor'easters. Downbursts cause the high winds in a thunderstorm.

1. HIGH WIND & THUNDERSTORM IMPACTS

The Community Resilience Stakeholder Committee held a workshop on June 16, 2016. During the workshop, stakeholders were divided into five groups. These five groups represented each of the Talbot County Community Pillars. Participants were provided with hazard descriptions and black hazard impacts worksheets. Each of the five groups were then asked to discuss hazard impacts from their community perspective and associated Community Pillar perspective. Results were reviewed and finalized during the Community Resilience Stakeholder Committee workshop held on September 8, 2016. The following table provides impacts from High Wind events to Talbot County per Community Pillar.

Hazard Impact Table	
High Wind & Thunderstorms	
Health, Safety, and Welfare	– Injury – Infrastructure damage. – Food security issues for all in a long-term disaster, i.e., looting, protecting/distributing food, etc. – Boats, especially Waterman community affected.
Economic Stability	– Damage to infrastructure (electric, cable, internet) negatively impacts businesses. – Property damage impacts business operations. – Crop damage for agriculture.
Education	– Interruption in power, data, communication o St. Michaels – antenna atop school – Building damage/property damage. – Data loss.
Infrastructure	– Communication – wind related O.H. line impacts. – Power - wind related O.H. line impacts.
Environmental	– Tree and habitat loss. – Sediment transport, dust from farm fields and construction sites carried into local waterways and homes/businesses. – Sinking boats may leak fuel, sewage, and debris. – Wave/tides lead to increased erosion and flooding.

Source: Talbot County Community Resilience Stakeholder Committee

2. PROBABILITY OF FUTURE HIGH WIND & THUNDERSTORMS

Wind-
Air that flows in relation to the earth's surface, generally horizontally. There are four areas of wind that are measured: **direction, speed, character (gusts and squalls), and shifts**.

Seasonal patterns are relevant to high wind events. The majority of wind events in Maryland occur in June and July. Two basic types of damaging wind events other than tropical systems affect Maryland: **synoptic-scale winds and thunderstorm winds**. Synoptic-scale or large-scale winds are high winds that occur typically with cold frontal passages or Nor'easters. When thunderstorm winds are over 58 mph, the thunderstorm is considered severe and a warning is issued. "Downbursts" cause the high winds in a thunderstorm. Downburst winds result from the sudden descent of cool or cold air toward the ground. As the air hits the ground, it spreads outward, creating a fast moving surge of high winds. Unlike tornadoes, downburst winds move in a straight line. Straight-line winds include any surface wind that is not associated with rotation. An example is the first gust from a thunderstorm, as opposed to tornado wind.

The following table indicates that twenty high wind events have occurred from 1996-2017 as reported within the National Centers for Environmental Information-Storm Events Database. On average number (1) high wind event occurs per year.

High Wind Event Narrative		
Date	**Event Narrative**	**Property Damage**
March 19, 1996	**High winds developed during the late afternoon and evening of the 19th as a low pressure system intensified across the central Appalachians and its associated occluded front moved through the region. The winds were strong enough to down trees and large limbs throughout the Eastern Shore and even take the roof off of a chicken house in Caroline County. No serious injuries were reported.**	0
February 4 to February 5, 1998	**The strongest Nor'easter of the winter brought heavy rain, damaging winds and minor tidal flooding to the southern half of the Maryland Eastern Shore. The strongest winds occurred during the afternoon and evening of the 4th, although gustiness continued through midday on the 5th. The heaviest rain occurred also at about the same time as lighter rain persisted well into the 5th. The combination of the strong winds and heavy rain made it easier for the trees to be knocked down because of the loose ground. Minor tidal flooding started during the afternoon high tide on the 4th and persisted in some areas through the 6th. The combination of the heavy rain, strong winds and higher than normal tides caused the worst problems the afternoon of the 4th with several road closures in each county.** **In Talbot County, flooding was reported along low lying areas of Neavitt, Oxford, Saint Michaels and Unionville during the afternoon of the 4th. Roadway flooding was also reported in Trappe. A few roads were closed and minor outages were reported because of the downed trees. The heavy rain might have also damaged the 275,000 acres of winter wheat planted across the lower Eastern Shore, especially if precipitation continues above normal for the rest of the winter.**	0

November 2, 1999	**An unseasonably humid air mass spread across the Middle Atlantic States on November 2nd. A couple of bands of showers preceding a cold front attached to a rapidly intensifying low pressure system moved through the Maryland Eastern Shore during the afternoon and early evening of the 2nd. These bands tapped into the very strong winds located just above the surface and mixed them to the ground. This produced wind damage across the Maryland Eastern Shore mainly in the form of downed trees, tree limbs and wires. In Talbot County, a skipjack sank just off of Tilghman Island. No serious injuries were reported.**	0
January 11, 2000	**A strong cold front produced damaging wind gusts in Cecil County and wind gusts as high as 50 mph across the rest of the Maryland Eastern Shore.**	0
January 13, 2000	**An Alberta Clipper (low pressure system) moved through Pennsylvania and New Jersey during the day on the 13th. The Delmarva Peninsula was located in the warm sector of this system and received little precipitation. The relatively warm surface temperatures coupled with an approaching cold front and strong winds aloft produced strong gusty winds near the ground during the afternoon. Isolated trees, tree limbs and wires were knocked down across the Eastern Shore as peak wind gusts averaged around 50 mph. In Royal Oak (Talbot County), one dead pine tree blew over and caught on fire. There was a ban on recreational vehicles and empty tractor trailers crossing the Chesapeake Bay Bridge between 3 p.m. and 8 p.m. EST. Peak wind gusts included 53 mph in Salisbury (Wicomico County) and 50 mph in Centreville (Queen Annes County).**	0
April 8, 2000	**Gusty southwest winds spread across the Maryland Eastern Shore during the afternoon and early evening of the 8th. Peak wind gusts reached between 40 and 45 mph and downed some weak tree limbs.**	0
April 9, 2000	**A strong cold front moved through the Maryland Eastern Shore during the early evening on the 8th. A strong secondary low formed on the frontal boundary overnight and by 8 a.m. EDT on the 9th was located near Worcester, Massachusetts. The intensifying low pressure system brought strong and gusty west to northwest winds into the Eastern Shore from the early morning of the 9th into the early evening the same day. It also ingested enough cold air to change the rain over to snow before it ended across the region during the morning of the 9th. The changeover was too brief for snow to accumulate across much of the Eastern Shore. The highest wind gust at the Baltimore-Washington International Airport was 43 mph.**	0
December 12, 2000	**A rapidly intensifying low pressure system and its associated cold front produced high winds across the Maryland Eastern Shore. during the morning of the 12th. Peak wind gusts ranged between 50 and 60 mph and knocked down trees, tree limbs and power lines. About 11,000 homes and businesses lost power. But by 2 p.m. EST, all but 100 customers had it restored. The peak wind gust at the Baltimore-Washington International Airport was 54 mph.**	0
December 17, 2000	**An unseasonably warm air mass and an intense low pressure system and cold front set the stage for an extremely windy day across the Maryland Eastern Shore on December 17th. Gusty southerly winds buffeted the region during the first half of the day. Thunderstorms**	0

	embedded within bands of heavy precipitation exacerbated the wind, especially in Cecil County. As the cold front passed through the region during the early afternoon of the 17th, the strong southerly winds were replaced by equally strong westerly winds into the evening. The difference was there were no thunderstorms to mix down even stronger winds. Most of the peak wind gusts occurred during the morning and were between 40 and 50 mph. The peak wind gust at Baltimore-Washington International Airport was 43 mph and the high temperature was 62 degrees. The high temperature in Stevensville (Queen Anne's County) was 61 degrees and was 64 degrees in Easton (Talbot County).	
February 10, 2000	**A strong cold front moved through the Maryland Eastern Shore during the morning of the 6th. Gusty northwest winds accompanied and followed the cold frontal passage. Peak wind gusts were between 40 and 50 mph. No serious damage was reported. The peak wind gust at the Baltimore-Washington International Airport was 48 mph.**	0
January 13, 2001	**A strong cold front moved through the state around daybreak on the 13th. As its associated low-pressure system intensified quickly as it moved into the Canadian Maritimes, northwest winds increased and peak wind gusts reached between 40 to 45 mph in most places.**	0
February 1, 2002	**A rapidly intensifying low pressure system and the pressure gradient (difference in surface pressure) between the low and a high pressure system building in from the Southern Plains caused strong southwest winds preceding the cold front during the early afternoon and even stronger northwest winds behind the cold front the during the late afternoon and evening on the first. Peak wind gusts averaged between 40 and 50 mph and included 49 mph at the Baltimore-Washington International Airport.**	0
February 4, 2002	**A cold front ushered in colder air into the Maryland Eastern Shore during the mid-afternoon on the 4th. Strong gusty winds followed the front through the evening of the 4th. Peak wind gusts averaged between 40 and 50 mph and included 46 mph at the Baltimore-Washington International Airport.**	0
February 11, 2002	**For the third time during the first eleven days of February, strong winds followed the passage of a vigorous cold front through the Maryland Eastern Shore. Strong winds began around sunrise and persisted throughout the daylight hours. Peak wind gusts averaged between 40 and 50 mph and included 44 mph at the Baltimore-Washington International Airport.**	0
March 10, 2002	**A strong cold frontal passage before dawn ushered in one of the coldest air masses of the winter season on the 10th. Scattered thunderstorms accompanied its passage.. As the high pressure system moved closer to Maryland late in the day, winds diminished. Peak wind gusts averaged between 40 and 50 mph. The peak wind gust at the Baltimore-Washington International Airport was 49 mph.**	0
March 21, 2002	**A strong cold front moved through the Maryland Eastern Shore during the evening of the 21st. It was accompanied by wind gusts of around 40 mph inland and around 50 mph along the bay. The strong gusty winds persisted throughout the night, although the strongest wind gusts occurred with the cold frontal passage and during the ensuing evening. Peak wind gusts 41 mph at the Baltimore-Washington International Airport.**	0

September 11, 2002	**The pressure difference between a strong high pressure system in the central part of the country and Tropical Storm Gustav located well east of the Delmarva Peninsula produced strong gusty northwest winds throughout the day on the 11th. The strongest gusts occurred during the early afternoon and averaged around 40 mph. The winds pulled down tree limbs and caused power outages to about 3,000 Conectiv Power Delivery customers. All power was restored by the evening of the 11th. Peak wind gusts included 44 mph in Tolchester Beach (Kent County), 37 mph in Salisbury (Wicomico County) and 36 mph at the Baltimore-Washington International Airport.**	0
December 1, 2004	**The combination of a rapidly intensifying low pressure system and a strong cold frontal passage produced peak wind gusts of between 50 and 62 mph across most of the Maryland Eastern Shore during the second half of the morning and throughout most of the afternoon. Winds increased from the southwest preceding the cold front after 9 a.m. EST, but reached their peak speeds from the time of the cold frontal passage (around 10 a.m. EST) into the first half of the afternoon. Numerous weaker trees and limbs were knocked down. The wind damage was exacerbated by the recent wet weather which made the ground soft and the prolonged duration of the stronger winds. Peak wind gusts (from the west) included 62 mph in Saint Michael's (Talbot County), 60 mph in Tolchester Beach (Kent County), 56 mph at the Baltimore-Washington International Airport and 53 mph in Salisbury (Wicomico County).**	10K
December 31, 2008	**High winds buffeted the Eastern Shore during the afternoon of the 31st. Numerous tree limbs, trees and power lines were knocked down. Delmarva Power and Light reported about 40,000 homes and businesses lost power in their service area including the Eastern Shore. Peak wind gusts included 62 mph in Salisbury (Wicomico County) and 51 mph at the Baltimore-Washington International Airport.**	4K
February 15, 2015	**The increasing pressure difference (gradient) between a rapidly intensifying low pressure system offshore and an arctic high pressure system moving east from the Great Lakes caused strong to high damaging northwest winds to occur on the Eastern Shore from the evening of the 14th into the early afternoon on the 15th. Strong wind gusts started during the second half of the evening on the 14th, peaked overnight and continued into the early afternoon of the 15th. Peak wind gusts averaged around 55 mph and knocked down or snapped trees and tree limbs. This caused downed wires and widely scattered power outages. The strong to high winds also hampered road crews trying to keep roadways clear from the snow that fell on the 14th. It also ushered into the Eastern Shore one of the coldest air masses of the entire winter season.** **Peak wind gusts 55 mph in Easton (Talbot County) and 54 mph in Royal Oak (Talbot County).**	12.5K

Source: National Centers for Environmental Information-Storm Event Database

In addition, the following table indicates that ten strong wind events with damages of $5k or over have occurred from 2006-2017 as reported within the National Centers for Environmental Information-Storm Events Database. On average number (1) strong wind events resulting in $5K or more in damages occur per year.

Strong Wind Event Narrative		
Date	**Event Narrative**	**Property Damage**
September 1 to September 2, 2006	**The combination of the remnants of Tropical Storm Ernnesto and a large high pressure system over eastern Canada produced heavy rain and strong winds along the Maryland Eastern Shore. Strong winds started during the late morning on the 1st, peaked during the evening of the 1st and around midnight EDT on the 2nd and subsided before sunrise on the 2nd.**	100K
December 3, 2007	**Strong winds buffeted the Maryland Eastern Shore during the second half of the morning and the afternoon on the 3rd. Highest wind gusts averaged around 50 mph and downed trees and wires caused power outages. The strong winds blew over road signs and one street light in Easton (Talbot County). One downed tree also caused isolated power outages. Specific wind gusts included 54 mph in Salisbury (Wicomico County), 53 mph in Ridgely (Caroline County), 47 mph at the Baltimore-Washington International Airport and 46 mph in Tolchester Beach (Kent County).**	20K
March 8, 2008	**Strong winds both preceding and then following a strong cold front downed weak trees, tree limbs and wires across the Eastern Shore during the afternoon and evening of the 8th. Peak wind gusts averaged around 50 mph. Peak wind gusts included 53 mph in Tolchester Beach (Kent County) and 51 mph in Queen Anne (Talbot County).**	5K
February 12, 2009	**Strong to high winds affected the Eastern Shore during the day on the 12th. The strong winds started shortly after a cold frontal passage between 3 a.m. and 5 a.m. EST and persisted through most of the day. Peak wind gusts averaged around 50 mph and knocked down several tree limbs, weak trees and power lines. Delmarva Power and Light reported about 4,600 homes and businesses in Delaware and Cecil County lost power.**	5K
March 2, 2009	**Strong winds occurred just after Midnight EST on March 2nd along most of the Eastern Shore as a gravity wave helped mix stronger winds aloft to the ground. The combination of the wind and heavy snow helped cause power outages across the Delmarva Peninsula. Delmarva Power and Light reported about 26,000 homes and businesses lost power in its service area. About 16,000 of the outages were in Kent, Queen Anne's, Caroline and Talbot Counties. All power was restored by Noon EST on the 3rd. Choptank Electric reported about 8,700 homes and businesses lost power along the Eastern Shore with the most outages in Kent and Cecil Counties. Most power was restored by the afternoon of the 2nd. The strong winds also caused considerable blowing and drifting of snow and made it difficult for crews to keep roads plowed and open. The strong winds were associated with the nor'easter that brought the heavy snow to the Eastern Shore. The nor'easter low pressure system moved from the Georgia and South**	12.5K

	Carolina border at 7 a.m. EST on the 1st to about 150 miles east of the southern New Jersey coast at 7 a.m. EST on the 2nd. The strongest winds occurred during the early morning of the 2nd as a gravity wave that emanated from the low pressure system passed across the state.	
January 25, 2010	**Strong southerly winds affected the Eastern Shore during the morning of the 25th. Peak wind gusts averaged 45 to 50 mph, with the strongest winds in the southern part of the Eastern Shore. The strong winds caused isolated power outages as the combination of the rain and wind helped knock down weak trees, tree limbs and power lines. In Queen Anne's County, downed trees damaged two homes in Centreville. Across the Eastern Shore about 2,300 homes and businesses lost power. Peak winds included 55 mph in Salisbury (Wicomico County), 48 mph in Easton (Talbot County), 47 mph in Stevensville (Queen Anne's County) and 43 mph in Tolchester Beach (Kent County). A wind gust of 58 mph was measured across Chesapeake Bay in Annapolis.**	5K
February 25, 2011	**A very strong cold frontal passage produced strong to high winds across the Eastern Shore during the afternoon of the 25th. Peak wind gusts averaged 50 to 60 mph and downed trees, tree limbs and power lines. The highest wind gusts occurred during the hour after the cold front passed and then slowly decreased the rest of the afternoon and evening. Peak wind gusts included 63 mph in Annapolis (Anne Arundel County), 61 mph at Tolchester Beach (Kent County), 60 mph at the Baltimore-Washington International Airport, 52 mph in Salisbury (Wicomico County) and 47 mph at Easton (Talbot County).**	5K
December 27, 2011	**Strong south winds occurred during the late afternoon and the early part of the evening on the 27th. A line of showers also helped mix stronger winds to the surface. Peak wind gusts averaged around 50 mph. The combination of the heavy rain and strong winds helped knock down tree limbs and weak trees in the Eastern Shore, particularly in Queen Anne's, Talbot and Caroline Counties. About 1,000 homes and businesses lost power. In Talbot County, in Easton, a downed tree badly damaged a home on Ocean Gateway. The home's roof and ceiling collapsed and electrical lines were severed. It was deemed uninhabitable. Another downed tree blocked Stoney Ridge Road in Easton. There were a couple of other trees that were knocked down on county roads. Peak wind gusts included 52 mph in Salisbury (Wicomico County) and 49 mph in Easton (Talbot County).**	35K
February 24 to February 25, 2012	**A nearly seventy millibar surface pressure difference between an intense low pressure system moving through the Canadian Maritimes (it bottomed at 963 millibars at 1 p.m. EST on the 25th in the Gulf of Saint Lawrence) and a high pressure system in the Central Plains produced nearly twenty-four hours of strong winds across the Maryland Eastern Shore from the late evening on the 24th through the early evening on the 25th. The strong winds downed weak trees, tree limbs and power lines and caused scattered outages. About 3,000 homes and businesses lost power, most of them in the southern part of the Eastern Shore. Peak wind gusts included 48 mph at the Baltimore-Washington International Airport and 45 mph in Salisbury (Wicomico County).**	5K
March 6, 2013	**An intense nor'easter brought strong winds across the Eastern Shore on the 6th. Peak wind gusts reached 45 to 50 mph downed weak trees, tree limbs and wires and caused scattered power outages. Downed**	20K

	trees and tree limbs caused isolated structural damage. In Easton (Talbot County), one downed tree fell onto a house. A westbound tractor-trailer overturned on the Chesapeake Bay Bridge. In combination with the strong winds, this forced the closure of the bridge on the 6th. The bridge was re-opened to passenger vehicles later that afternoon and to all traffic the next day. Peak wind gusts included 47 mph at Tolchester Beach (Kent County), 46 mph at Royal Oak (Talbot County), 44 mph in Easton (Talbot County) and 42 mph in Chesapeake City (Cecil County). **The nor'easter low pressure system emerged from the southern Rockies on the 4th and moved into the Tennessee Valley on the morning of the 5th, passed across the southern Appalachians during the evening of the 5th and reached northeastern North Carolina on the morning of the 6th. From there it slowly moved northeast and was off the Delmarva Peninsula on the afternoon of the 6th. It then drifted slowly offshore to the east that evening and that motion continued on the 7th and 8th. The low pressure system was not that intense overall (never deepened to less than 985 millibars near the coast), but a strong high pressure system that was located over southeastern Canada helped intensify the surface pressure gradient (difference) throughout this event.**	

In addition, the following table indicates that six thunderstorm wind events with damages of $5k or over have occurred from 2000-2017. On average number 0.375 thunderstorm wind events resulting in $5K or more in damages occur per year. Data presented below was obtained through the National Centers for Environmental Information-Storm Events Database.

Thunderstorm Wind Event Narrative		
Date	**Event Narrative**	**Property Damage**
July 31, 2009	**A cold front that moved through the Eastern Shore Friday afternoon helped produce strong to severe thunderstorms during the late afternoon of the 31st. Most of the wind damage occurred as a line of severe thunderstorms known as a bow echo moved across the region. Delmarva Power and Light reported about 8,000 homes and businesses lost power across the Delmarva Peninsula. Power was fully restored by August 1st.** **The gust front from a severe thunderstorm knocked down several trees in Easton and also pushed a mobile home off its foundation in the Black Dog Alley Development. The mobile home landed about twenty-five feet behind its foundation. No injuries were reported. Five large trees were also uprooted in the development. Damage was estimated at $40,000.**	40K
August 12, 2010	**A complex of showers and thunderstorms with damaging winds and frequent lightning moved along a stationary frontal boundary on the morning of the 12th through the lower Delmarva Peninsula.** **A severe thunderstorm knocked down several trees and caused cosmetic and isolated roof damage to homes on Tilghman Island.**	5K
November 17, 2010	**A squall line of showers and thunderstorms that preceded a cold front produced wind damage during the early morning on the 17th across the Maryland Eastern Shore. A severe thunderstorm knocked down**	10K

	numerous trees from St. Michaels east through Easton. The greatest concentration of wind damage occurred southwest of Easton. Trees were knocked down near Peachblossom Creek on Old Country Road. A sailboat in one garage was damaged by a downed tree. On Bailey's Neck Road, dozens of trees were knocked down. One downed tree shattered the roof of a garage. A couple of homes in the area suffered siding damage and had outdoor furniture damaged.	
June 17, 2011	**A decaying frontal boundary still managed to act as a focus for strong to severe thunderstorms to form during the early evening of the 17th. About 2,500 homes and businesses lost power in Talbot County and the last 100 did not have it restored until later in the day on the 18th. A severe thunderstorm on Tilghman Island knocked down several very large trees, poles and electrical wires at the entrance to Black Walnut Point. Another half dozen large trees were knocked over on Bar Neck Road and also damaged the power lines and power meters to several homes. In addition, sheds and patio furniture was overturned. One boat was also damaged as was the screened porch of another home. The same severe thunderstorm knocked down a very large tree that blocked Elston Shore Road in Neavitt.**	25K
June 17, 2011	**A decaying frontal boundary still managed to act as a focus for strong to severe thunderstorms to form during the early evening of the 17th. About 2,500 homes and businesses lost power in Talbot County and the last 100 did not have it restored until later in the day on the 18th. A severe thunderstorm caused pockets of property damage throughout Oxford. A boat was blown off its lift at Campbell's Boatyard at Jacks Point. The masthead at the Pier Street Marina was pulled off and rooftop air conditioning units were overturned. Flying debris shattered the glass of four cars. A homes' chimney at South Morris and Pier Street was blown away and debris fell through the window of a neighbors' home Fencing around the town's tennis courts and temporary construction fencing were destroyed. A tree fell onto a garage on Holly Harbor Road.**	50K
June 29, 2012	**A gust front outrunning a cluster of severe thunderstorms entered the Tilghman Island area of western Talbot County at approximately 11:22 pm EDT on the 29th. This gust front produced damaging wind gusts estimated at 65 mph as it traversed eastward across the county. Within approximately 20 minutes of the gust front passage, a potent line of severe thunderstorms tracked eastward through Talbot County, producing another round of destructive wind gusts, estimated at 65 mph. A significant number of trees and electric wires were reported down county-wide with damage first being noted on Tilghman Island. Severe thunderstorms exited eastern Talbot County, including the town of Matthews, at approximately 12:31 am EDT on the 30th.**	50K

Source: National Centers for Environmental Information-Storm Event Database

Climate change may exacerbate storm surges, higher sea levels, and more intense storms. Talbot County acknowledges the likelihood of the increasing risks and vulnerability from natural hazards. Through the development and implementation of the *2017 Talbot County Hazard Mitigation and Resilience Plan*, planning consideration for both today and tomorrow are evidenced.

3. HIGH WIND & THUNDERSTORM RISK AND VULNERABILITY

High Wind risk and vulnerability assessed for Talbot County included the following variables:

a. **Population Vulnerability**- Calculated as a percent of the total population in Maryland per jurisdiction.

b. **Injuries & Deaths**-As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

c. **Property & Crop Damage**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

d. **Design Wind Speed**-Information obtained American Society of Civil Engineers Design Wind Speed.

e. **Events**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

Note: Reported information from the National Center for Environmental Information (NCEI)-Storm Event data for tornado included the following NCEI categories: funnel cloud, tornado, and waterspout. The timeframes covered by the NCEI data used is from 8/11/1950 thru 12/31/2015.

Coastal Hazard Risk Assessment Data Table						
Population Vulnerability	***Injuries & Deaths***		***Property & Crop Damage***		***Design Wind Speed ASCE***	***Events***
.63	0	0	596K	1K	90 mph	203
						Annualized-3.38

4. CRITICAL AND PUBLIC FACILITIES HIGH WIND & THUNDERSTORM VULNERABILITY

There are no standard loss estimations models or tables for high wind events currently, thereby making it very difficult to calculate actual losses. The Enhanced Hazus Analysis for Hurricane Wind results in Chapter 4: Coastal Hazards may review as a reference. In terms of critical facilities, facility locations should be assessed for wind speed strength to ensure that they will withstand wind speeds generated by tornados.

5. HIGH WIND & THUNDERSTORM CONCLUSION

Through the identification and understanding of high wind risk, Talbot County has taken an important step to becoming more resilient. Communicating the hazard risk information compiled within this plan to residents, businesses, and institutional members of the community so that they fully understand is a crucial next step.

Conclusions from the five Talbot County Community Pillars have been summarized below.

a. Health, Safety, and Welfare

Essential Facilities, such as fire and police facilities that were built prior to 1965 may be more susceptible to wind damage. These facilities should be evaluated for wind load and vulnerability, and retrofitted accordingly to mitigate wind damage. Facilities include: Easton VFD, Oxford VFD, Trappe Police Department, Oxford Police Department, MSP Barracks, and the US Coast Guard facility.

b. Economic Stability

Wind damages oftentimes lead to long periods of business interruption. Power outages, debris cleanup, and damage repair may take days, if not weeks. The faster a business can reopen their doors following a disaster event, the better. Business continuity planning is integral to mitigating long periods of business interruption, which results in a more resilient community.

c. Education

Interruptions in services and an impaired transportation network form downed power lines and trees can lead to lost educational instructional time. In addition, educational facilities built prior to modern building codes may be at a higher risk to high wind events, especially those that do not meet the design wind speeds of 100 mph within the Talbot County Building Code. There are seven schools that were built in or prior to 1965.

Education Facilities Constructed 1965 or Prior			
Facility Type	**Facility Detail**	**Facility Name**	**Address**
Education	Public School	**Chapel District Elementary**	11430 Cordova Road, Cordova
Education	Public School	**Easton Elementary**	305 Glenwood Avenue, Easton
Education	Public School	**Easton High**	720 Mecklenburg Avenue, Easton
Education	Public School	**Easton Middle**	201 Peachblossom Road, Easton
Education	Public School	**Tilghman Elementary School**	21374 Foster Avenue, Tilghman
Education	Public School	**White Marsh Elementary School**	4322 Lovers Lane, Trappe

Source: 2017 Talbot County Critical and Public Facility Database

d. Infrastructure

High wind speeds impact infrastructure, specifically communications and utilities. Mass power outages affect facilities and utilities. In addition, downed trees and power lines on roadways negatively impact the communities' ability to quickly return to normal operations following a high wind event.

e. Environmental

Damages from high wind events, such as a synoptic scale winds and thunderstorm wind, oftentimes impact fuel tanks causing contamination. High winds may impact above ground storage tanks. A best practice is the installation of underground storage tanks. Also, utilization of a propane tank dome is the first line of defense against damage that can be caused to tank fittings installed under the dome. Without a protective dome, tank fittings are subject to damage and possible breakage by falling debris, heavy materials, or large tree limbs.

Chapter 9:

Drought & Extreme Heat

CHAPTER 9: DROUGHT & EXTREME HEAT

Drought- are periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or stream flow. Although maintaining water supplies for human use is an important aspect of drought management, drought can also have many other dramatic and detrimental effects on the environment and wildfire.

Extreme Heat- Temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as **extreme heat**. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground.

1. DROUGHT & EXTREME HEAT IMPACTS

The Community Resilience Stakeholder Committee held a workshop on June 16, 2016. During the workshop, stakeholders were divided into five groups. These five groups represented each of the Talbot County Community Pillars. Participants were provided with hazard descriptions and black hazard impacts worksheets. Each of the five groups were then asked to discuss hazard impacts from their community perspective and associated Community Pillar perspective. Results were reviewed and finalized during the Community Resilience Stakeholder Committee workshop held on September 8, 2016. The following table provides impacts from drought events to Talbot County per Community Pillar.

Hazard Impact Table	
Drought & Extreme Heat	
Health, Safety, and Welfare	– Long-term economic impacts to the agricultural economy. – Towns have wells.
Economic Stability	– Impacts to local farms/agriculture economy. – More irrigation could adversely increase cost to framing operation and run-off issues. – Impact on crop insurance cost.
Education	– Food supply & drinking water shortages. o Increased cost for bottled water o Delay while waiting for assistance
Infrastructure	– Water issues may arise for older residential wells (older shallow wells). Extreme Heat – Problems with utilities associated with heat events.
Environmental	– Increased withdraw of ground water for irrigation may lead to saltwater intrusion and depressed water table. – Shrink & swell cycle of soils may lead to decrease in soil health, pipe damage, and damage to foundations. – Lower water levels impact waterfowl. – Loss of surface water inputs to ponds, swimming area closures, and loss of habitat/biodiversity (inland aquatic habitat).

	Extreme Heat – Increased power demand and fossil fuel use – Wildlife Stress – Warming water temperature leading to less dissolved oxygen, which is harmful to fish and crabs.

Source: Talbot County Community Resilience Stakeholder Committee

2. PROBABILITY OF FUTURE DROUGHT AND EXTREME HEAT HAZARDS

According United States Geological Survey-Water Science for Maryland, Delaware, and the District of Columbia, the most severe drought of record was 1930-32; 1930 was the driest year recorded since 1869. The 1958-71 drought was regional in extent and produced the largest recorded annual departures from average stream discharge.

Drought & Extreme Heat
Droughts occur when a long period passes without substantial rainfall. A heat wave combined with a drought is a very dangerous situation.

Droughts occur when large-scale atmospheric circulation is persistently unfavorable to normal precipitation - producing mechanisms for several weeks, months, seasons, or years. A strong flow of air from the northwest tends to prevent moisture from the Atlantic Ocean and the Gulf of Mexico from reaching the area by pushing the coastal storm track further eastward. If this situation persists for more than a month, it commonly creates a drought. Another pattern that can produce a drought at any time of the year, although most often in the summer, is a strong ridge of high pressure in the upper atmosphere near the central Appalachian Mountains or mid-Atlantic area. Even though humidity in the lower atmosphere may be nearly normal, moisture aloft is deficient because of a large-scale descending flow of air that warms the air mass. A mixed layer of air extending from the surface of the Earth to a height of about 0.5 to 1 mile is capped by a warm air layer (temperature inversion) that inhibits the growth of convective clouds, which decreases significant thunderstorm activity. This occurrence results in a drought that generally is augmented by excessive heat. During the winter, this pattern results in dry conditions, primarily because frontal systems are kept from the area.

Typically, droughts affecting Talbot County result from prolonged periods of dry weather accompanied by extreme heat and usually occur in the summer months (July and August) when high pressures settle in with prevailing dry, west to southwest winds. The warmest time of the year is July when maximum temperatures average 89 degrees Fahrenheit. The occurrence of drought cannot be predicted.

Several major droughts have occurred in Maryland.

Major Droughts in Maryland

Date	Area Affected	Recurrence Interval (yrs.)	Remarks
1930-32	Statewide	>25	Regional drought. Estimated crop losses inn 1930, $40 million.
1953-56	Statewide	10 to >25	None
1956-71	Statewide	>25	None
1980-83	Statewide, except	10 to 25	Multistate

	for Western Region		
1984-88	Monocacy River Basin. East of Baltimore, and Chesapeake Bay	10 to 25	Estimated agricultural losses for 1886-88, $302 million.

Source: USGS Water Science for Maryland, Delaware, and the District of Columbia, Online Publication-WSP-2375

Data was compiled and analyzed producing a drought analysis summary for Maryland, and presented in *USGS Water Science for Maryland, Delaware, and the District of Columbia, Online Publication-WSP-2375.* Annual departures from average streamflow were determined, and recurrence intervals were assigned to droughts by using data from 38 gaging stations. Results indicate that droughts have occurred about once every 10 years since 1930 but differed in severity and duration. Annual departure generally was most severe at the end of the 1958-71 drought.

According to the Maryland Department of the Environment (MDE), the drought status for the Eastern Region, which includes Talbot County, has been at normal as of December 14, 2016. This information may be is maintained and updated by MDE, and may be obtained on their website. In addition, Maryland has a statewide *Drought Monitoring and Response Plan* published by the Maryland Statewide Water Conservation Advisory Committee, which includes monitoring and reporting procedures, as well as mandatory water restrictions during documented drought events.

The Center for Climate and Energy Solutions reported the following information regarding extreme heat and climate change:

During the past decade, daily record high temperatures have occurred twice as often as record lows across the continental United States, up from a near 1:1 ratio in 1950. By midcentury, if greenhouse gas emissions are not significantly curtailed, scientists expect 20 record highs for every low. The ratio could be 50:1 by the end of the century. By the 2050's, many of the Mid-Atlantic States including urban parts of Maryland and Delaware could see a doubling of days per year above 95 degrees F.

Extreme heat can also increase the risk of other types of disasters. When heat occurs in conjunction with a lack of rain, drought can occur. This, in turn, can encourage more extreme heat, as the sun's energy acts to heat the air and land surface, rather than to evaporate water. Hot dry conditions also increase the risk of wildfires, like the ones in 2013 in Colorado that were fueled by record high heat and an ongoing drought.

3. DROUGHT & EXTREME HEAT RISK

Drought and extreme heat risk and vulnerability assessed for Talbot County included the following variables:

a. **Population Vulnerability**- Calculated as a percent of the total population in Maryland per jurisdiction.

b. **Injuries & Deaths**-As reported within the National Center for Environmental Information (NCEI)-Storm Event data 1/1/1998 thru 12/31/2015.

c. **Property & Crop Damage**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data 1/1/1998 thru 12/31/2015.

d. **Geographic Extent**-Information obtained from 2012 Agricultural Census.

e. **Events**- As reported within the National Center for Environmental Information (NCEI)-Storm Event data thru 12/31/2015.

Note: Reported information from the National Center for Environmental Information (NCEI)-Storm Event data for drought included the following NCEI categories: ***drought and excessive heat****. The timeframes covered by the NCEI data used is from 1/1/1998 thru 12/31/2015. Note: Information within table was obtained form the 2016 State of Maryland Hazard Mitigation Plan.*

Wind Hazard Risk Assessment Data Table						
Population Vulnerability	***Injuries & Deaths***		***Property & Crop Damage***		***Geographic Extent % of Crop from Agricultural Census***	***Events***
.63	0	0	0	4.2 million (Aggregated)	72.19 %	75 Annualized-3.57

Source: 2016 State of Maryland Hazard Mitigation Plan

4. DROUGHT & EXTREME HEAT VULNERALBILITY

In order to monitor potential drought conditions, Maryland uses four indicators for water sufficiency. The indicators are based on the amount of precipitation (or lack of precipitation) in the hydrologic system. These indicators include: precipitation levels, stream flows, ground water levels, and reservoir storage.

The record high temperature of 102 degrees F was recorded at Royal Oak on 6 July 2010 according to www.plantmaps.com.

According to the Maryland Department of the Environment, Maryland will implement a staged process for defining drought conditions. Drought indicators will be monitored on an ongoing, year-round basis, and drought status will be determined on a variable timeframe according to drought stage (See Tables 1 and 2 below). The frequency of evaluation will increase if the drought intensifies as indicated below:

- *Stage 1* Monthly;
- *Stage 2* Bi-weekly;
- *Stage 3* Weekly; and,
- *Stage 4* Weekly or as needed.

Stage 1 – Normal (Green)

No more than one indicator outside of the normal range.

- Precipitation exceeds the percent of normal precipitation for the time period in Table 2;
- Streamflows are above the 25th percentile;
- Ground water levels are above the 25th percentile; and,
- Reservoirs exceed 120 days of storage.

Stage 2 – Watch (Yellow)

At least 2 indicators meet the following conditions:

- Precipitation levels are at or below the percent of normal precipitation for the time period in Table 2;
- Streamflows fall between the 10th and 25th percentile;
- Ground water levels fall between the 10th and 25th percentile; and,
- Reservoirs contain between 90 and 120 days of storage.

Stage 3 – Warning (Orange)

At least 2 indicators meet the following conditions:

- Precipitation levels are at or below the percent of normal precipitation for the time period in Table 2;
- Streamflows fall between the 5th and 10th percentile;
- Ground water levels fall between the 5th and 10th percentile; and,
- Reservoirs contain between 60 and 90 days of storage.

Stage 4 – Emergency (Red)

At least 2 indicators meet the following conditions:

- Precipitation levels are at or below the percent of normal precipitation for the time period in Table 2;
- Streamflows are at or below the 5th percentile;
- Ground water levels are at or below the 5th percentile; and,
- Reservoirs contain 60 days or less of storage.

During periods of drought, Maryland implements mandatory water use restrictions including the following prohibited uses:

- Watering of lawns;
- Water of gardens and irrigation, except for agriculture and certain commercial uses;
- Restrictions on irrigation and watering of golf courses;
- Washing of paved surfaces such as streets, roads, sidewalks, driveways, garages, parking areas, tennis courts and patios;
- Use of water for the operation of ornamental fountains, waterfalls, and reflecting pools;
- Use of water for washing or cleaning of mobile equipment including automobiles, trucks, trailers, and boats;
- Use of water to fill and top off swimming pools; and,
- Homeowner power-washing of buildings, fences, decks, or other structures.

Note: There are additional exceptions to the Maryland Water Use Restrictions listed above.

The USGS Water Science for Maryland, Delaware and the District of Columbia monitors conditions and host a MD-DE-DC Drought Watch at: http://md.water.usgs.gov/drought/index.html. Real time Maryland Streamflow data is available, as well as drought status and resources.

In addition, Water Audits and Loss Reduction Reports for 2013 thru 2015 as per the Maryland Department of the Environment indicate the following information:

Water audits are conducted to determine the amount of water lost from a distribution system due to leakage, storage overflow, water theft, and/or water meter malfunctions. A comprehensive audit can provide the water system with a detailed profile of the distribution system and the water uses allowing for more effective management of the resource and infrastructure. As a condition of the water system's Water Appropriation and Use Permit, water audits are usually required for water systems serving greater than 10,000 people. Audits are completed annually using data from the previous year and report on how efficiently the systems are operating. When water loss is greater than 10%, it triggers submission of a water loss reduction plan. For calendar year 2015: The State had 31 water systems serving a population greater than 10,000 people. Twenty-nine of these systems completed an audit and 38% of the systems reported water loss below 10%, while 62% reported more than 10% water loss. Collectively these 29 water systems produced 114.12 billion gallons (bg) of water in 2015. Of those billions of gallons, 17.8 bg were lost.

