



2011 Ocean City All-Hazard Mitigation Plan Update

Adopted: December __, 2011

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CHAPTER ONE INTRODUCTION, PURPOSE, GOALS

OCEAN CITY, MARYLAND MULTI-HAZARD MITIGATION PLAN

Chapter I. Introduction and Purpose

The Town of Ocean City, Maryland is located on a barrier island (Fenwick Island), stretching from the Maryland-Delaware state line on the north to the Ocean City Inlet, which separates Ocean City and Assateague Island, on the south. (See Figure 1 - Location Map) Due to its barrier island location, Ocean City is vulnerable to two primary natural hazards - hurricanes and Noreasters - both of which cause wind and flood damage. The end result of this plan will be to enable properties to better protect themselves from hazards, thus avoiding or minimizing future damage, and to enable all properties in the Town to more effectively recover from future damage.

The Hazard Mitigation Plan serves several purposes:

1. To identify and assess the hazards to which Ocean City is most vulnerable.
2. To establish policies and proposals to reduce or eliminate the human and economic loss from future natural hazards.
3. To promote long-term solutions to repetitive loss problems.
4. To meet the mitigation planning requirements that are prerequisite to requests for financial assistance in post-disaster situations. Some assistance programs that require a local Hazard Mitigation Plan are:
 - a) the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Section 409). The Stafford Act@ establishes the Hazard Mitigation Grant Program which provides assistance to local governments following a Presidentially-declared disaster. **The 2000 Disaster Mitigation Act amended the Stafford Act of 1988 by requiring states and local governments to adopt a state or local hazard mitigation plan.**
 - b) the Flood Mitigation Assistance Program, authorized by the National Flood Insurance Reform Act of 1994, provides financial assistance for mitigation projects such as elevation and/or dry floodproofing of structures, acquisition of flood prone property, relocation or demolition of structures, structural flood protection projects, and beach nourishment activities.
 - c) the Maryland Hazard Mitigation Grant Program which supplements the

FIGURE 1
location map

Stafford Act assistance.

d) the Comprehensive Flood Management Grant Program (Flood Hazard Mitigation Act of 1976) is a Maryland program that provides assistance to local governments immediately after floods for the acquisition, elevation and relocation of flood-damaged dwellings.

e) the Pre Disaster Mitigation Program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event.

f) the Severe Repetitive Loss Program provides funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss (SRL) structures insured under the National Flood Insurance Program.

5. To serve as the Floodplain Management Plan required by the Community Rating System (CRS), a program under the auspices of the Federal Emergency Management Agency which rewards local communities which improve their resistance to flood damage by reducing flood insurance premiums paid by property owners. Toward this end, this plan assesses the flood hazards facing Ocean City; assesses the more specific problems, including repetitive loss properties; **addresses manmade hazards that can pose risks**, sets goals and objectives for the community; reviews alternative methods of addressing the problems; and proposes specific actions to remedy problems.

The Update Process

The original hazard plans were approved in 2001 and 2004. The Ocean City Hazard Mitigation Plan Update was performed in mid 2011 to meet the requirements of 44 CFR Part 201.6, Local Mitigation Plans and to reflect changes in development, progress in local mitigation efforts, and changes in priorities to remain eligible for mitigation project grant funding. Discussions between the regional I.S.O. auditor and Ocean City staff took place in late 2010 during the 5-year audit of Ocean City's Community Rating System Program.

Public outreach efforts since the original plan have included the use of the town's website to publicize hazard-related news and events, educational outreach held each May prior to the official hurricane season, posting news on the town's public access channel, and the continuation of weather articles in the annual town newsletter mailed out to all property owners. Town officials and planners strongly believe an educated public will react to hazard warnings and pre-plan their activities far more consciously with an eye towards personal safety than those visitors and property owners who have not been exposed to preparedness information. The town stresses

prompt evacuation when orders are given and securing personal items kept outdoors to reduce damages from flying objects during high winds and floating objects during extreme high tides and flooding.