Easton was included as one of the 31 water systems within the MDE Data.

Water Audit for Easton				
System	**Population**	**Loss Per Year (2013-2015)**		**Water Reduction Plan**
Easton	11,760	2015	9.22%	No
		2014	8.49%	No
		2013	7.81%	No

Source: Maryland Department of the Environment Water Audits and Loss Reduction Reports for 2013 thru 2015

While the Easton water system has been included in the 38% of water systems reporting a water loss below 10% for the past three consecutive years as indicated on the table above, the water system is reporting an increased water loss per year. In fact, the water loss was just under 10% in 2015, at 9.22%.

5. DROUGHT & EXTREME HEAT CONCLUSION

Through the identification and understanding of drought and extreme heat risk, Talbot County has taken an important step to becoming more resilient. Communicating the hazard risk information compiled within this plan to residents, businesses, and institutional members of the community so that they fully understand is a crucial next step.

Mitigation involves management and planning activities to prevent or decrease the potential for water-shortage emergencies and planning for extreme heat events. These activities include watershed planning and development of supplemental supplies, water-conservation programs, local drought and water-shortage emergency plans, and

planning cooling centers. Preparation and response activities incorporate various monitoring, alert, and response actions designed to provide timely and useful information and assistance during actual or impending water shortages and extreme heat events. These actions include drought-monitoring programs, identification of emergency supply sources, and control of water withdrawals through the water appropriation permit program. Finally, cooling centers are established during extremely hot days. Libraries and community centers are frequently used in Talbot County as cooling centers.

Conclusions from the five Talbot County Community Pillars have been summarized below.

a. Health, Safety, and Welfare

Local law enforcement agencies are responsible for the enforcement of mandatory drought restrictions. Public safety works with the health department and allied agencies to determine the need for and establishment of community cooling centers during extreme heat events.

b. Economic Stability

Each community water supplier is responsible for monitoring water supply conditions in their service areas, responding to customer complaints and problems related to drought conditions, and reporting any drought-related problems to MDE. Water suppliers may impose water use restrictions on their customers based on their individual situations when conditions warrant.

c. Education

Responsibilities of Local Environmental Health Agencies include**:**

- Provide year-round oversight of transient non-community water systems including assistance with drought-related problems.
- Assess and respond to impacts of water shortages on public health. Issue well construction permits.
- Assist owners of residential wells with drought-related problems.
- Provide public education related to drought, well failures and public health issues.

d. Infrastructure & Environmental

Drought Coordinators identified by the Maryland Department of the Environment for Talbot County include: Ms. Mary Kay Verdery, Talbot County Planning Officer and Mr. Ray Clarke, Talbot County Engineer.

Local Drought Coordinators-

The members of Talbot County Council will appoint a drought coordinator to coordinate with MDE regarding drought assessment and response, and to handle applications for exemptions or variances to the Mandatory Drought Restrictions. During times of drought emergency, drought coordinators may be removed from that designation at any time by the Secretary of the Department of the Environment, and replaced by Drought Coordinators of the Secretary's choice who may serve for the duration of the emergency.

- Maintain communications and coordinate with MDE throughout the drought emergency;

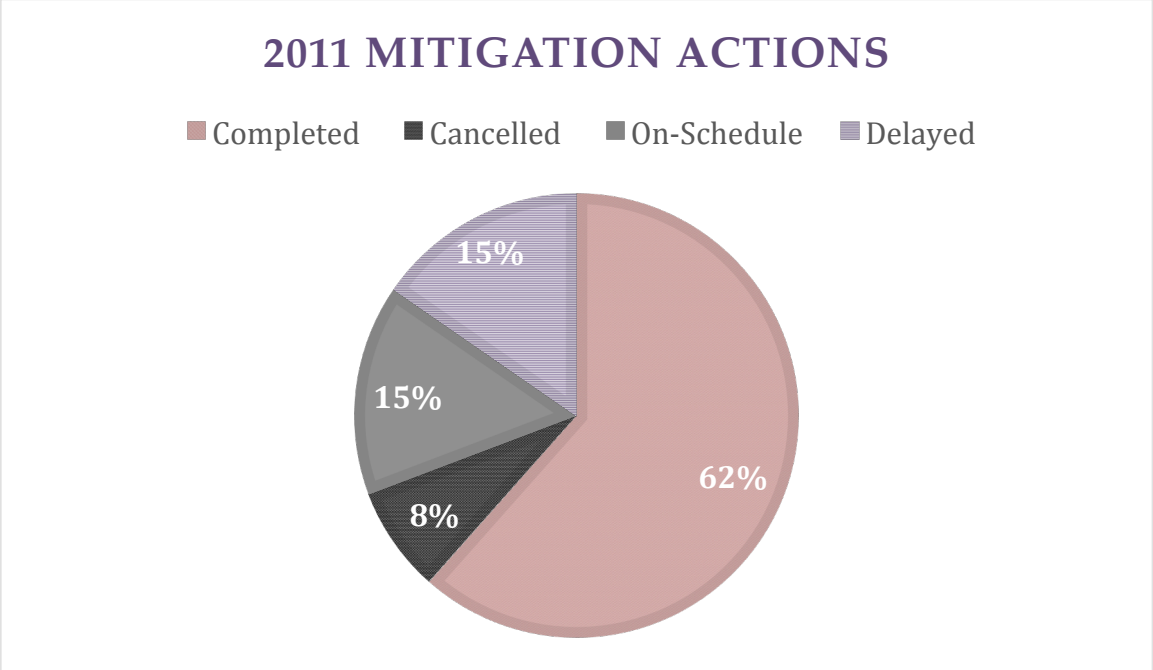
- Render decisions regarding applications received for exemptions or variances to mandatory restrictions and nonessential water uses when a drought emergency has been declared; and,
- Establish local drought emergency public information and education programs.

Chapter 10:

Mitigation Status Report

CHAPTER 10: MITIGATION STATUS REPORT

In order to complete the mitigation status report the 2011 Mitigation Actions rated as a "High" priority were assessed during the plan update process. Information was collected from various stakeholders. The Core Planning Team reviewed and finalized status updates. Results indicated that 62% of the 2011 mitigation actions have been completed as shown on the chart below.



1. 2011-2016 MITIGATION ACTION, GOALS & OBJECTIVES

Furthermore, the 2011 mitigation actions rated as a "High" priority were reviewed to ascertain which goals and objectives were met during the 2011-2016 planning cycle Goals and objectives met include the following:

- *Goal 1 - Minimize damage caused by flooding.*
  - Objective 1.1 - Ensure that existing structures in the floodplain are resistant to flood damage.
  - Objective 1.3 - Protect the critical facilities in the 100-year flood plain. Consider the most appropriate flood control measures such as acquisition and relocation, elevation, dry/wet flood proofing, etc.
  - Objective 1.6 - Reduce road closures, specifically evacuation routes and protect public infrastructure from flood damage.
  - Objective 1.7 - Restore barrier islands to provide protection for Talbot County's shorelines from wave action.
  - Objective 1.8 - Prepare a Community Rating System application to reduce the cost of flood insurance within Talbot County.
- *Goal 7 - Ensure adequate protection of critical facilities and infrastructure throughout the County.*

  - Objective 7.1 - Reduce the possibility of damage and loss to existing community assets - including addressable structures, critical facilities and infrastructure due to flooding and other hazard events.
- *Goal 8 - Increase public understanding, support, and demand for hazard mitigation.*
  - Objective 8.2 - Ensure County residents are aware of evacuation procedures.

Three (3) goals and seven (7) objectives were achieved during this planning cycle.

Following the review of the Mitigation Action Progress Reports, projects that were delayed or in need of modification have been considered for 2017 Mitigation Action items. These projects include:

- Utilizing the Culvert Assessment completed by Talbot County Department of Public Works, prioritize culvert upgrade projects for flood mitigation.
- Assess the Talbot County Department of Social Services facility for possible Maryland Department of Human Resources shelter location.
- Develop a database detailing facilities located within St. Michaels and the County lacking generators.
- Request Maryland State Highway Administration to conduct an evacuation study for the entire corridors of: MD 322, MD 33 since Tred Avon regularly floods roads during tidal surges.
- Conduct an Enhanced Hazus Coastal Flood Analysis utilizing use defined data; depth grids and user defined facilities.

2. MITIGATION ACTION PROGRESS REPORT FORMS

The following pages have been included to provide additional details specific to mitigations actions identified in the 2011 Plan and the associated progress report for each action. There are a total of fourteen progress reports provided for review.

Mitigation Action Progress Report Form #1

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**#1 - Perform a detailed structural assessment to the 184 buildings in the floodplain in St. Michaels to determine appropriate mitigation measures (elevation, dry/wet flood proofing) to reduce low level repetitive flooding.**	
Responsible Agency	Talbot County Tax Assessors Office, Talbot County GIS Department, Talbot County Department of Emergency Services, Town of St. Michaels	
Contact Name	Jean Weiseman, St. Michaels	
Contact Phone/Email	410-745-9535	
Project Status	o Project completed o Project canceled o Project on schedule o Anticipated completion date:_____ o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**

N/A

2. **What obstacles, problems, or delays did the project encounter?**

N/A

3. **If uncompleted, is the project still relevant? Should the project be changed or revised?**

N/A

4. **Other comments**

No action *for existing structures within the mapped floodplain, however, new construction or substantially improved structures must be elevated to base flood plus one foot freeboard.*

Mitigation Action Progress Report Form # 2

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**# 2 – CRS Develop a system for recording and storing elevation certificates, first-floor elevation data using County GIS and database technology.**	
Responsible Agency	Talbot County Tax Assessors Office, Talbot County GIS Department, Talbot County Permits and Inspections, Municipalities	
Contact Name	Mark Cohoon (DPW) and Martin Sokolich (DP&Z)	
Contact Phone/Email	mcohoon@talbotcountymd.gov; msokolick@talbotcountymd.gov	
Project Status	✓ **Project completed** o Project canceled o Project on schedule o Anticipated completion date:_____ o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**
Elevation Certificates submitted after 2000 are being stored electronically and are available online. Utilizing the Talbot County Flood Risk Map Application, elevation certificates can be viewed. As a part of the Community Rating System we win points for this project toward a community discount of FEMA Flood Insurance.

2. **What obstacles, problems, or delays did the project encounter?**
Symbol for Elevation Certificate appears, however certificate information was not immediately shown when selected in side column. That problem has been resolved. Grant funds were obtained through the NOAA CoastSmart program and software was procured to develop an on-line interactive web map dedicated to Talbot County Flood Risk. Some custom development of the interactive web map was necessary.

Mitigation Action Progress Report Form # 3

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**#3 - Consider elevation increase for the County Solid Waste Transfer Station on 21559 Donnell Jones Road in Sherwood. The County should protect the Solid Waste Transfer Station in Sherwood from flood damage that could lead to pump power failure and sewage back-up. The transfer station is located within the 100-year floodplain. The station should be elevated at least 1-2 feet above the BFE in the area, and ideally to the 500-year flood level, which is often used as the design protection level for critical facilities. In order to have access to the panel, it would be necessary to construct a permanent ladder/catwalk-type platform along the panel. It is estimated that the elevation of the control panel along with the installation of the ladder and platform would cost approximately $125,000. This is a rough cost estimate based on similar projects completed in nearby communities.**	
Responsible Agency	Talbot County Public Works Department, Talbot County Department of Planning, Talbot County Permits and Inspections, municipalities, Town of Oxford	
Contact Name	Mark Cohoon (DPW)	
Contact Phone/Email	mcohoon@talbotcountymd.gov	
Project Status	✓ **Project completed** o Project canceled o Project on schedule o Anticipated completion date:_____ o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**

The County Solid Waste Transfer Station was removed. This site is now utilized by the Army Core of Engineers as a storage site for dredge material.

2. **Other comments**

This Solid Waste Transfer Station has been permanently closed.

Mitigation Action Progress Report Form #4

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**#4 - While the Oxford WWTP has been discussed previously in the document, pre-draining prior to storm events was not discussed. Both upgrades to the facility and pre-draining will help mitigate flooding issues.**	
Responsible Agency	Talbot County Public Works Department, Talbot County Department of Planning, Talbot County Permits and Inspections, municipalities, Town of Oxford	
Contact Name	Cheryl Lewis, Town of Oxford Public Works Administrative Clerk/Treasure	Ray Clarke, TC
Contact Phone/Email	410-226-5122 oxfordclerk@goeaston.net rclarke@talbotcountymd.gov	410-77-8171
Project Status	o Project completed o Project canceled ✓ **Project on schedule** ✓ **Anticipated completion date: 2018** o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**

Engineering upgrades are in progress now. Funding has been secured to upgrade the wastewater treatment plant and will be out for bid in 2017.

2. **What obstacles, problems, or delays did the project encounter?**

No obstacles or issues have been encountered thus far in the project process.

Mitigation Action Progress Report Form #5

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**#5 - Develop an enhanced flood warning system to include the use of GIS and a loss estimation software (such as FEMA's HAZUS-MH software) in the development of flood stage forecast maps, flood depth maps and images of vulnerable structures linked to parcels and flood stage maps. This could be started with digital images of all structures in the County linked to structure center-points for its GIS data.**	
Responsible Agency	Talbot County Public Works Department, GIS Department, Municipalities	
Contact Name	Mark Cohoon (DPW)	
Contact Phone/Email	mcohoon@talbotcountymd.gov	
Project Status	✓ **Project completed** o Project canceled o Project on schedule o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**
   Talbot County recently adopted new FEMA Flood Insurance Rate Maps and the County is now expected to obtain additional mapping products as supplemental information to the FIRMs. Some of these products may be added to the Talbot County Interactive Flood Risk Map to enhance the public outreach effort.
2. **What obstacles, problems, or delays did the project encounter?**
   There were significant delays in the review process before the County could adopt the FEMA FIRMs. There are still map corrections that will have to be performed before these supplemental products will be released by FEMA.
3. **If uncompleted, is the project still relevant? Should the project be changed or revised?**
   This is an effort that is still in the process of being completed. Minor adjustments to the project may be necessary in order to effectively implement the data.
4. **Other comments**
   Previously Salisbury University ran the model; however, an error in the elevation dataset occurred. The model was run a second time and not utilized by the County staff. The HAZUS model was updated and information included 2017 Plan Update.

Mitigation Action Progress Report Form # 6

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**#6 - CRS The County should petition Region III (Mitigation Branch) and the State (Maryland Department of the Environment) and request the County's FIRMS/flood maps to be updated to reflect recent annexations, new development, and changing floodplains. This information prepared should be compatible with the Light Detection and Ranging (LIDAR) that is being conducted by the Maryland Department of Natural Resources for the majority of the county and has new elevation data in 2 foot intervals. Program: Flood Plain Ordinance**	
Responsible Agency	Talbot County Public Works Department, GIS Department, Municipalities	
Contact Name	Ray Clarke and Mark Cohoon (DPW)	
Contact Phone/Email	rclarke@talbotcountymd.gov; mcohoon@talbotcountymd.gov	
Project Status	✓ **Project completed** o Project canceled o Project on schedule o Anticipated completion date:_____ o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**

The Federal Emergency Management Agency (FEMA) in coordination with the Maryland Department of the Environment (MDE) updated Flood Insurance Rate Maps (FIRMs) for every county in the State of Maryland.

An enhanced riverine (nontidal) mapping process included updating riverine floodplain models in both detailed (Zone AE) and approximate study (Zone A) areas. Geographic Information System (GIS) data sets and digital topography were used to develop georeferenced HEC-RAS models for most of the riverine flood models derived after 2005. Talbot County FIRMs will be effective July 2016.

2. **Other comments**

2011 PLAN UPDATE STATUS: Effective DFIRMS were published July, 2016

Mitigation Action Progress Report Form #7

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**#7 - The committee identified areas of concern throughout the County that experience repetitive flooding and/or flood related issues, as shown on Table 52. Areas with flood related issues were analyzed and ranked by priority. Those projects that are currently with the County Capital Improvement Program (CIP) are discussed in gray within the table.**	
Responsible Agency	Talbot County Department of Public Works, Emergency Services	
Contact Name	Ray Clarke, DPW	
Contact Phone/Email	rclarke@talbotcountymd.gov 410-770-8171	
Project Status	✓ **Project completed** o Project canceled o Project on schedule o Anticipated completion date: _____ o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**

CRS points were received for identifying these areas of concern. The following areas of concern have been addressed:

- *Glebe Road – Culvert upgraded, road widened & ditched redesigned;*
- *Dutchman's Lane – Three (3) culverts upgraded to bottomless culverts and concrete bridge; and*
- *Tanyard Branch – Easton Pond (SWM pond) was constructed.*

2. **Other comments**

Through State Aid, a consultant was hired to conduct an assessment of culverts within Talbot County. New projects have been developed from this assessment.

Additional status updates and recommendations to Table 52 were provided and are detailed on the table below.

FLOOD RELATED ISSUES					
Flood Related Issue	**Evacuation Issue (Y/N)**	**SWM Elevation Problem**	**Flooding: Occasional or Repetitive**	**State, County, or Municipal**	**Ranking (High, Medium, Low)**
Approach to Oak Creek Bridge on Route 33	Y	Elevation	Repetitive	State	**High**
a. Recommend noting the north and/or south approach to the bridge. b. Maintenance work was completed on this bridge about 5 + years ago. c. Talbot County has identified Maryland Route 33 as the highest priority project in the County, and the County requested that SHA complete a corridor study that would review evacuation and flooding issues. d. Funding will be an issue. This project is owned and operated by SHA.					
Bozman-Neavitt Road; Inaccessible to Emergency Vehicles	Y	Elevation	Repetitive	County/State	**High**
a. Recommend that the problem areas being identified so it can then be determined if it is a state or county problem b. Need more data to determine the costs for mitigating this problem.					
Route 33; Flooding stops traffic flow into and out of St. Michaels	Y Note: Main Evacuation Route	Elevation	Repetitive	State	**High**
a. SHA has funded design of a streetscape project from Pea Neck Road to Yacht Club Road, construction of the proposed improvements have not been funded. b. Streetscape project will address road drainage and highway capacity. Timing of improvements is unknown.					
Low spots on Glebe Road; Overtops 3' with storm event	N	Elevation	Repetitive	County	Medium
Mitigation Project included in CIP – Elevating road surface 12-18", Designed to Hurricane Isabel's Base Flood Elevation and is currently out-to-bid.					
a. Talbot County completed road and drainage improvements about 4 years ago.					
Intersection of Route 329/Royal Oak Road; Ditches fill beyond capacity and overflows onto road – STATE ROAD	Y	SWM	Repetitive	County	Medium
a. Need to be more specific as to the location of flooding b. If flooding is at one or both intersection of MD Route 33 and MD Route 329 (there are two intersections), this needs to be clarified. c. MD Route 329 also intersects Bellevue Road (County Road)					
Intersection of Route 303 and Cordova; Railroad Bypass, Road drops down	N	Elevation	Repetitive	State	Low
Three Bridge Branch; both ends of the road experience flooding issues	N	Elevation	Repetitive	County	Medium
a. Need input from Road Department on flooding issues?					
The community of Tilghman and Town of Oxford experience flooding issues with a regular rain	Y	Both	Repetitive	Municipal and County	**High**
a. Commmunity of Tilghman – County – Roads Department has completed ditch work to improve drainage					

on Tilghman Island. The Roads Department will continue to work on improving drainage as time and funding allows. b. Town of Oxford i. Causeway floods during high tides – State Road – Town has request SHA raise the road. ii. Other areas within the Town would need to be reviewed with Cheryl Lewis, Town Manager.					
Route 33 Cutoff Area; Major storms cause issues with evacuation or emergency vehicle access	Y	Elevation	Repetitive	State	**High**
a. Intersection of MD Route 33 and MD Route 322 experiences flooding during major storms b. Low spots within the Town of St. Michaels along MD Route 33 experience flooding during major storms c. Talbot County has identified Maryland Route 33 as the highest priority project in the County, and the County requested that SHA complete a corridor study that would review evacuation and flooding issues.					
Routes 303 and 404 Alternate; Occasional Flooding Experienced	N	Elevation	Occasional	State	Low
a. Need to review with SHA					
Route 404 Alternate before the bridge to Caroline County in the town of Queen Anne	N	Elevation	Repetitive	State	Medium
a. Need to review with SHA					
Routes 662 and 50; Flooding experienced during major storms in low spots	N	Elevation	Occasional	State	Low
a. MD Route 662 at bridge – washes out during major storm events b. US Route 50 – need to check with SHA as to the locations					
MD Route 309/Cordova Road prior to Klondike Road; Continues to flood even after road improvements	N	Both	Occasional	County	Medium
a. Need to check with SHA					
Dutchman's Lane Road Flooding; Club East Subdivision & Club Ridge Subdivision	Y	Both	Repetitive	County	
Mitigation Project included in CIP – Replacing three existing culverts with bottomless culvert and concrete bridge. Verizon and Easton Utilities' lines relocated. CIP: $1.5 million of which $890,000 is in grant funding through AARA Federal Aid. Project Completed					
a. Bridge structure constructed in 2010					
MD 331/Dover Road and MD 328/Goldsborough Road; Poor drainage causes flooding during heavy storms in downtown area – Town of Easton/State Road?	N	SWM	Repetitive	County	
Mitigation Project included in CIP – Tanyard Branch Stormwater Improvement Project: Installation of a 1.8-acre SWM facility that will serve to a drainage area of 75-acres. This drainage area includes both Dover & Goldsborough Streets. CIP: $56,000, MDE Trust NPS Grant: $510,000, Total: $566,000.					
a. Need to check with SHA and/or the Town of Easton – improvements have been completed on some sections of these roads.					
Easton; Higher in elevation but has stormwater issues	N	SWM	Occasional	Municipal	Low
a. Need to review with the Town of Easton					

Intersection of Mulberry and Cherry Streets (Town of St. Michaels, East of Route 33; Continuing flooding issues – 2 projects	Y	SWM	Repetitive	Municipal	Medium
a. Intersection of Mulberry and MD Route 33 (Talbot Street); Continuing flooding issues i. Need to review with SHA and the Town of St. Michaels. ii. Talbot County has identified Maryland Route 33 as the highest priority project in the County, and the County requested that SHA complete a corridor study that would review evacuation and flooding issues. b. Intersection of Cherry Street and MD Route 33 (Talbot Street); Continuing flooding issues i. Need to review with SHA and the Town of St. Michaels. ii. Talbot County has identified Maryland Route 33 as the highest priority project in the County, and the County requested that SHA complete a corridor study that would review evacuation and flooding issues.					
Buck Bryan Road; flooding surrounded by wetlands	Y	Elevation	Occasional	County	Low
a. Need to review with Roads Department					
Black Dog Alley; Flooded during December 2009	N	Elevation	Occasional	County	Low
a. Flooding still an issue b. County will need to program improvements when funding is available					
Gregory Road Flooding	N	Both	Repetitive	County	Low
a. Need input from Roads Department					
Route 50; Flooding, particularly South at Choptank River	Y	Elevation	Repetitive	State	Medium
a. Need input from SHA					
Talbot Street, St. Michaels' main street; Flooded 10 July 2010	Y	SWM	Occasional	Municipal	Low
a. Talbot County has identified Maryland Route 33 as the highest priority project in the County, and the County requested that SHA complete a corridor study that would review evacuation and flooding issues. b. SHA has funded a Streetscape design, but SHA has not programmed any construction funding.					
Intersection of Seymour Avenue and Riverview Terrance; Flooded 15" on 10 July 2010	N	SWM	Occasional	Municipal	Low
a. Road intersection is low, and SWM will not address this problem due to this intersection being in very close proximity to the Miles River.					

Source: Talbot County Public Works & Talbot County Community Resilience Committee

Mitigation Action Progress Report Form # 8

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**# 8 - In order to restore Sharps Island and protect Talbot County shorelines, begin with coordination between Talbot County, the State of Maryland and Federal agencies. The next step is a written request for a Section 204 feasibility study provided to the U.S. Army Corps of Engineers.**	
Responsible Agency	U.S. Army Corps of Engineers (USACE), Maryland Department of Transportation Port Administration, Talbot County Department of Emergency Services, Talbot County Municipalities, Watershed Groups	
Contact Name	Mark Cohoon (DPW)	
Contact Phone/Email	mcohoon@talbotcountymd.gov	
Project Status	o Project completed o Project canceled o Project on schedule o Anticipated completion date:_____ ✓ Project delayed Explain State and Federal involvement is necessary to initiate this project.	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**

   This project was not completed. A letter of interest was submitted to the Army Core of Engineers, however the project was denied.

2. **What obstacles, problems, or delays did the project encounter?**

   This project by its very nature is not within the ability of the county to initiate on its own. State and Federal agencies need to be highly involved in the effort to recreate bay islands. The science and cost analysis as well as environmental assessments would need to be completed to justify the cost and time to take on this effort.

3. **If uncompleted, is the project still relevant? Should the project be changed or revised?**

   The project is still relevant. There is a window of opportunity that could be taken advantage of while the Poplar Island Beneficial Use Facility is actively being filled. While the facility is active, there exists the possibility of using dry dredged material, including good quality sand, to rebuild or repair eroding shorelines. This opportunity is greatly reduced once the project closes.

Mitigation Action Progress Report Form #9

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**#9 - Prepare a CRS application to reduce flood insurance costs within Talbot County. Complete the CRS application for credit. For additional CRS credits not discussed under other Plan objectives complete the following projects:** • **On the Talbot County website add Flood Insurance and Flood Protection information. Also maintain Flood Insurance and Flood Protections information at local libraries;** • **Publicize FIRM mapping information to local residents. Assist residents in obtaining flood zone information pertaining to their property;** • **Document flood proof or elevated pre-FIRM buildings.**	
Responsible Agency	Talbot County Department of Emergency Services & Department of Planning & Zoning	
Contact Name	Martin Sokolich	
Contact Phone/Email	msokolich@talbotcountymd.gov	
Project Status	✓ **Project completed** o Project canceled o Project on schedule o Anticipated completion date:_____ o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**

Talbot County submitted a CRS application and was accepted. Currently the County is a Class 8 meaning insurance premiums are discounted 10% for properties within the SFHA and 5% for those located outside the SFHA. The County is working towards becoming a Class 7, which would raise the insurance premiums discount to 15% for properties within the SFHA.

Mitigation Action Progress Report Form #10

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**#10 - Engineering services should provide specifications for backup generators and fuel tanks to provide the municipalities and County with a continuous source of electrical power. Pre-wiring should be considered in all new buildings (schools and emergency shelters) or when upgrades or retrofits are made to these facilities.**	
Responsible Agency	Talbot County Department of Emergency Services, Department of Public Works	
Contact Name	Jim Bass	
Contact Phone/Email	jbass@talbotcountymd.gov	
Project Status	o Project completed o Project canceled ✓ **Project on schedule** o Anticipated completion date: _____ o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**

The Operations Manager for public schools stated Easton High School and the St. Michaels School Complex are the only facilities that have generators. The EHS generator powers essentially the entire facility (see progress report form #11) and the St. Michaels generator powers the cafeteria, coolers, emergency lights and phones.

2. **What obstacles, problems, or delays did the project encounter?**

This project has not encountered any delays, however, a facilities database has not been developed to date. Therefore, this project is still in progress and cannot be classified as completed.

3. **Other comments**

2011 PLAN UPDATE STATUS: St. Michaels has a new generator at Water Tower and additional Critical Facilities have generators including the Community Center, however a facilities database is needed for those that do not have generators.

Mitigation Action Progress Report Form #11

Progress Report Period	Start Date: 2011	End Date: 2016
Action/Project Title	**#11 - Install transfer switch and necessary wiring in order to utilize an available generator for the primary shelter at Easton High School.**	
Responsible Agency	Talbot County Department of Emergency Services, Department of Public Works	
Contact Name	Jim Bass	
Contact Phone/Email	jbass@talbotcountymd.gov	
Project Status	✓ **Project completed** o Project canceled o Project on schedule o Anticipated completion date:_____ o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**

Transfer switch and wiring were installed. Generator now powers most of the EHS facility with the exclusion of the new addition, which houses the Automotive Tech program.

Mitigation Action Progress Report Form #12

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**#12 - Due to repetitive flooding on Dutchman's Lane, a project has been developed to mitigate this issue. This project includes the replacement of three existing culverts with bottomless culvert(s). In addition, the relocation of utility lines (Verizon and Easton Utilities) is included and adds to construction costs.**	
Responsible Agency	Talbot County Public Works	
Contact Name	Ray Clarke	
Contact Phone/Email	rclarke@talbotcountymd.gov 410-770-8171	
Project Status	✓ **Project completed** o Project canceled o Project on schedule o Anticipated completion date:_____ o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**

Three (3) bottomless culverts and concrete bridges have been constructed on Dutchman's Lane. Utilities companies have relocated the utility lines outside of the County's right of ways. The section passing through Windmill Branch, lines have been placed underground, however once past this section, lines are above ground.

2. **What obstacles, problems, or delays did the project encounter?**

No obstacles or problems were encountered during this project process.

Mitigation Action Progress Report Form #13

Progress Report Period	**From Date:** 2011	**To Date:** 2016
Action/Project Title	**#13 - Oak Creek Bridge was elevated following Hurricane Isabel; however Route 33 has unresolved flooding issues, causing part of the County, including St. Michaels and Tilghman Island, to be cut-off.**	
Responsible Agency	Talbot County Department of Emergency Services & Department of Public Works	
Contact Name	Ray Clarke	
Contact Phone/Email	rclarke@talbotcountymd.gov 410-770-8171	
Project Status	✓ **Project completed** o Project canceled o Project on schedule o Anticipated completion date:_____ o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**

State Highway did work on the Oak Creek Bridge and repaired the road, however the road was never elevated. The County did obtain surrounding land and convert it to open space (parks).

2. **What obstacles, problems, or delays did the project encounter?**

No obstacles or issues were encountered during this project process.

3. **Other comments**

Due to Tred Avon flooding roads during a tidal surge, Talbot County has requested State Highway Administration to conduct an evacuation study for the entire corridors of MD 322 and MD 33.

Mitigation Action Progress Report Form #14

Progress Report Period	**Start Date:** 2011	**End Date:** 2016
Action/Project Title	**#14 - In the event of an evacuation of the Eastern Shore as part of the State Mass Care Shelter Strategy, the Talbot County Community Center would provide a shelter for approximately 3,000 residents/evacuees of Talbot County and would also serve to shelter evacuees transiting the County if the evacuation routes to the Western Shore (the Chesapeake Bay and the Kent Narrows bridges) were closed. This would be a shelter of last resort as this area on the lower Eastern Shore has limited access to the mainland via bridges to the Western Shore and Delaware. This would also be used as a shelter for first responders as the Talbot County Community Center is located 5 miles from the Talbot County Department of Emergency Services. This property is also adjacent to the location of the soon-to-be-built Easton Memorial Hospital complex and would provide shelter for staff and patients if needed.**	
Responsible Agency	Talbot County Department of Emergency Services, MEMA	
Contact Name	Mark James	
Contact Phone/Email	mark.james@maryland.gov	
Project Status	o Project completed ✓ **Project canceled** o Project on schedule o Anticipated completion date: _____ o Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. **What was accomplished for this project during this reporting period?**
The sub-grant project application was submitted to FEMA for the Talbot County Community Center Shelter Project. The application was for $1.8 million submitted under the 2010 Pre Disaster Mitigation. The project proposed a 361 standard hardening of a second field house, which would be constructed in the future. The primary use of the shelter outside of a field house was to house medical staff and patients of a proposed hospital that was planned for the adjacent property.
2. **What obstacles, problems, or delays did the project encounter?**
FEMA denied the project on the basis that the shelter was dependent on the construction of a hospital and without a specific user population the shelter would serve as a general evacuation shelter.

3. **If uncompleted, is the project still relevant? Should the project be changed or revised?**

   Since utilizing the Community Center as a shelter was denied, other facilities have been considered. Maryland's Department of Human Resources (DHR), Talbot County Department of Social Services, has been designated as a potential shelter location.

Chapter 11:

Mitigation & Resilience Goals, Objectives & Actions

CHAPTER 11: MITIGATIO & RESILIENCE GOALS, OBJECTIVES, AND ACTIONS

This chapter discusses both past goals and objectives established in the *2004 and 2011 Talbot County Hazard Mitigation Plan* and new objectives developed during the 2017 Hazard Mitigation and Resilience Planning Process. The goals and objectives presented herein help to guide Talbot County in identifying and selecting mitigation actions and resilience strategies to address its hazard vulnerabilities. The actions address the vulnerabilities discussed in Section 2 by identifying measures that will help the County avoid, prevent, or otherwise reduce damages and downtime resulting from hazards.

While the hazard identification, risk and vulnerability assessments presented in Section 2 of the plan document identified potential hazards, the affected areas, and facilities in the County vulnerable to them, Section 3 identifies specific strategies and specific actions that address these vulnerabilities and reduce the risk from natural hazards.

Talbot County's vision of a safe, secure, and resilient community is:

- *A County with buildings located outside of hazardous areas and built to withstand the hazards that threaten them;*
- *A County integrating hazard mitigation concerns into decisions on growth and future development;*
- *An informed citizenry charged with protecting their families, homes, workplaces, communities, and livelihoods from the impact of disasters;*
- *County and municipal departments integrating cost-effective mitigation and resilience programs into routine planning and budgeting decisions; and,*
- *A partnership of local, State, and Federal governments, volunteer agencies, business and industry, and individual citizens focused on preventing or reducing the loss of life and property from the full range of hazards.*

1. GOALS AND OBJECTIVES

During the various Core Planning Team and Community Resilience Stakeholder Committee meetings, the 2017 risk and vulnerability assessments and potential mitigation strategies were discussed. During these discussions, the main desire of community stakeholders was that mitigation and resilience goals and objectives maintain the social, economic and environmental fabric of the community. First and foremost, goals and objectives would serve to protect people, property, local governmental operations, and the local economy from the effects of hazards.

Goal	Goals are general guidelines that explain what you want to achieve. They are usually broad policy-type statements, long-term and represent global visions.
Objective	Objectives define strategies or implementation steps to attain the identified goals. Unlike goals, they are specific and measurable.

The goals and objectives from previous plan iterations published in 2004 and in 2011 were reviewed by stakeholders, who then revised the goals and objectives as necessary and created additional goals and objectives for inclusion in the 2017 Plan. These goals and objectives represent the County's vision for reducing damages caused by flooding and other natural hazards and creating community resilience. Goals and objectives have been categorized into broad topics.

Flood

Goal 1 - Minimize damage caused by flooding.

1.1 Ensure that existing structures in the floodplain are resistant to flood damage.
1.2 Create awareness among residents and businesses of the potential hazards associated with floodplain areas and how they can protect themselves and their properties from flood events.
1.3 At a minimum, protect the critical facilities in the 100-year flood plain. In addition, the *2015 FEMA Flood Risk Management Standard* recommends protection of critical facilities to the 0.2% chance (500-year) flood elevation as an added margin of error against climate risk. Consider the most appropriate flood control measures such as acquisition and relocation, elevation, dry/wet flood proofing, etc.
1.4 Review, revise and update local floodplain ordinances, as appropriate.
1.5 Prepare stormwater management plans for various areas in the County.
1.6 Reduce road closures, specifically evacuation routes and protect public infrastructure from flood damage.
1.7 Restore barrier islands to provide protection for Talbot County's shorelines from wave action.
1.8 Continue to improve Community Rating System score to reduce the cost of flood insurance within Talbot County.
1.9 Locate new development outside the floodplain.
1.10 Map future flood risk areas.

Winter Storm

Goal 2 - Minimize the impacts of winter storms on County residents.

2.1 Ensure residents are forewarned to be prepared with supplies to face winter storms.
2.2 Protect utilities, so that they may not be impacted and interrupted from exposure to hazards such as hail, icy conditions, high winds, etc.

Erosion

Goal 3 - Minimize damage caused by erosion.

3.1 Provide flood protection while reducing erosion and sediment at the Choptank River, East Wye, Miles, and Tred Avon Rivers.
3.2 Provide information to waterfront property owners regarding ways to mitigate erosion problems on their shorelines.
3.3 Encourage the education and use of living shorelines in appropriate locations for shore stabilization.

Wildfire

Goal 4 - Reduce damage and loss to existing community assets including residential structures, critical facilities, and infrastructure due to fire.

4.1 Reduce the exposure to critical facilities in high or extreme fire hazard areas.
4.2 Reduce the exposure of residences and infrastructure to fire hazard incidents.

Tornadoes and Hurricane Winds

Goal 5 - Reduce exposure of structures to wind hazards.

5.1 Improve the County's ability to identify structures that are vulnerable to high winds.

5.2 Consider actions for wind mitigation wherever appropriate.

Drought

Goal 6 – Minimize loss due to drought.

6.1 Introduce farmers and residents to water saving methods and devices through an education process.

6.2 Encourage the use of xeriscaping and drip irrigation.

Critical Facilities

Goal 7 - Ensure adequate protection and resilience of critical facilities and infrastructure throughout the County.

7.1 Reduce the possibility of damage and loss to existing community assets including addressable structures, critical facilities and infrastructure due to flooding and other hazard events.

7.2 Design new critical facilities with resilience against conditions (i.e. sea levels, flood risk, precipitation, and temperatures that are projected throughout the lifetime of the facility.

Public Awareness

Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.

8.1 Develop a public awareness campaign that will be a long-term initiative, providing consistent educational opportunities to advance the community's knowledge and skills.

8.2 Ensure County residents are aware of evacuation procedures.

8.3 Ensure proper real estate disclosure including elevation certificates to enable buyers to make informed purchase decisions.

Sustainable Development

Goal 9 - Promote sustainable development to improve the quality of life.

9.1 Provide for the conservation and protection of natural resources.

9.2 Ensure density is controlled in hazard prone areas.

9.3 Use smart growth planning techniques to conserve land and reduce exposure to hazards.

9.4 Create a Post Disaster Redevelopment Plan (PDRP) to guide rebuilding after a disaster.

Building Construction

Goal 10 - Maintain high construction standards through the adoption of current International Building Codes-Building Performance Standards.

10.1 Ensure current building codes and standards follow FEMA's basic guidelines and are properly enforced.

Communication

Goal 11 - Improve communication between local jurisdictions.

11.1 Promote partnerships among the municipalities and the County to develop a countywide approach to mitigation activities and resilience initiatives.

11.2 Develop a distribution plan for public outreach materials and other relevant information.

11.3 Promote GIS technology for updating and exchanging of data, countywide.

Training

Goal 12 - Enhance performance of staff to become competent in reducing vulnerability and improving community resilience.

12.1 Encourage County and municipal staff to attend hazard mitigation and resilience related training programs to enhance performance of their existing job functions.

Shelters

Goal 13 - Ensure that there are an adequate number of shelters in the County.

13.1 Ensure that facilities designated as shelters have adequate back-up power (correctly sized for facility).

Plan Integration

Goal 14- Integrate plan and policies across disciplines and agencies within the County through the consideration of potential hazards and future development.

14.1 Integrate hazard mitigation and resilience into areas such as land use, transportation, climate change, natural and cultural resource protection, water resources, and economic development.

14.2 Solicit participation and offer opportunities for various departments to work together on a regular basis.

14.3 Cleary define roles of, and improve intergovernmental coordination between planners, emergency managers, engineers, and other staff, and municipal and regional partners in improving disaster resilience.

Community Resilience

Goal 15: Organize effectively and address resilience risks and priorities.

15.1 Prioritize improvements to the built environment based on their role in supporting the five Talbot Community Pillars and functions during recovery.

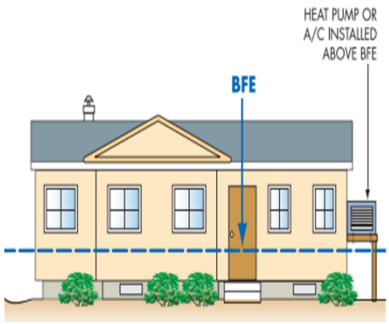
15.2 Address Infrastructure dependencies and cascading effects in system failures.

15.3 Determine customized long-term resilience initiatives.

15.4 Regularly review and integrate the best available projections for sea level rise, flooding, precipitation, and other hazards into county planning.

2. MITIGATION & RESILIENCE IMPLEMENTATION ACTIONS

The Core Planning Team and the Community Resilience Stakeholder Committee worked diligently over the course of several months and multiple meetings to identify, develop, and prioritize twenty-four mitigation and resilience implementation actions. Six of the twenty-four actions were rated as a "high" priority. The following pages provide detailed information on each action including: background/issue, ideas for integration, responsible agency. Partners, potential funding, cost estimate, benefits (losses avoided), timeline, and associated goals and objectives.

ACTION ITEM #1	
Location:	Countywide
Mitigation Action/ Project Title:	**#1 - Flood Mitigation Non-Substantial Improvements for Businesses**
Background/Issue:	Proposed improvements are "non-substantial" if the costs of all improvements are less than 50% of the market value of the building. Although owners are not required to bring the existing building into compliance, elevation is the best way to reduce vulnerability. There are many other things owners can do to reduce future flood damage: • Use flood resistant material, for example tile, closed-cell wall insulation, and polyvinyl wall coverings. • Raise air conditioning equipment, heat pump, furnace, hot water heater, and other appliances on platforms. • Install electrical outlets higher above the floor. • Move ductwork out of crawlspaces. • Retrofit crawlspaces with flood openings. • Fill in below-grade crawlspaces/utility space. • Raise window sills and entryways above Base Flood Elevation (BFE) for stores located in floodplains. 
Ideas for Integration:	- Informational brochures provided by insurance agencies. - Pre-disaster mitigation and planning for businesses - Federal Emergency Management Agency (FEMA) Brochures
Responsible Agency:	Business Owners Talbot County Department of Planning and Zoning
Partners:	Insurance Agencies
Potential Funding:	Possible insurance cost reduction
Cost Estimate:	Dependent upon proposed improvement
Benefits: (Losses Avoided)	Improvements will reduce or eliminate property damage caused by flooding.
Timeline:	Dependent upon proposed improvement
Goals & Objectives	***Goal 1 - Minimize damage caused by flooding.*** 1.2 Create awareness among residents of the potential hazards associated with floodplain areas and how they can protect themselves and their properties from flood events. 1.3 At a minimum, protect the critical facilities in the 100-year flood plain. In

	addition, the 2015 FEMA Flood Risk Management Standard recommends protection of critical facilities to the 0.2% chance (500-year) flood elevation as an added margin of error against climate risk. Consider the most appropriate flood control measures such as acquisition and relocation, elevation, dry/wet flood proofing, etc. ***Goal 7 - Ensure adequate protection and resilience of critical facilities and infrastructure throughout the County.*** 7.1 Reduce the possibility of damage and loss to existing community assets including addressable structures, critical facilities and infrastructure due to flooding and other hazard events. ***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.1 Develop a public awareness campaign that will be a long-term initiative, providing consistent educational opportunities to advance the community's knowledge and skills. ***Goal 11 - Improve communication between municipalities and partners.*** 11.2 Develop a distribution plan for public outreach materials and other relevant information.

ACTION ITEM #2	
Location:	Countywide
Mitigation Action/ Project Title:	**#2 - Disaster Recovery Planning for Economic Development**
Background/Issue:	Small business owners invest a tremendous amount of time, money and resources to make their ventures successful, yet, many owners fail to properly plan and prepare for disaster situations. According to the Institute for Business and Home Safety, an estimated **25 percent** of businesses do not reopen following a major disaster. You can protect your business by identifying the risks associated with natural and man-made disasters, and by creating a plan for action should a disaster strike. By keeping those plans updated, you can help ensure the survival of your business. The resources provided below will get you started on the process of advance planning. • Small Business Disaster Preparedness Guide Offers information to help prepare your business for a disaster and apply for a disaster loan from the SBA. • PrepareMyBusiness.Org Agility Recovery Solutions offers business continuity planning tips for small businesses. • Emergency Management Guide for Business and Industry Gives step-by-step advice on how to create and maintain a comprehensive emergency management plan. • Protect Your Business from Disaster Supplies information on how to protect your property from natural disasters. Getting Back in Business: Disaster Recovery Before a disaster strikes, it is important to preserve your equipment and the business records you will need to help your business get back on track. • Protecting Your Tax and Financial Records Gives tips and advice from the IRS on protecting your tax and financial records. • Standard Checklist Criteria for Business Recovery Offers a checklist of creating a business recovery manual for medium to large businesses. **BUSINESS CONTIUNITY WORKSHOP** The Maryland Emergency Management Agency offers FEMA business continuity workshops. Talbot County may host a workshop for local businesses.
Ideas for Integration:	Recovery plans for all towns and county

Responsible Agency:	Business Owners
Partners:	County & Municipal Economic Development Offices Chamber of Commerce/Emergency Management
Potential Funding:	Small Business Administration Pre-Disaster Mitigation Loan Program
Cost Estimate:	Dependent upon recovery plan
Benefits: (Losses Avoided)	- Reduces disruption of a business' function and resources - Provide critical services to citizens post disaster
Timeline:	Less than one (1) year for planning
Goals & Objectives	***Goal 1 - Minimize damage caused by flooding***. 1.2 Create awareness among residents of the potential hazards associated with floodplain areas and how they can protect themselves and their properties from flood events. ***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.1 Develop a public awareness campaign that will be a long-term initiative, providing consistent educational opportunities to advance the community's knowledge and skills.

ACTION ITEM #3	
Location:	County Schools
Mitigation Action/ Project Title:	**#3 - County Schools Flood Evacuation Destinations**
Background/Issue:	The following schools and their primary and secondary evacuation destination are listed below for fire and bomb threats. However, an evacuation destination listing for flood events has not been created. The listing below would not be utilized for flood events considering several of the facilities are located in the Hurricane evacuation zones and/or the Special Flood Hazard Area (SFHA). **White Marsh Elementary School** – Flood Zone X Primary: Trappe Fire House – Flood Zone X Secondary: Easton High School – Flood Zone X **Chapel Elementary School** – Flood Zone X Primary: Cordova Fire House – Flood Zone X Secondary: Easton High School – Flood Zone X **Tilghman Elementary School – Located in Evacuation Zone 1** Primary: Tilghman Fire House **- Located in Evacuation Zone 1** Secondary: St. Michael's Elementary **- Located in Evacuation Zone 3** **St. Michaels Elementary School – Located in Evacuation Zone 3** Primary: Maritime Museum **– Located in Flood Zone AE: Flood Depth – 1.7′** Secondary: Easton High School – Flood Zone X **St. Michael's Middle/ High School – Located in Evacuation Zone 3** Primary: Maritime Museum **– Located in Flood Zone AE: Flood Depth – 1.7′** Secondary: Easton High School – Flood Zone X **Easton Elementary Campus** – Flood Zone X Primary: Moton Park (Walk) – Flood Zone X Secondary: Easton High School – Flood Zone X **Easton Middle School** – Flood Zone X Primary: YMCA (Walk) – Flood Zone X Secondary: Easton High School – Flood Zone X **Easton High School** – Flood Zone X Primary: EHS Stadium (Walk) – Flood Zone X Secondary: St. Marks Church in Easton – Flood Zone X
Ideas for Integration:	Incorporate into the Talbot County Emergency Operations Plan.
Responsible Agency:	Talbot County Public Schools Talbot County Department of Emergency Services
Partners:	Fire Companies
Potential Funding:	N/A
Cost Estimate:	Staff Time

Benefits: (Losses Avoided)	Ensures a safe location and avoids possible child endangerment.
Timeline:	Less than one (1) year for planning
Goals & Objectives	***Goal 7 - Ensure adequate protection and resilience of critical facilities and infrastructure throughout the County.*** 7.1 Reduce the possibility of damage and loss to existing community assets including addressable structures, critical facilities and infrastructure due to flooding and other hazard events. 7.2 Design new critical facilities with resilience against conditions (i.e. sea levels, flood risk, precipitation, and temperatures that are projected throughout the lifetime of the facility. ***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.2 Ensure County residents are aware of evacuation procedures. ***Goal 11 - Improve communication between local jurisdictions.*** ***11.3 Promote GIS technology for updating and exchanging of data, countywide.*** ***Goal 13 - Ensure that there are an adequate number of shelters in the County.*** 13.1 Ensure that facilities designated as shelters have adequate back-up power (correctly sized for facility).

ACTION ITEM #4	
Location:	Talbot County
Mitigation Action/ Project Title:	**#4 - Environmental Education and Resilience Opportunity**
Background/Issue:	Flood Resilience Mitigation via Habitat Restoration (Seagrasses/Riparian Buffers) - Provide opportunities for students to help restore/create habitats that help increase flood resilience. Chesapeake Bay Program - Environmental Literacy - Goal: Enable students in the region with the knowledge and skills to act responsibly to protect and restore their local watershed.  Environmental Literacy Planning outcome: - Each participating Bay jurisdiction should develop a comprehensive and systemic approach to environmental literacy for all students in the region that includes policies, practices and voluntary metrics that support the environmental literacy Goals and Outcomes of this Agreement.
Ideas for Integration:	Apply student service learning hours and environmental literacy standards.
Responsible Agency:	Talbot County Public Schools
Partners:	Children in Nature Maryland Association of Environmental and Outdoor Education (MAEOE) Chesapeake Bay Trust North American Association of Environmental Education (NAAEE) LEA Environmental Literacy - Point-of-Contact for Talbot Co: William Kesnick wkesnick@tcps.k12.md.us Phillips Wharf Pickering Creek
Potential Funding:	Chesapeake Bay Trust Chesapeake Bay Program Maryland Department of Natural Resources
Cost Estimate:	Dependent upon resources necessary to complete project
Benefits: (Losses Avoided)	Protects coastal communities from flooding, erosion, and storm surge impacts.

Timeline:	Ongoing
Goals & Objectives	***Goal 3 - Minimize damage caused by erosion.*** 3.3 Encourage the education and use of living shorelines in appropriate locations for shore stabilization. ***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.1 Develop a public awareness campaign that will be a long-term initiative, providing consistent educational opportunities to advance the community's knowledge and skills. ***Goal 9 - Promote sustainable development to improve the quality of life.*** 9.1 Provide for the conservation and protection of natural resources.

ACTION ITEM #5	
Location:	Countywide
Mitigation Action/ Project Title:	**#5 - Design Resilience into Capital Investments**
Background/Issue:	Ensure new infrastructure or significant improvements to infrastructure are designed for flood, extreme temperature, and precipitation conditions that are expected during the facility's full lifetime (i.e., if the wastewater treatment plant is expected to function for 50 years, it should be designed to cope with 2 feet of sea level rise and greater stormwater flows). For all capital investment projects, develop guidelines that ensure projects are adequately designed for the environmental conditions they will encounter during their full lifetimes.
Ideas for Integration:	Building Codes Land Use Policies Design Specifications, reference CoastSmart design guidelines
Responsible Agency:	Talbot County Department of Public Works
Partners:	Municipal Public Works Maryland State Highway Administration Maryland Sea Grant Maryland Department of Natural Resources National Oceanic and Atmospheric Administration Maryland Department of Environment
Potential Funding:	Staff time for research
Cost Estimate:	Dependent upon project design
Benefits: (Losses Avoided)	– May lower maintenance and repair costs over lifetime. – Will reduce downtime during/after a disaster. – Prevent loss of service at critical times.
Timeline:	Dependent upon project design
Goals & Objectives	***Goal 1 - Minimize damage caused by flooding.*** 1.4 Review, revise and update local floodplain ordinances, as appropriate. 1.5 Prepare stormwater management plans for various areas in the County. 1.9 Locate new development outside the floodplain. ***Goal 9 - Promote sustainable development to improve the quality of life.*** 9.3 Use smart growth planning techniques to conserve land and reduce exposure to hazards. ***Goal 10 - Maintain high construction standards through the adoption of current International Building Codes-Building Performance Standards.*** 10.1 Ensure current building codes and standards follow FEMA's basic guidelines and are properly enforced.

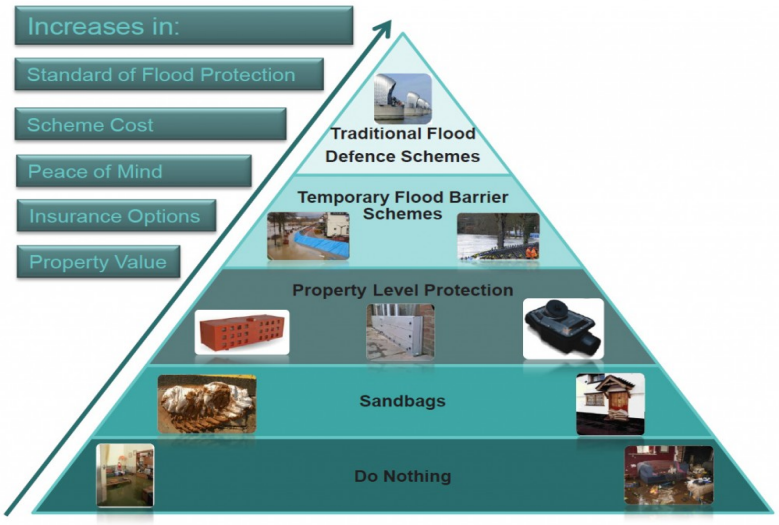
	Goal 15: Organize effectively and address resilience risks and priorities. 15.1 Prioritize improvements to the built environment based in their role in supporting the five Talbot Community Pillars and functions during recovery. 15.2 Address Infrastructure dependencies and cascading effects in system failures. 15.3 Determine customized long-term resilience initiatives.
Priority:	**HIGH**

ACTION ITEM #6	
Location:	Countywide
Mitigation Action/ Project Title:	**#6 - Flood Prevention & Stormwater Management Best Practices**
Background/Issue:	– Review regulations to evaluate whether current stormwater management regulations/Best Management Practices (BMP) designs are adequate to address climate change and larger, more frequent rain events. (i.e., 100 year rainstorm or greater-500 year) – Look at projections for increases in precipitation intensity and frequency and ensure that policies and regulations can adapt accordingly, especially as it relates to stormwater BMPs, infrastructure (e.g., bridges, culverts, ditches) maintenance/replacement that considers future conditions, and floodplain management. – Incentivize a reduction in impervious surfaces via removal or replacement with pervious materials. – Incentivize incorporation of green infrastructure on private property.
Ideas for Integration:	Building Codes Stormwater Management Regulations Land Use Policies Floodplain Ordinance
Responsible Agency:	Talbot County Department of Public Works
Partners:	- Regional collaboration via Eastern Shore Climate Adaption Partnership (ESCAP) – The partnership has cooperated with a University of Maryland researcher to apply for a National Oceanic and Atmospheric Administration(NOAA) grant (decision from NOAA in spring 2017) to research increases in extreme precipitation events on the Eastern Shore. A key outcome would be an evaluation of whether "design-storm" guidance for infrastructure, stormwater management practices, and floodplain management is adequate for current and future rainfall scenarios. - Maryland Department of Natural Resources - National Oceanic and Atmospheric Administration - Non-Governmental Organization Watershed Groups
Potential Funding:	Maryland Department of Natural Resources CoastSmart Grant Chesapeake Bay Trust
Cost Estimate:	Project Dependent Staff Time
Benefits: (Losses Avoided)	- Analysis could inform Watershed Implementation Plan (WIP) activities. - Better water quality due to less water quantity. - May lower maintenance and repair costs over lifetime. - Will reduce downtime during/after a disaster. - Prevent loss of service at critical times. - Decrease grey infrastructure by increasing green infrastructure.

Timeline:	Short Term: If selected, project funding runs July 1, 2017 to June 30, 2019 Long Term: 2025
Goals & Objectives	***Goal 1 - Minimize damage caused by flooding.*** 1.1 Ensure that existing structures in the floodplain are resistant to flood damage. 1.4 Review, revise and update local floodplain ordinances, as appropriate. 1.5 Prepare stormwater management plans for various areas in the County. 1.6 Reduce road closures, specifically evacuation routes and protect public infrastructure from flood damage. ***Goal 7 - Ensure adequate protection and resilience of critical facilities and infrastructure throughout the County.*** 7.1 Reduce the possibility of damage and loss to existing community assets including addressable structures, critical facilities and infrastructure due to flooding and other hazard events. 7.2 Design new critical facilities with resilience against conditions (i.e. sea levels, flood risk, precipitation, and temperatures that are projected throughout the lifetime of the facility. ***Goal 10 - Maintain high construction standards through the adoption of current International Building Codes-Building Performance Standards.*** 10.1 Ensure current building codes and standards follow FEMA's basic guidelines and are properly enforced. ***Goal 14- Integrate plan and policies across disciplines and agencies within the County through the consideration of potential hazards and future development.*** ***14.1 Integrate hazard mitigation and resilience into areas such as land use, transportation, climate change, natural and cultural resource protection, water resources, and economic development.*** ***Goal 15: Organize effectively and address resilience risks and priorities.*** 15.2 Address Infrastructure dependencies and cascading effects in system failures. 15.3 Determine customized long-term resilience initiatives.

ACTION ITEM #7	
Location:	Shoreline Parcels
Mitigation Action/ Project Title:	**#7 – Open Space Preservation**
Background/Issue:	Identify priority shoreline parcels for acquisition or easement to improve flood storage and wave buffering utilizing open space preservation funding or pre-disaster/flood risk mitigation funding. 
Ideas for Integration:	Land Use Policies Maryland Department of Natural Resources – Coastal Resilience Assessment
Responsible Agency:	Talbot County Department of Planning and Zoning
Partners:	Municipalities Maryland Department of Natural Resources Eastern Shore Land Conservancy Maryland Environmental Trust
Potential Funding:	Program Open Space Hazard Mitigation Grant Program
Cost Estimate:	Dependent upon acquisition cost
Benefits: (Losses Avoided)	– Can protect critical habitats and marsh migration zone (which could provide future protection against flooding and erosion) – Community Rating System credits
Timeline:	Planning/Site Identification: 1-2 years Acquisition/Implementation: 2-5 years
Goals & Objectives	***Goal 1 - Minimize damage caused by flooding.*** 1.7 Restore barrier islands to provide protection for Talbot County's shorelines from wave action. 1.8 Continue to improve Community Rating System score to reduce the cost of flood insurance within Talbot County. ***Goal 3 - Minimize damage caused by erosion.*** 3.1 Provide flood protection while reducing erosion and sediment at the Choptank River, East Wye, Miles, and Tred Avon Rivers. 3.3 Encourage the education and use of living shorelines in appropriate locations for shore stabilization. ***Goal 11 - Improve communication between municipalities and partners.*** 11.1 Promote partnerships among the municipalities and the County to develop a countywide approach to mitigation activities and resilience initiatives.

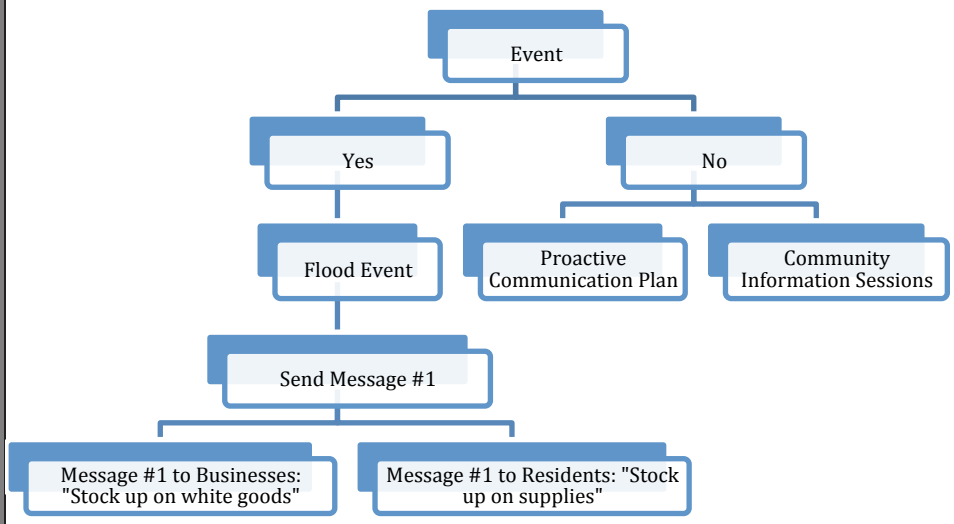
	Goal 15: Organize effectively and address resilience risks and priorities. 15.3 Determine customized long-term resilience initiatives.
Priority:	**HIGH**

ACTION ITEM #8	
Location:	Flood Prone Areas
Mitigation Action/ Project Title:	**#8 - Flood – Public Education/Awareness**
Background/Issue:	Implement a program for public information about flood risk and steps residents, homeowners, businesses can take to reduce risk.  Look for opportunities to tie in messages about other county priorities (e.g. shoreline stabilization, pollution and fertilizer runoff, etc.).
Ideas for Integration:	Provide informational packets to insurance agencies for distribution.
Responsible Agency:	Talbot County Department of Planning and Zoning
Partners:	- Regional collaboration via Eastern Shore Climate Adaption Partnership (ESCAP) – partner communities may wish to collaborate on creating public outreach materials and programs under the Community Rating System. - Non-Governmental Organizations - Talbot County Department of Emergency Services
Potential Funding:	Hazard Mitigation Grant Program
Cost Estimate:	Staff Time
Benefits: (Losses Avoided)	Community Rating System Credits/Discounts Watershed Implementation Plan – Nutrient Reduction Watershed Implementation Plan – Outreach Credit
Timeline:	Program Development – 2 years Program - Ongoing
Goals & Objectives	***Goal 1 - Minimize damage caused by flooding.*** 1.2 Create awareness among residents of the potential hazards associated with floodplain areas and how they can protect themselves and their properties from flood events. 1.8 Continue to improve Community Rating System score to reduce the cost of

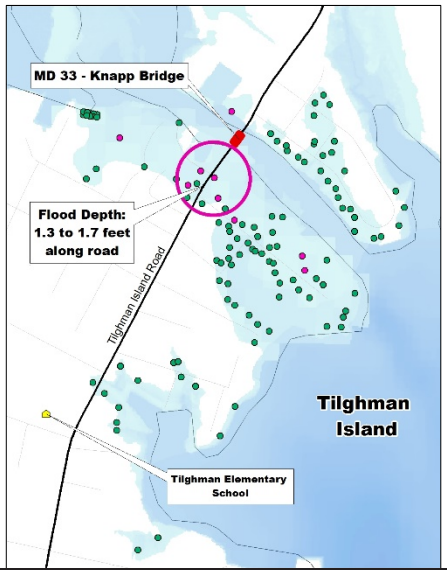
	flood insurance within Talbot County. ***Goal 3 - Minimize damage caused by erosion.*** 3.2 Provide information to waterfront property owners suspecting erosion problems on their shorelines. ***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.1 Develop a public awareness campaign that will be a long-term initiative, providing consistent educational opportunities to advance the community's knowledge and skills. ***Goal 11 - Improve communication between municipalities and partners.*** 11.2 Develop a distribution plan for public outreach materials and other relevant information.
Priority:	**HIGH**

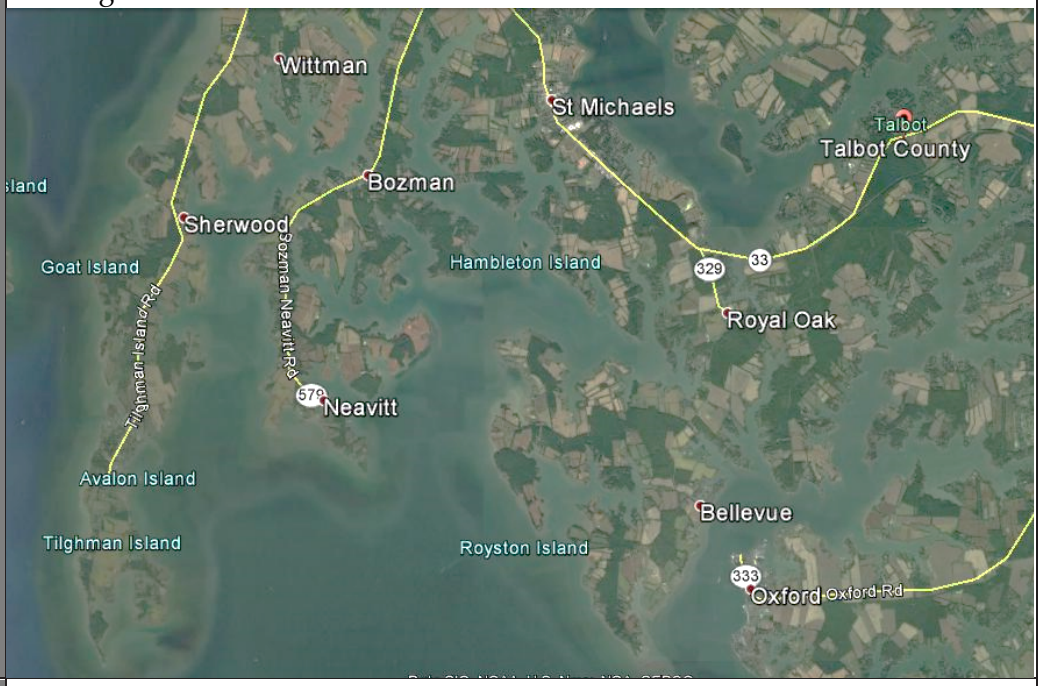
ACTION ITEM #9	
Location:	Countywide
Mitigation Action/ Project Title:	**#9 - Public Outreach Sessions**
Background/Issue:	Being prepared can reduce fear, anxiety, and losses that accompany disasters. Communities, families, and individuals should know what to do during a disaster event and where to seek shelter. They should be ready to evacuate their homes and take refuge in public shelters and know how to care for their basic medical needs. Public Information and Training should include at a minimum: Talbot County Emergency Information • Hazards that impact Talbot County • Talbot County Warning and Notification • Evacuation Routes Emergency planning and Checklists • Escape Routes • Family Communications Plan • Utility Shut-off and Safety • Insurance and Vital Records • Special Needs • Caring for Animals • Safety Skills Disaster Supply Kit Assembly The following items are recommended for inclusion in your basic disaster supplies kit: • Three-day supply of non-perishable food. • Three-day supply of water – one gallon of water per person, per day. • Portable, battery-powered radio or television and extra batteries. • Flashlight and extra batteries. • First aid kit and manual. • Sanitation and hygiene items (moist towelettes and toilet paper). • Matches and waterproof container. • Whistle. • Extra clothing. • Kitchen accessories and cooking utensils, including a can opener. • Photocopies of credit and identification cards. • Cash and coins. • Special needs items, such as prescription medications, eye glasses, contact lens solutions, and hearing aid batteries. • Items for infants, such as formula, diapers, bottles, and pacifiers. • Other items to meet your unique family needs.
Ideas for Integration:	Facebook YouTube

Responsible Agency:	Talbot County Department of Planning and Zoning
Partners:	Talbot County Department of Public Works – Geographic Information System (GIS)
Potential Funding:	Maryland's Community Resilience Grant Program
Cost Estimate:	Staff Time
Benefits: (Losses Avoided)	Effective messaging will mitigate the possibility of injury or loss of life and reduce panic during a disaster event.
Timeline:	Ongoing
Goals & Objectives	***Goal 2 - Minimize the impacts of winter storms on County residents.*** 2.1 Ensure residents are forewarned and prepared with supplies to face winter storms. ***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.1 Develop a public awareness campaign that will be a long-term initiative, providing consistent educational opportunities to advance the community's knowledge and skills. 8.2Ensure County residents are aware of evacuation procedures. ***Goal 11 - Improve communication between municipalities and partners.*** 11.2 Develop a distribution plan for public outreach materials and other relevant information.

ACTION ITEM #10	
Location:	Countywide
Mitigation Action/ Project Title:	**#10 - Mass Communication**
Background/Issue:	- Craft messages to convey how important it may be to evacuate. - Create a "Communication Tree" designed for businesses and residents. Example: 
Ideas for Integration:	Informational Video Talbot County Citizen Alert Messaging
Responsible Agency:	Talbot County Department of Emergency Services
Partners:	Talbot County Roads Department MD State Highway Administration
Potential Funding:	Maryland's Community Resilience Grant Program
Cost Estimate:	Staff Time
Benefits: (Losses Avoided)	Effective messaging will mitigate the possibility of injury or loss of life.
Timeline:	Ongoing
Goals & Objectives	***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.2 Ensure County residents are aware of evacuation procedures. ***Goal 11 - Improve communication between municipalities and partners.*** 11.2 Develop a distribution plan for public outreach materials and other relevant information.

ACTION ITEM #11	
Location:	Countywide
Mitigation Action/ Project Title:	**#11 - Public Outreach Plan**
Background/Issue:	Create messages that are detailed, yet understandable. When developing the emergency communication strategy, it is important to incorporate both alert and warning. An alert is meant to grab people's attention and make them aware that an emergency is occurring and that important information will soon follow. The warning message that follows instructs, clearly and succinctly, what actions residents should take. Standard guidelines should be developed for each outlet utilized to convey message.
Ideas for Integration:	Talbot County Citizen Alert Messaging
Responsible Agency:	Talbot County Department of Emergency Services
Partners:	
Potential Funding:	Maryland's Community Resilience Grant Program
Cost Estimate:	Staff Time
Benefits: (Losses Avoided)	Effective messaging will mitigate the possibility of injury or loss of life.
Timeline:	Ongoing
Goals & Objectives	***Goal 11 - Improve communication between municipalities and partners.*** 11.2 Develop a distribution plan for public outreach materials and other relevant information. ***Goal 12 - Enhance performance of staff to become competent in reducing vulnerability and improving community resilience.*** 12.1 Encourage County and municipal staff to attend hazard mitigation and resilience related training programs to enhance performance of their existing job functions. ***Goal 14- Integrate plan and policies across disciplines and agencies within the County through the consideration of potential hazards and future development.*** ***14.2 Solicit participation and offer opportunities for various departments to work together on a regular basis.***
Priority:	**HIGH**

ACTION ITEM #12	
Location:	Hazard Prone Areas
Mitigation Action/ Project Title:	**#12 - Public Education and Awareness**
Background/Issue:	For specific residents and areas: - Targeted mailings; - Warn of flood areas utilizing mapping products; - Education on issues with sheltering in-place; - Education about sheltering in-place; and - Public outreach sessions. 
Ideas for Integration:	
Responsible Agency:	Talbot County Department of Emergency Services
Partners:	Talbot County Roads Department Postal Service
Potential Funding:	Maryland's Community Resilience Grant Program
Cost Estimate:	Staff Time Printing Cost Mailing Cost
Benefits: (Losses Avoided)	Effective messaging will mitigate the possibility of injury or loss of life.
Timeline:	Ongoing
Goals & Objectives	***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.2 Ensure County residents are aware of evacuation procedures. ***Goal 11 - Improve communication between municipalities and partners.*** 11.2 Develop a distribution plan for public outreach materials and other relevant information.

ACTION ITEM #13	
Location:	Oxford, St. Michaels, Tilghman Island, and the areas of Royal Oak, Sherwood, Bozman, and Whitman
Mitigation Action/ Project Title:	**#13 - Communication Infrastructure**
Background/Issue:	Install high speed broadband using installation standards that ensure strong communication infrastructure in high-risk areas, for community resilience. Using FEMA flood zones, high risk areas include: Oxford, St. Michaels, Tilghman Island, and the areas of Royal Oak, Sherwood, Bozman, and Whitman. Improve cell Wi-Fi on local towers and install backup generators. According to high wind events data, areas frequently affected include Bozman and Tilghman Island. 
Ideas for Integration:	- Installation of "dark fiber" infrastructure (unused optical fiber that is available for use in fiber-optic communication) at time of other utility install and repair. - Modify local code to require backup generator for community facilities (towers, communication buildings, etc.)
Responsible Agency:	Talbot County Department of Public Works
Partners:	Easton Utilities Atlantic Broadband Delmarva Power
Potential Funding:	N/A

Cost Estimate:	Project Dependent
Benefits: (Losses Avoided)	Ensures critical services to citizens before and after disaster event.
Timeline:	1-2 years
Goals & Objectives	***Goal 2 - Minimize the impacts of winter storms on County residents.*** 2.2 Protect utilities, so that they may not be impacted and interrupted from exposure to hazards such as hail, icy conditions, high winds, etc. ***Goal 5 - Reduce exposure of structures to wind hazards.*** 5.1 Improve the County's ability to identify structures that are vulnerable to high winds. 5.2 Consider actions for wind mitigation wherever appropriate. ***Goal 15: Organize effectively and address resilience risks and priorities***. 15.3 Determine customized long-term resilience initiatives.

ACTION ITEM #14	
Location:	Wastewater Treatment Plants
Mitigation Action/ Project Title:	**#14 – Mitigate Pump Station Risk to Overflow**
Background/Issue:	All pump stations are located within FEMA Flood Zone X with the exception of the Chapel East Pump Station located at 9076 Chapel Road, Easton which is located within FEMA Flood Zone A. The actual pump station is being flooded. This allows too much flow due to Infill and Infiltration (I & I). Improvements to construction standards/modification is needed for this structure. Wastewater treatment facilities located within FEMA Flood Zones include: – Oxford WWT (Zone AE) – Easton WWT (Zone X) – St. Michaels WWT (Zone X) – Tilghman Island WWT (Zone X) – Trappe WWT (Zone X) In addition, the County Bio-Solid Utilization Facility is located within the FEMA Flood Zone X. Note: FEMA Flood Zone X is the area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level and/or protected by a levee.
Ideas for Integration:	Contingency plan for: - Backup Generators and Pumps - Pump and Haul
Responsible Agency:	Talbot County Department of Public Works
Partners:	Municipal Public Works
Potential Funding:	Hazard Mitigation Grant Program Pre Disaster Mitigation Grant Program
Cost Estimate:	Dependent upon migration measures necessary to alleviate flooding at the pump station and/or wastewater treatment plant (WWTP)
Benefits: (Losses Avoided)	Reduces damage to facility and contamination into the watershed
Timeline:	Project Dependent
Goals & Objectives	***Goal 1 - Minimize damage caused by flooding.*** 1.1 Ensure that existing structures in the floodplain are resistant to flood damage. 1.3 At a minimum, protect the critical facilities in the 100-year flood plain. In addition, the 2015 FEMA Flood Risk Management Standard recommends protection of critical facilities to the 0.2% chance (500-year) flood elevation as

	an added margin of error against climate risk. Consider the most appropriate flood control measures such as acquisition and relocation, elevation, dry/wet flood proofing, etc. ***Goal 7 - Ensure adequate protection and resilience of critical facilities and infrastructure throughout the County.*** 7.1 Reduce the possibility of damage and loss to existing community assets including addressable structures, critical facilities and infrastructure due to flooding and other hazard events. 7.2 Design new critical facilities with resilience against conditions (i.e. sea levels, flood risk, precipitation, and temperatures that are projected throughout the lifetime of the facility. ***Goal 11 - Improve communication between municipalities and partners.*** 11.1 Promote partnerships among the municipalities and the County to develop a countywide approach to mitigation activities and resilience initiatives. ***Goal 15: Organize effectively and address resilience risks and priorities***. 15.2 Address Infrastructure dependencies and cascading effects in system failures. 15.3 Determine customized long-term resilience initiatives.

ACTION ITEM #15	
Location:	Countywide
Mitigation Action/ Project Title:	**#15 - Well Head Protection**
Background/Issue:	Wells are direct access routed to drinking water aquifers. If a well is flooded, floodwaters will get into the aquifer creating a polluted water supply. If floodwaters reach a well or the top of a well casing, assume the well is contaminated. Water from the well should not be used for drinking, cooking, or brushing teeth. Well head elevations should be inventoried and where feasible raised above the Federal Emergency Management Agency (FEMA) base flood elevation. Well head covers may also be utilized as a preventative measure to mitigate flood contamination. An example of a well cap is shown to the right. Standard well caps usually have bolts around the side of the cap that hold the cap onto the top of the casing. Note: a water tight cap is needed. 
Ideas for Integration:	Include in public outreach materials for floodplain management and health related disaster information.
Responsible Agency:	Talbot County Health Department
Partners:	Department of Housing and Mental Hygiene Maryland Department of the Environment MD Geological Survey Talbot County Environmental Health Office Talbot County Planning and Zoning Talbot County Floodplain Management
Potential Funding:	Department of Housing and Mental Hygiene Hazard Mitigation Assistance
Cost Estimate:	$150K/county for inventory Cost for a standard well cap - $20-$50 (supplier dependent) $2,500 Public Information Campaign
Benefits: (Losses Avoided)	Maintenance of Drinking Water Supply
Timeline:	Inventory: 1 year Retrofit: 1-2 Years
Goals & Objectives	***Goal 1 - Minimize damage caused by flooding.*** 1.1 Ensure that existing structures in the floodplain are resistant to flood damage.

	1.2 Create awareness among residents of the potential hazards associated with floodplain areas and how they can protect themselves and their properties from flood events. ***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.1 Develop a public awareness campaign that will be a long-term initiative, providing consistent educational opportunities to advance the community's knowledge and skills. ***Goal 11 - Improve communication between municipalities and partners.*** 11.2 Develop a distribution plan for public outreach materials and other relevant information.