The Hazard Mitigation Planning Committee was formed within weeks of the 5-year audit to share information and guide the update process. Each department chosen to participate in the update had pertinent and necessary information to share. The engineering and public works staff provided dates, costs, and construction details of past storm events and what the town had done to prepare for those events, as well as future ones. The zoning and planning staff provided dates, maps, project details, and previous plans to help document storms and the damages from them. The police, fire, and emergency services staff provided the locations of hazardous elements in town, their respective resources to combat future hazards, methods of responding to events, and their own perspectives of how well the town is prepared for unexpected hazardous situations. Salisbury University’s planning professor helped edit our draft plan and offered relevant ideas on how to present our plan as one not only for governmental agencies, but for the general public to easily grasp its concepts. The Worcester County Health Department provided current health crisis data. Worcester County Emergency Services agreed with our descriptions of all hazards and their threat levels. They were helpful in confirming the details of a number of past events. Worcester County planners commented that.....

The time period for the update initially focused on the summer of 2011. As various requests for information passed by and the need to consult with state agencies loomed, our timeframe continued to move forward. Eventually, the planning committee agreed that a deadline for draft completion ought to be considered for very late in 2011 to allow for sufficient input from agencies contacted and for two public hearings.

The Hazard Mitigation Planning Committee met on several occasions to gather additional data. Minutes from these meetings can be seen in [Appendix B](#). Two public hearings were held in the Ocean City, City Hall building. Both hearings were held at night after they were properly-advertised on the town’s website and in local newspapers. Minutes from the two public hearings can be seen in [Appendix A](#).

A copy of the plan was sent via email to the towns of Berlin and Snow Hill, Maryland and Fenwick Island, Delaware requesting their feedback. A similar request was made to Dr. Amal Ali, Professor of Planning at Salisbury University and to the Planning office and the Emergency Services offices of Worcester County, Maryland. Dr. Ali responded with some very useful suggestions. The Worcester County Health Department responded with their own health emergency response plans. A draft plan was sent to the Ocean City Hotel-Motel-Restaurant Association and the Ocean City Chamber of Commerce asking for their comments. The Ocean City Departments of Police, Fire, Public Works, Planning, and Emergency Services provided valuable comments to the Plan. The Ocean City Hazard Mitigation Planning Committee held

several meetings to discuss updates to the plan. All members were present at those meetings. The town's engineer, planning director, and emergency planner oversaw the proceedings and were

kept abreast of the update process with opportunities to comment at any time.

Hazards not related to the weather have been included in this update as committee members believe it is important to discuss each hazard affecting people's lives in Ocean City. Natural hazards are presented first with man-made hazards following later in Chapter Three.

The Ocean City Emergency Operations Plan, presently being revised by the Emergency Services staff, offers many procedures involved in the response to hazards within the town's borders. Some topics discussed in the EOP include the Emergency Operations Center, the emergency control procedures explaining how barriers will be established to maintain control over an event. The national threat level warning system is being updated to the new system. Man-made and natural hazards are also discussed in detail. The Town has an early warning system in place to notify the public of impending dangers. We have attached a map of siren locations in Ocean City to this draft plan. An evacuation procedure is clearly in place to guide the public to safe routes of exit as soon as a hazardous event is expected to diminish personal safety or following the onset of an event to maximize survivability. The town's Emergency Services staff, police and fire personnel are all highly trained to handle any situation and are in constant contact with state and federal authorities.