ACTION ITEM #16	
Location:	Countywide
Mitigation Action/ Project Title:	**#16 - Repetitive Roadway Flooding Issues**
Background/Issue:	County Public Works' staffed reviewed repetitive roadway flood issues and provided updates and/or recommendations (in italics). Roadways of concern are those ranked high and evacuation routes. These roadways include: • Approach to Oak Creek Bridge on Route 33 – Elevation Issue – State Road o *Note whether this is north and/or south approach to the bridge;* o *Talbot County has identified Maryland Route 33 as the highest priority project in the County, and the County requested that SHA complete a corridor study that would review evacuation and flooding issues.* • Bozman-Neavitt Road (Inaccessible to emergency vehicles) – Elevation Issue – State or County Road; needs to be determined. o *Recommend that the problem areas being identified so it can then be determined if it is a state or county problem* o *Need more data to determine the costs for mitigating this problem.* • Route 33; Flooding stops traffic flow into and out of St. Michaels – Elevation Issue – State Road o *SHA has funded design of a streetscape project from Pea Neck Road to Yacht Club Road, construction of the proposed improvements has not been funded.* o *Streetscape project will address road drainage and highway capacity. Timing of improvements is unknown.* • Route 33 Cutoff Area; Major storms cause issues with evacuation or emergency - Elevation Issue – State Road o *Intersection of MD Route 33 and MD Route 322 experiences flooding during major storms* o *Low spots within the Town of St. Michaels along MD Route 33 experience flooding during major storms* o *Talbot County has identified Maryland Route 33 as the highest priority project in the County, and the County requested that SHA complete a corridor study that would review evacuation and flooding issues.* • The community of Tilghman and Town of Oxford experience flooding issues with a regular rain – Elevation & Stormwater Issues – Municipal and County Roads. o *Community of Tilghman – County – Roads Department has*

	completed ditch work to improve drainage on Tilghman Island. The Roads Department will continue to work on improving drainage as time and funding allows. ○ *Town of Oxford* ▪ *Causeway floods during high tides – State Road – Town has request SHA raise the road.* ▪ *Other areas within the Town would need to be reviewed with Cheryl Lewis, Town Manager.* In addition to high ranking issues, other roadway flooding issues were identified and are listed below.
Ideas for Integration:	Capital Improvement Plan Transportation Plan
Responsible Agency:	Talbot County Department of Public Works
Partners:	Maryland State Highway Administration Talbot County Roads Department Municipal Public Works
Potential Funding:	Hazard Mitigation Grant Program
Cost Estimate:	Project Dependent
Benefits: (Losses Avoided)	Eliminates reoccurring flood damage to roadways and road closures.
Timeline:	Project Dependent
Goals & Objectives	***Goal 1 - Minimize damage caused by flooding.*** 1.6 Reduce road closures, specifically evacuation routes and protect public infrastructure from flood damage. ***Goal 7 - Ensure adequate protection and resilience of critical facilities and infrastructure throughout the County.*** 7.1 Reduce the possibility of damage and loss to existing community assets including addressable structures, critical facilities and infrastructure due to flooding and other hazard events. ***Goal 11 - Improve communication between municipalities and partners.*** 11.1 Promote partnerships among the municipalities and the County to develop a countywide approach to mitigation activities and resilience initiatives. ***Goal 14- Integrate plan and policies across disciplines and agencies within the County through the consideration of potential hazards and future development.*** 14.1 Integrate hazard mitigation and resilience into areas such as land use, transportation, climate change, natural and cultural resource protection, water resources, and economic development. 14.2 Solicit participation and offer opportunities for various departments to

	work together on a regular basis. ***Goal 15: Organize effectively and address resilience risks and priorities***. 15.2 Address Infrastructure dependencies and cascading effects in system failures. 15.3 Determine customized long-term resilience initiatives.
Priority:	**HIGH**

FLOOD RELATED ISSUES					
Flood Related Issue	**Evacuation Issue (Y/N)**	**Issue: SWM / Elevation**	**Flooding: Occasional or Repetitive**	**State, County, or Municipal**	**Ranking (High, Medium, Low)**
Intersection of Route 329/Royal Oak Road; Ditches fill beyond capacity and overflows onto road – STATE ROAD	Y	SWM	Repetitive	County	Medium
a. Need to be more specific as to the location of flooding b. If flooding is at one or both intersection of MD Route 33 and MD Route 329 (there are two intersections), this needs to be clarified. c. MD Route 329 also intersects Bellevue Road (County Road)					
Intersection of Route 303 and Cordova; Railroad Bypass, Road drops down	N	Elevation	Repetitive	State	Low
Three Bridge Branch; both ends of the road experience flooding issues	N	Elevation	Repetitive	County	Medium
a. Need input from Road Department on flooding issues?					
Routes 303 and 404 Alternate; Occasional Flooding Experienced	N	Elevation	Occasional	State	Low
a. Need to review with SHA					
Route 404 Alternate before the bridge to Caroline County in the town of Queen Anne	N	Elevation	Repetitive	State	Medium
a. Need to review with SHA					
Routes 662 and 50; Flooding experienced during major storms in low spots	N	Elevation	Occasional	State	Low
a. MD Route 662 at bridge – washes out during major storm events b. US Route 50 – need to check with SHA as to the locations					
MD Route 309/Cordova Road prior to Klondike Road; Continues to flood even after road improvements	N	Both	Occasional	County	Medium
a. Need to check with SHA					
Easton; Higher in elevation but has stormwater issues	N	SWM	Occasional	Municipal	Low
a. Need to review with the Town of Easton					

Flood Related Issue	Evacuation Issue (Y/N)	Issue: SWM / Elevation	Flooding: Occasional or Repetitive	State, County, or Municipal	Ranking (High, Medium, Low)
Intersection of Mulberry and Cherry Streets (Town of St. Michaels, East of Route 33; Continuing flooding issues – 2 projects	Y	SWM	Repetitive	Municipal	Medium
a. Intersection of Mulberry and MD Route 33 (Talbot Street); Continuing flooding issues i. Need to review with SHA and the Town of St. Michaels. ii. Talbot County has identified Maryland Route 33 as the highest priority project in the County, and the County requested that SHA complete a corridor study that would review evacuation and flooding issues. b. Intersection of Cherry Street and MD Route 33 (Talbot Street); Continuing flooding issues i. Need to review with SHA and the Town of St. Michaels. ii. Talbot County has identified Maryland Route 33 as the highest priority project in the County, and the County requested that SHA complete a corridor study that would review evacuation and flooding issues.					
Buck Bryan Road; flooding surrounded by wetlands	Y	Elevation	Occasional	County	Low
a. Need to review with Roads Department					
Black Dog Alley; Flooded during December 2009	N	Elevation	Occasional	County	Low
a. Flooding still an issue b. County will need to program improvements when funding is available					
Gregory Road Flooding	N	Both	Repetitive	County	Low
a. Need input from Roads Department					
Route 50; Flooding, particularly South at Choptank River	Y	Elevation	Repetitive	State	Medium
a. Need input from SHA					
Talbot Street, St. Michaels' main street; Flooded 10 July 2010	Y	SWM	Occasional	Municipal	Low
a. Talbot County has identified Maryland Route 33 as the highest priority project in the County, and the County requested that SHA complete a corridor study that would review evacuation and flooding issues. b. SHA has funded a Streetscape design, but SHA has not programmed any construction funding.					
Intersection of Seymour Avenue and Riverview Terrance; Flooded 15" on 10 July 2010	N	SWM	Occasional	Municipal	Low
a. Road intersection is low, and SWM will not address this problem due to this intersection being in very close proximity to the Miles River.					

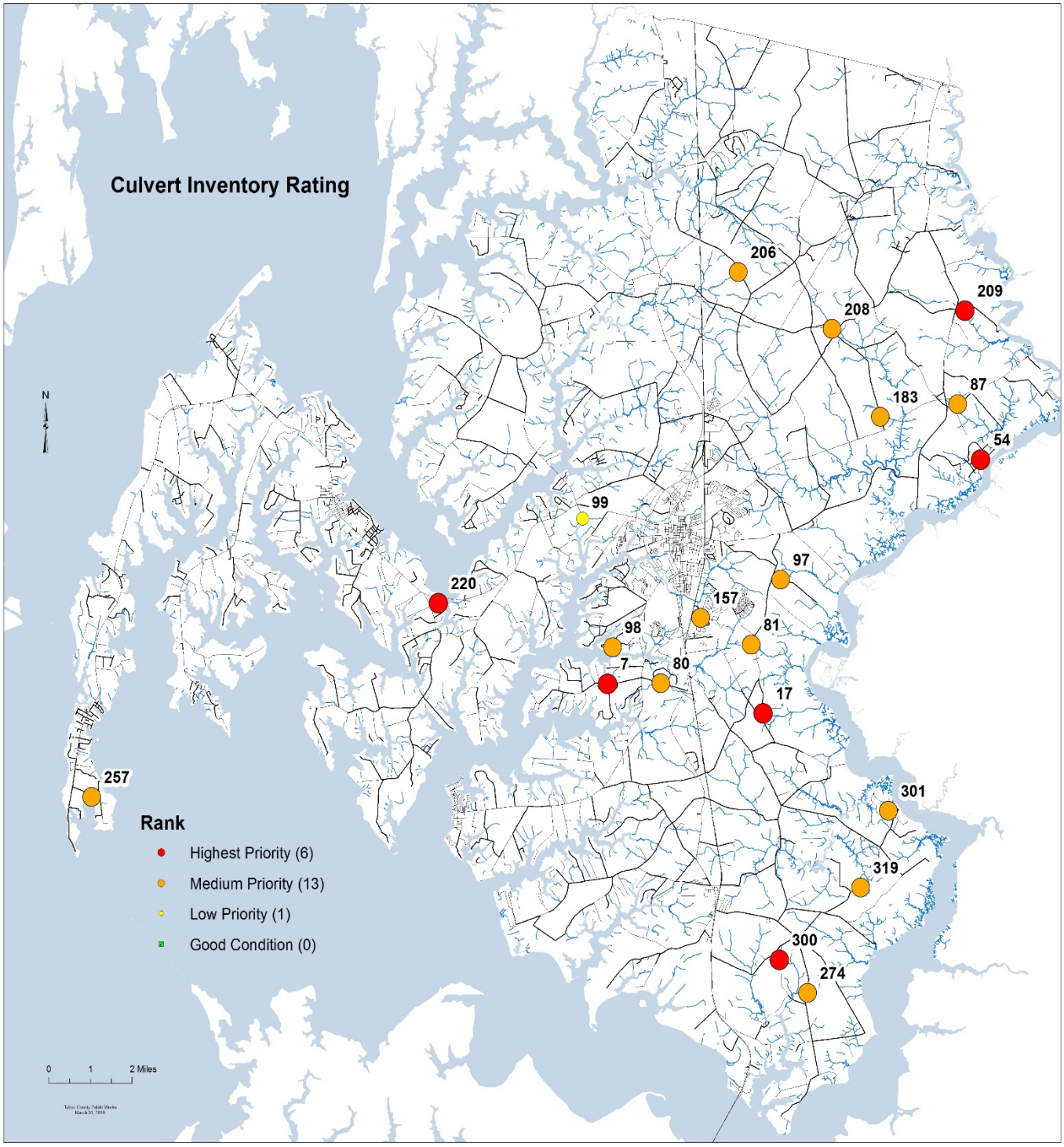
Source: Talbot County Department Public Works & Talbot County Community Resilience Stakeholder Committee

ACTION ITEM #17	
Location:	Countywide
Mitigation Action/ Project Title:	**#17 - Update County Code for Well Head Elevation**
Background/Issue:	Due to well contamination from flood waters, require that new well heads be installed two feet above base flood elevation. Well contaminated with flood waters pose a health risk. Wells that may become contaminated from flooding need to be tested and disinfected. Water cannot be used until this is done. Often times a professional well driller is needed to clean out any sediment and debris. Using the well pump to flush out the well could ruin the pump. Also, wells will need to be disinfected and tested several times to ensure the well is free of bacterial contamination. 
Ideas for Integration:	Municipal Codes
Responsible Agency:	Talbot County Department of Planning and Zoning
Partners:	Talbot County Department of Environmental Health Maryland Department of Environment
Potential Funding:	N/A
Cost Estimate:	Staff Time
Benefits: (Losses Avoided)	Eliminates the possibility of well contamination and ensures drinking water supply to homeowners.
Timeline:	1 year
Goals & Objectives	***Goal 1 - Minimize damage caused by flooding.*** 1.1 Ensure that existing structures in the floodplain are resistant to flood damage. 1.2 Create awareness among residents of the potential hazards associated with floodplain areas and how they can protect themselves and their properties from flood events. 1.4 Review, revise and update local floodplain ordinances, as appropriate. ***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.1 Develop a public awareness campaign that will be a long-term initiative, providing consistent educational opportunities to advance the community's knowledge and skills.

	Goal 10 - Goal 10 - Maintain high construction standards through the adoption of current International Building Codes-Building Performance Standards. 10.1 Ensure current building codes and standards follow FEMA's basic guidelines and are properly enforced. ***Goal 11 - Improve communication between municipalities and partners.*** 11.2 Develop a distribution plan for public outreach materials and other relevant information. ***Goal 15: Organize effectively and address resilience risks and priorities***. 15.2 Address Infrastructure dependencies and cascading effects in system failures. 15.3 Determine customized long-term resilience initiatives.

ACTION ITEM #18	
Location:	Countywide
Mitigation Action/ Project Title:	**#18 - Culvert Mitigation**
Background/Issue:	Talbot County Culvert Evaluators and the Talbot County – List of priority 1 culverts provides the top 20 culverts in need of mitigation. These culverts have been ranked as High, Medium, and Low. Six culverts were listed as "High Priority" and description of issue are as follows: -#209 – Three culverts are located side-by-side. Severe erosion and headwall collapsed. Two of the three culverts are completely clogged with sediment. -#54 – Culvert failed. Upper side entirely filled with sand, end of culvert pipe is crushed. Severe erosion of embankment behind headwall. -#17 – Four-foot section separated from lower end of culvert. Riprap and separated culvert section eroding and severe scour/entrenchment below outfall. -#220 – Collapsed and eroded culvert with sedimentation. -#7 – Small depression in the road alongside culvert. Culvert is partially submerged and likely collapsed. -#300 – Under cutting of road with exposed culvert and eroding embankment. Severe erosion and scour at outfall. These culverts are shown on the attached map.
Ideas for Integration:	- Approach armoring and overflow management (road profile modifications to provide emergency spillway) - Continuous ongoing evaluations - Inventory streams to determine State/Federal jurisdiction
Responsible Agency:	Talbot County Department of Public Works Talbot County Roads Department
Partners:	MD State Highway Administration Municipalities Maryland Department of Environment
Potential Funding:	Hazard Mitigation Grant Program
Cost Estimate:	Culverts – Estimated construction cost and recommended improvement: #209 – 60K - Remove sediment, replace culvert and headwall, and repair embankment and outfall pool. #54 – 50K – Remove sediment, replace culvert, and repair embankment and roadway. #17 – 30K – Replace culvert, repair embankments, repair outfall, and downstream channel. #220 – 20K – Replace culvert. #7 – 15K – Replace pipe.

	#300 – 25K – Replace culvert in sections and repair embankment and outfall pool.
Benefits: (Losses Avoided)	Improve stormwater infrastructure. Reduction of debris in flood prone areas.
Timeline:	Project Dependent
Goals & Objectives	***Goal 1 - Minimize damage caused by flooding.*** 1.6 Reduce road closures, specifically evacuation routes and protect public infrastructure from flood damage. ***Goal 7 - Ensure adequate protection and resilience of critical facilities and infrastructure throughout the County.*** 7.1 Reduce the possibility of damage and loss to existing community assets including addressable structures, critical facilities and infrastructure due to flooding and other hazard events. ***Goal 11 - Improve communication between municipalities and partners.*** 11.1 Promote partnerships among the municipalities and the County to develop a countywide approach to mitigation activities and resilience initiatives. ***Goal 14- Integrate plan and policies across disciplines and agencies within the County through the consideration of potential hazards and future development.*** 14.1 Integrate hazard mitigation and resilience into areas such as land use, transportation, climate change, natural and cultural resource protection, water resources, and economic development. 14.2 Solicit participation and offer opportunities for various departments to work together on a regular basis. ***Goal 15: Organize effectively and address resilience risks and priorities.*** 15.2 Address Infrastructure dependencies and cascading effects in system failures. 15.3 Determine customized long-term resilience initiatives.


Culvert Inventory Rating
N
206
209
208
87
183
54
99
97
220
157
98
81
7
80
17
257
301
319
300
274
Rank
Highest Priority (6)
Medium Priority (13)
Low Priority (1)
Good Condition (0)
0
1
2 Miles

ACTION ITEM #19	
Location:	Emergency Operations Center
Mitigation Action/ Project Title:	**#19 Establish a Business Liaison in the Emergency Operations Center for economic recovery.**
Background/Issue:	By not having a business liaison within the Emergency Operations Center (EOC), information exchange about needs and capabilities from local businesses can be lost. With the inclusion of a business liaison in the EOC, close collaboration between county agencies and business will assist in coordination and may eliminate potential duplicative efforts. The cooperative collaboration will also assist with identifying where support is available or needed to restore business operations to the affected areas.
Ideas for Integration:	Include business liaison in Incident Command System (ICS) training.
Responsible Agency:	Talbot County Department of Emergency Services
Partners:	Local Businesses
Potential Funding:	N/A
Cost Estimate:	Staff Time
Benefits: (Losses Avoided)	- Reduces disruption of a business' function and resources - Provide critical services to citizens post disaster
Timeline:	Ongoing
Goals & Objectives:	***Goal 14- Integrate plan and policies across disciplines and agencies within the County through the consideration of potential hazards and future development.*** 14.2 Solicit participation and offer opportunities for various departments to work together on a regular basis. 14.3 Cleary define roles of, and improve intergovernmental coordination between planners, emergency managers, engineers, and other staff, and municipal and regional partners in improving disaster resilience. ***Goal 15: Organize effectively and address resilience risks and priorities***. 15.1 Prioritize improvements to the built environment based in their role in supporting the five Talbot Community Pillars and functions during recovery.
Priority:	**HIGH**

ACTION ITEM #20	
Location:	Hazard Mitigation Planning Committee
Mitigation Action/ Project Title:	**#20 – Pillar and overall stakeholder groups to continue to meet annually.**
Background/Issue:	To ensure continuity of each pillar group and overall stakeholder group's goal and objectives defined within the Hazard Mitigation and Resilience Plan, the groups will need to continue meeting on an annually basis. The purpose of the meeting is to: • Evaluate the goals and objectives to ensure they address current and expected conditions. • Determine if the nature or magnitude of hazard risks have changed. • Evaluate whether current resources are adequate for implementing the plan. • Discuss mitigation projects and their progress. • Overall discussions on current projects and accomplishments.
Ideas for Integration:	Invite additional agencies or organizations to join the annual meeting.
Responsible Agency:	Talbot County Department of Emergency Services
Partners:	Eastern Shore Land Conservancy Shore Regional Health Department of Public Works Chesapeake College Talbot County Public Schools Talbot County Department of Planning and Zoning Easton Utilities American Microgrid Talbot County Sheriff's Office Maryland Department of Natural Resources Municipalities: Easton, Oxford, Queen Anne, St. Michaels, and Trappe Maryland Emergency Management Agency Sea Grant Extension Mid-Shore Riverkeeper
Potential Funding:	N/A
Cost Estimate:	Committee Members Time
Benefits: (Losses Avoided)	Meeting annually provides the committee the opportunity to discuss current projects and accomplishments.
Timeline:	Ongoing
Goals & Objectives:	***Goal 11 - Improve communication between municipalities and partners.*** 11.1 Promote partnerships among the municipalities and the County to develop a countywide approach to mitigation activities and resilience

	initiatives. 11.2 Develop a distribution plan for public outreach materials and other relevant information. ***Goal 12 - Enhance performance of staff to become competent in reducing vulnerability and improving community resilience.*** 12.1 Encourage County and municipal staff to attend hazard mitigation and resilience related training programs to enhance performance of their existing job functions. ***Goal 14- Integrate plan and policies across disciplines and agencies within the County through the consideration of potential hazards and future development.*** 14.2 Solicit participation and offer opportunities for various departments to work together on a regular basis. 14.3 Cleary define roles of, and improve intergovernmental coordination between planners, emergency managers, engineers, and other staff, and municipal and regional partners in improving disaster resilience. ***Goal 15: Organize effectively and address resilience risks and priorities***. 15.1 Prioritize improvements to the built environment based in their role in supporting the five Talbot Community Pillars and functions during recovery. 15.2 Address Infrastructure dependencies and cascading effects in system failures. 15.3 Determine customized long-term resilience initiatives.

ACTION ITEM #21	
Location:	Small Communities
Mitigation Action/ Project Title:	**#21 – Power Generators at Essential Facilities**
Background/Issue:	During significant storm events, many small communities are isolated without basic services such as electric or water and sewer. It is necessary for essential facilities, such as, Town Halls or Fire Stations, to have reliable sources of sustained electrical power to achieve continued operation for citizens to seek shelter during these events.
Ideas for Integration:	Inventory vulnerable communities and inventory existing facilities that could function as resilience centers; example: Town Halls, Fire Stations, or schools.
Responsible Agency:	Talbot County Department of Emergency Services
Partners:	Talbot County Public Schools Volunteer Fire Departments Non-Governmental Organizations
Potential Funding:	Hazard Mitigation Grant Program
Cost Estimate:	Project Dependent
Benefits: (Losses Avoided)	Provides shelter and safety for those in need during a significant storm event.
Timeline:	1-2 years
Goals & Objectives:	***Goal 1 - Minimize damage caused by flooding.*** 1.1Ensure that existing structures in the floodplain are resistant to flood damage. ***Goal 7 - Ensure adequate protection and resilience of critical facilities and infrastructure throughout the County.*** 7.1 Reduce the possibility of damage and loss to existing community assets including addressable structures, critical facilities and infrastructure due to flooding and other hazard events. 7.2 Design new critical facilities with resilience against conditions (i.e. sea levels, flood risk, precipitation, and temperatures that are projected throughout the lifetime of the facility. ***Goal 11 - Improve communication between municipalities and partners.*** 11.2 Develop a distribution plan for public outreach materials and other relevant information. ***Goal 13 - Ensure that there are an adequate number of shelters in the County.*** 13.1 Ensure that facilities designated as shelters have adequate back-up power (correctly sized for facility).

ACTION ITEM #22	
Location:	Talbot County Shorelines
Mitigation Action/ Project Title:	**#22 - Restore barrier islands to provide protection for Talbot County's shorelines from wave action.**
Background/Issue:	Due to the lack of barrier island protection, specifically, the disappearance of Sharps Island, places like Tilghman Island, St. Michaels and Oxford are battered by waves causing shoreline erosion and increased tidal flooding. Without the protection of barrier islands, the shorelines are eroding at an increased rate as well as increasing the flooding risk for the Towns of Oxford and St. Michaels. An example of a barrier island restoration project is the *Paul S. Sarbanes Ecosystem Restoration Project* at Poplar Island, which involves the use of approximately 68 million cubic yards of dredge material from the approach channels of the Baltimore Harbor and Channels Federal navigation project areas. This project will restore 1,715 acres of remote island habitat, consisting of 840 acres of upland habitat at an elevation up to +25 feet, 737 acres of wetland habitat divided into low marsh and high marsh, and approximately 138 acres of open water embayment. Another example of shoreline protection mitigation measures involves various techniques designed to decrease or halt shoreline erosion. One technique would utilize rock berms, which are applied directly to the eroding shoreline. Other techniques include segmented breakwaters and wave-damping fences. These are placed in the adjacent open water in order to decrease a wave's energy before it hits the shoreline and promote sediment buildup. Through *Section 204 of the Water Resources Development Act of 1992,* the U.S. Army Corps of Engineers has the authority for *Environmental Restoration Projects in Connection with Dredging*. According to Section 204, "this allows the Corps to restore, protect, and create aquatic and wetland habitats in connection with construction or maintenance dredging of an authorized project. The project costs are identified as those in excess of the least costly plan that accomplishes the disposal of dredge material from a navigation project." The costs of the project would be shared between federal and non-federal funds, 75% and 25% respectively. In order to restore barrier islands and protect Talbot County shorelines, begin with coordination between Talbot County, the State of Maryland and Federal agencies. The next step is a written request for a Section 204 feasibility study provided to the U.S. Army Corps of Engineers.
Ideas for Integration:	Work with allied agencies to determine extent of shoreline erosion from wave action.
Responsible Agency:	U.S. Army Corps of Engineers (USACE)

	Maryland Department of Transportation Port Administration Talbot County Department of Emergency Services Talbot County Municipalities Watershed Groups
Potential Funding:	Section 204 Funding Hazard Mitigation Program Grant Emergency Advance Measures for Flood Prevention
Cost Estimate:	75% Federal and 25% Non-Federal of Total Costs
Timeline:	Project Dependent
Goals & Objectives:	***Goal 1 - Minimize damage caused by flooding.*** 1.1 Ensure that existing structures in the floodplain are resistant to flood damage. 1.7 Restore barrier islands to provide protection for Talbot County's shorelines from wave action. ***Goal 3 - Minimize damage caused by erosion.*** 3.1 Provide flood protection while reducing erosion and sediment at the Choptank River, East Wye, Miles, and Tred Avon Rivers. ***Goal 9 - Promote sustainable development to improve the quality of life.*** 9.1 Provide for the conservation and protection of natural resources.

ACTION ITEM #23	
Location:	Countywide
Mitigation Action/ Project Title:	**#23 - Increase Community Rating System Rating**
Background/Issue:	Talbot County is currently a Class 8 community. Increasing the Community Rating System (CRS) rating would help citizens be better prepared in the event of a flood. A higher rating would also give citizens a higher rate discount on flood insurance.
Ideas for Integration:	- Increase awareness of flooding potential and hazards by expanding outreach projects.
Responsible Agency:	Talbot County Department of Planning & Zoning
Partners:	Talbot County Department of Public Works Talbot County Department of Emergency Services Non-Governmental Organizations Eastern Shore Climate Adaption Partnership (ESCAP)
Potential Funding:	Hazard Mitigation Grant Program
Cost Estimate:	Staff Time
Benefits: (Losses Avoided)	- Reduced flood insurance premiums - Increase preparedness and understanding
Timeline:	Ongoing
Goals & Objectives:	***Goal 1 - Minimize damage caused by flooding.*** 1.8 Continue to improve Community Rating System score to reduce the cost of flood insurance within Talbot County. ***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.1 Develop a public awareness campaign that will be a long-term initiative, providing consistent educational opportunities to advance the community's knowledge and skills. ***Goal 11 - Improve communication between municipalities and partners.*** 11.2 Develop a distribution plan for public outreach materials and other relevant information. ***Goal 14- Integrate plan and policies across disciplines and agencies within the County through the consideration of potential hazards and future development.*** 14.1 Integrate hazard mitigation and resilience into areas such as land use, transportation, climate change, natural and cultural resource protection, water resources, and economic development. ***Goal 15: Organize effectively and address resilience risks and priorities.*** 15.3 Determine customized long-term resilience initiatives.

ACTION ITEM #23	
Location:	Countywide
Mitigation Action/ Project Title:	**#24 – Mitigate Flood Prone Properties**
Background/Issue:	Consider the acquisition, reconstruction, relocation, and/or elevation of the most vulnerable flood-prone properties within the County, including but not limited to repetitive loss properties. This acquisition process would include: contacting the property owner and determining the willingness to sell, obtaining property assessment information, and eventually applying for funding. Once property is acquired, the County should ensure the removal of all structures located on the property and remains as open space in perpetuity. Green infrastructure could be incorporated on the acquired property. This would assist water management with protecting, restoring, or mimicking the natural water cycle. Green infrastructure is effective, economical, and enhances community safety and quality of life. In the right circumstances, Talbot County would support acquisition, reconstruction, relocation, and/or elevation of the most vulnerable flood-prone properties within the County.
Ideas for Integration:	- Increase awareness of flooding potential by expanding outreach projects.
Responsible Agency:	Talbot County Department of Planning & Zoning
Partners:	Talbot County Department of Public Works Talbot County Department of Emergency Services Maryland Emergency Management Agency
Potential Funding:	Hazard Mitigation Grant Program Flood Mitigation Assistance
Cost Estimate:	Median Price of Similar Properties in the Community plus $10,000-20,000 for additional costs
Benefits: (Losses Avoided)	- Reduced flood insurance premiums - Increase preparedness and understanding
Timeline:	1-2 Years
Goals & Objectives:	***Goal 1 - Minimize damage caused by flooding.*** 1.1 Ensure that existing structures in the floodplain are resistant to flood damage. ***Goal 3 - Minimize damage caused by erosion.*** 3.3 Encourage the education and use of living shorelines in appropriate locations for shore stabilization. ***Goal 8 - Increase public understanding, support, and demand for hazard mitigation and resilience efforts.*** 8.1 Develop a public awareness campaign that will be a long-term initiative, providing consistent educational opportunities to advance the community's knowledge and skills. ***Goal 10 - Maintain high construction standards through the adoption of current International Building Codes-Building Performance Standards.*** 10.1 Ensure current building codes and standards follow FEMA's basic guidelines and are properly enforced.

	Goal 11 - Improve communication between municipalities and partners. 11.2 Develop a distribution plan for public outreach materials and other relevant information. ***Goal 14- Integrate plan and policies across disciplines and agencies within the County through the consideration of potential hazards and future development.*** 14.1 Integrate hazard mitigation and resilience into areas such as land use, transportation, climate change, natural and cultural resource protection, water resources, and economic development. ***Goal 15: Organize effectively and address resilience risks and priorities***. 15.3 Determine customized long-term resilience initiatives.

Chapter 12:

Municipal Synopsis & Perspective

CHAPTER 12: MUNICIPAL SYNOPSIS & PERSPECTIVE

Talbot County is home to the charming towns of Easton, Oxford, Queen Anne, St. Michaels and Trappe. In order to obtain specific information from the municipal perspective, each of the five municipalities were invited to serve on the Hazard Mitigation & Resilience Stakeholder Committee.

Talbot County Municipalities include:
- *Town of Easton;*
- *Town of Oxford;*
- *Town of Queen Anne;*
- *Town of St. Michaels; and,*
- *Town of Trappe.*

In addition, Jim Bass, the County Emergency Management Coordinator met and discussed the municipal hazard mitigation and resiliency packets with municipalities. The packets contained the following handouts for their review and to provide an opportunity for municipal information gathering and input:

- Municipal Questionnaire;
- Update of Flood Issues Infrastructure Data Table;
- Municipal Mitigation Capability Assesment Matrix; and,
- Permit Data Update.

Information gathered from the municipal packets and meetings are presented in this chapter. Mapping products were developed for each Town during the plan development process, in an effort to display important information from the town perspective, rather than county-wide, as is the case in previous plan chapters. Finally, information from each Town specific to hazards, impacts, issues, and potential mitigation and resilience action items have been included.

Following the five Municipal Sysnopsis & Perspectives, the updated Municipal Mitigation Capability Assessment Matrix is presented.

1. Town of Easton Synopsis & Perspective

Town of Easton *Source: http://tourtalbot.org/talbot-county/easton/*	**Small-Town Comfort, Big-City Fun** Deemed the "big city" of Talbot County, Easton is as sophisticated as it is lively. Featuring a world-class theater, renowned art galleries and impeccably curated museums, it's the heart of the Shore's arts and culture scene. This mini metropolis draws international artists, musicians and cultural connoisseurs to a series of acclaimed festivals each year. This art lovers' retreat is rated among the Top Ten Best Small Towns and Top 100 Small Arts Communities in America.

a. Hazards

Hazards that impact or have the potential to impact the Town of Easton include: Coastal Hazards, Flood, Winter Storm, Tornado, High Wind, Thunderstorm, Earthquake Drought, and Wildfire. The highest risk hazards to Easton are winter storms and wind.

b. Repetitive Flood Issues

Areas of concern within Easton that experience repetitive flood issues include:

- Earle Avenue;
- Commerce/ Brooks Drive; and,
- South Washington Street.

c. Town of Easton Mitigation & Resilience Projects

The Town of Easton identified seven new projects during the plan development process.

- Salt Storage- a second location is needed;
- Expansion of Department of Public Works Facility;
- Stormwater Projects:
  - Tanyard Branch video project;
  - Matthewstown pond fencing;
- Streetlight conversion to LED's;
- Landfill Methane ⇒Electricity; and,
- Easton Utilities Commission Solar Array for a "sustainable campus".

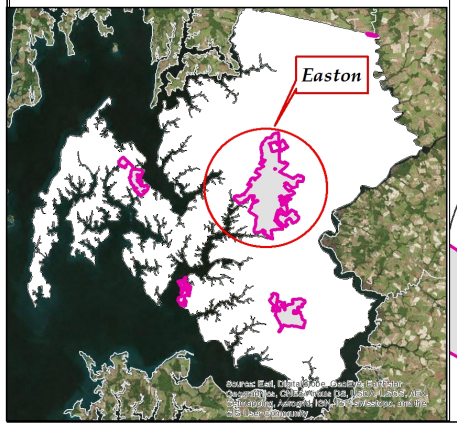
Municipal Synopsis - Town of Easton

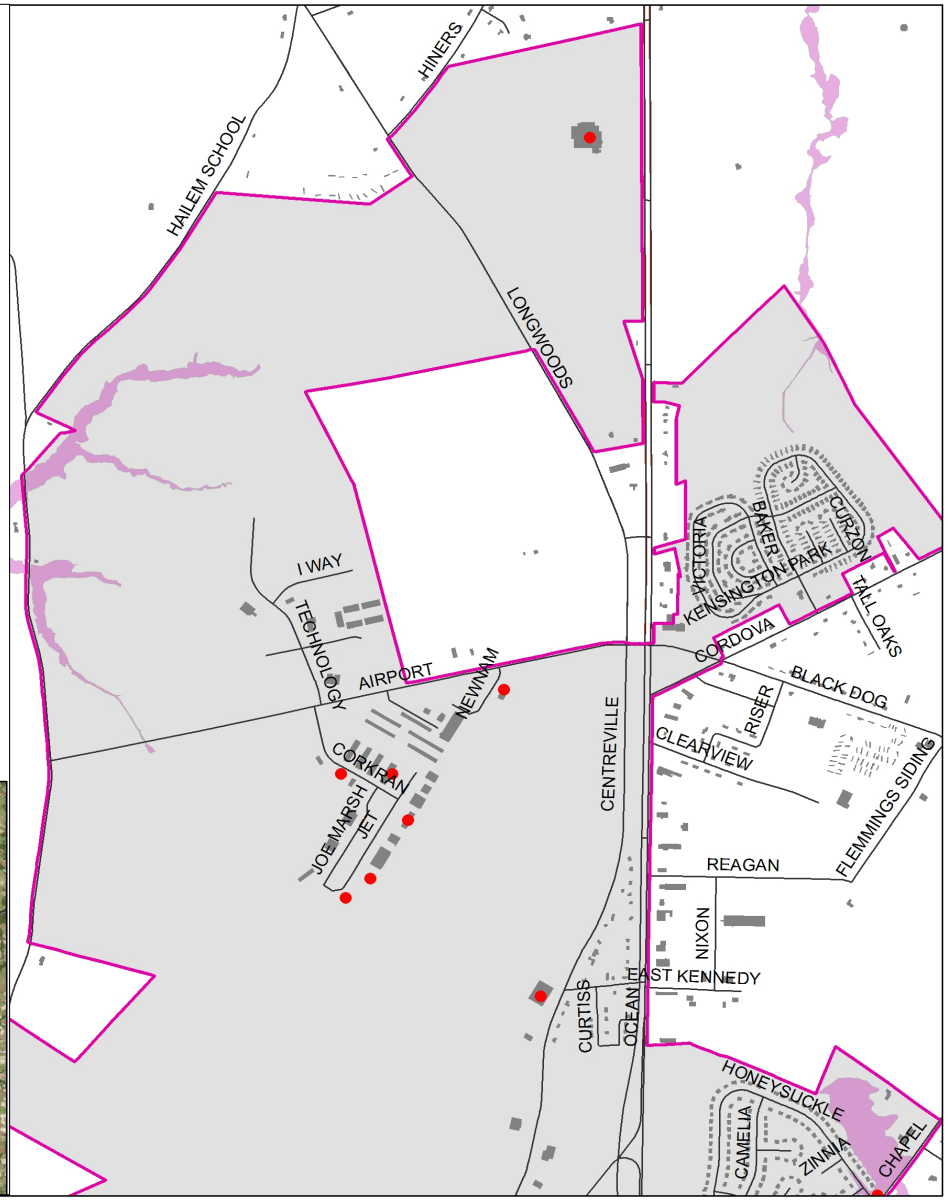
Town of Easton's Municipal Perspective:

Hazard Vulnerability:
- Flood
- Winter Storm
- Wind

Areas of Concern:
- Earle Avenue
- Commerce Drive/Brooks Drive
- South Washington Street

Critical & Public Facilties in FEMA Special Flood Hazard Areas:
Within this portion of Easton, there are no Critical or Public Facilities located in the FEMA SFHA .