Locally, the following were involved directly in the Plan update:

- Ocean City Planning and Zoning Department
- Ocean City Police Department
- Ocean City Engineering Department
- Ocean City Planning and Zoning Commission
- Ocean City Public Works Department
- Ocean City Mayor and City Council
- Ocean City Emergency Services Department
- Ocean City Hazard Mitigation Planning Committee
- Worcester County, Maryland Health Department
- Worcester County, Maryland Emergency Services
- Worcester County, Maryland Planning Staff
- Salisbury University Planning Staff, Salisbury, Maryland (Dr. Amal Ali)

In order to develop a more comprehensive approach to reducing the effects of disasters, the Planning process includes:

- (1) An opportunity for the public to comment on the Plan during the drafting stage and prior to Plan approval;

- (2) An opportunity for neighboring communities, Salisbury University's Planning Department, and the local business community to be involved;
- (3) Review and incorporation of studies, reports, and existing plans.

Comprehensive emergency management includes four components.

1. Preparedness activities, which improve the ability to respond quickly to an incident. Preparedness activities include development of response procedures, design and installation of warning systems, exercises to test emergency operational procedures, and training of emergency personnel.
2. Response activities which occur during or immediately after a disaster, and include such time-sensitive actions as search and rescue operations, evacuation, emergency medical care, food, and shelter programs. Response activities are designed to meet the urgent needs of disaster victims.
3. Recovery activities are actions which begin after the disaster to meet urgent needs, such as repairs to roads, utilities and other public services. These are activities that help restore the community to normal operations.
4. Mitigation activities reduce or eliminate damage caused by hazardous events. These activities can occur before, during and after a disaster, and overlap all phases of emergency management. Structural mitigation pertains to actions such as dam and levee projects to protect against flooding, requiring the construction of disaster-resistant structures, retrofitting existing structures to withstand damage, etc. Non-

structural mitigation activities include development of land use plans, zoning ordinances, subdivision regulations, and incentives and disincentives to guide growth away from disaster prone areas. Mitigation also includes educating the public about the hazards to which their community is vulnerable, as well as the importance of mitigation and how to prepare their community to withstand a disaster.

Hazard mitigation, defined by FEMA as any sustained action taken to reduce long-term risk to human life and property from natural hazards, can be viewed as the foundation of emergency management because it influences the extent that the other three components will be needed. Mitigation is the only component that has the potential to break the costly cycle of damage and reconstruction that can occur when a community is subjected to natural hazards.

Mitigation is a very local effort, because different communities are vulnerable to different types of hazards at various times throughout the year. This revised hazard plan is able to discuss not only natural hazards but also man-made ones that have become a part of our daily lives since the events of September 11, 2001.

The Ocean City Hazard Mitigation Plan is designed to be consistent with the *Comprehensive Plan for Ocean City (2006)*, and supplemental to the *Ocean City Emergency Operations Plan*. In 2012, an update to the Ocean City Comprehensive Plan will commence with this plan's goals and objectives in mind. It is also intended to be consistent with the Maryland Smart Growth goals whenever applicable.

The Disaster Mitigation Act of 2000, further mitigation Planning requirements are set forth in six programs administered by FEMA. These HMA programs present a critical opportunity to reduce the risk to individuals and property from natural hazards while simultaneously reducing the reliance on Federal disaster funds. States, Territories, Indian Tribal governments, and communities are encouraged to take advantage of funding provided by HMA programs in both pre- and post-disaster timeframes. Together, these programs provide significant opportunities to reduce or eliminate potential losses to State, Tribal, and local assets through hazard mitigation planning and project grant funding. Each HMA program was authorized by separate legislative action, and as such, each program differs slightly in scope and intent. The guidance applies to the programs of: Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), Flood Mitigation Assistance Program (FMA), Repetitive Flood Claims Program (RFC), and Severe Repetitive Loss Program (SRL). While the statutory origins of the programs differ, all share the common goal of reducing the risk of loss of life and property due to natural hazards.

Below you will find a description of the programs:

- **Flood Mitigation Assistance Program (FMA).** To qualify to receive grant funds to implement projects such as acquisition or elevation of flood-prone homes, local jurisdictions must prepare a mitigation Plan. The Plan must include specific elements and be prepared following the process outlined in the National Flood Insurance Program's (NFIP) Community Rating System.
- **Hazard Mitigation Grant Program (HMGP).** To qualify for post-disaster mitigation funds, local jurisdictions must have adopted a mitigation Plan that is approved by FEMA.
- **Pre-Disaster Mitigation Grant Program (PDM-C).** To qualify for pre-disaster mitigation funds, local jurisdictions must adopt a mitigation Plan that is approved by FEMA.
- **NFIP Community Rating System (CRS).** The CRS offers recognition to communities that exceed minimum requirements of the National Flood Insurance Program. Recognition comes in the form of discounts on flood insurance policies purchased by

citizens. The CRS offers credit for mitigation Plans that are prepared according to a multi-step process.

- **FEMA/NFIP Severe Repetitive Loss Program (SRL).** The SRL program was authorized by the Flood Insurance Reform Act of 2004 to provide funding to reduce or eliminate the long-term risk of flood damage to residential structures under the NFIP which have suffered repetitive losses. SRL properties have at least four NFIP claim payments over \$5,000, with at least two of the claims within a 10-year period. SRL properties are also residential structures that have at least two separate claim payments made within a 10 year period with the cumulative amount of the building portion of the claims exceeding the value of the property.

- **FEMA/NFIP Repetitive Flood Claim Program (RFC).** The SRL program was authorized by the Flood Insurance Reform Act of 2004 to assist States and communities reduce flood damages to properties that have at least one NFIP claim payment. Various hazard mitigation activities are eligible including acquisition, elevation, and dry floodproofing of residential structures.

The goals of this plan are to develop a hazard mitigation program that will:

A. Protect lives, property, essential services, and critical facilities from natural hazards.

- Utilize the most effective approaches to protect buildings from hazards.
- Enact and enforce regulatory measures (codes, ordinances) to ensure that new development will not increase hazard threats from storm surge, high winds, or sea level rise.
- Review and update building codes to ensure that manufactured housing and other homes are constructed and installed in a manner to minimize wind and storm surge damage.
- Reduce the number of homes in the floodplain that are subject to flooding and elevate those that are potentially vulnerable.
- Increase the number of critical facilities that have carried out mitigation measures to ensure their functionality in a 100-year storm event.
- Prioritize new mitigation projects, highest risk going first.
- Improve communications capability between the Town and Worcester County Emergency Services and law enforcement agencies.

B. Reduce repetitive flooding of susceptible properties.

- Ensure existing high risk structures are using retrofitting techniques to mitigate repetitive flooding.
- Target properties labeled as “repetitive losses” with methods to improve the likelihood of suffering less expensive flood losses from future events.
- Continually monitor federal grant programs for available funding, such as the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) program, and the Pre-Disaster Mitigation (PDM) program, the Repetitive Flood Claims (RFC) program, and the Severe Repetitive Loss (SRL) program

C. Reduce short and long-term recovery and reconstruction costs after a disaster.

- Consider using the two new grant programs, RFC and SRL, designed to reduce or eliminate the long-term risk of flooding to NFIP-insured structures, and thereby reduce the number of claims paid from the National Flood Insurance Fund (NFIF).

D. Clearly identify the natural hazards confronting Ocean City.

- Maintain discussions among the Hazard Mitigation Planning Committee.
- Ensure the hazard plan is coordinated with the comprehensive plan and Emergency Operations Plan updates.

E. Educate and inform the public of the impacts of natural disasters and enable the public to be better prepared.

- Encourage property owners to become educated in self protection measures.
- Continue holding Hurricane Awareness Nights each spring.

F. Increase Ocean City's ability to receive federal and state funding for disaster planning, recovery and reconstruction.

- Use public funding to protect public services, including critical and public facilities.
- Maximize the use of outside funding sources, especially state grants through the Maryland Emergency Management Agency.
- Maintain and improve upon how Ocean City uses the Community Rating System to remain in good standing with F.E.M.A. and the discounted flood insurance policy premiums currently in place.