Legend

- 2016 Critical & Public Facilities
- Building Footprints

Flood Zones

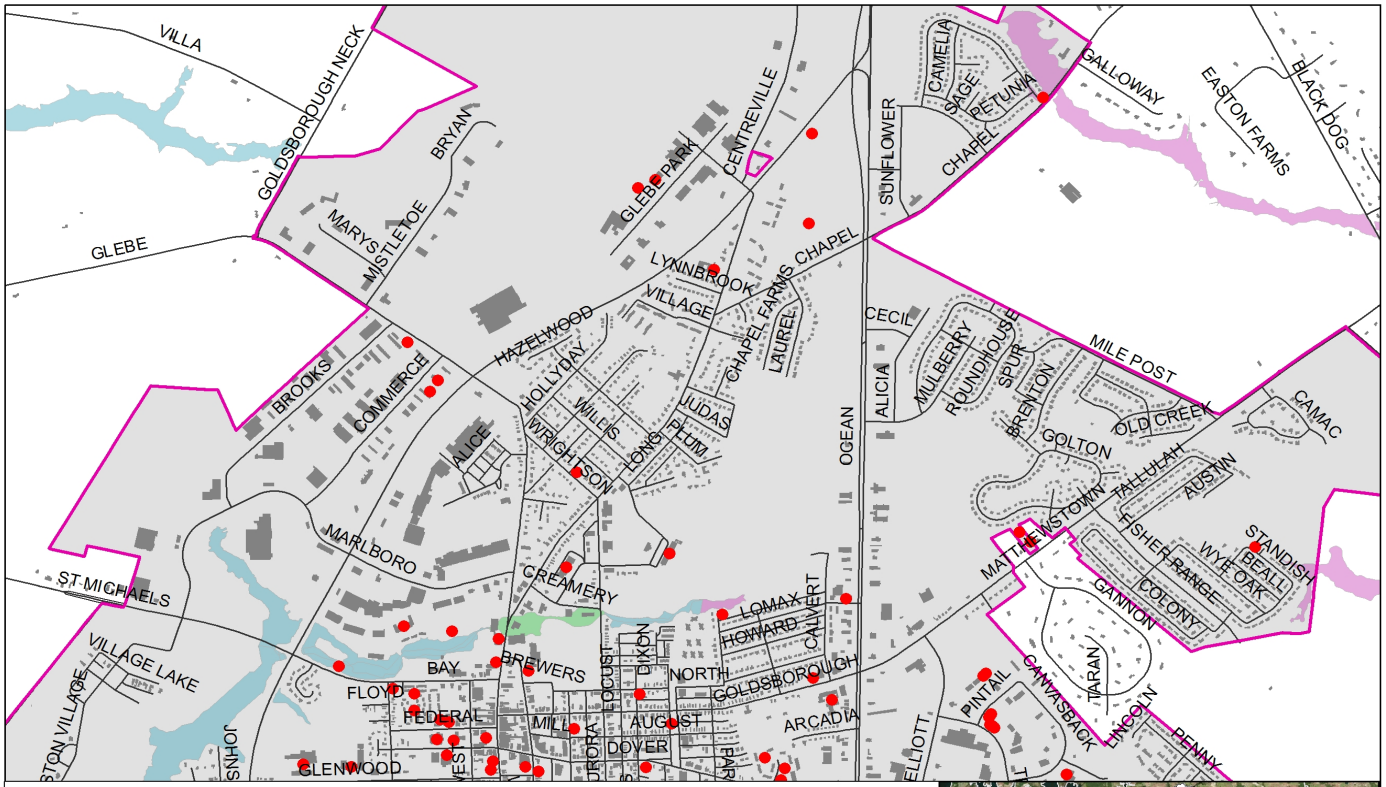
- Zone A
- Zone AE
- Zone AO
- Zone VE
- Centerlines
- Municipalities
- Maryland Routes
- US Routes
- Talbot County
- Maryland Counties

Data Sources:

FEMA DFIRM;
Town of Easton;
Talbot County Department of Planning & Zoning;
Smith Planning & Design; and
ESRI.

0 0.035.07 0.14 0.21 0.28 Miles

Municipal Synopsis - Town of Easton

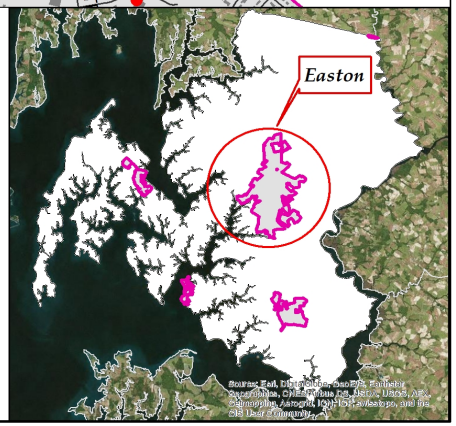


Town of Easton's Municipal Perspective:

Hazard Vulnerability:
- Flood
- Winter Storm
- Wind

Areas of Concern:
- Earle Avenue
- Commerce Drive/Brooks Drive
- South Washington Street

Critical & Public Faciltities in FEMA Special Flood Hazard Areas:
- Easton Utilities on Bay Street
- - Contains IT Infrustructure and Pump Station



Legend

- 2016 Critical & Public Facilities
- Building Footprints

Flood Zones

- Zone A
- Zone AE
- Zone AO
- Zone VE
- Centerlines
- Municipalities
- Maryland Routes
- US Routes
- Talbot County
- Maryland Counties

Data Sources:

FEMA DFIRM;
Town of Easton;
Talbot County Department of Planning & Zoning;
Smith Planning & Design; and ESRI.

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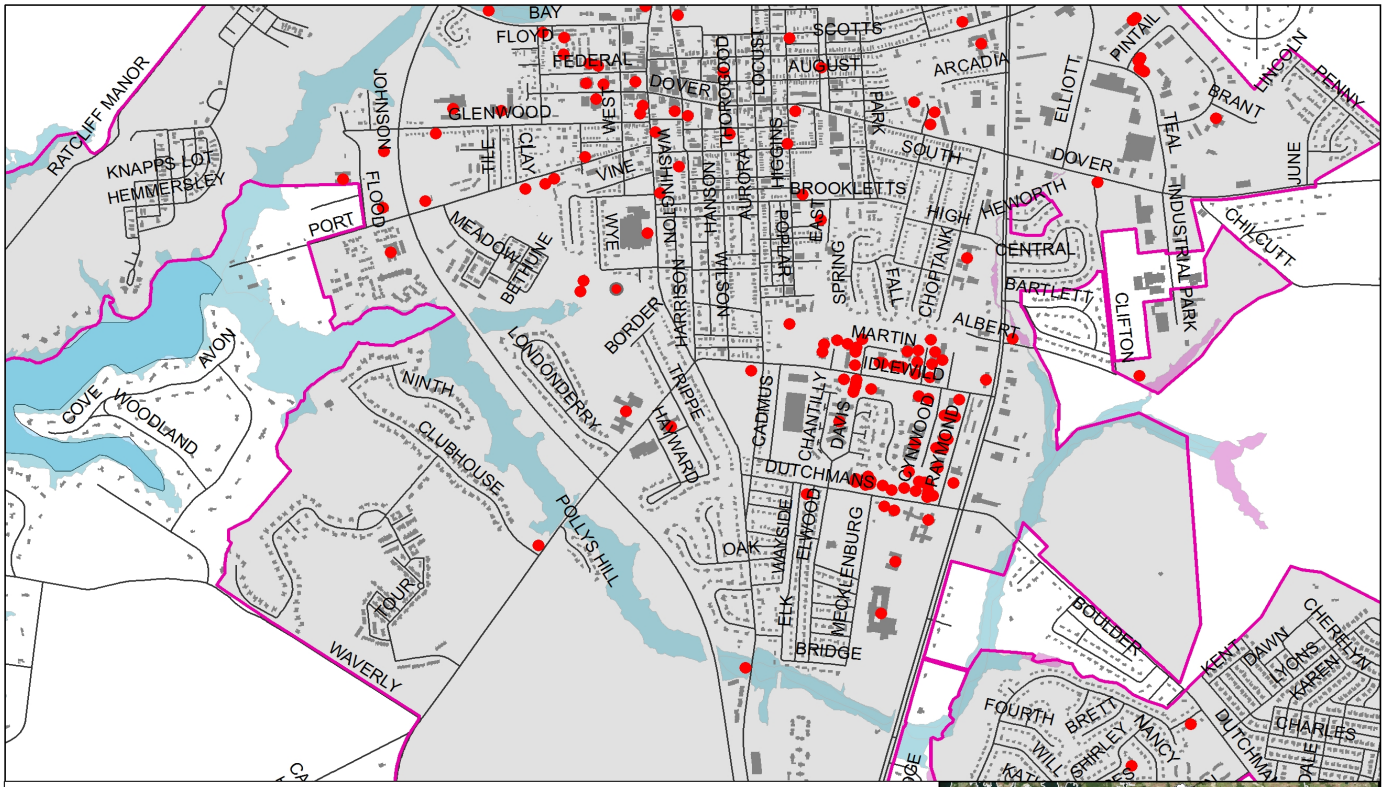
Municipal Synopsis - Town of Easton

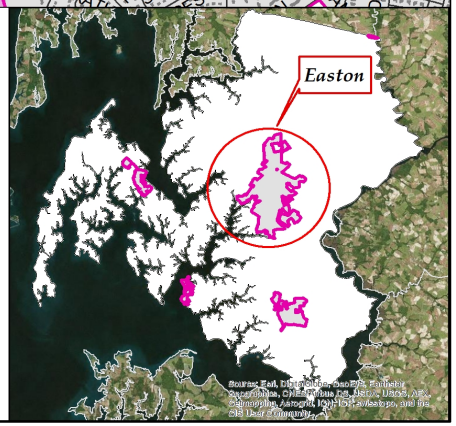


Town of Easton's Municipal Perspective:

Hazard Vulnerability:
- Flood
- Winter Storm
- Wind

Areas of Concern:
- Earle Avenue
- Commerce Drive/Brooks Drive
- South Washington Street

Critical & Public Faciltities in FEMA Special Flood Hazard Areas:
- Pump Station on South Washington Street



Legend

- 2016 Critical & Public Facilities
- Building Footprints

Flood Zones

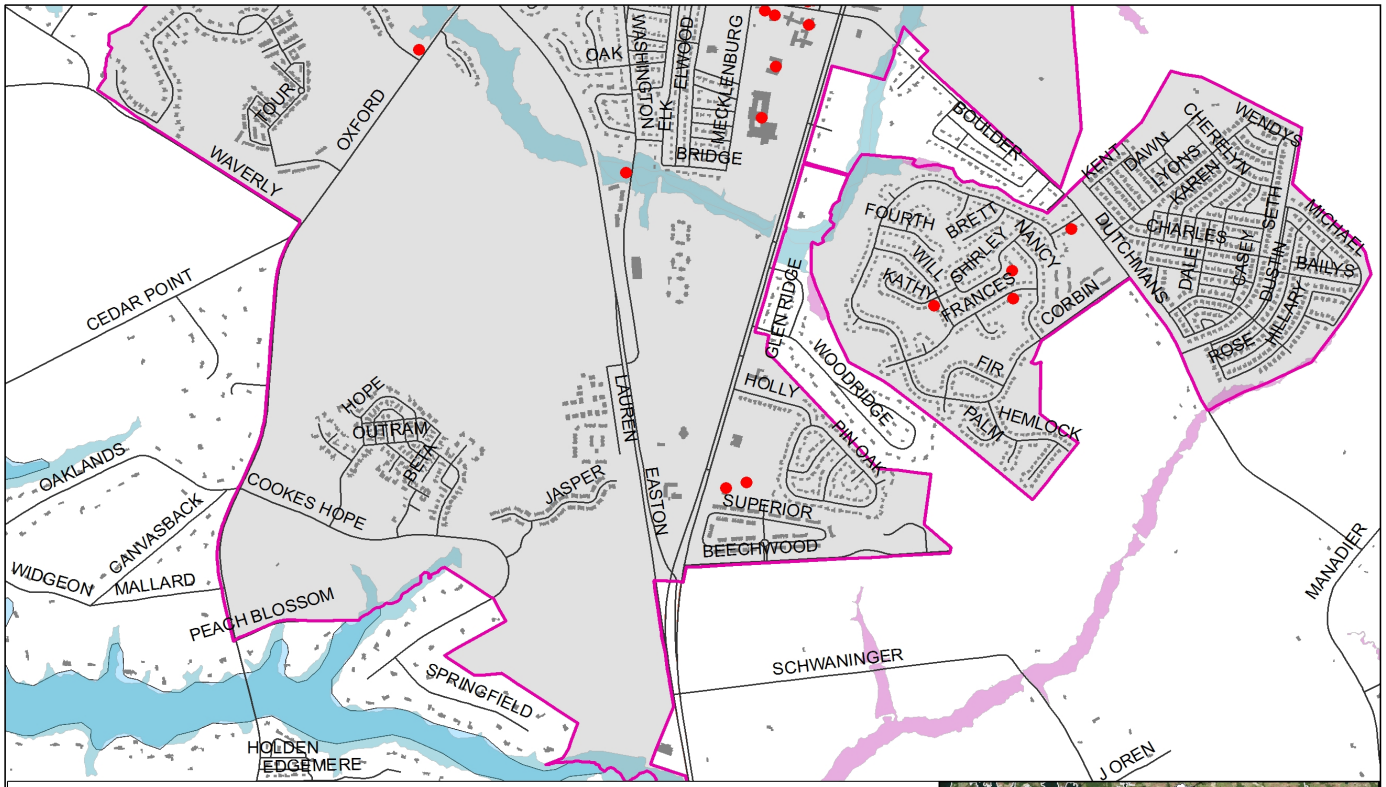
- Zone A
- Zone AE
- Zone AO
- Zone VE
- Centerlines
- Municipalities
- Maryland Routes
- US Routes
- Talbot County
- Maryland Counties

Data Sources:

FEMA DFIRM;
Town of Easton;
Talbot County Department of Planning & Zoning;
Smith Planning & Design; and ESRI.

0 0.04 0.095 0.19 0.285 0.38 Miles

Municipal Synopsis - Town of Easton



Legend

- 2016 Critical & Public Facilities
- Building Footprints
- Centerlines

Flood Zones

- Zone A
- Zone AE
- Zone AO
- Zone VE
- Municipalities
- Maryland Routes
- US Routes
- Talbot County
- Maryland Counties

Data Sources:

FEMA DFIRM;
Town of Easton;
Talbot County Department of Planning & Zoning;
Smith Planning & Design; and ESRI.

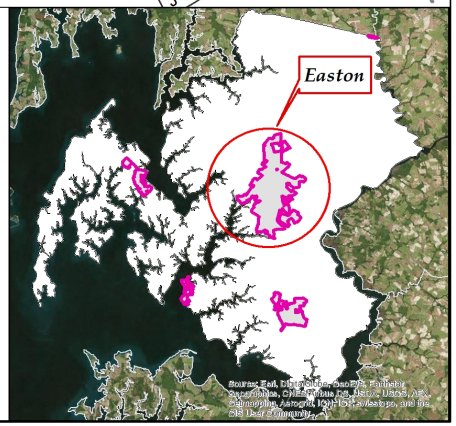
0 0.04 0.095 0.19 0.285 0.38 Miles

Town of Easton's Municipal Perspective:

Hazard Vulnerability:
- Flood
- Winter Storm
- Wind

Areas of Concern:
- Earle Avenue
- Commerce Drive/Brooks Drive
- South Washington Street

Critical & Public Faciltities in FEMA Special Flood Hazard Areas:
- Pump Station on South Washington Street



2. Town of Oxford Synopsis & Perspective

Town of Oxford *Source: http://tourtalbot.org/talbot-county/oxford/*	**More Than a Ferry Tale** Like an old-fashioned postcard, Oxford is picture perfect. Surrounded by water with Town Creek to the east and the Tred Avon River to the north and west, the town's waterways bustle with the passing of yachts, sailboats, powerboats and its own Oxford-Bellevue Ferry. Author James Michener even penned the novel Chesapeake in this peaceful nautical oasis. Take a stroll back in time as you navigate the tree-lined streets, peppered with historic homes and picket fences, charming inns and taverns, and a local ice cream creamery. It's a quiet escape with water views around every turn.

a. Hazards

Hazards that impact or have the potential to impact the Town of Oxford include: Coastal Hazards, Flood, Winter Storm, Tornado, High Wind, Thunderstorm, Drought, and Wildfire. The highest risk hazards to the Oxford are flood, coastal hazards, winter storms, thunderstorms, and high wind.

b. Repetitive Flood Issues

Areas of concern within Oxford that experience repetitive flood issues include:

- Oxford Causeway, where 333/Oxford Road turns sharply to the right coming into town;
- South Morris Street at Pleasant Street; and,
- Second Street at East Pier Street.
  Note: When these intersections flood, Oxford is essentially cut in half, severely limitinged access to first responders and the evacuation of residents.

The three intersections listed above, commonly referred to as the pincushion, flood once a year, on average. Floodwaters exceed the height of the floodwall on the causeway, on average, once every 2-3 years.

c. Areas of High Flood Risk and Vulnerability

Neighborhoods within Oxford that are particularly vulnerable to flooding include the north and the south sections of town. Specifically, the Bank Street and Tilghman Street Area, in the north section, and the area surrounding Willows Avenue and Riverview Avenue, in the south section.

d. Town of Oxford Mitigation & Resilience Projects

The Town of Oxford identified two new projects during the plan development process.

1. CRS Partnership between Talbot County and Oxford, as well as other interested municipalities- CRS activities such as public information & outreach may be undertaken jointly. A collaborative effort would ensure the obtainment of the maximum points available and foster new ideas.

2. New generator for Oxford Town Hall- at this time the only facility within Oxford with a generator is the fire department. A new generator at Town Hall would enhance the Town's capabilities, providing a center for emergency command operations and shelter capacity.

Municipal Synopsis - Town of Oxford

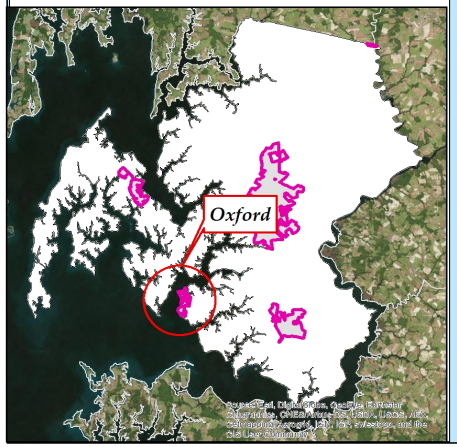
Town of Oxford's Municipal Perspective:

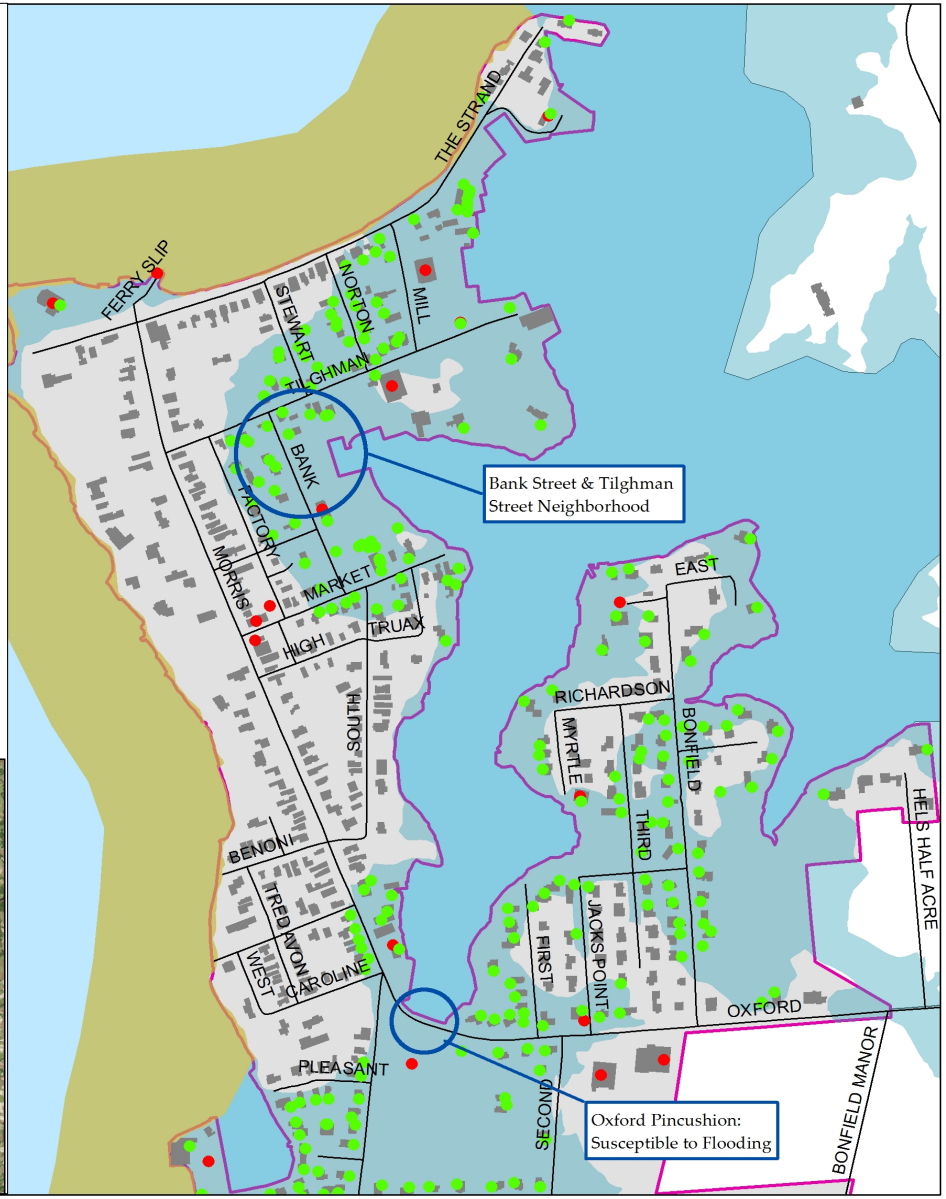
Hazard Vulnerability:
- Flood
- Coastal Hazards
- Thunderstorm
- Winter Storm
- Wind

Areas of Concern:
- "Pincushion" of Oxford, three intersections that flood
- RT 333 at Oxford Road
- S Morris Street at Plesant Street
- Second Street at E Pier Street
- Neighborhoods susceptible to flooding:
- Bank Street and Tilghman Street Area
- Willows Avenue and Riverview Avenue Area

Critical & Public Faciltities in FEMA Special Flood Hazard Areas:
- 11 Boat Yards/Marinas

Residential & Commerical Structures in FEMA Special Flood Hazard Areas:
- Residential: 251 structures
- Commercial: 21 structures





Legend

- *Residential & Commercial Structures*
- *2016 Critical & Public Facilities selection*
- *Building Footprints*
- *Centerlines*

Flood Zones

- *Zone A*
- *Zone AE*
- *Zone AO*
- *Zone VE*
- *Municipalities*
- *Maryland Routes*
- *US Routes*
- *Talbot County*

Data Sources:

FEMA DFIRM & FRR;
Town of Oxford;
Talbot County Department of Planning & Zoning;
Smith Planning & Design; and
ESRI.

0 0.015 0.03 0.06 0.09 0.12 Miles

Municipal Synopsis - Town of Oxford

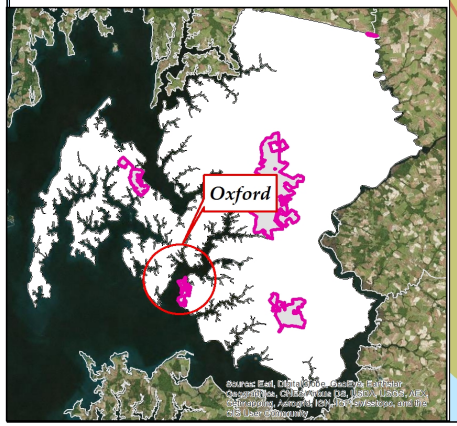
Town of Oxford's Municipal Perspective:

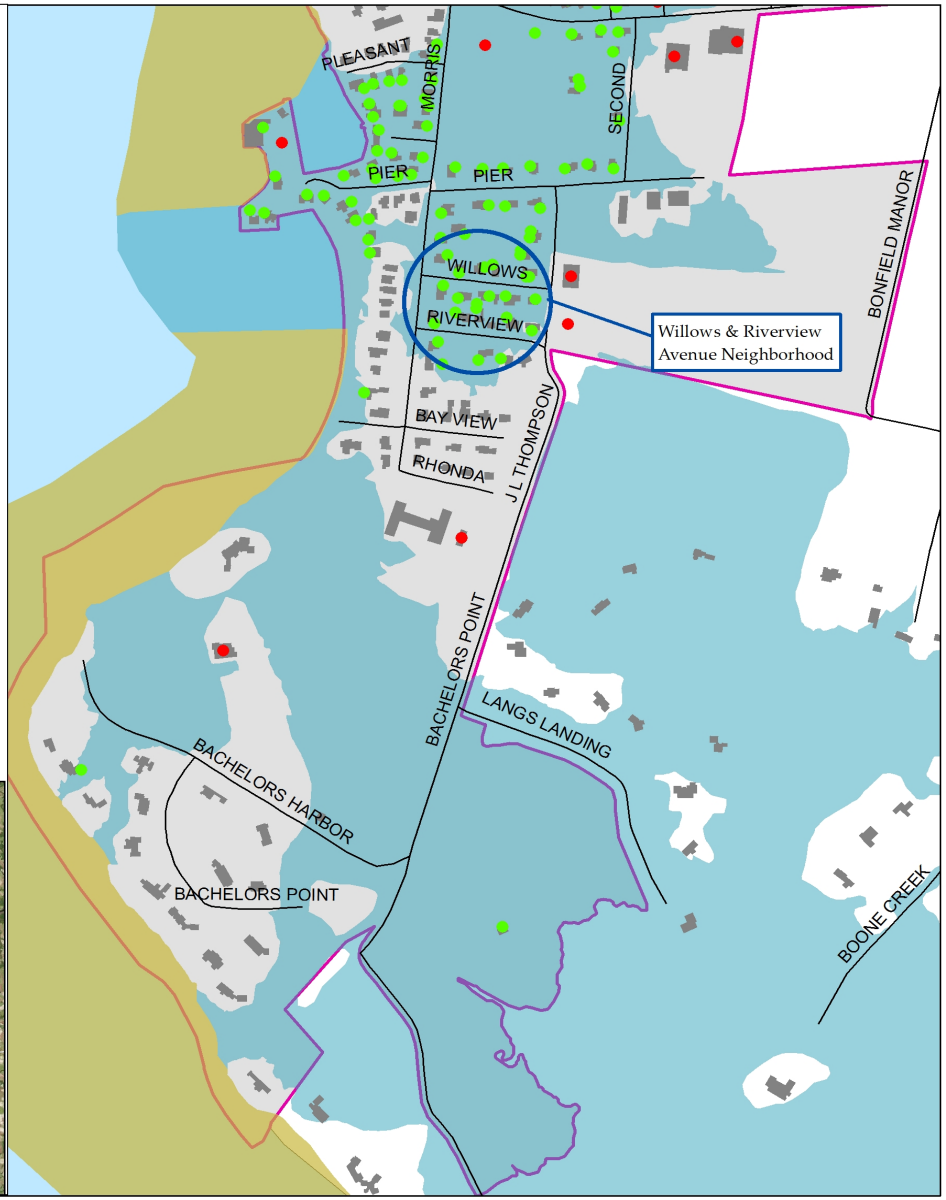
Hazard Vulnerability:
- Flood
- Coastal Hazards
- Thunderstorm
- Winter Storm
- Wind

Areas of Concern:
- "Pincushion" of Oxford, three intersections that flood
- RT 333 at Oxford Road
- S Morris Street at Plesant Street
- Second Street at E Pier Street
- Neighborhoods susceptible to flooding:
- Bank Street and Tilghman Street Area
- Willows Avenue and Riverview Avenue Area

Critical & Public Faciltities in FEMA Special Flood Hazard Areas:
- 12 Boat Yards/Marinas
- Oxford Tennis Courts

Residential & Commerical Structures in FEMA Special Flood Hazard Areas:
- Residential: 251 structures
- Commercial: 21 structures





Legend

- Residential & Commercial Structures
- 2016 Critical & Public Facilities selection
- Building Footprints
- Centerlines

Flood Zones

- Zone A
- Zone AE
- Zone AO
- Zone VE
- Municipalities
- Maryland Routes
- US Routes
- Talbot County
- Maryland Counties

Data Sources:

FEMA DFIRM & FRR;
Town of Oxford;
Talbot County Department of Planning & Zoning;
Smith Planning & Design; and
ESRI.

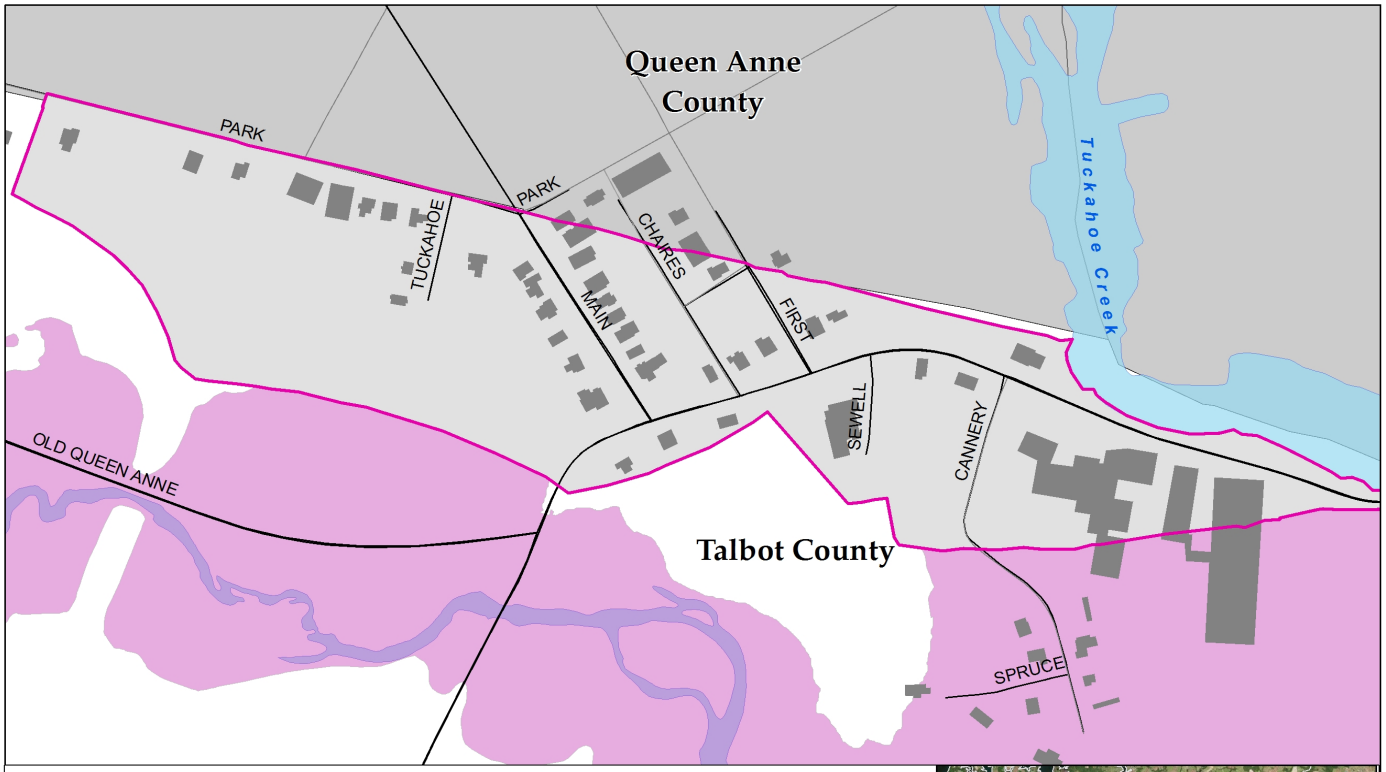
0 0.015 0.03 0.06 0.09 0.12 Miles

3. Town of Queen Anne Synopsis & Perspective

Town of Queen Anne ***Source:*** ***www.qac.org/327/Towns***	Queen Anne is a pleasant town of residences and local rural commerce. It is situated in two counties, Talbot and Queen Anne's, and borders on Caroline County.

The borders between Talbot County and Queen Anne's County runs through the middle of town. Tuckahoe Creek passes by the town. A municipal packet was not completed for the town. However, municipal mapping and data was collected during the plan development process.

Municipal Synopsis - Town of Queen Anne



Legend

- 2016 Critical & Public Facilities selection
- Building Footprints
- Centerlines

Flood Zones

- Zone A
- Zone AE
- Zone AO
- Zone VE
- Municipalities
- Maryland Routes
- US Routes
- Talbot County
- Maryland Counties

Data Sources:

FEMA DFIRM;
Talbot County Department of Planning & Zoning;
Smith Planning & Design; and
ESRI.

0.0075 0.015 0.03 0.045 0.06
Miles

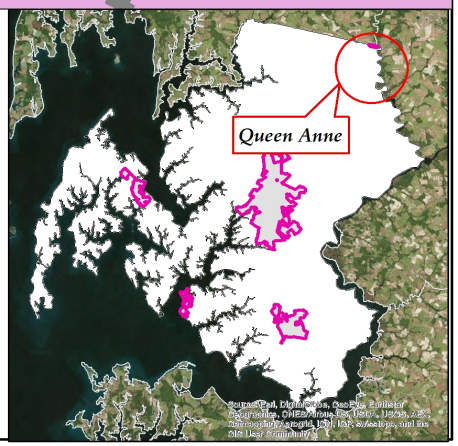
Town of Queen Anne's Municipal Synopsis:

Town of Queen Anne is divided between Talbot and Queen Anne's Counties. Thirty-seven (37) acres of the municipality is located within Talbot County, the remaing land mass is within Queen Anne's County.

Hazard Vulnerability:
- Flood
- Thunderstorm
- Winter Storm
- Wind

Areas of Concern:
- Area around the Tuckahoe Creek

Only 48 structures are located in the Town of Queen Anne (Talbot County). Of these structures, seven (7) are commercial and forty-one (41) are residential. No critical or public facilities are located in the Talbot County portion of the Town.



4. Town of St. Michaels Synopsis & Perspective

Town of St. Michaels *Source: http://tourtalbot.org/talbot-county/St.Michaels/*	**Another World, And Oh So Close** Though its picturesque setting earned national attention as the backdrop for the movie *Wedding Crashers*, St. Michael's physical beauty offers only a glimpse of its idyllic charm. Nestled along the Miles river in the heart of the Chesapeake, the historic waterfront town provides something for everyone.

a. Hazards

Hazards that impact or have the potential to impact the Town of St. Michaels include: Coastal Hazards, Flood, Winter Storm, Tornado, High Wind, Thunderstorm, Drought, and Wildfire. The highest risk hazard, by a significant margin, is flood. Both tidal flooding and heavy rains result in flood issues.

b. Repetitive Flood Issues

Areas of concern within St. Michaels that experience repetitive flood issues include:

- Church Street/Muskrat Park-Heavy Rains; and,
- Mulberry Street & Mill Street-Tidal Flooding.

c. Areas of High Flood Risk and Vulnerability

Businesses located near Mulberry Street at the Town Dock have dealt with repetitive flooding for years. The most severe location for tidal flooding is Mill Street at the Victorian Inn (on Cherry Street), and the St. Michaels Town Office. The bulkhead at the Town Office is frequently breached. Building additional bulkhead would adversely impact the Maritime Museum, thereby making the additional bulkhead mitigation action impossible.

d. Town of St. Michaels Mitigation & Resilience Projects

The Town of St. Michaels identified three new projects during the plan development process.

- Arsenic Removal-removal of arsenic from the town's drinking water. This is an ongoing need and would cost approximately 2 million dollars.
- Power Poles Removal-power poles along Talbot Street pose serious safety concerns. Numerous accidents involving vehicles crashing into the poles have occurred along this narrow road. In addition, sidewalk safety is a concern due to all of the space being taken up by the poles. The Town acknowledges that burying the poles is an expensive endeavor, however, an opportunity would open up to add high-speed fiber and other utility investments, during the construction phase. Residents are very interested in both the safety of this area and maintaining the historic integrity. To that end, many have expressed a desire to participate in a cost-sharing (50/50 split) project with the utility company.
- Increase Volunteer First Responder Membership-the need for new members has been increasing due to the age of many of the existing volunteers. As fire volunteers are an aging group in Talbot County and are ready to leave the

fire community, new volunteers are needed to replace those leaving. Adding career firefighters to Talbot County is an expensive prospect and politically contentious at this time.

Municipal Synopsis - Town of St. Michaels

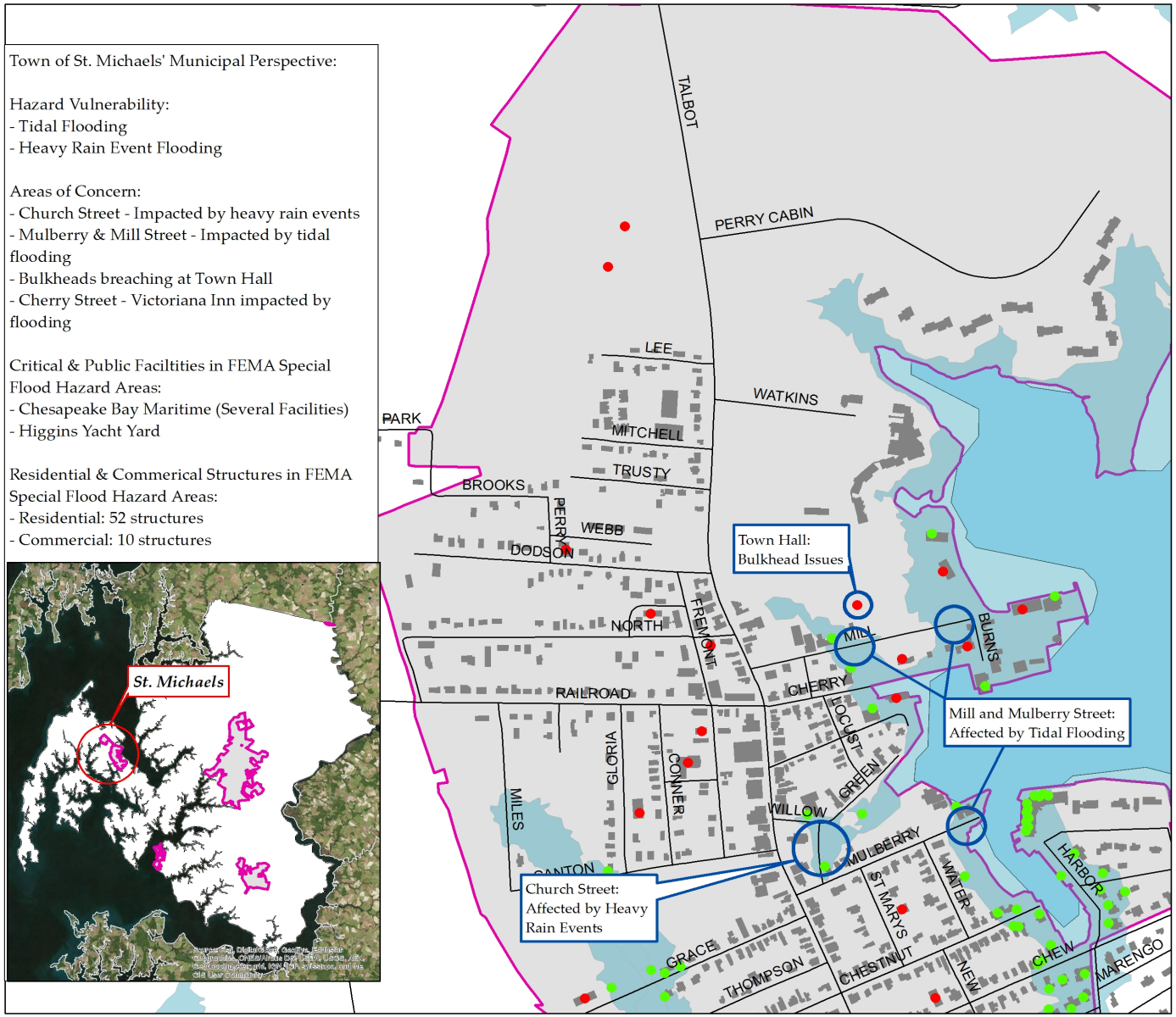
Town of St. Michaels' Municipal Perspective:

Hazard Vulnerability:
- Tidal Flooding
- Heavy Rain Event Flooding

Areas of Concern:
- Church Street - Impacted by heavy rain events
- Mulberry & Mill Street - Impacted by tidal flooding
- Bulkheads breaching at Town Hall
- Cherry Street - Victoriana Inn impacted by flooding

Critical & Public Facilties in FEMA Special Flood Hazard Areas:
- Chesapeake Bay Maritime (Several Facilities)
- Higgins Yacht Yard

Residential & Commerical Structures in FEMA Special Flood Hazard Areas:
- Residential: 52 structures
- Commercial: 10 structures



Legend

- *Residential & Commerical Structures*
- *2016 Critical & Public Facilities*
- *Building Footprints*
- *Centerlines*

Flood Zones

- *Zone A*
- *Zone AE*
- *Zone AO*
- *Zone VE*
- *Municipalities*
- *Maryland Routes*
- *US Routes*
- *Talbot County*
- *Maryland Counties*

Data Sources:

FEMA DFIRM & FRR; Town of St. Michaels; Talbot County Department of Planning & Zoning; Smith Planning & Design; and ESRI.