G. Facilitate sustainable development that will reduce or eliminate the potential impacts of disasters.

- Provide for the conservation and preservation of natural resources.
- Limit additional construction in areas of high hazard risk.

Continuity of Operations Planning

COOP is a planning effort to ensure the continued performance of critical business and government functions during a wide range of potential emergencies. Whether the hazard is the result of a natural event, or something man-made, an all-hazards approach assures that regardless of the emergency, critical functions will continue to operate.

COOP efforts are taken to ensure the continued performance of essential government functions during a wide range of potential emergencies. Whether the hazard is the result of a natural or human-induced event, an “all hazards” approach assures that, regardless of the emergency, essential functions will continue. Ocean City was the first municipality in the State of Maryland to submit a completed COOP to the Maryland Emergency Management Agency and be approved.

How well (or poorly) a COOP plan is designed and implemented will determine *response, resumption, recovery, and restoration*. Ocean City’s departmental plans are currently being updated to ensure services are maintained to the residents in time of need. Each individual plan within the Town must be examined by its leadership to keep procedures current and to allow for the proper resources to be allocated to the locations where services will be re-established following an disruptive incident. It is assumed that services rendered by the Town’s staff at alternate locations could easily be expected to continue for many weeks and record-keeping must be immediate and precise in order for the Town to seek reimbursement from state and federal agencies for costs associated with an event.

CHAPTER TWO

DESCRIPTION OF OCEAN CITY

Chapter II. Description of Ocean City

The Town of Ocean City was founded as a fishing village over 125 years ago, and was incorporated by the State of Maryland in 1880. One of four municipalities in Worcester County, the town occupies approximately five square miles and is located on a barrier island about 150 miles from Washington, D.C., and 135 miles from Baltimore, Md.

From its modest beginnings, Ocean City has emerged as one of the primary full service seaside resorts on the east coast. Maryland's only ocean resort, the town hosts over 8,000,000 visitors annually and generates nearly \$3 billion into the State's economy.

Originally, tourism consisted of boarding houses and cottages, run by the wives of commercial fishermen. Now hotel chains, family owned motels, bed and breakfasts, condominiums, townhouses and single-family homes provide a variety of living choices.

Geographically, Ocean City is a flat, narrow strip of sand preserved by dunes, beach replenishment, and jetties. Nearly any part of the town is equally vulnerable to any of the hazards described within this report. History has shown that all properties in Ocean City are subject to damage from natural hazards, some properties more than others due to their construction quality or their location. Oceanfront structures will endure high winds and waves off the ocean while bayfront structures will see flooding and debris damage caused by floating materials and high winds. Bayside properties do not have the protection of any dunes, seawall, or jetties to interrupt incoming waves and high tides.

Located beyond the barrier islands of Maryland's Atlantic shore, the Atlantic Continental Shelf Province is the submerged continuation of the Coastal Plain Province, which extends eastward for about 75 miles. The Atlantic Continental Shelf Province is comprised primarily of sand deposits and only affects the Town of Ocean City, Maryland.

A. Population

The town provides services for two different populations - the permanent year-round population of 7,102, as of 2010, as estimated by the U.S. Census Bureau, and the peak summer population of about 300,000. Ocean City has experienced consistent, and in some time periods, remarkable growth. Year-round population growth is depicted in Table 1 and Figure 2.

The growth since the 1970s resulted from the increasing tourist economy enabling more households to be supported year-round by the summer trade, and the expansion of public facilities to serve an increasing population. In addition, there has been an influx of retirees who have found Ocean City to be a desirable place to live. The 2010 Census shows that about ___% of

Ocean City's 7,102 permanent residents are 60 years of age and older.

It is projected that the town's permanent population will continue to grow at a steady rate for the foreseeable future, with a projected population in 2030 of about 8,800.

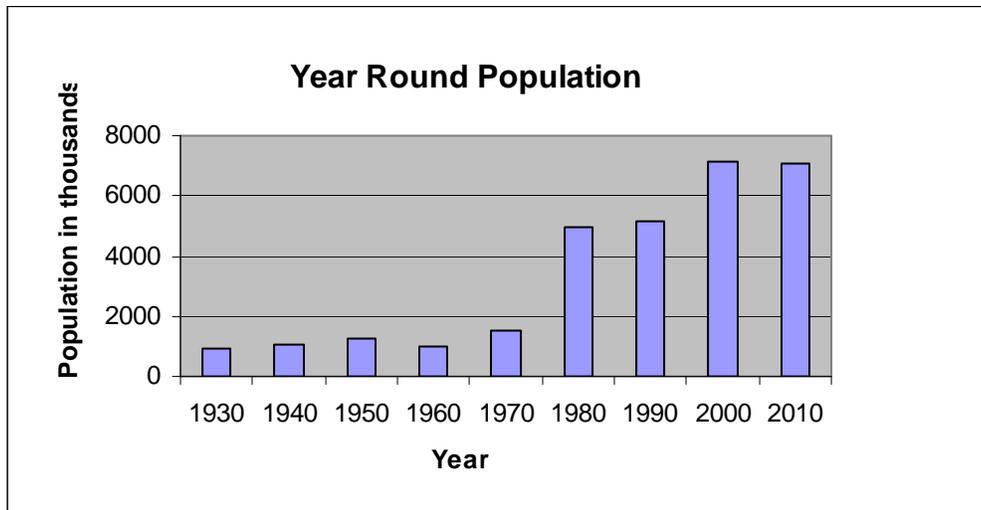
Table 1

Year-Round Population

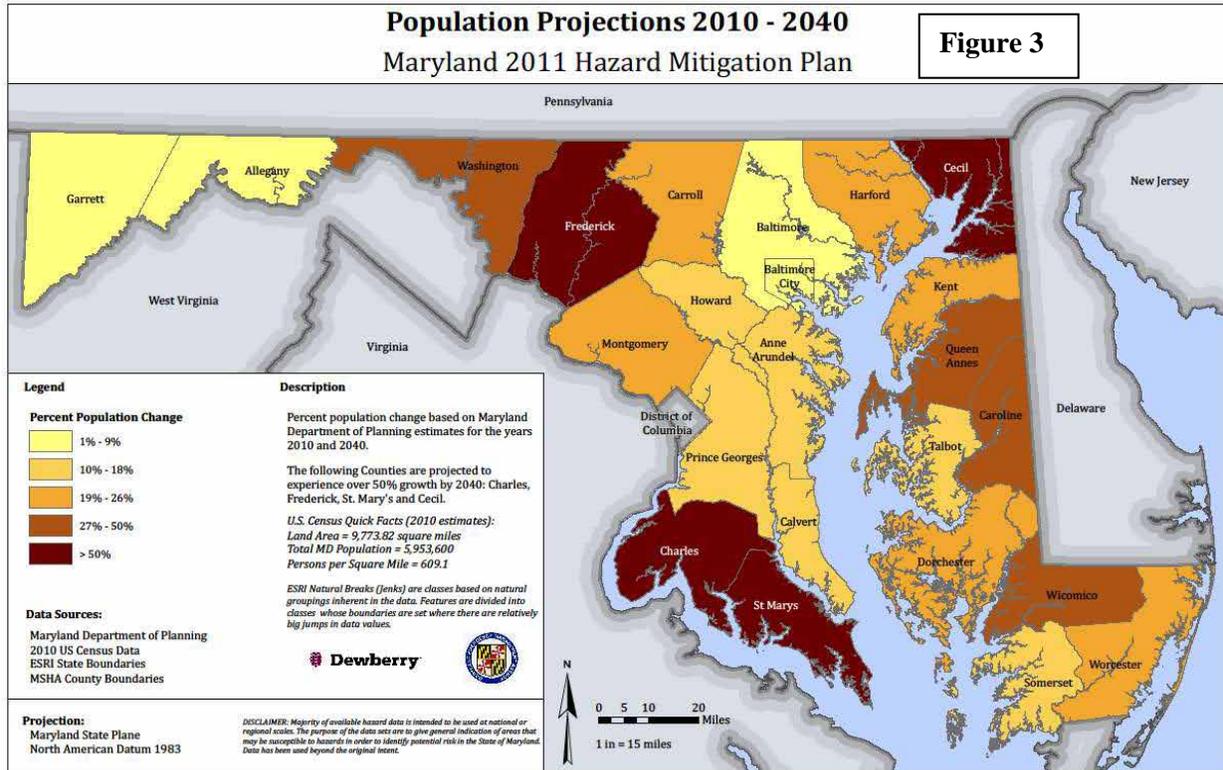
Year	Population	Avg. Annual Change
1930	946	
1940	1,052	1.1%
1950	1,234	1.7%
1960	983	-2.0%
1970	1,493	5.2%
1980	4,946	23.1%
1990	5,146	0.4%
2000	7,173	3.9%
2010	7,102	—%