0 0.015 0.03 0.06 0.09 0.12 Miles

Municipal Synopsis - Town of St. Michaels

Town of St. Michaels' Municipal Perspective:

Hazard Vulnerability:
- Tidal Flooding
- Heavy Rain Event Flooding

Areas of Concern:
- Church Street - Impacted by heavy rain events
- Mulberry & Mill Street - Impacted by tidal flooding
- Bulkheads breaching at Town Hall
- Cherry Street - Victoriana Inn impacted by flooding

Critical & Public Facilties in FEMA Special Flood Hazard Areas:
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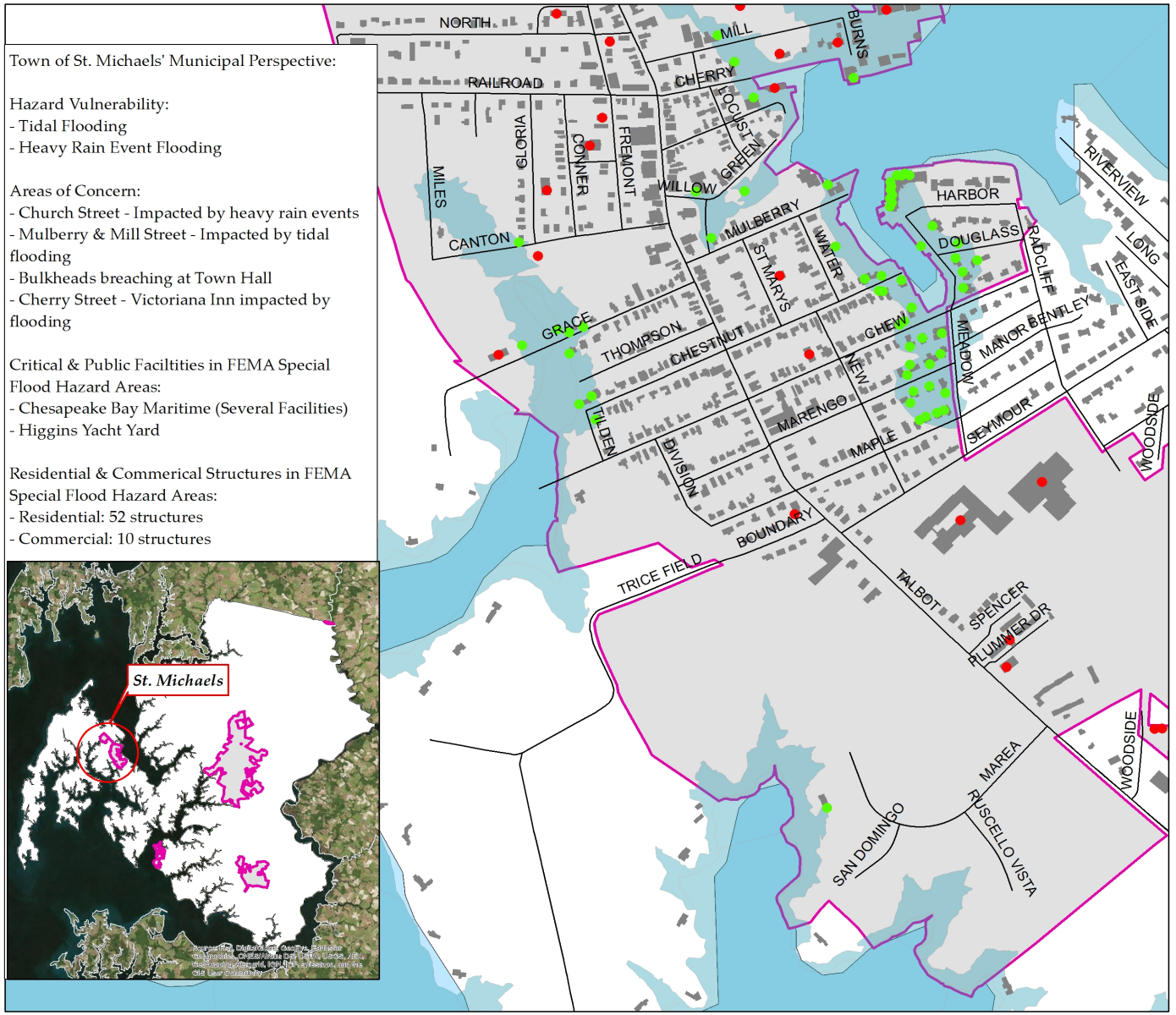


5. Town of Trappe Synopsis & Perspective

Town of Trappe *Source: http://tourtalbot.org/talbot-county/trappe/*	**19th Century Charm, 21st Century Progress** With a population of just over 1,000 people and an land area of just under 3 square miles, Trappe is one of Talbot's County smallest towns-but it has an outsized history. Trappe is a great home base for visitors to Talbot County.

a. Hazards

Hazards that impact or have the potential to impact the Town of Trappe include: Coastal Hazards, Flood, Winter Storm, Tornado, High Wind, Thunderstorm, Drought, and Wildfire. The highest risk hazards are flash floods, winter storm, high wind, and thunderstorms.

b. Repetitive Flood Issues

Areas that experience repetitive flood issues impacting the Town of Trappe include:

- Route 50 at Barber Road-Undersized Culvert;
- Route 50 at Maple Avenue-dip in the road that occurred during the construction of the High's Gas Station; and,
- Five-point intersection (Greenfield & Main) at the Trappe Post Office- there is a low point with poor drainage.

c. Town of Trappe Mitigation & Resilience Projects

The Town of Trappe identified three new projects during the plan development process.

- Sidewalk Completion on MD 565 (old Trappe Road)- MD 565 leads into town, particularly to White March Elementary School and the Post Office. The existing portions of sidewalk were installed intermittently. Installation of a new sidewalk and the maintenance of the existing portions of sidewalk is difficult due to the road being maintained by the town, county, and state. This is a safety issue and there have been various accidents along this stretch of road involving pedestrians being struck by vehicles. MD 565 is an evacuation route for White Marsh Elementary.
- Installation of Town Wells-Trappe currently operates two wells, which supply water for the existing population. These wells are at capacity and will not be adequate to accommodate additional development. In addition, both wells are old. A backup town well is currently being installed; however, there are limited options for any future wells due to lack of town-owned property.

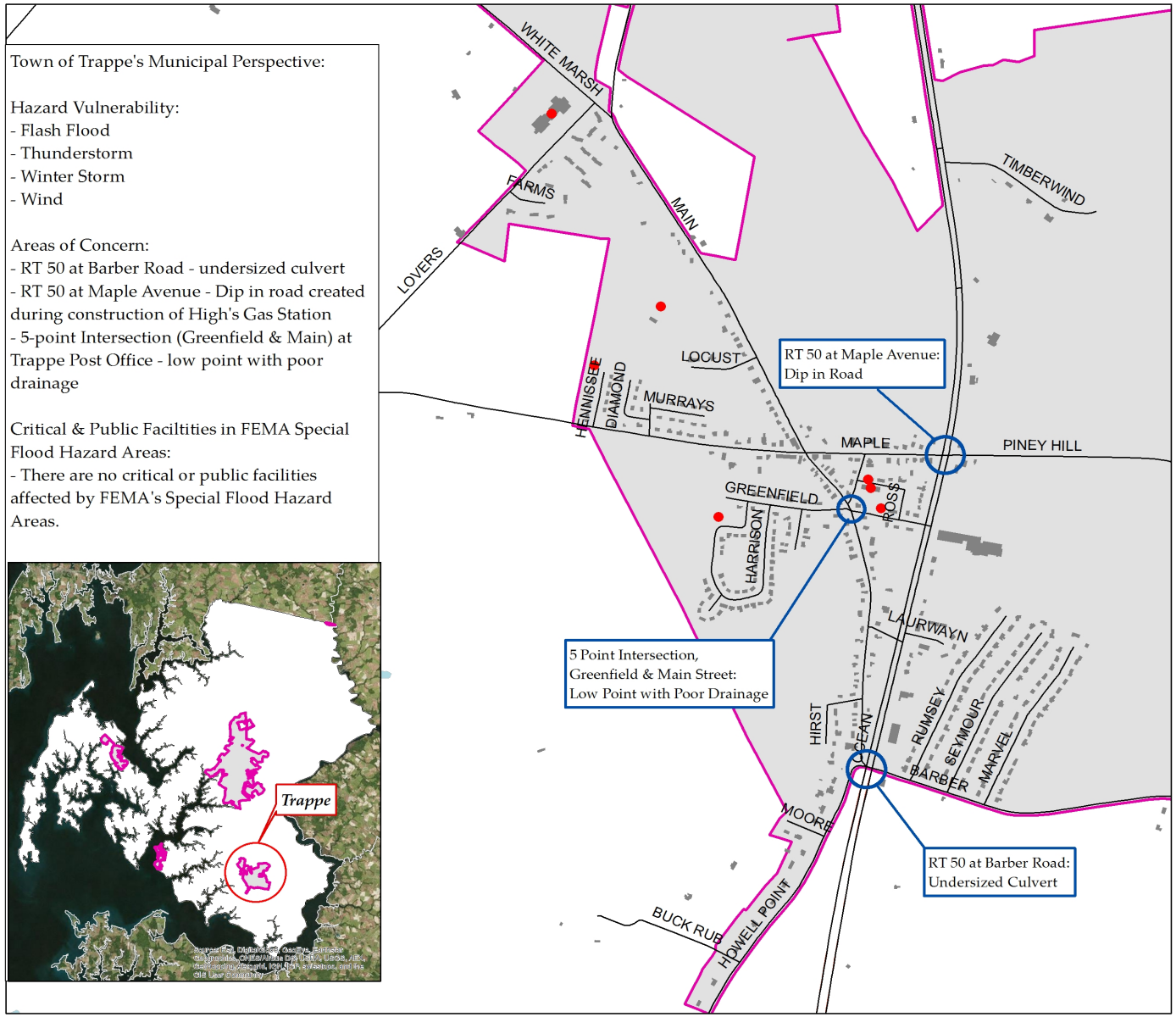
Municipal Synopsis - Town of Trappe

Town of Trappe's Municipal Perspective:

Hazard Vulnerability:
- Flash Flood
- Thunderstorm
- Winter Storm
- Wind

Areas of Concern:
- RT 50 at Barber Road - undersized culvert
- RT 50 at Maple Avenue - Dip in road created during construction of High's Gas Station
- 5-point Intersection (Greenfield & Main) at Trappe Post Office - low point with poor drainage

Critical & Public Facilities in FEMA Special Flood Hazard Areas:
- There are no critical or public facilities affected by FEMA's Special Flood Hazard Areas.



Legend

- 2016 Critical & Public Facilities
- Building Footprints
- Centerlines

Flood Zones

- Zone A
- Zone AE
- Zone AO
- Zone VE
- Municipalities
- Maryland Routes
- US Routes
- Talbot County
- Maryland Counties

Data Sources:

FEMA DFIRM;
Town of Trappe;
Talbot County Department of Planning & Zoning;
Smith Planning & Design; and ESRI

0 0.0275 0.055 0.11 0.165 0.22 Miles

THE GREAT SEAL OF TALBOT COUNTY MARYLAND

SMITH Planning and Design, LLC

6. Municipal Mitigation Capability Assessment Matrix

TALBOT COUNTY HAZARD MITIGATION PLAN MITIGATION CAPABILITY ASSESSMENT MATRIX						
	Talbot County	**Easton**	**Oxford**	**Queen Anne**	**St. Michaels**	**Trappe**
Comprehensive Plan with Hazard Mitigation	Yes, in the 2005 Plan Section IV *Sensitive Areas Protection*	Yes	Yes	Yes	Yes	No
Land Use Plan	Yes 2005 Comprehensive Plan	Yes	Yes	Yes	Yes	Yes April 7, 2010
Subdivision Ordinance	Yes 2009	Yes	Yes, Ordinance 8822 – August 9, 1988	Yes	Yes	Yes June 27, 2006
Zoning Ordinance	Yes 2009	Yes	Yes, Ordinance 9612 – July 9, 1996	Yes	Yes Town Code CH. 340	Yes June 27, 2008
Flood Mitigation Assistance Plan (FMA)	No	No	Yes, Resolution 0505 – December 14, 2004	No	No	No
Floodplain Management Ordinance	Yes	Yes	Yes, Ordinance 9612 – February 11, 1992	Yes	Yes Town Code CH. 173	No, Town not in Floodplain
Stormwater Program	Yes MD Stormwater Regulations	Yes	Yes, Ordinance 0601 – August 23, 1995	No	Yes Town Code CH. 281	Yes October 2009
Building Code	Yes	Yes	Yes, Ordinance 0904/0903 – March 10, 2009	Yes	Yes Town Code CH. 108	IBC 2015
Building Official	Yes	Yes	Middle Dept. Inspection Agency	Planning Commissioner	Yes Town Code CH. 108	Middle Dept. Inspection Agency
- Inspections?	Yes	Yes	Middle Dept. Inspection Agency	Yes Middle Dept. Inspection Agency	Yes Middle Dept. Inspection Agency	Middle Dept. Inspection Agency
Building Code Effectiveness	No	Adopted International	No	Adopted International	No	No

Grading Schedule (BCEGS) Rating		Building Code		Building Code		
Warning-sirens?	Yes, Fire Dept. Sirens	Yes	Yes Fire Dept. Sirens	Yes	Yes, Fire Dept. Sirens	Yes, Fire Dept. Sirens
NOAA Weather Radio?	Yes, scattered sites	Yes	Yes	Yes	Yes	Yes
Cable Override?	Yes	Yes	No	No	Yes	No
Mass Notification System	Yes	Talbot County System	Talbot County System	Talbot County System	Talbot County System	Talbot County System
Structural Projects	No	Yes	No	No	No	No
Property Protection	No	Yes	No	No	No	No
Critical Facility Protection	No	Yes	No	N/A	No	No
Natural / Cultural Resources Inventory	No	Yes	No	No	No	No
Erosion Control	Yes Soil Conservation District	Yes	Yes	Critical Area Buffers	Yes Town Code CH. 154	No
Sediment Control	Yes Soil Conservation District	Yes	Yes	N/A	Yes Town Code CH. 154	No
Public Information Program	No	Yes	Yes	No	No	No
Environmental Education Program	No	No	Yes	No	No	No

Chapter 13:

Plan Implementation & Monitoring

CHAPTER 13: PLAN IMPLEMENTATION & MONITORING

1. BRINGING THE PLAN TO LIFE

This Plan document is Talbot County's road map for evaluating hazards, identifying resources and capabilities, selecting appropriate actions, and developing and implementing mitigation and resilience measures to eliminate or reduce future impacts from those hazards in order to protect the health, safety, and welfare of the residents in the community. Implementation of the plan is a critical component of strengthening the resilience of Talbot County.

The implementation of the plan includes the completion of the twenty-three mitigation and resilience actions that were identified by the Resilience Stakeholder Committee's five pillar workgroups. An extensive listing of potential funding sources available to assist in the implementation of the identified mitigation and resilience actions has been included at the end of this chapter for reference.

Mitigation and Resilience Implementation Actions

The **Resilience Stakeholder Committee** was held on **November 22, 2016.** The meeting agenda included the review of mitigation implementation action worksheets that were developed from the results of the September mitigation & resilience strategy session. Committee members were divided into their five respective Pillar workgroups and were tasked with the review of the mitigation implementation action worksheets. During this time committee members had an opportunity to make any modifications that they deemed necessary. In addition, committee members were requested to add ideas that may be missing. As a result, five new ideas were added.

Following the Pillar workgroup review session, each pillar workgroup presented their group's mitigation & resilience ideas to the committee at large. This portion of the meeting provided an opportunity for each Pillar workgroup to hear, comment, and ask questions on all the ideas. The finalized twenty-three Mitigation and Resilience Implementation Actions have been include in *Chapter 11: Mitigation & Resilience Goals, Objectives, & Actions.*

2. MONITORING, EVALUATING AND UPDATING THE PLAN

Monitoring, evaluating, and updating the Plan are critical to maintaining its relevance. Effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section identifies who will be responsible for monitoring, evaluating, and updating the Plan, and what those responsibilities entail. This section also lays out the method and schedule of these and describes how the public will be involved on a continuing basis.

Talbot County's Department of Emergency Services will be the permanent entity responsible for maintaining the Plan and for monitoring, evaluating, and updating it. The *2011 Talbot County Hazard Mitigation Plan* had recommended retaining the Hazard Mitigation Planning Committee (with representation from all participating municipalities). However, the retention of the HMPC did not occur. This issue was

discussed with the Department of Emergency Services and the members of the 2016-17 Resilience Stakeholder Committee (RSC). The retention and continuation of the 2016-17 RSC has been met with resounding approval. This committee will continue to meet annually, at a minimum. The Emergency Planner from the County's Department of Emergency Services will lead the Committee in conjunction with the County's Director of Emergency Services.

The RSC will oversee the progress made on the implementation of the identified mitigation and resilience actions and update the Plan, as needed, to reflect changing conditions. The RSC will therefore serve as the focal point for coordinating countywide mitigation and resilience efforts. The RSC will serve in an advisory capacity to the Talbot County Department of Emergency Services.

The RSC will monitor the mitigation activities by reviewing reports from the agencies identified for implementation of the different actions and the County Capital Improvement Planning process for partnering opportunities. During the 2016-17 HMP update process, various infrastructure projects were identified. These identified infrastructure projects provide opportunities for the County and State to incorporate flood mitigation into the scope of work for maintenance and repair projects.

In order to facilitate and capture the review and status of the mitigation and resilience implementation actions, an Implementation Matrix has been developed. This matrix should be viewed in a large format and printed on ledger paper, 11X17. At a glance RSC members will be able to view the identified actions, along with the associated hazards and pillars, responsible agency, capital budget timeframe, costs (if known), and designated high priority actions. In addition, the matrix includes a yearly status completion box to be populated, as appropriate, during the annual review process.

The Department of Emergency Services will distribute an annual report to the RSC. RSC members will have an opportunity to provide their feedback prior to widespread distribution. Copies of these status reports will be made available to the general public on the County's website under the Department of Emergency Services.

Evaluation of the plan should include not only be checking on whether or not mitigation and resilience actions have been implemented, but also assessing their degree of effectiveness. This would be done through a review of the qualitative and quantitative benefits (or avoided losses) of the mitigation activities. These would then be compared to the goals and objectives that the Plan was intended to achieve. The RCS will also need to evaluate mitigation projects to see if they need to be modified or discontinued in light of new developments during their annual meetings.

The Plan will be updated every five years, as required by the Disaster Mitigation Act of 2000, or following a disaster. The Department of Emergency Services will oversee and facilitate the update of the Plan. The updated Plan will account for any new developments in the County or special circumstances (post-disaster). Issues that come up during monitoring and evaluation, which require changes in mitigation strategies and projects should be incorporated in the Plan at this stage.

3. PUBLIC ENVOLVEMENT

The Department of Emergency Services in cooperation with the RSC will involve the public during the evaluation and update of the Plan through annual public education activities, public workshops, and public hearings. The County's website will serve as a means of communication by providing information about mitigation and resilience initiatives.

4. FUNDING SOURCES

Note: Updated April 2017

The following is a list of Federal and State Grants that may assist in implementing local All Hazard Mitigation Plans.

This information is subject to change at anytime, contact the federal or state agency for current grant status.

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Federal Emergency Management Agency, Hazard Mitigation Grant Program (HMGP)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	All Hazards Mitigation Planning. Acquisition, relocation, elevation and flood-proofing of flood-prone insured properties, flood mitigation planning, wind retrofit, stormwater improvements, education and awareness.	Federal - 75% Non Federal - 25%	Local government must be in compliance with the National Flood Insurance Program to be eligible. Projects must be cost effective, environmentally sound and solve a problem. Repetitive loss properties are a high priority.	After a Presidential Disaster Declaration
Federal Emergency Management Agency, Pre Disaster Mitigation Grant Program (PDM)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations.	Federal - 75% Non Federal - 25%	PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.	Annual-Spring/Summer
Federal Emergency Management Agency, Flood Mitigation Assistance Program (FMA)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	Assist States and communities to implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program.	RL: Federal - 90% Non Federal - 10% SRL: Federal - 100% Non Federal - 0%	Available once a Flood Mitigation Plan has been developed and approved by FEMA.	Annual-Spring/Summer
National Flood Insurance Program (NFIP)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	Provides financial protection by enabling persons to purchase insurance against floods, mudslide or flood related erosion.	Varies	Includes Federally backed insurance against flooding, available to individuals and businesses that participate in the NFIP	Anytime

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Increased Cost of Compliance	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	ICC coverage provides payment to help cover the cost of mitigation activities that will reduce the risk of future flood damage to a building. If a Flood Insurance Policy Holder suffers a flood loss and is declared to be substantially or repetitively damaged, ICC will pay up to 30,000 to bring the building into compliance with State or community floodplain management laws or ordinances. Usually this means elevating or relocating the building so that it is above the base flood elevation (BFE).	Varies	Once the local jurisdiction determines the building is substantially or repetitively damaged, the policy holder can contact insurance agent to file an ICC claim.	Anytime
U.S. Economic Development Administration, Economic Adjustment Program	U.S. Department of Commerce Economic Development Administration Curtis Center, 601 Walnut Street, Ste 140 South Philadelphia, PA 19106-3323 215-597-4603	Improvements and reconstruction of public facilities after a disaster or industry closing. Research studies designed to facilitate economic development.	Federal - 50%-70% Local- 30%-50%	Documenting economic distress, job impact and proposing a project that is consistent with a Comprehensive Economic Development Strategy are important funding selection criteria.	Anytime
U.S Economic Development Administration, Public Works and Development Facilities	U.S. Department of Commerce Economic Development Administration Curtis Center, 601 Walnut Street, Ste 140 South Philadelphia, PA 19106-3323 215-597-4603	Water and sewer, Industrial access roads, rail spurs, port improvements technological and related infrastructure	Federal - 50%-70% Local- 30%-50%	Documenting economic distress, job impact and projects that is consistency with a Comprehensive Economic Development Strategy are important funding selection criteria.	Quarterly Basis
Small Business Administration (SBA) Pre-disaster Mitigation Loan Program	James Rivera, Office of Disaster Assistance, Small Business Administration, 409 3rd Street, SW, STE 6050 Washington, DC 20416;202-205-6734	Activities done for the purpose of protecting real and personal property against disaster related damage.	No information	The mitigation measures must protect property or contents from damage that may be caused by future disasters and must conform to the priorities and goals of the state or local government's mitigation plan.	

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Community Development Block Grants / States Program	U.S Department of Housing and Urban Development, Office of Block Grant Assistance, 451 7th Street SW., Washington, DC 20410-7000;202-708-1112	Used for long-term recovery needs, such as: rehabilitation residential and commercial building; homeownership assistance, including down-payment assistance and interest rate subsidies; building new replacement housing; code enforcement; acquiring, construction, or reconstructing public facilities.	No information	Citizen participation procedures must be followed. At least 70 percent of funds must be used for activities that principally benefit persons of low and moderate income. Formula grants to States for non-entitlement communities.	After a Presidential Disaster Declaration
Fire Suppression Assistance Program	Infrastructure Division, Response and Recovery Directorate, FEMA, 500 C Street SW., Washington DC 20024; 202-646-2500.	Provides real-time assistance for the suppression of any fire on public (non-Federal) or privately owned forest or grassland that threatens to become a major disaster.	Federal - 70% Local - 30%	The State must first meet annual floor cost (if percent of average fiscal year fire costs) on a single declared fire. After the State's out-of-pocket expenses exceed twice the average fiscal year costs, funds are made available for 100 percent of all costs for each declared fire.	Funds from President's Disaster Relief Fund for use in a designated emergency or major disaster area.
Historic Preservation: Repair and Restoration of Disaster-Damaged Historic Properties	Infrastructure Division, Response and Recovery Directorate, FEMA, 500 C Street SW., Washington DC 20024; 202-646-4621.	To evaluate the effects of repairs to, restoration of, or mitigation hazards to disaster-damaged historic structures working in concert with the requirements of the Stafford Act.	Federal - 75% Local - 25%	Eligible to State and local governments, and any political subdivision of a State. Also, eligible are private non-profit organizations that operate educational, utility, emergency, or medical facilities.	After a Presidential Disaster Declaration
Transportation: Emergency Relief Program	Federal Transit Authority, FHWA, DOT, 1200 New Jersey Avenue Washington, DC 20590; 202-366-4043	Provides aid for the repair of Federal-aid roads and roads on Federal lands.	Federal - 100%	Application is submitted by the State department of transportation for damages to Federal-aid highway routes, and by the applicable Federal agency for damages to roads on Federal lands.	After serious damage to Federal-aid roads or roads on Federal lands caused by a natural disaster or by catastrophic failure.
Animals: Emergency Haying and Grazing	Emergency and Non-insured Assistance Programs, FSA, USDA, 1400 Independence Ave, SW, Washington, DC 20013; 202-720-4053	To help livestock producers in approved counties when the growth and yield of hay and pasture have been substantially reduced because of a widespread natural disaster.	No information	Assistance is provided by the Secretary of Agriculture to harvest hay or graze cropland or other commercial use of forage devoted to the Conservation Reserve Program (CRP0 in response to a drought or other similar emergency.	Anytime

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Emergency Watershed Protection Program	Natural Resources Conservation Service 1400 Independence Avenue, SW Washington, DC 20250	Implementing emergency recovery measures for runoff retardation and erosion prevention to relieve imminent hazards to life and property created by a natural disaster that causes a sudden impairment of a watershed.	Federal - 75% Local - 25%	It cannot fund operation and maintenance work or repair private or public transportation facilities or utilities. The work cannot adversely affect downstream water rights and funds cannot be used to install measures not essential to the reduction of hazards.	TBD
Watershed Protection and Flood Prevention Program	Natural Resources Conservation Service 1400 Independence Avenue, SW Washington, DC 20250	To provide technical and financial assistance in carrying out works of improvement to protect, develop, and utilize the land and water resources in watersheds.	Varies due to project type.	Watershed area must not exceed 250,000 acres. Capacity of a single structure is limited to 25,000 acre-feet of total capacity and 12,500 acre-feet of floodwater detention capacity.	TBD
Watershed Surveys and Planning	Natural Resources Conservation Service 1400 Independence Avenue, SW Washington, DC 20250	To provide planning assistance to Federal, State, and local agencies for the development of coordinated water and related programs in watersheds and river basins. Emphasis is on flood damage reduction, erosion control, water conservation, preservation of wetlands and water quality improvements.	No information	These watershed plans form the basis for installing needed works of improvement and include estimated benefits and costs, cost-sharing, operation and maintenance arrangements, and other information necessary to justify the need for Federal assistance in carrying out the plan.	Anytime
Emergency Advance Measures for Flood Prevention	USACE 441 G Street, NW, Washington DC 20314; 202-761-0011	To perform activities prior to flooding or flood fight that would assist in protecting against loss of life and damages to property due to flooding.	No information	There must be an immediate threat of unusual flooding present before advance measures can be considered. Any work performed under this program will be temporary in nature and must have a favorable benefit cost ratio.	Governor of State must request assistance
Emergency Streambank and Shoreline Protection	USACE 441 G Street, NW, Washington DC 20314; 202-761-0011	Authorizes the construction of emergency streambank protection measures to prevent damage to highways, bridge approaches, municipal water supply systems, sewage disposal plants, and other essential public works facilities endangered by floods or storms due to bank erosion.	No information	Churches, hospitals, schools, and other non-profit service facilities may also be protected under this program. This authority does not apply to privately-owned property or structures.	TBD

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Small Flood Control Projects	USACE 441 G Street, NW, Washington DC 20314; 202-761-0011	Authorizes the construction of small flood control projects that have not already been specifically authorized by Congress.	No information	There are two general categories of projects: structural and nonstructural. Structural projects may include levees, floodwalls, diversion channels, pumping plants, and bridge modifications. Nonstructural projects have little or no effect on water surface elevations, and may include flood proofing, the relocation of structures, and flood warning systems.	TBD
Flood: Emergency Advance Measures for Flood Prevention	USACE 441 G Street, NW, Washington DC 20314; 202-761-0011	To mitigate, before an event, the potential loss of life and damages to property due to floods.	No information	Assistance may consist of temporary levees, channel cleaning, preparation for abnormal snowpacks, etc.	Governor of State must request assistance
Continuing Authorities Program (CAP)	USACE 441 G Street, NW, Washington DC 20314; 202-761-0011	Initiates a short reconnaissance effort to determine Federal interest in proceeding. If there is interest, a feasibility study is performed.	Federal - 65% Local-35%	A local sponsor must identify the problem and request assistance. Small flood control projects are also available.	Anytime
Hazardous Materials: State Access to the Oil Spill Liability Trust Fund	Director, USCG National Pollution Funds Center, U.S. Coast Guard Stop 7605 2703 Martin Luther King Jr. Avenue, SE Washington, DC 20593-7605 202-795-6000	To encourage greater State participation in response to actual or threatened discharges of oil.	No information	Eligible to States and U.S. Trust Territories and possessions.	Anytime
Emergency Management Assistance (EMA)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	Funds may be used for salaries, travel expenses, and other administrative cost essential to the day-to-day operations of State and Local emergency management agencies. Program also includes management processes that ensure coordinated planning, accountability for progress, and trained qualified staffing.	Federal - 50%	EMA funded activities may include specific mitigation management efforts not otherwise eligible for Federal funding. Management Assistance program funds may not be used for construction, repairs, equipment, materials or physical operations required for damage mitigation projects for public or private buildings, roads, bridges, or other facilities.	Anytime

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Maryland Program Open Space	Department of Natural Resources 580 Taylor Ave. Annapolis, MD 21401 410-260-8445	Local provides financial and technical assistance to local subdivisions for the planning, acquisition, and/or development of recreation land or open space areas.	A local governing body may use up to $25,000 annually from its 100% (Acquisition) money to fund planning projects that update the Local Land Preservation and Recreation Plans.	Acquires outdoor recreation and open space areas for public use. Administers funds made available to local communities for open and recreational space by the Outdoor Recreation Land Loan of 1969 and from the Land and Water Conservation Fund of the National Park Service, U.S. Department of the Interior.	July 1st
Maryland Recreational Trails Program	Maryland Scenic Byways /Recreational Trails Program* Office of Planning & Preliminary Engineering State Highway Administration 707 N Calvert Street Baltimore, MD 21201 (p) 410.545.8637 (f) 410.209-5012 tmaxwell@sha.state.md.us	Maintenance and restoration of existing recreational trail; Development and rehabilitation of trailside facilities and trail linkages; Purchase and lease of trail construction equipment; Construction of new trails; Acquisition of easements or property for recreational trails or recreational trail corridors; and Implementation of interpretive/educational programs to promote intrinsic qualities, safety, and environmental protection, as those objectives relate to the use of recreational trails.	Administered by the State Highway Administration (SHA), this program matches federal funds with local funds or in-kind contributions to implement trail projects. Projects can be sponsored by a county or municipal government, a private non-profit agency, a community group or an individual (non-governmental agencies must secure an appropriate government agency as a co-sponsor). Federal funds administered by the State Highway Administration are available for up to 80% of the project cost, matched by at least 20% funding from the project sponsor. Matching funds must be committed and documented in the local jurisdiction's budget. A Memorandum of Understanding outlining funding and project implementation responsibilities will be prepared by SHA and signed by all parties before the project funds are released.	Projects must meet state and federal environmental regulatory requirements (NEPA, MEPA, Section 106, Section 4(f)). SHA will provide assistance to the project sponsor to acquire these approvals.	July 1st

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
CoastSmart Communities Grant Program	Maryland Department of Natural Resources Chesapeake and Coastal Service (p) 410.260.8718 (f) 410.260.8739 sasha.land@maryland.gov	Municipalities and counties in the coastal zone are eligible to apply for and receive funds: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George's, Queen Anne's, St. Mary's, Somerset, Talbot, Wicomico, and Worcester counties and Baltimore City. Funding for a one-year project that contributes to understanding, planning for, or implementing planning and outreach measures to address coastal hazard issues.	Up to $75,000 annually	Track A can fund flood vulnerability and risk assessments, updates to planning documents (e.g. hazard mitigation plans, zoning ordinances, building codes, floodplain ordinances, comprehensive plans), education and outreach campaigns and materials, applications to FEMA's Community Rating System in concert with other task outcomes, support for adopting an updated plan and integrating the plan into day-to-day existing planning processes that reduce overall flood risk due to tidal events or stormwater and rain events.	TBD
Green Infrastructure Resiliency Grant Program	Maryland Department of Natural Resources Chesapeake and Coastal Service (p) 410.260.8799 (f) 410.260.8739 (e) megan.granato@maryland.gov	Municipalities and counties within the Maryland portion of the Chesapeake Bay watershed are eligible to apply for and receive funds. Please note that projects proposed in Cecil, Garrett and Worcester counties must be located within the portions of those counties that are within the watershed in order to be eligible. Funding for one year for Phase 1 and Phase 2 projects and up to 2 years for Phase 3 projects that will assess stormwater management needs associated with localized flooding and design or construct targeted green infrastructure practices to address those needs.	Up to $100,000 per project	Track B can fund watershed assessments that focus on determining local flood risks and how green infrastructure can be used to address those risks, site or watershed-level green infrastructure implementation plans, and green infrastructure project designs. This track can also fund construction of green infrastructure projects. In order to apply for construction funding, all applicable permit preapplication meetings must be complete.	TBD

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Maryland Community Parks and Playgrounds Program	Department of Natural Resources 580 Taylor Ave. Annapolis, MD 21401 410-260-8445	1) development of new parks 2) rehabilitation of existing parks 3) expansion or improvement of existing parks 4) purchase and installation of playground equipment 5) development of environmentally oriented parks and recreation projects 6) development of new trails or extension of existing trails 7) creation of access points to water recreation resources 8) acquisition of land to create new parks.	The source of funds for this program is primarily State General Obligation Bonds, which may be authorized on an annual basis. The Community Parks and Playgrounds Program provides funding to incorporated municipalities and Baltimore City. Grants may be for up to 100% of the project cost and are selected on a competitive basis. Each applicant will be limited to one (1) Grant Proposal List submission package, which may contain several prioritized projects, per award cycle.	The Department of Natural Resources works to provide opportunities for Marylanders, especially our children, to experience nature. The Department has developed a web site http://www.dnr.state.md.us/cin/NPS/index.asp that provides information about Nature Play Spaces. Nature Play Spaces are one of the many types of public recreation projects eligible for consideration for Community Parks and Playgrounds grant funding. • While land acquisition costs may be considered for project funding, the highest priority will be placed on capital costs associated with park development and improvement.	TBD

Project #	Project Title	Hazard								Pillar					Responsible Agency	Implementation Timeframe			Cost (if known)	Designated High Priority	Project Completion Yearly Review (Yes/No)				
		Coastal	Flood	Winter	Tornado	High Wind	Thunderstorm	Drought	Extreme Heat	Economic Stability	Education	Environmental	Health, Safety & Welfare	Infrastructure		1-3 years	4-7 years	7-10 years			Year 1	Year 2	Year 3	Year 4	Year 5
1	Flood Mitigation Non-Substantial Improvements for Businesses	X	X							X					Business Owners, Talbot County Department of Planning and Zoning	X									
2	Disaster Recovery Planning for Economic Development	X	X	X	X	X	X	X	X	X					Business Owners	X									
3	County Schools Flood Evacuation Destinations	X	X								X				Talbot County Public Schools, Talbot County Department of Emergency Services	X			Staff Time						
4	Environmental Education and Resiliency Opportunity	X	X								X				Talbot County Public Schools	X	X	X							
5	Design Resilience into Capital Investments	X	X	X	X	X	X	X	X	X	X	X	X	X	Talbot County Department of Public Works	X				X					
6	Flood Prevention & Stormwater Management Best Practices	X	X									X			Talbot County Department of Public Works										
7	Open Space Preservation	X	X									X			Talbot County Department of Planning and Zoning	X	X		Acquisition Cost	X					
8	Flood – Public Education/Awareness	X	X									X			Talbot County Department of Planning and Zoning	X			Staff Time	X					
9	Public Outreach Sessions	X	X	X	X	X	X	X	X				X		Talbot County Department of Planning and Zoning	X	X	X	Staff Time						
10	Mass Communication	X	X	X	X	X	X	X	X				X		Talbot County Department of Emergency Services	X	X	X	Staff Time						
11	Public Outreach Plan	X	X	X	X	X	X	X	X				X		Talbot County Department of Emergency Services	X	X	X	Staff Time	X					
12	Public Education and Awareness	X	X										X		Talbot County Department of Emergency Services	X	X	X	Staff Time						
13	Communication Infrastructure	X	X											X	Talbot County Department of Public Works	X									
14	Mitigate Pump Station Risk to Overflow		X											X	Talbot County Department of Public Works										
15	Well Head Protection	X	X											X	Talbot County Health Department	X			$152.5K						
16	Repetitive Roadway Flooding Issues	X	X											X	Talbot County Department of Public Works					X					
17	Update County Code for Well Head Elevation	X	X											X	Talbot County Department of Planning and Zoning	X			Staff Time						
18	Culvert Mitigation	X	X											X	Talbot County Department of Public Works, Talbot County Roads Department				$200K for all 6 projects						
19	Establish a Business Liaison in EOC	X	X	X	X					X					Talbot County Department of Emergency Services	X			Staff Time	X					
20	Pillar and overall stakeholder groups to continue to meet annually	X	X	X	X	X	X	X	X	X	X	X	X	X	Talbot County Department of Emergency Services	X	X	X	Staff Time						
21	Power Generators at Essential Facilities	X	X	X									X		Talbot County Department of Emergency Services	X									
22	Restore barrier islands to provide protection for Talbot County's shorelines from wave action.	X										X			Talbot County Department of Emergency Services, US Army Corps of Engineers, MD Department of Transportation Port Administration										
23	Increase Community Rating System Rating	X	X							X					Talbot County Department of Planning and Zoning	X	X	X	Staff Time						