Source: U.S. Census, 1930 - 2010

Figure 2



In a resort like Ocean City, it is more important to understand the demographics of the total population, including year-round residents and seasonal visitors, rather than only the permanent population. Planning for future development and for the provision of public facilities must be based on the total population to be accommodated and served (Figure 3)



Emergency planning must also concentrate in the total population, especially its seasonality. Hurricane season coincides largely with the tourist season, and evacuation plans must take this into account. As population numbers increase through the years, it can be expected that there will be no loss in housing stock, thus, severe hazards will impact more and more homes with higher dollar losses. Most locations in Ocean City are similarly prone to damage from most hazards, depending on the severity of that hazard. There are some locations that are slightly higher in elevation above sea level but not enough to avoid being affected by most hazards. Ocean City’s flat terrain and lack of drainage place nearly any structure in harm’s way.

Measuring the seasonal or total population is a difficult task for a resort community. Obviously, the summer season has the highest populations. Since the 1970s, Ocean City has estimated its total population by using a mathematical formula called “demoflush”, which correlates population to flows through the sewage treatment plant. Table 2 and Figure 4 show the peak demoflush (total) population for each year since 2000. This is the number of people in Ocean City on the peak day of each year. The peak population has remained relatively stable at about

326,000. Assuming that current growth policies remain unchanged and no major annexation takes place, it is projected that the total population will not increase dramatically in the future.

Table 2
Peak Demoflush Population
2000 - 2010

Year	Peak Demoflush Population	Annual Percent Change
2000	354,440	
2001	317,814	-10.3%
2002	344,562	8.4
2003	342,952	0.06
2004	328,413	4.2
2005	322,308	1.8
2006	311,321	3.4
2007	315,649	-1.4
2008	309,434	1.9
2009	321,920	-4.0
2010	318,368	1.1

(Source: Ocean City Dept. of Planning)

It is important to know what the population is at various times of year to enable emergency personnel to effectively plan for evacuation of the town when necessary. [Table 3](#) shows the demoflush population by season. Obviously, summer is the most populous season, coinciding with the peak of the hurricane season. Evacuation plans must account for this population.