Appendix A
2017 Critical & Public Facilities

Account ID	Facility Type	Facility Detail	Facility Name	Address	Critical Facility	Public Facility	Shelter (Yes/No)	Flood Zone	Flood Depth	Category 1	Category 2	Category 3	Category 4	Within 100 ft Buffer	Built Prior 1965	SLR 0-2ft	SLR 2-5 ft	SLR 5-10 ft
2101066315	County Owned	Airport	Easton Airport	29137 Newnam Road	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101036882	County Owned	Community Center	Talbot County Community	10028 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No				
2105187788	County Owned	Dock		7381 Tilghman Island Road	No	Yes	No	AE	1.7	0	0	0	0	Yes			Yes	
2101046713	County Owned	Dock			No	Yes	No	AE	2.3	1	0	0	0	Yes			Yes	
2102086794	County Owned	Dock			No	Yes	No	X	N/A	0	0	0	0	Yes			Yes	
2103126897	County Owned	Dock			No	Yes	No	AE	3.7	1	0	0	0	Yes			Yes	
2104156269	County Owned	Dock			No	Yes	No	AE	4.4	0	0	0	0	Yes				
2104156277	County Owned	Dock			No	Yes	No	AE	3.7	1	0	0	0	Yes		Yes		
2104160185	County Owned	Dock			No	Yes	No	AE	2.5	0	0	0	0	Yes			Yes	
2105187796	County Owned	Dock			No	Yes	No	AE	3.5	1	0	0	0	Yes		Yes		
2101096443	County Owned	Housing Authority	Talbot County Pool	501 Port Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101051997	County Owned	Library	Talbot Count Library	10 W Dover Street	No	Yes	No	X	N/A	0	0	0	0	No	No			
2102067080	County Owned	Library	Talbot County Library in St. Michaels	106 Fremont Street	No	Yes	No	X	N/A	0	0	3	0	No	No			
2101026720	County Owned	Museum	Historical Society of Talbot	29 S Washington Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101063235	County Owned	Museum	Historical Society of Talbot		No	Yes	No	X	N/A	0	0	0	0	No				
2104156250	County Owned	Museum		11308 Longwoods Road	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101026615	County Owned	Office	Talbot County Courthouse	11 N Washington Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101006274	County Owned	Office	Talbot County Government Building	142 N Harrison Street	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101026607	County Owned	Office	Talbot County Health Department	100 S Hanson Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101014587	County Owned	Office	Talbot County Government Offices	215 Bay Street	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101049925	County Owned	Parks and Recreation	Hog Neck Golf Course	10027 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No	No			
2103153665	County Owned	Parks and Recreation	Homerun Baker Park	4200 Main Street	No	Yes	No	X	N/A	0	0	0	0	No	No			

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2104154134	County Owned	Parks and Recreation	Talbot Count tennis court		No	Yes	No	X	N/A	0	0	0	0	No				
2104156226	County Owned	Parks and Recreation	Talbot County baseball court	31028 Skipton Cordova Road	No	Yes	No	X	N/A	0	0	0	0	No				
2102086786	County Owned	Parks and Recreation	Talbot County basketball court	5536 Public Landing Road	No	Yes	No	X	N/A	0	2	0	0	Yes				Yes
2102101645	County Owned	Parks and Recreation			No	Yes	No	X	N/A	0	0	0	4	No				
2101069934	County Owned	Plane Hangar	Clark Transportation	29065 Corkran Road	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101092367	County Owned	Plane Hangar		29050 Corkran Road	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101031414	Education	Private School	Benedictine School Group	29517 Dutchmans Lane	Yes	No	No	X	N/A	0	0	0	0	No	No			
2101055380	Education	Private School	Calhoon MEBA Engineering	27050 Saint Michaels Road	Yes	No	No	X	N/A	0	0	3	0	No				
2101027611	Education	Private School	Church of God Private School	1009 N Washington Street	Yes	No	No	X	N/A	0	0	0	0	No				
2101026542	Education	Private School	Christ Church Day School	111 S Harrison Street	Yes	No	No	X	N/A	0	0	0	0	No				
2101026585	Education	Private School	Country School	716 Goldsborough Street	Yes	No	No	X	N/A	0	0	0	0	No				
2101076876	Education	Private School	Easton Montessori School	2 Martin Court	Yes	No	No	X	N/A	0	0	0	0	No				
2101026933	Education	Private School	SS Peter and Paul K-12	900 High Street	Yes	No	No	X	N/A	0	0	0	0	No				
2101026895	Education	Private School	St. Marks Church	100 Peachblossom Road	Yes	No	No	X	N/A	0	0	0	0	No				
2102066912	Education	Public School	St. Michaels High School	200 Seymour Avenue	Yes	No	No	X	N/A	0	0	3	0	No	No			
2101026518	Education	Public School	Board of Education	12 Magnolia Street	Yes	No	No	X	N/A	0	0	0	0	No				
2104156242	Education	Public School	Chapel District Elementary	11430 Cordova Road	Yes	No	No	X	N/A	0	0	0	0	No	Yes			
2101026526	Education	Public School	Easton Elementary	305 Glenwood Avenue	Yes	No	No	X	N/A	0	0	0	0	No				
2101026488	Education	Public School	Easton High	720 Mecklenburg Avenue	Yes	No	Yes	X	N/A	0	0	0	0	No				
2101026496	Education	Public School	Easton Middle	201 Peachblossom Road	Yes	No	No	X	N/A	0	0	0	0	No				

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2102066912	Education	Public School	St. Michaels Elementary/Middle	100 Seymour Avenue	Yes	No	No	X	N/A	0	0	3	0	No				
2105187753	Education	Public School	Tilghman Elementary School	21374 Foster Avenue	Yes	No	No	X	N/A	0	0	3	0	No				Yes
2103126307	Education	Public School	White Marsh Elementary School	4322 Lovers Lane	Yes	No	No	X	N/A	0	0	0	0	No	Yes			
2101026526	Education	Public School	Easton Elementary	307 Glenwood Avenue	Yes	No	No	X	N/A	0	0	0	4	No				
2105189489	Education	School	US Naval Research Lab Tilghman	4642 Black Walnut Point Road	Yes	No	No	AE	0.0	0	2	0	0	Yes				Yes
2101068261	Education	Special Needs	Benedictine School Group Home	29369 Will Street	Yes	No	No	X	N/A	0	0	0	0	No	No			
2101068628	Education	Special Needs	Benedictine School Group Home	7301 Frances Street	Yes	No	No	X	N/A	0	0	0	0	No	No			
2101075748	Education	Special Needs	Benedictine School Group Home	7333 Shirley Drive	Yes	No	No	X	N/A	0	0	0	0	No	No			
2104158326	Education	Special Needs	Benedictine School Vacation Retreat Home	9018 High Banks Terrace	Yes	No	No	X	N/A	0	0	0	4	No	No			
2101046764	Emergency	EMS	Talbot County EMS	29041 Corkran Road	Yes	No	No	X	N/A	0	0	0	0	No	No			
2101034103	Emergency	EOC	Talbot County EOC	605 Port Street	Yes	No	No	X	N/A	0	0	0	0	No	No			
2104160258	Emergency	Fire Department	Cordova VFD	11864 Kittys Corner Road	Yes	No	No	X	N/A	0	0	0	0	No	No			
2101027220	Emergency	Fire Department	Easton VFD	315 Aurora Park Drive	Yes	No	No	X	N/A	0	0	0	0	No				
2103126536	Emergency	Fire Department	Oxford VFD	300 Oxford Road	Yes	No	No	AE	0.0	1	0	0	0	No	Yes			Yes
2102078384	Emergency	Fire Department	Street. Michaels VFD	1001 S Talbot Street	Yes	No	No	X	N/A	0	2	0	0	No	No			Yes
2105187893	Emergency	Fire Department	Tilghman VFD	5979 N Main Street	Yes	No	No	X	N/A	0	0	3	0	No	No			Yes
2103126625	Emergency	Fire Department	Trappe VFD	4001 Powell Ave	Yes	No	No	X	N/A	0	0	0	0	No	No			
2101027107	Emergency	Fire Department	Easton VFD Substation	29496 Matthewstown Road	Yes	No	No	X	N/A	0	0	0	0	No	No			
	Emergency	Fire Station	Queen Anne Hillsboro VFD	13520 First Street	Yes	No	No			0	0	0	0	No				
2102066602	Emergency	Police Station	St. Michaels Police Department	100 Fremont Street	Yes	No	No	X	N/A	0	0	3	0	No	No			Yes
2101046764	Emergency	Police Station	DNR Police	9385 Jet Lane	Yes	No	No	X	N/A	0	0	0	0	No	No			
2103126803	Emergency	Police Station	US Coast Guard	904 S Morris Street	Yes	No	No	AE	0.0	1	0	0	0	No	Yes			Yes

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2101009907	Emergency	Police Station	Talbot County Detention Center/Sheriff	115 W Dover Street	Yes	No	No	X	N/A	0	0	0	0	No	No			
2101027131	Emergency	Police Station	Easton Police	106 W Dover Street	Yes	No	No	X	N/A	0	0	0	0	No				
2103126331	Emergency	Police Station	Oxford Police	101 Market Street	Yes	No	No	X	N/A	0	0	3	0	No	Yes			Yes
2103126455	Emergency	Police Station	Trappe Police	4011 Powell Avenue	Yes	No	No	X	N/A	0	0	0	0	No	Yes			
2101026976	Emergency	Police Station	Maryland State Police	7053 Ocean Gateway	Yes	No	No	X	N/A	0	0	0	0	No	Yes			
2101013173	Medical	Assisted Living	Ambulatory Assistance	20 N Hanson Street	Yes	No	No	X	N/A	0	0	0	0	No	Yes			
2101069985	Medical	Assisted Living	Channel Marker Inc.	222 Port Street	Yes	No	No	X	N/A	0	0	0	0	No				
2101079336	Medical	Assisted Living	Cynwood Assisted Living	545 Cynwood Drive	Yes	No	No	X	N/A	0	0	0	0	No	No			
2101026771	Medical	Hospital	Memorial Hospital	219 S Washington Street	Yes	No	No	X	N/A	0	0	0	0	No				
2101069349	Medical	Hospital	Memorial Hospital	505 Dutchmans Lane	Yes	No	No	X	N/A	0	0	0	0	No				
2101091727	Medical	Nursing Home	Londonderry	700 Port Street	Yes	No	No	X	N/A	0	0	0	0	No	No			
2101008447	Medical	Nursing Home	Parkview at Easton	640 Mecklenburg Ave	Yes	No	No	X	N/A	0	0	0	0	No	No			
2101010840	Medical	Nursing Home	The Pines Genesis Elder Care	610 Dutchmans Lane	Yes	No	No	X	N/A	0	0	0	0	No	Yes			
2101076744	Medical	Office	Digestive Health Associates	509 Idlewild Avenue	Yes	No	No	X	N/A	0	0	0	0	No	No			
2101058363	Medical	Office	Dr. Sharriff	607 Dutchmans Lane	Yes	No	No	X	N/A	0	0	0	0	No	No			
2102062100	Medical	Office	Robert J. Patterson MD	800 S Talbot Street	Yes	No	No	X	N/A	0	2	0	0	No	Yes			Yes
2101072102	Medical	Office	Alternative Addictions	29515 Canvasback Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101079263	Medical	Office	Dr. Canter	556 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101088815	Medical	Office	Brian F Corden MD PA	508 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101088823	Medical	Office	Brian F Corden MD PA	508 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101061755	Medical	Office	Charles Dinapoli MD	404 Marvel Court	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101079220	Medical	Office	Chesapeake Cardiology	522 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No	No			

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2101099582	Medical	Office	Chesapeake Internal Medicine	598 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101099590	Medical	Office	Chesapeake Internal Medicine	598 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101099604	Medical	Office	Chesapeake Internal Medicine	598 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101099612	Medical	Office	Chesapeake Internal Medicine	598 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101076167	Medical	Office	Delmarva Foundation	9240 Centreville Road	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101012592	Medical	Office	Dankmeyer Inc.	604 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101090321	Medical	Office	David Smith MD	29466 Pintail Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101010409	Medical	Office	Dental Choice	400 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101066730	Medical	Office	Diagnostic and Imaging Center	10 Martin Court	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101061763	Medical	Office	Dialysis Corporation	402 Marvel Court	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101062778	Medical	Office	Digestive Health Associates	511 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101066765	Medical	Office	Digestive Health Associates	509 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101076736	Medical	Office	Digestive Health Associates	511 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No				
2101085670	Medical	Office	Digestive Health Associates	511 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101009834	Medical	Office	Dr. Christopher Cianci	606 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101071769	Medical	Office	Dr. Martin C. Haley	7 Caulk Lane	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101001612	Medical	Office	Dr. Mehrizi Ali	719 Goldsborough Street	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101071777	Medical	Office	Eastern Shore Urology	6 Caulk Lane	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101076884	Medical	Office	Easton Clinic, LLC	2 Martin Court	No	Yes	No	X	N/A	0	0	0	0	No				
2101067532	Medical	Office	Easton Family Physician	508 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No				
2101075373	Medical	Office	Easton Family Physician	508 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No				
2101075381	Medical	Office	Easton Family Physician	508 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No				

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2101092596	Medical	Office	Easton Family Physician		No	Yes	No	X	N/A	0	0	0	0	No				
2101092642	Medical	Office	Easton Family Physician		No	Yes	No	X	N/A	0	0	0	0	No				
2101069381	Medical	Office	Elizabeth A. Orsini DDS	505 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No				
2101101021	Medical	Office	Frederick J. Heaton DDS	538 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101061771	Medical	Office	Gordon K Calvert Jr. DD	400 Marvel Court	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101060260	Medical	Office	Healthsouth of Easton	510 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101061712	Medical	Office	Healthsouth Sports Medicine	401 Marvel Court	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101066676	Medical	Office	Helpco LLC	1 Martin Court	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101066684	Medical	Office	Herbert Gorin DDS	2 Martin Court	No	Yes	No	X	N/A	0	0	0	0	No				
2101101331	Medical	Office	David Oliver, MD	503 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101009133	Medical	Office	Hospital Commission	121 Federal Street	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101010565	Medical	Office	Houch William R. DDS	613 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101100971	Medical	Office	J. Frederick Heaton DDS	538 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101079328	Medical	Office	Ali Soulati, DDS	508 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101090364	Medical	Office	Lab Corps	29466 Pintail Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101086529	Medical	Office	Mark Higgin Bottom DDS	556 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101106651	Medical	Office	Maryland Special Population	401 Purdy Street	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101051970	Medical	Office	Plastic Surgery Specialist	611 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No				
2101080490	Medical	Office	Richard Heide, DMD, MSD	611 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No				
2101061720	Medical	Office	Michael Del Torto MD	403 Marvel Court	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101003712	Medical	Office	Mid Shore Surgical Eye	8420 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101054120	Medical	Office	Parkway Dentist	8695 Commerce Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			

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2101066692	Medical	Office	Pinnancle Plastic Surgeon	5 Martin Court	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101074687	Medical	Office	YMCA	506 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101060821	Medical	Office	Red Cross of the Delmar	706 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101069357	Medical	Office	Regis T. Storch MD PA	505 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No				
2101069365	Medical	Office	Shore Surgical Center	505 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No				
2101069403	Medical	Office	Regis T. Storch MD PA	505 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No				
2101092685	Medical	Office	River Family Physicians	555 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101069373	Medical	Office	Shore Surgical	505 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No				
2101079298	Medical	Office	Talbot Hospice Foundation	586 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101058398	Medical	Office	Tidewater Pediatrics	605 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101061747	Medical	Office	Tidewater Physical Therapy	406 Marvel Court	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101023853	Medical	Office	Adam Weinstein, MD	7969 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101061739	Medical	Office	William Friedel MD	405 Marvel Court	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101005146	Medical	Office		218 Bay Street	No	Yes	No	X	N/A	0	0	0	4	No	Yes			
2101009117	Medical	Office	Dr. Periz Detrich	140 S Washington Street	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101016660	Medical	Office		609 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101058428	Medical	Office	Malak Derakhshani	603 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101069411	Medical	Office		505 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No				
2101071750	Medical	Office	Talbot Dermatology	5 Caulk Lane	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101072625	Medical	Office		8221 Teal Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101079905	Medical	Office		508 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101080156	Medical	Office	Century Spine Center	611 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No				

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2101086561	Medical	Office	Mark Higgin Bottom DDS	556 Cynwood Drive	No	Yes	No	X	N/A	0	0	0	0	No				
2101091433	Medical	Office		8221 Teal Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101091484	Medical	Office		8221 Teal Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101091522	Medical	Office		8221 Teal Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101111973	Medical	Office		5 Caulk Lane	No	Yes	No	X	N/A	0	0	0	0	No				
2101091514	Medical	Office		8221 Teal Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101091557	Medical	Office		8221 Teal Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101091603	Medical	Office		8221 Teal Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101069055	Medical	Retirement Center	Candle Light Cove	106 W Earle Avenue	No	Yes	No	X	N/A	0	0	0	4	No	No			
2101055097	Medical	Retirement Center	Bailey Intergrace	501 Dutchmans Lane	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101069055	Medical	Retirement Center	Candle Light Cove	106 W Earle Avenue	No	Yes	No	X	N/A	0	0	0	4	No	No			
2101069055	Medical	Senior Center	Candle Light Cove	106 W Earle Avenue	No	Yes	No	X	N/A	0	0	0	4	No	No			
2101026739	Medical	Senior Housing	The Dixon House Inc.	108 N Higgins Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101021923	Medical	Senior Housing	Senior Housing	204 Bay Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101026658	Medical	Senior Housing	Senior Housing		No	Yes	No	X	N/A	0	0	0	0	No				
2101051407	Medical	Senior Housing	Senior Housing		No	Yes	No	X	N/A	0	0	0	0	No				
2101017004	Medical	Special Needs	Deaf Independent Living	13 Wrightson Avenue	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101046675	Medical	Special Needs	Deaf Independent Living	8784 Black Dog Alley	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101061194	Medical	Special Needs	Deaf Independent Living	7391 Patrick Road	No	Yes	No	X	N/A	0	0	0	0	No	No			
2103121364	Miscellaneous	Marina	Bachelor Point Yacht Company		No	Yes	No	AE	0.0	0	2	0	0	Yes	No			Yes
2103109232	Miscellaneous	Marina	Bates Marine Basin	106 Richardson Street	No	Yes	No	AE	0.5	1	0	0	0	Yes	No			Yes
2103106624	Miscellaneous	Marina	Campbell Town Creek Boat Yard	107 Myrtle Avenue	No	Yes	No	AE	1.3	1	0	0	0	Yes	No		Yes	
2103107604	Miscellaneous	Marina	Cutts and Case Shipyard		No	Yes	No	AE	0.0	1	0	0	0	Yes				Yes

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2103124088	Miscellaneous	Marina	Dickerson Harbor	3831 Trappe Landing Road	No	Yes	No	AE	0.0	0	2	0	0	Yes	No			Yes
2101032704	Miscellaneous	Marina	Easton Point Marina	975 Port Street	No	Yes	No	AE	1.8	1	0	0	0	Yes			Yes	
2102062534	Miscellaneous	Marina	Higgins Yacht Yard		No	Yes	No	AE	3.3	0	0	0	0	Yes	No			
2103107728	Miscellaneous	Marina	Hinckley Yacht Services	202 Bank Street	No	Yes	No	AE	0.7	0	0	0	0	Yes	No		Yes	
2105180465	Miscellaneous	Marina	Knapps Marina	6176 Tilghman Island Road	No	Yes	No	AE	0.0	0	2	0	0	Yes	No			Yes
2105180228	Miscellaneous	Marina	Lowes Wharf Marina	21651 Lowes Wharf Road	No	Yes	No	AE	0.5	1	0	0	0	Yes			Yes	
2103110656	Miscellaneous	Marina	Mears Yacht Haven	500 E Strand	No	Yes	No	AE	0.0	1	0	0	0	Yes	Yes		Yes	
2102076705	Miscellaneous	Marina	Oak Creek Marina	7419 Back Street	No	Yes	No	AE	0.0	1	0	0	0	Yes				Yes
2103109658	Miscellaneous	Marina	Oxford Boatyard Yacht Sales	407 Strand	No	Yes	No	AE	0.5	1	0	0	0	Yes	Yes			Yes
2103106705	Miscellaneous	Marina	Oxford Yacht Agency	317 S Morris Street	No	Yes	No	AE	0.6	1	0	0	0	Yes	No		Yes	
2103107736	Miscellaneous	Marina	Pier Street Marina	104 W Pier Street	No	Yes	No	AE	3.0	1	0	0	0	Yes	Yes		Yes	
2105178193	Miscellaneous	Marina	Severn Marine Services		No	Yes	No	AE	1.0	1	0	0	0	Yes	Yes		Yes	
2105177472	Miscellaneous	Marina	Tilghman on Chesapeake	21610 Island Club Road	No	Yes	No	VE	0.0	1	0	0	0	Yes	No			Yes
2105197899	Miscellaneous	Marina		21764 Camper Circle	No	Yes	No	AE	0.5	1	0	0	0	Yes	No		Yes	
2104153693	Miscellaneous	Marina		12498 Wye Landing Lane	No	Yes	No	X	N/A	0	2	0	0	Yes	No			Yes
2104150066	Miscellaneous	Storage Yard	Marina Mart	12214 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	4	Yes	Yes			
2101077236	Miscellaneous	Storage Yard	Talbot River Tours	846 Point Road	No	Yes	No	X	N/A	0	0	0	4	No	No			
2102090694	Miscellaneous	Storage Yard	Tidewater Canvas		No	Yes	No	X	N/A	0	2	0	0	No	No			Yes
2101021540	Municipal-Easton	Housing Authority	Asbury Place	400 E Dover Street	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101051679	Municipal-Easton	Housing Authority	Doverbrook Apartments		No	Yes	No	X	N/A	0	0	0	0	No				
2101060066	Municipal-Easton	Housing Authority	Doverbrook Apartments		No	Yes	No	X	N/A	0	0	0	0	No				
2101003410	Municipal-Easton	Housing Authority	Easton - apartment complex	705 Dover Road	No	Yes	No	X	N/A	0	0	0	0	No				

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2101026453	Municipal-Easton	Housing Authority	Easton - apartment complex		No	Yes	No	X	N/A	0	0	0	0	No				
2101062190	Municipal-Easton	Housing Authority	Easton - apartment complex		No	Yes	No	X	N/A	0	0	0	0	No				
2101020684	Municipal-Easton	Housing Authority	Easton - Residence	323 South Street	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101054686	Municipal-Easton	Office	Chesapeake Wildlife Heritage		No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101027336	Municipal-Easton	Office	Easton Business Management	11 S Harrison Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101027328	Municipal-Easton	Office	Easton Mayor and Council	14 S Harrison Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101027387	Municipal-Easton	Parks and Recreation	Easton tennis court		No	Yes	No	X	N/A	0	0	0	0	No	No			
2101040928	Municipal-Easton	Parks and Recreation	North Easton Sports Com	1078 N Washington Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101027123	Municipal-Easton	Public Works	Easton Utilities	219 N Washington Street	No	Yes	No	X	N/A	0	0	0	4	No				
2101007866	Municipal-Easton	Public Works	Easton Utilities	201 N Washington Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101027255	Municipal-Easton	Public Works	Easton Public Works		No	Yes	No	X	N/A	0	0	0	4	No				
2101027379	Municipal-Easton	Public Works	Easton pump station		No	Yes	No	AE	0.5	0	2	0	0	No			Yes	
2101051229	Municipal-Easton	Public Works	Easton Public Works		No	Yes	No	X	N/A	0	0	0	0	No				
2101027050	Municipal-Easton	Public Works	Easton Garage	220 Port Street	No	Yes	No	X	N/A	0	0	0	4	No				
2103126293	Municipal-Oxford	Community Center	Grace Community Church		No	Yes	No	AE	0.0	1	0	0	0	No	Yes			Yes
2103126587	Municipal-Oxford	Library	Oxford Library		No	Yes	No	X	N/A	0	0	3	0	No	Yes			Yes
2103107213	Municipal-Oxford	Museum	Oxford Museum Inc.		No	Yes	No	X	N/A	0	0	3	0	No	Yes			Yes
2103126390	Municipal-Oxford	Parks and Recreation	Oxford tennis courts		No	Yes	No	AE	1.5	1	0	0	0	Yes			Yes	
2103127117	Municipal-Oxford	Dock	Oxford Dock		No	Yes	No	AE	2.7	0	0	0	0	Yes		Yes		
2102116545	Municipal-Street. Michaels	Housing Authority	St. Michaels	300 N Talbot Street	No	Yes	No	X	N/A	0	0	3	0	No				
2102067285	Municipal-Street. Michaels	Housing Authority	St. Michaels Housing Au		No	Yes	No	X	N/A	0	0	3	0	No				

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2102065525	Municipal-Street. Michaels	Housing Authority	Storage		No	Yes	No	X	N/A	0	0	3	0	No				
2102103605	Municipal-Street. Michaels	Museum	Chesapeake Bay Maritime	213 N Talbot Street	No	Yes	No	AE	2.7	1	0	0	0	No			Yes	
2102067099	Municipal-Street. Michaels	Museum	Street. Mary's Square Museum	409 St. Mary's Square	No	Yes	No	X	N/A	0	2	0	0	No	Yes			Yes
2102064944	Municipal-Street. Michaels	Office	Town of St. Michaels	300 Mill Street	No	Yes	No	AE	0.0	0	2	0	0	Yes	Yes			Yes
2102067048	Municipal-Street. Michaels	Public Works	Commissioners of St. Michaels	301 Mill Street	No	Yes	No	AE	0.0	0	2	0	0	Yes				Yes
2102067145	Municipal-Street. Michaels	Public Works	Street. Michaels Town Shop		No	Yes	No	X	N/A	0	0	3	0	No	Yes			
2104164164	Utility	Electric	Choptank Electric	11324 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No				
	Utility	Electric	Easton Utilities	450 Glenwood Avenue	No	Yes	No	X	N/A	0	0	0	4	No				
2102061236	Utility	Electric	Delmarva Power Substation	129 Grace Street	No	Yes	No	X	N/A	0	2	0	0	No				Yes
2102067137	Utility	Electric	Delmarva Power & Light		No	Yes	No	AE	0.0	1	0	0	0	No				Yes
2103132692	Utility	Electric	Delmarva Power & Light		No	Yes	No	X	N/A	0	0	0	0	No				
2104160509	Utility	Electric	Delmarva Power & Light		No	Yes	No	X	N/A	0	0	0	0	No				
2102070162	Utility	Electric	Choptank Electric	6901 Schoolhouse Lane	No	Yes	No	X	N/A	0	2	0	0	No				Yes
2101027077	Utility	Electric	Easton Utilities Cable	405 Bay Street	No	Yes	No	AE	0.5	0	2	0	0	No				Yes
2101049011	Utility	Electric	Easton Utilities	8940 Glebe Park Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101032631	Utility	Gas	Eastern Shore Natural Gas		No	Yes	No	X	N/A	0	0	0	0	No				
2102061805	Utility	Gas/Oil	United Shoregas	929 S Talbot Street	No	Yes	No	X	N/A	0	0	3	0	No	Yes			Yes
2101001345	Utility	Gas/Oil	Meintzer Brothers Petroleum	400 S Aurora Street	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101038583	Utility	Gas/Oil	Delmarva Oil Inc.	900 Port Street	No	Yes	No	AE	0.0	0	2	0	0	No	Yes		Yes	

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2101034944	Utility	Gas/Oil	Pep Up Inc./ Russ Oil Co	956 Port Street	No	Yes	No	AE	1.1	1	0	0	0	No	Yes		Yes	
2101043447	Utility	Gas/Oil	Southern States Petroleum - Talbot	801 Port Street	No	Yes	No	X	N/A	0	0	0	4	No	No			
2101009079	Utility	Gas/Oil	Tri Gas and Oil Company	407 Brookletts Ave	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101021966	Utility	Gas/Oil	Suburban Propane	1080 N Washington Street	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101035428	Utility	Gas/Oil	Tri Gas and Oil Company	9253 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101045288	Utility	Gas/Oil	Sharp Energy Inc.	9387 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101029525	Utility	Gas/Oil	Valley National Gases Inc.	9580 Black Dog Alley	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101034944	Utility	Gas/Oil	McMahan Oil Company	930 Port Street	No	Yes	No	AE	0.5	1	0	0	0	No	Yes		Yes	
2102075016	Utility	Pumping Station	Pumping Station #2	25940 Royal Oak Road	No	Yes	No	X	N/A	0	2	0	0	No	No			Yes
2102067471	Utility	Pumping Station	Pumping Station #1	25730 Royal Oak Road	No	Yes	No	X	N/A	0	0	3	0	No				Yes
2102083795	Utility	Pumping Station	Pumping Station #3	6020 Bellevue Road	No	Yes	No	X	N/A	0	2	0	0	No				Yes
2101031147	Utility	Pumping Station	Pumping Station	9345 Unionville Road	No	Yes	No	X	N/A	0	0	0	4	No				
2101077678	Utility	Pumping Station	Chapel East Pumping Station	9076 Honeysuckle Drive	No	Yes	No	A	N/A	0	0	0	0	No	No			
2101074636	Utility	Pumping Station	Peachblossom Pumping Station	7606 Oxford Road	No	Yes	No	X	N/A	0	0	3	0	No				
2101095145	Utility	Pumping Station	Easton Pump Station	29853 Standish Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101027697	Utility	Pumping Station	Clifton Pump Station Easton	7891 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101030523	Utility	Substation	Choptank Electric	6979 Dover Neck Road	No	Yes	No	X	N/A	0	0	0	0	No				
2101046756	Utility	Substation	Delmarva Power Substation	8289 Old Bloomfield Road	No	Yes	No	X	N/A	0	0	3	0	No				
2101031937	Utility	Substation	Delmarva Power Substation	602 W Glenwood Avenue	No	Yes	No	X	N/A	0	0	0	0	No				
2102104792	Utility	Substation	Delmarva Substation Bozman	23931 Street Michaels Road	No	Yes	No	X	N/A	0	0	3	0	No				
2103115097	Utility	Substation	Delmarva Power Substation	28340 Almshouse Road	No	Yes	No	X	N/A	0	0	0	0	No				
2101062093	Utility	Substation	Easton Public Works		No	Yes	No	X	N/A	0	0	0	0	No				

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2101003933	Utility	Telephone	Verizon	40 S Washington Street	No	Yes	No	X	N/A	0	0	0	0	No				
2101030493	Utility	Telephone	Verizon	781 Idlewild Avenue	No	Yes	No	X	N/A	0	0	0	0	No				
2101030507	Utility	Telephone	T Mobile	10496 Hiners Lane	No	Yes	No	X	N/A	0	0	0	0	No				
2102060590	Utility	Telephone	Verizon	111 E Chew Avenue	No	Yes	No	X	N/A	0	2	0	0	No				Yes
2103105288	Utility	Telephone	Verizon Trappe	29428 Greenfield Avenue	No	Yes	No	X	N/A	0	0	0	0	No				
2103107353	Utility	Telephone	Verizon		No	Yes	No	AE	0.5	1	0	0	0	No			Yes	
2104146360	Utility	Telephone	Verizon		No	Yes	No	X	N/A	0	0	0	0	No				
2105176336	Utility	Telephone	Verizon	5932 Tilghman Island Road	No	Yes	No	X	N/A	0	0	3	0	No				Yes
2102116480	Utility	Tower	Verizon	108 Woodside Avenue	No	Yes	No	X	N/A	0	2	0	0	No				Yes
2102071444	Utility	Tower		7869 Bozman Neavitt Road	No	Yes	No	X	N/A	0	2	0	0	No				Yes
2103119505	Utility	Tower	Verizon	Landing Neck Road	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2103112233	Utility	Tower	Dover Radion Page	2987 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101031945	Utility	Tower	Delmarva Power & Light	26985 Street Michaels Road	No	Yes	No	X	N/A	0	0	3	0	No				
2103152448	Utility	Tower	Comcast Cablevision of Delmarva	2500 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No				
2101079794	Utility	Tower	Easton Airport Tower	29065 Corkran Road	No	Yes	No	X	N/A	0	0	0	0	No	No			
2103133028	Utility	Tower	Gateway Marina and Ships Store		No	Yes	No	AE	5.0	0	0	0	0	Yes	No	Yes		
2101026976	Utility	Tower	Maryland State Police	7053 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2105187605	Utility	Tower	Mid Atlantic Communication	9855 Wades Point Road	No	Yes	No	X	N/A	0	0	0	4	No				
2104149858	Utility	Tower	American Towers Inc	30530 Matthewstown Road	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2104164563	Utility	Tower	Cellular One	11780 Longwoods Road	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2104146743	Utility	Tower	Shortall Building Supplies	11523 Cordova Road	No	Yes	No	X	N/A	0	0	0	0	No	No			
2103110575	Utility	Tower	Tred Avon Yacht Club	102 W The Strand	No	Yes	No	AE	0.5	1	0	0	0	Yes	No		Yes	

Account ID	Facility Type	Facility Detail	Facility Name	Address	Critical Facility	Public Facility	Shelter (Yes/No)	Flood Zone	Flood Depth	Category 1	Category 2	Category 3	Category 4	Within 100 ft Buffer	Built Prior 1965	SLR 0-2ft	SLR 2-5 ft	SLR 5-10 ft
2103145735	Utility	Tower	Verizon	26709 Oxford Road	No	Yes	No	X	N/A	0	0	3	0	No				Yes
2103111296	Utility	Tower	American Towers Inc	3389 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No				
2101001914	Utility	Tower	Cellular One	402 Brookletts Avenue	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2101004220	Utility	Tower	WCEI Radio	306 Port Street	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2104147553	Utility	Tower	Wye Mills Tower Site for 800	14056 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No	No			
2104146670	Utility	Tower	Wye Tree Experts Inc.	12721 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2103125653	Utility	Tower	Falcon Cable Trappe Tower	29415 Tarbutton Mill Road	No	Yes	No	X	N/A	0	0	0	0	No	Yes			
2103146189	Utility	Tower	Trappe Tower Site for 800 MHz	3269 Ocean Gateway	No	Yes	No	X	N/A	0	0	0	0	No	No			
2104151348	Utility	Tower			No	Yes	No	X	N/A	0	0	0	0	No				
2101027107	Utility	Water Tower	Easton Water Tower	29496 Matthewstown Road	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101051792	Utility	Water Tower	Easton Water Tower	Hickory Ridge Road	No	Yes	No	X	N/A	0	0	0	0	No				
2102103583	Utility	Water Tower	Street Michaels Water Tower	N Talbot Street	No	Yes	No	X	N/A	0	0	0	4	No				
2103126382	Utility	Water Tower	Oxford Water Tower	400 Tilghman Street	No	Yes	No	AE	0.5	1	0	0	0	Yes			Yes	
2102116480	Utility	Water Tower	Street. Michaels Water Tower	106 Woodside Avenue	No	Yes	No	X	N/A	0	2	0	0	No				Yes
2103126439	Utility	Water Tower	Town of Oxford	103 JL Thompson Drive	No	Yes	No	AE	0.0	0	2	0	0	No	No			Yes
2103126609	Utility	Water Tower	Trappe Water Tower	3932 Harrison Circle	No	Yes	No	X	N/A	0	0	0	0	No				
2101049011	Utility	Water tower	Easton Utilities	8940 Glebe Park Drive	No	Yes	No	X	N/A	0	0	0	0	No	No			
2101076795	Utility	WTP	Glebe Road Water Treatment	28705 Glebe Road	No	Yes	No	X	N/A	0	0	0	0	No	No			
2102090724	Utility	WTP	Martingham Utilities Cooperative	24490 Deepwater Point Drive	No	Yes	No	X	N/A	0	0	0	4	No	No			
2101052535	Utility	WWTP	Easton Waste Treatment	30770 North Dover Road	No	Yes	No	X	N/A	0	0	0	4	Yes				
2101075985	Utility	WWTP	MidShore Regional Transfer Station	7341 Bakers Landing Road	No	Yes	No	X	N/A	0	0	0	0	No				
2102070448	Utility	WWTP	Street Michaels WWTP	929 Calvert Avenue	No	Yes	No	X	N/A	0	0	3	0	No				Yes

Account ID	Facility Type	Facility Detail	Facility Name	Address	Critical Facility	Public Facility	Shelter (Yes/No)	Flood Zone	Flood Depth	Category 1	Category 2	Category 3	Category 4	Within 100 ft Buffer	Built Prior 1965	SLR 0-2ft	SLR 2-5 ft	SLR 5-10 ft
2105181836	Utility	WWTP	Tilghman Island Wastewater Treatment Plant	21345 Seth Ave	No	Yes	No	X	N/A	0	0	3	0	Yes				Yes
2103126595	Utility	WWTP	Trappe Wastewater Treatment Plant	4099 Hennissee Lane	No	Yes	No	X	N/A	0	0	0	0	No				
2104147324	Utility	WWTP	Talbot County Biosolids Facility	9786 Klondike Road	No	Yes	No	X	N/A	0	0	0	0	No	No			
2103126439	Utility	WWTP	Town of Oxford	103 JL Thompson Drive	No	Yes	No	AE	0.0	0	2	0	0	No	No			Yes

Appendix B

Data Methodology

Critical and Public Facilities identified for the 2011 Talbot County Hazard Mitigation Plan were reviewed and updated for utilization in the 2017 Talbot County Hazard Mitigation & Community Resilience Plan (HM&RP). For the 2017 HM&RP, Smith Planning and Design included additional critical facility types and public facilities in the Vulnerability Analysis. The following steps detail the data update methodology.

Step 1. A critical facilities database provided by Talbot County GIS staff was cross-referenced with the 2011 Critical and Public Facilities database for new facilities or update existing facilities.

Step 2. The Core Group Committee reviewed the database for further modifications and/or additions.

Step 3. For facilities lacking necessary information, the 2013 Maryland Property View Database was utilized to extrapolate information such as: account number, address, city, improved value, and facilities descriptions.

Step 4. Once the database was finalized, facilities were included on hazard inundation mapping and utilized in tables for the Vulnerability Analysis.

Overall modifications include the following updates:

- **Critical & Public Facilities**
  - 2011 – 277 Facilities
  - 2017 – 313 Facilities
    - 36 Facilities added:
      - Education – 1 Public School
      - Emergency – 1 EMS, 1 Fire, 2 Police Stations
      - Medical – 2 Nursing Homes
      - Utility – 2 Electric, 11 Gas/Oil, 7 Pumping Stations, 1 Telephone, 4 Towers, 3 Water Towers, and 1 Water Treatment Plant

- **2016 Critical & Public Facilities New Attributes**
  - New Attributes Columns added in 2017 Plan Update Process
    - Public Facility (Yes/No)
    - Flood Depth
    - Built 1965 & Prior

Appendix C

Hazus Wind Reports

Hazus-MH: Hurricane Event Report

Region Name: TC_HU_Wind

Hurricane Scenario: Isabel_Talbot

Print Date: Tuesday, November 15, 2016

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Maryland

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 271.83 square miles and contains 10 census tracts. There are over 16 thousand households in the region and has a total population of 37,782 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 19 thousand buildings in the region with a total building replacement value (excluding contents) of 6,489 million dollars (2010 dollars). Approximately 90% of the buildings (and 81% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 19,758 buildings in the region which have an aggregate total replacement value of 6,489 million (2006 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	5,233,143	80.6%
Commercial	865,586	13.3%
Industrial	185,657	2.9%
Agricultural	32,018	0.5%
Religious	79,507	1.2%
Government	33,226	0.5%
Education	60,065	0.9%
Total	**6,489,202**	**100.0%**

Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 128 beds. There are 13 schools, 6 fire stations, 5 police stations and 1 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name: Isabel_Talbot

Type: Deterministic

Maximum Peak Gust in Study Region: 95 mph

User Defined Storm Track Input Data

Point	Latitude	Longitude	Time Step (hour)	Translation Speed (mph)	Radius To Max Winds (miles)	Max. Sustained Wind Speed (mph @ 10m)	Cental Pressure (mBar)	Profile Parameter	Radius to Hurricane Force Winds (miles)
1	35.40	-76.60	--	67.96	6.21	90.40	957.00	--	--
2	36.95	-76.75	--	70.00	6.21	90.40	959.00	--	--
3	38.44	-76.71	--	55.85	27.41	90.40	960.00	--	--
4	39.64	-76.77	--	39.65	26.31	83.32	965.00	--	--

Building Damage

General Building Stock Damage

Hazus estimates that about 114 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the region. There are an estimated 4 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	112	94.07	6	4.75	1	0.83	0	0.33	0	0.02
Commercial	1,206	95.58	49	3.86	7	0.52	0	0.03	0	0.00
Education	42	95.98	2	3.67	0	0.34	0	0.01	0	0.00
Government	43	96.88	1	2.95	0	0.16	0	0.00	0	0.00
Industrial	366	95.44	15	3.97	2	0.51	0	0.07	0	0.00
Religion	112	96.38	4	3.41	0	0.21	0	0.00	0	0.00
Residential	16,448	92.45	1,240	6.97	97	0.54	2	0.01	4	0.02
Total	**18,328**		**1,316**		**107**		**3**		**4**	

Table 3: Expected Building Damage by Building Type

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	356	94.65	18	4.70	2	0.63	0	0.01	0	0.00
Masonry	4,968	92.32	370	6.88	41	0.75	1	0.03	1	0.02
MH	551	99.90	0	0.08	0	0.02	0	0.00	0	0.00
Steel	855	95.59	34	3.77	5	0.59	0	0.05	0	0.00
Wood	11,634	92.63	867	6.90	55	0.44	1	0.01	3	0.02

Essential Facility Damage

Before the hurricane, the region had 128 hospital beds available for use. On the day of the hurricane, the model estimates that 128 hospital beds (only 100.00%) are available for use. After one week, 100.00% of the beds will be in service. By 30 days, 100.00% will be operational.

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	1	0	0	1
Fire Stations	6	0	0	6
Hospitals	1	0	0	1
Police Stations	5	0	0	5
Schools	13	0	0	12

Induced Hurricane Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 88,264 tons of debris will be generated. Of the total amount, 73,355 tons (83%) is Other Tree Debris. Of the remaining 14,909 tons, Brick/Wood comprises 22% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 129 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 11,672 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 4 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 37,782) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 57.5 million dollars, which represents 0.89 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 58 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 97% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	40,256.26	697.48	164.50	191.42	41,309.65
	Content	13,960.73	64.35	53.14	34.69	14,112.91
	Inventory	0.00	1.75	10.06	3.46	15.26
	Subtotal	**54,216.99**	**763.58**	**227.69**	**229.57**	**55,437.83**
Business Interruption Loss						
	Income	0.00	74.20	1.09	8.34	83.63
	Relocation	1,238.66	71.44	8.39	20.94	1,339.43
	Rental	508.96	33.33	0.80	1.25	544.34
	Wage	0.00	60.16	1.86	47.26	109.28
	Subtotal	**1,747.62**	**239.13**	**12.14**	**77.79**	**2,076.68**
Total						
	Total	**55,964.60**	**1,002.72**	**239.83**	**307.36**	**57,514.50**

Appendix A: County Listing for the Region

Maryland
- Talbot

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Maryland				
Talbot	37,782	5,233,143	1,256,059	6,489,202
Total	**37,782**	**5,233,143**	**1,256,059**	**6,489,202**
Study Region Total	**37,782**	**5,233,143**	**1,256,059**	**6,489,202**

Direct Economic Losses For Buildings:

November 15, 2016

All values are in thousands of dollars

	Capital Stock Losses				Income Losses				
	Cost Building Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Maryland									
Talbot	41,310	14,113	15	0.64	1,339	84	109	544	57,515
Total	**41,310**	**14,113**	**15**	**0.64**	**1,339**	**84**	**109**	**544**	**57,515**
Study Region Total	**41,310**	**14,113**	**15**	**0.64**	**1,339**	**84**	**109**	**544**	**57,515**

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/state were selected at the time of study region creation.

Study Region : TC_HU_Wind

Scenario : Isabel_Talbot

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National Center for Environment Information, 2015
National Oceanic and Atmospheric Administration – Storm Events Database.
Available at http://www.ncdc.noaa.gov/stormevents

PlantMaps
Website: http://www.plantmaps.com/

United States Geological Survey
Water Science for Maryland, Delaware, and the District of Columbia, Drought Watch
Website: http://md.water.usgs.gov/drought/index.html

Maryland Department of the Environment
Drought Status
Website:
http://mde.maryland.gov/programs/Water/DroughtInformation/Pages/Water/drought/index.aspx

Maryland Department of the Environment
Water Audits and Loss Reduction Reports, 2013-2015
Websites:
http://www.mde.maryland.gov/programs/Water/WaterConservation/WaterAuditing/Documents/WaterAuditsAndLossReductionFor2013.pdf
http://www.mde.maryland.gov/programs/Water/WaterConservation/WaterAuditing/Documents/WaterAuditsAndLossReductionFor2014.pdf
http://www.mde.maryland.gov/programs/Water/WaterConservation/WaterAuditing/Documents/WaterAuditsAndLossReductionFor2015.pdf

Section 3: Chapter 11

Federal Emergency Management Agency
Flood Risk Management Standard, 2015
Website: https://www.fema.gov/news-release/2015/02/05/federal-flood-risk-management-standard

Federal Emergency Management Agency
Post Disaster Redevelopment Plan (PDRP)
Website:

Federal Emergency Management Agency
Building Code Guidelines

Section 3: Chapter 12

Town of Easton
Website: http://tourtalbot.org/talbotcounty/easton/

Town of Oxford
Website: http://tourtalbot.org/talbotcounty/oxford/

Town of Queen Anne
Website: www.qac.org/327/Towns

Town of St. Michaels
Website: http://tourtalbot.org/talbotcounty/st.michaels/

Section 3: Chapter 13

Federal Emergency Management Agency
Hazard Mitigation Grant Program
Website: http://www.fema.gov/hazard-mitigation-grant-program
Federal Emergency Management Agency
Pre-Disaster Grant Program
Website: http://www.fema.gov/pre-disaster-mitigation-grant-program

Federal Emergency Management Agency
Flood Mitigation Assistance Program
Website: https://www.fema.gov/flood-mitigation-assistance-grant-program

National Flood Insurance Program
Website: https://www.fema.gov/national-flood-insurance-program

U.S. Economic Development Administration
Economic Adjustment Program
Website: https://eda.gov/

U.S. Economic Development Administration
Public Works and Development Facilities
Website: https://eda.gov/

Small Business Administration
Pre-Disaster Mitigation Loan Program
Website: https://www.sba.gov/

U.S. Department of Housing and Urban Development
Community Development
Block Grants/States Program
Website: https://www.usa.gov/federal-agencies/department-of-housing-and-urban-development

Federal Emergency Management Agency
Fire Suppression Assistance Program
Website: www.fema.gov

Federal Emergency Management Agency
Historic Preservation
Repair and Restoration of Disaster Damaged Historic Properties
Website: www.fema.gov

Federal Transit Authority
Transportation Emergency Relief Program
Website: https://www.transit.dot.gov/

U.S. Department of Agriculture
Animals Emergency Haying and Grazing
Website: https://www.usda.gov/wps/portal/usda/usdahome

Natural Resources Conservation Service
Emergency Watershed Protection Program
Website: https://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/

Natural Resources Conservation Service
Watershed Protection and Flood Prevention Program
Website: https://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/

Natural Resources Conservation Service
Watershed Surveys and Planning
Website: https://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/

United States Army Corps of Engineers
Emergency Advance Measures for Flood Prevention
Website: http://www.usace.army.mil/

United States Army Corps of Engineers
Emergency Streambank and Shoreline Protection
Website: http://www.usace.army.mil/

United States Army Corps of Engineers
Small Flood Control Projects
Website: http://www.usace.army.mil/

United States Army Corps of Engineers
Flood Emergency Advance Measures for Flood Prevention
Website: http://www.usace.army.mil/

United States Army Corps of Engineers
Continuing Authorities Program
Website: http://www.usace.army.mil/

United States Coast Guard
Hazardous Materials State Access to the Oil Spill Liability Trust Fund
Website: http://www.uscg.mil/

Maryland Emergency Management Agency
Emergency Management Assistance
Website: http://mema.maryland.gov

Appendix E

Meeting Notes

TALBOT COUNTY HAZARD MITIGATION & RESILIENCY PLAN

COMMUNITY RESILIENCE STEERING COMMITTEE MEETING

May 17, 2016 at 1 pm
Public Works Office Complex

ATTENDEES:

- Jim Bass, Department of Emergency Services
- Brian Ambrette, Eastern Shore Land Conservancy
- Michael Boldosser, Shore Regional Health
- Clay Stamp, Department of Emergency Services
- Mark Cohoon, Department of Public Works
- Greg Farley, Chesapeake College
- Gabriel Rose, Safety & Security Specialist – Talbot County Public Schools
- Martin Sokolich, Planning and Zoning
- Virginia Smith, Smith Planning and Design
- Michele King, Smith Planning and Design

INTRODUCTIONS

Mrs. Smith reviewed the March 15th Core Planning Team agenda. Jim Bass advised that Gabriel Rose, Safety & Security Specialist – Talbot County Public Schools will be replacing Kelly Griffith on the Core Planning Team. Additionally, Mrs. Smith requested that the team review the hazard mitigation and resiliency handout. The handout will be used for the upcoming Stakeholder meeting in June. Finally, the plan development process was reviewed for new members who could not attend the March 15th meeting.

SAFE GROWTH AUDIT

A draft of a Safe Growth Audit (SGA) was provided and reviewed. It was discussed that the Floodplain Ordinance have been recently modified and adopted. Ms. King will follow up with Martin Sokolich, Planning and Zoning on this section of the Safe Growth Audit.

2011 MITIGATION ACTION ITEMS

The group reviewed the 2011 Mitigation Action Items. Additional information is needed to complete the Status Report. Information will be sought and the Mitigation Status Report will be presented at the upcoming Stakeholder meeting in June.

STAKEHOLDERS' MEETING

Jim Bass assigned representatives for each of the five (5) pillars:

- Health, Safety, Welfare –Michael Boldosser, Sheriff, Jim Bass
- Economic Stability –Paige Tilghman, Tim Jones, Chamber of Commerce, Al Silverstein (Chamber of Commerce)

- Infrastructure –Martin Sokolich, Mark Cohoon, Ray Clarke, Easton Utilities
- Education –Gabriel Rose, Greg Farley
- Environmental - Brian Ambrette, Greg Farley

Mr. Bass will contact sub-committee leads. The sub-committee leads will identify individuals to serve on their committee. There will be 4-6 members per committee.

NEXT STEPS

Community Resilience Steering Committee Meeting
Date: June 16, 2016
Time: 1:00-3:00 pm
Location: Shore Regional Health - Health Education Center

Draft Agenda Items- Community Resilience Steering Committee Meeting:

- What is Hazard Mitigation? What is Resiliency
- Review of 2016 Hazard Mitigation Process
- Mitigation Status Report
- Hazard Impact Work Session

TALBOT COUNTY HAZARD MITIGATION & RESILIENCY PLAN

CORE PLANNING TEAM

July 22, 2016 at 10 am
Public Works Office Complex

ATTENDEES:

- Jim Bass, Department of Emergency Services
- Brian Ambrette, Eastern Shore Land Conservancy
- Michael Boldosser, Shore Regional Health
- Mark Cohoon, Department of Public Work
- Paige Tilghman, Economic Development
- Virginia Smith, Smith Planning and Design
- Michele King, Smith Planning and Design

2011 MITIGATION ACTION ITEMS

Additional information was added to the Status Report. There is one remaining project in need of status information. The project entailed detailed structural assessments for floodplain properties within St. Michaels. Jim Bass indicated that he will follow-up with St. Michaels to obtain a status update.

OUTREACH STRATEGY

A sample press release was distributed and reviewed by the Core Planning Team. The idea of producing a tri-fold brochure was discussed, as well. The Team discussed possible points of distribution for outreach materials:

- Star Democrat
- Facebook
- County Council Meeting
- Website
- Talbot Spy Website
- Easton Airport Day-August 27th
- CERT Training

SP&D will update the press release and provide an informational tri-fold brochure to Jim Bass for review and dissemination. Also, Mark Cohoon indicated that the County was in the process of hiring a new Floodplain Manager. There may be opportunities for CRS Outreach in conjunction with the Plan Update.

MUNICIPAL PARTICIPATION

In order to encourage municipal participation, municipal packets will be developed for distribution via email and regular mail. SP&D will provide the municipal packets for review to Jim Bass prior to distribution. Following approval, packets will be distributed to municipalities in mid-August.

TALBOT COUNTY HAZARD MITIGATION & RESILIENCY PLAN

STAKEHOLDER WORK SESSION RESULTS-HAZARD IMPACTS BY PILLAR

Completed tables were reviewed and discussed by the Core Planning Team. Tables will be proved to the five Pillars Workgroups for their review at the next Stakeholder Meeting.

COMMUNITY RESILIENCE STAKEHOLDER MEETING

Community Resilience Stakeholder Meeting
Date: September 8, 2016
Time: 1:30-3:30 pm
Location: Chesapeake College-Higher Education Center

Agenda Items- Community Resilience Stakeholder Meeting:

- 1:30-2:30
  Presentations:
  Cheryl Lewis, Town of Oxford Vulnerability Assessment,
  Nicole Carlozo, DNR-Coastal Resiliency Assessment Results
  Michele King, SP&D-Flood Vulnerability Assessment.
- 2:30-3:30
  Work Session:
  Review and Comment-Hazard Impact Tables
  Mitigation & Resiliency Strategy Session

TALBOT COUNTY HAZARD MITIGATION & RESILIENCY PLAN

CORE PLANNING TEAM

October 25, 2016 at 10 am
Public Works Office Complex

ATTENDEES:

- Jim Bass, Department of Emergency Services
- Clay Stamp, Department of Emergency Services
- Gabriel Rose, Board of Education
- Meagan Patrick, Department of Planning and Zoning
- Brian Ambrette, Eastern Shore Land Conservancy
- Michael Boldosser, Shore Regional Health
- Mark Cohoon, Department of Public Work
- Virginia Smith, Smith Planning and Design
- Michele King, Smith Planning and Design

MITIGATION GOALS AND OBJECTIVES

Members were asked to review the Goals and Objectives based on their respective pillar. Comments received to date have been incorporated. Please provide any additional comments to SP& D.

2011 MITIGATION ACTION ITEMS

Several incomplete action items from the 2011 Plan were discussed. These actions included:

- Barrier Island Restoration-members decided to move this project forward as a 2016 Mitigation Action Item. Mark Cahoon will provide additional information.
- St. Michaels Base Flood Elevation Project- for those properties within the SFHA, acquire BFE's. This project will be moved forward and included within the new projects.
- Statewide Emergency Shelter at the Community Center Project-Emergency Services staff applied for grant funding to complete this project. The project was not approved. Members decided to not move this project forward.
- CRS Project- members decided to move this project forward and include additional information. Brian Ambrette will provide information on the Eastern Shore Climate Adaptation Partnership specific to regional CRS public outreach project(s). In addition, Megan Patrick will provide direction on CRS specific objectives and actions planned for completion during the 5-year planning cycle.
- Generator Project(s)- Mark Cahoon will provide facilities with generator listing to SP&D. SP&D will compare listing to essential facilities listing and determine which, if any facilities are without necessary generator. In addition, certain facilities may be in need of transfer switch and proper wiring to accept generator power. Information gathered will be reviewed at the next Core Planning Team meeting.

TALBOT COUNTY HAZARD MITIGATION & RESILIENCY PLAN

OUTREACH STRATEGY

A sample tri-fold informational brochure was distributed during the meeting for review and comment. The brochure provides information on mitigation and resiliency as well as the planning process.

MUNICIPAL PARTICIPATION

In order to encourage municipal participation, municipal packets were developed for distribution. SP&D provided the municipal packets to Jim Bass for distribution. Jim will be meeting with municipalities over the next few weeks.

STAKEHOLDER WORK SESSION RESULTS-MITIGATION IDEAS

Mitigation Idea sheets were distributed to members for review and discussion. Mitigation ideas were grouped under the applicable Pillar. Team members provided additional information during the meeting.

- Education Pillar
  - Environmental Education and Resiliency Opportunity
    - Forward to Greg for review. Question pertaining to the Environmental Literacy mitigation idea.
  - Evacuation Routes
    - Primary and secondary locations were identified for multi-hazards events.
      - List was evaluated for the flood hazard.
        - Several of the primary and secondary locations are within SFHA.
    - Project needs to define relocation listing for flood events. Mark Cahoon and Gabriel Rose will discuss and add additional language to Mitigation Idea sheet and provide to SP&D.
- Public Safety Pillar
  - Public Information
    - Increase public awareness
      - Create video for YouTube, Facebook
      - Conduct more specific targeted notifications
        - Use GIS to target areas
    - Target specific residents
      - Use GIS again
    - Public outreach plan
      - Detail yet understandable statements
  - Jim Bass indicated that he would like to have further discussions with pillar group before providing finalized information.
- Environmental Pillar
  - Shoreline Erosion
    - Possibly explore open space for preservation/acquisition

- SWM Best Practices
  - Grant request submitted 10.24.16 to research precipitation
    - NOAA & UMD
      - Study to be completed for 5 counties
  - Action should be to review results from study
- Implement outreach specific to fertilizer and water contamination.
  - Re-word this idea.

- Economic Stability Pillar
  - Disaster Recovery Planning
    - Responsible Agency: Talbot County Economic Development Commission
      - Rep: Tim Jones
    - Relates to the downtime of the business and how the community is affected.
  - Shoreline Fund
    - Oxford Study – Code created in Oxford
    - Modify Mitigation Idea sheet to focus on obtaining grant-funding not a special tax.
      - Separate SWM & shoreline protection
  - Flood mitigation – non-substantial improvements for businesses
    - Outreach program to vulnerable businesses located in the floodplain and other businesses thinking long term
      - Grant opportunities
      - Retrofitting ideas
  - New project – ensure continued power
    - Transfer switches and/or generators
- Infrastructure
  - Pump stations
    - Key pump stations
    - Need to evaluate which stations have generators
  - Communication
  - Repetitive Roadways
  - Culvert mitigation
    - Roads department looking upstream of culverts to ensure debris is removed and ditches are cleared
  - Wellhead protection & codes

Modifications will be made to the Mitigation Idea sheets prior to distribution at the upcoming November Stakeholder meeting.

COMMUNITY RESILIENCE STAKEHOLDER MEETING

The purpose of the upcoming Stakeholder Meeting is twofold: opportunity for pillar groups to review the Mitigation Idea sheets and the prioritization of those ideas per

pillar. The Core Planning Team will use results obtained at the Stakeholder Meeting to inform their final ranking process scheduled for November 29th. The finalized priority rankings will be incorporated into the Plan, as well as a plan implementation-measuring tool.

Community Resilience Stakeholder Meeting
Date: November 22, 2016
Start Time: 9:00 AM
Location: Chesapeake College-Higher Education Center

TALBOT COUNTY HAZARD MITIGATION & RESILIENCY PLAN

CORE PLANNING TEAM

December 19, 2016 at 1:00 pm
ESLC Building

ATTENDEES:

- Jim Bass, Department of Emergency Services
- Meagan Patrick, Department of Planning and Zoning
- Brian Ambrette, Eastern Shore Land Conservancy
- Michael Boldosser, Shore Regional Health
- Mark Cohoon, Department of Public Work

MITIGATION ACTION IMPLEMENTATION WORKSHEETS

Members were asked to review the action worksheets and the priority rankings completed during the November 22, 2016 Stakeholder meeting. Members agreed with the ranking results, which included five "High" priority actions, however, the Core Planning Team (CPT) added two additional "High" priority actions, both of which were focused on public outreach and related to one of the original five "High" priority actions. An additional action was included as "High" priority action by the CPT, thereby changing the total number of "High" priority actions to eight.

Corrections and clarification on several of the twenty-three action worksheets were made during the course of the meeting. Many of these actions are interrelated, and overall strategies will be developed and presented within Chapter 11.

Comments received to date have been incorporated. Please provide any additional comments to SP& D.

MUNICIPAL PARTICIPATION

Jim Bass provided SP&D staff with results from the municipal packets and his meeting notes. Jim was able to generate enough information from the town meetings that he conducted over the past few months that a new chapter was developed, *Chapter 12 Municipal Synopsis & Perspective.*

NEXT STEPS

- Draft Plan submittal & local review: January 2017
- Draft Plan submittal & state review-MEMA: February-2017
- Draft Plan submittal & federal review-FEMA: March 2017
- Local Adoption Process: April-May, 2017

Appendix F
Public Outreach Documentation

For More Information:

Talbot County Department of Emergency Services

605 Port Street

Easton, MD 21601

Phone: 410-770-8160

Fax: 410-770-8163

Website:
http://www.talbotdes.org/

Talbot County Department of Emergency Services

605 Port Street

Easton, MD 21601

Talbot County Pillars of Resilience

Empowering the Community to prepare for and alleviate the impacts of weather and other events.

What is Resiliency?

Resilience is the capacity of individuals, communities, businesses, institutions, and governments to adapt to changing conditions and to prepare for, withstand, and rapidly recover from disruptions to everyday life, such as hazard events. Resilience enables communities to adapt to change so that they not only "bounce back" from a disaster, but also "bounce forward" to a safer state.

Pillars & Resiliency

Talbot County is poised to further advance resilience via policy, planning, and action. To that end, Talbot County has established five Pillars to help guide the process and establish the foundation of resiliency planning and implementation. The five Pillars established include:

- Education;
- Public Safety, Health & Welfare;
- Economic Stability;
- Infrastructure; and.
- Environmental.

Communities must address flooding and other risks associated with living near the water. Talbot County has strong economic ties to the water and tourism. Moderate flooding in these areas can disrupt the economy in these key areas, and catastrophic flooding could permanently affect the economic character and overall quality of life in the county. In addition to enacting ordinances for development within floodplains, Talbot County is working to address the physical connections of the community and the five pillars. Effective hazard avoidance, mitigation, and resilience efforts that address all five pillars will enable Talbot County to thrive.

Hazards Impacting Talbot County

The following hazards have been identified as to having the greatest impact on Talbot County:

- Coastal Hazards including: Coastal Storms, storm surge, hurricane, tropical storm, and Nor'easters;
- Flood;
- Winter Storm;
- Tornado;
- Thunderstorm;
- Wildfire;
- Drought; and,
- High Wind.

Resiliency Stakeholder Committee

The Talbot County Community Resiliency Stakeholder Committee was formed in 2016 to assist in resiliency planning and implementation projects. The Community Resiliency Stakeholder Committee is comprised of the following agencies:

- Department of Emergency Services;
- Eastern Shore Land Conservancy;
- Shore Regional Health;
- Department of Public Works;
- Chesapeake College;
- Public Schools;
- Planning and Zoning;
- Easton Utilities;
- American Microgrid;
- MSFSC;
- TCSO;
- Maryland DNR;
- Municipalities: Easton, Oxford, Queen Anne, St. Michaels, and Trappe;
- MEMA;
- Sea Grant Extension; and
- Mid-Shore Riverkeeper.

Hazard Mitigation

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

TALBOT COUNTY HAZARD MITIGATION & RESILIENCY PLAN

Press Release

Talbot County has been awarded grant funding from the Federal Emergency Management Agency, to complete a county-wide Hazard Mitigation and Resiliency Plan. Hazard mitigation is sustained action taken to reduce or eliminate the long-term to human life and property from hazards. Resilience is the capacity of individuals, communities, businesses, institutions, and governments to adapt to changing conditions and to prepare for, withstand, and rapidly recover from disruptions to everyday life, such as hazard events. Resilience enables communities to adapt to change so that they not only "bounce back" from a disaster, but "bounce forward" to a safer state. Mitigation is the foundation of community resilience and touches all parts of a community: how floodplains and natural resources are managed, how a community builds, and where infrastructure and critical facilities are placed.

Talbot County may engage in mitigation efforts both before and after a disaster to become more resilient. This requires addressing not only the physical and environmental impacts of hazards, but also the economic and social impacts. To that end, a stakeholder group has been identified to assist in the plan development process. Members of the stakeholder group represent the five pillars established by the Talbot County Council. The five pillars include: Health, Safety and Welfare; Economic Stability; Education; Infrastructure; and Environment. The five pillars form the foundation of the community, and as such, community resiliency will be built upon this foundation.

To obtain more information about the Talbot County Hazard Mitigation and Resiliency Plan, please visit the Talbot County website - Emergency Services page at: http://www.talbotdes.org.

Appendix G

Safe Growth Audit

1. INTRODUCTION

Generally described as the routine consideration and management of hazard risks in your community's existing planning framework – plan integration is the collection of plans, policies, codes, and programs that guide development in your community, how those are maintained and implemented, and the roles of people, agencies, and departments in evaluating and updating them. Effective integration of hazard mitigation occurs when your community's planning framework leads to develop patterns that do not increase risks from known hazards or leads to redevelopment that reduces risk from known hazards.

2. SAFE GROWTH AUDIT

During the preparation of the *2016 Talbot County Hazard Mitigation & Resiliency Plan*, a Safe Growth Audit was conducted. Performing a Safe Growth Audit is a way to assess how well the existing planning tools address hazard risks and community resiliency. Safe Growth Audit questions provide a systematic way to review local planning tools and identify the presence of, or need for, hazard-related actions.

The goal of SAFE GROWTH is to build environments that are safe for current and future generations and to protect building, transportation, utilities, and the natural environment from damage.

Local documents reviewed during the Safe Growth Audit include:

- 2015 Draft Comprehensive Plan;
- Zoning Ordinance;
- Subdivision of Land;
- 2011 Hazard Mitigation Plan; and
- FY2014-FY2015 Capital Improvement Plan.

Plan	*Location*
COMPREHENSIVE PLAN	
LAND USE	
Does the future land-use map clearly identify natural hazard areas?	Yes *Draft Plan* Chapter 2: Land Use Plan Map 2-K: Proposed Land Use Western Rural Conservation & Chesapeake Bay Critical Area Page 2-29
Do the land-use policies discourage development or redevelopment within hazard areas?	Yes *Draft Plan* Chapter 2: Land Use Plan Sensitive Areas Planning Policies 2.27 through 2.33 Open Spaces, Agriculture, Forestry, and Low-Density Single Family Detached Homes. Page 2-15
Does the Plan provide adequate space for expected future growth in areas located outside natural hazard areas?	Yes *Draft Plan* Chapter 2: Land Use Plan II. General Land Use Plan A. Development and Growth Sectors 1. Designated Growth Areas and Future Growth Areas Pg. 2-4 through 2-10
TRANSPORTATION	
Does the transportation plan limit access to hazard areas?	No
Is the transportation policy used to guide growth to safe locations?	Yes *Draft Plan* Chapter 3: Transportation and Utilities Regional and Local Road Policies Pages 3-5 through 3-6
Are movement systems designed to function under disaster conditions (e.g., evacuation)?	Yes *Draft Plan* Chapter 3: Transportation and Utilities Easton Airport is the home base for Maryland State Police Helicopter Trooper 6, providing emergency medical evacuation and law enforcement services in the region. In the event of a major disaster, Easton Airport may become essential as a hub for evacuation and to receive food, medical supplies and personnel. Pages 3-8 through 3-10 Map 3-B Easton Airport Class D Airspace

Plan	*Location*
ENVIRONMENTAL MANAGEMENT	
Are environmental systems that protect development from hazard identified and mapped?	Yes *Draft Plan* Chapter 5: Agricultural and Rural Conservation Map 5A – Protected Lands and Priority Preservation Area Maryland Agriculture Land Preservation Foundation, Rural Legacy, State/DNR, Other NGO, Eastern Shore Land Conservation, Maryland Environmental Trust, County Park, Priority Preservation Areas, and Towns Pg.5-9 Chapter 6: Natural Resource Conservation Map 6D – Chesapeake Bay Critical Area
Do environmental policies maintain and restore protective ecosystems?	Yes *Draft Plan* Chapter 6: Natural Resource Conservation II. Water Resource Element Page 6-3 III. Natural Resource Conservation A. Chesapeake Bay Critical Areas B. Sensitive Area Protection Pg. 6-19 through 6-20
Do environmental policies provide incentives to development that is located outside of protective ecosystems?	Yes *Draft Plan* Chapter 5: Agricultural and Rural Conservation General Agricultural and Land Use Policies 5.1 through 5.5 Pg. 5-2 Chapter 6: Natural Resource Conservation A. Chesapeake Bay Critical Areas B. Sensitive Area Protection Pg. 6-1 through 6-27
PUBLIC SAFETY	
Are the goals and policies of the comprehensive plan related to the FEMA Local Hazard Mitigation Plan?	Yes Ensuring hazard mitigation goals and objectives are consistent with goals and objectives of other plans in the County. • Revise existing ordinances and plans as appropriate. • Incorporate hazard mitigation concerns into county planning and budgeting processes.

Plan	Location
Are the goals and policies of the comprehensive plan related to the FEMA Local Hazard Mitigation Plan? *Cont.*	Increase public understanding, support, and demand for hazard mitigation. • Develop a public awareness campaign that will be a long-term initiative, providing consistent educational opportunities to advance community's knowledge and skills. Promote sustainable development to improve the quality of life. • Provide for the conservation and protection of natural resources. Ensure density is controlled in hazard prone areas. • Use smart growth planning techniques to conserve land and reduce exposure to hazards. *Draft Plan* Chapter 4: Community Services and Facilities Hazard Mitigation Policies 4.10 Talbot County shall research and implement plans to improve County resilience in the face of coastal and climate hazards and other threats to the foundation of our County such as public safety, health, and welfare, the economy, education, the infrastructure, and the environment. 4-11 Talbot County will maintain an emergency management program as part of the federal, State, local, and private sector emergency management network to identify and recommend ways to mitigate hazards, effectively plan for response to major emergencies, monitor and appropriately issue public alerts, and coordinate evacuation, response and recovery operations. Pg. 4-7
Is safety explicitly included in the plan's growth and development policies? Yes	*Draft Plan* Chapter 3: Transportation and Utilities Plan Goal: *Ensure the safe and efficient provision of transportation utility and broadband communication services to the greatest degree possible.* Page 3-1 Regional and Local Road Policies Pages 3-5 through 3-6 3.3 Road construction and improvements will promote traffic safety, improve vehicular capacity (consistent with area land uses and regional demand) and conform to resource protection policies of the Comprehensive Plan.

Plan	*Location*
Is safety explicitly included in the plan's growth and development policies? *Cont.*	3.14 New roads serving residential developments should be designed to ensure safety and convenience for all users including motorists, cyclists, pedestrians and emergency vehicles. The SHA has published Bicycle Policy and Design Guidelines (http://roads.maryland.gov/OHD2/bike_policy_and_design_guide.pdf), a manual that should be consulted when considering and initiating transportation improvements. Page 3-8
Does the monitoring and implementation section of the plan cover safe growth objectives??	Yes Introduction VII. Implementation Pg. V
ZONING ORDINANCE	
Does the zoning ordinance conform to the comprehensive plan in terms of discouraging development or redevelopment within natural hazard areas?	Talbot County Zoning Ordinance Chapter 190: Zoning, Subdivision, and Land Development Article VI: Critical Area Intent. In 1984, the Maryland General Assembly passed the Chesapeake Bay Critical Area Act in response to growing concern over the decline of the quality and productivity of the waters of the Chesapeake Bay and its tributaries. The decline was found to have resulted, in part, from the cumulative effects of human activity that caused increased levels of pollutants, nutrients, and toxins, and also from declines in protective land uses such as forest land and agricultural land in the Bay region. The regulations in this article apply within the Critical Area. Section **190-10** shows the relationship between the various zoning districts within the Critical Area and the Critical Area designations of Resource Conservation Area (RCA), Limited Development Area (LDA), and Intensely Developed Area (IDA). Any applicant for a permit or license to pursue development activities within the Critical Area shall have such permits or licenses issued by the appropriate regulatory authorities after review under the County's Critical Area Program.

Plan	*Location*
Does the ordinance contain natural hazard overlay zones that set conditions for land use within such zones?	Talbot County Zoning Ordinance Chapter 190: Zoning, Subdivision, and Land Development 190-110 Gateway Overlay District The purpose of the Gateway Overlay District (GD) is to consider and incorporate the long-range development plan for the towns and County within the sensitive roadway corridors that enter and exit the towns. Gateway areas are intended to preserve a scale and design that is compatible with the community's vision for the area. 190-111 Easton Airport Overlay District (1) The purpose of the Easton Airport Overlay District is to prevent structures, temporary structures, or other objects from constituting hazards or obstructions to aircraft operating to, from, or in the vicinity of the Easton Municipal Airport. (2) The purpose of the larger area defining the proximity of the airport is to inform residents and businesses undertaking development activity about the presence of the airport. 190-112 Buffer Management Area Overlay District The Buffer Management Area Overlay District recognizes areas where existing patterns of development prevent the shoreline development buffer from fulfilling its natural functions. In such areas special regulations apply to accommodate limited use of shoreline areas while protecting water quality and wildlife habitat to the extent possible, and providing for mitigation measures where encroachment of the shoreline development buffer takes place. (2) In Buffer Management Areas certain types of development activities are permitted to encroach into the shoreline development buffer without the need for a variance.
Do rezoning procedures recognize natural hazard areas as limits on zoning changes that allow greater intensity or density use?	Talbot County Zoning Ordinance Chapter 190: Zoning, Subdivision, and Land Development
SUBDIVISION REGULATIONS	
Do the subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas?	Talbot County Zoning Ordinance Chapter 190: Zoning, Subdivision, and Land Development

Plan	*Location*
Do the regulations provide for conservation subdivision or cluster subdivisions in order to conserve environmental resources?	Talbot County Zoning Ordinance Chapter 190: Zoning, Subdivision, and Land Development
Do the regulations allow density transfer where hazard areas exist?	Talbot County Zoning Ordinance Chapter 190: Zoning, Subdivision, and Land Development
CAPITAL IMPROVEMENT PROGRAM AND INFRASTRUCTURE POLICIES	
Does the capital improvement program provide funding for hazard mitigation projects identified in the FEMA Mitigation Plan?	The FY2014-FY2018 CIP for Talbot County includes capital expenditures designed to improve the infrastructure of Talbot County, including waterways and wharves, waterwaste improvements, park and rec facilities, and road improvement projects.
Does the capital improvement program limit expenditures on projects that would encourage development in areas vulnerable to natural hazards?	Talbot County, Maryland Capital Improvement Plan – FY2014-FY2018

Source: FEMA and the Talbot County Hazard Mitigation Planning Committee

3. CONCLUSION

Integrating hazard planning and resiliency into the County's planning framework will lead to development patterns and redevelopment that decreases hazard risk and vulnerability. In order to achieve and facilitate integration, Talbot County should review the safe growth audit and conduct an evaluation on how planning documents, policies, codes and programs are maintained and implemented, and the roles of people, agencies, and departments in evaluating and updating them. This depth of review will enable the County to identify opportunities for plan integration, resulting in effective ways to reduce hazard vulnerability and build a resilient Talbot County.

The development of a more in-depth inventory will enable the county to identify further gaps and overlaps between the current hazard mitigation plan and the larger planning framework including the County Comprehensive Plan. Identifying existing tools may lead to opportunities for integration. The identification of gaps will lead to the consideration of capacity specific to county and municipal staffing and resources. Finally, the systematic planning process will yield a roadmap displaying steps that are available to, and achievable by, Talbot County.

The Comprehensive Plan is not a stand-alone document, but is supported by (and, in turn supports) related planning program documents including:

- Chesapeake Bay Critical Area Plan
- Comprehensive Water and Sewer Plan
- Land Preservation and Recreation Plan

- Floodplain Ordinance
- Zoning, Subdivision and Land Development (Zoning Ordinance)
- Septic Tier Maps (SB236)
- Roads Ordinance
- Forest Conservation Ordinance
- Building Code
- Livability Code
- Stormwater Management Ordinance

These and other plans and ordinances must be in conformance with the Comprehensive Plan. However, as with any update or revision of a major planning document, conflicts may arise between previously adopted policies and newly proposed policies. The policies and guidelines contained within this Comprehensive Plan supersede any conflicting policies and/or guidelines contained in the above mentioned plans. The Talbot County Comprehensive Plan takes into consideration the comprehensive development plans and ordinances of the incorporated municipalities within the County.

However, the county Hazard Mitigation Plan is not included. The new Talbot County Hazard Mitigation and Resiliency Plan should be included within the early Comprehensive Plan.

Within the Comprehensive Plan Chapter 9: Community Design and Appearance, add a county-wide design policy that encourages site design that takes into account potential hazards and hazard areas, and mitigate hazard impacts within the design process, prior to construction.