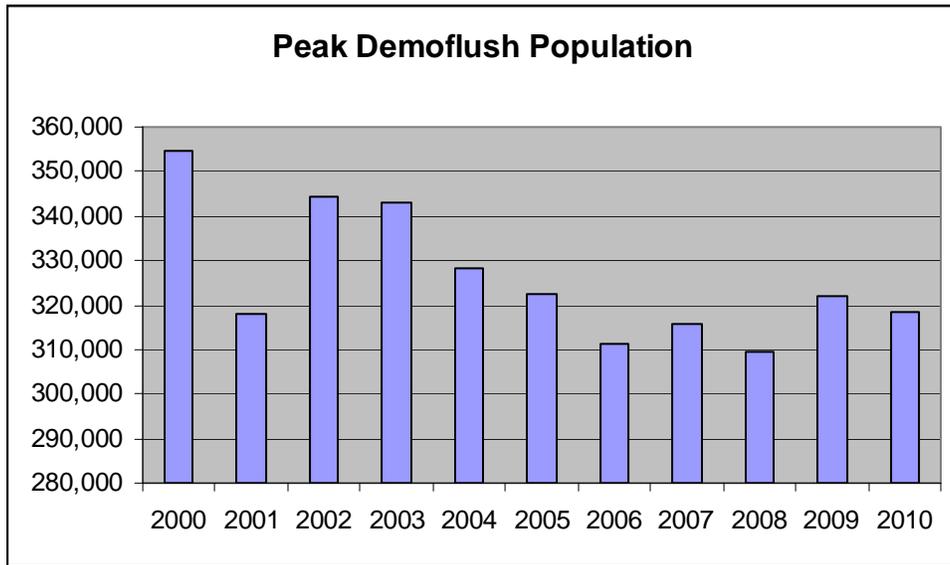


Figure 4

Table 3

AVERAGE POPULATION BY SEASON

	2007	2008	2009	2010	Average
Winter	1,108,325	1,032,090	1,009,389	1,255,301	1,101,276
Spring	2,378,135	1,559,767	2,514,438	2,221,269	2,168,402
Summer	3,406,161	3,336,725	3,485,983	3,523,013	3,437,970
Fall	1,257,511	1,256,182	1,463,819	1,245,200	1,305,678

Source: Ocean City Dept. of Wastewater, Demoflush Totals

B. The Economy

Ocean City’s economy is dominated by one industry, tourism. The tourism industry is comprised of three sectors: accommodations, food and beverage, and retail and services. A year round economy exists to serve the needs of permanent residents and the substantial number of off-season visitors, although many establishment do close for part of the off-season.

Table 4 lists employment in Ocean City by industry. It is obvious that the classification that support tourism (retail trade and services) are the dominant employers.

Table 4

Employment by Industry - Ocean City Residents, 2010

<u>Industry</u>	<u>Number Employed</u>	<u>%</u>
Agriculture, forestry, mining	0	
Construction	327	11.4
Manufacturing	39	1.4
Arts, Entertainment, Recreation	483	16.7
Other Services, except public administration	98	3.3
Information	147	5.0
Transportation	59	2.0
Communications and other public utilities		
Educational-healthcare, social assistance	501	17.4
Wholesale trade	124	4.4
Retail trade	361	12.4
Finance, insurance, and real estate	310	10.7
Professional, scientific, administrative	236	8.1
Public administration	209	7.2
TOTAL	2,894	

Source: U.S. Census, 2010 (supplied by MD. Dep't. of Planning)

An economic goal of Ocean City in recent years has been to diversify its economy, but still within the tourism industry. **The expansion of the Roland E. Powell Convention Center has increased the number and size of conventions and conferences that the town can accommodate,** and the growth of golf as an alternative recreational activity in the area has strengthened the economy of the fall and spring months.

Because the local economy is so dependent on and affected by the environment, hazard mitigation is a crucial undertaking. If damage from floods, hurricanes and other hazards can be minimized, the impact of these events on the economy can also be minimized. This is especially true in a seasonal economy. The economic damage caused by a hurricane striking during the peak summer tourist season would be devastating when the major portion of business income is made in such a short time period. The more damage that can be avoided by proper planning and mitigation, the less the local economy will suffer. The Town of Ocean City updates its insurable property so that all are properly covered. The Risk Assessment staff are trained to investigate

C. Development Trends

It is estimated that 95% to 98% of the land in Ocean City is developed, and this lack of vacant land dictates that future growth and development will consist primarily of redevelopment. This trend that has already begun, with many older structures being razed and replaced with new, modern structures. Redevelopment such as this bodes well for the hazard resistance of structures in the future, because as older structures that may not have been built to current code requirements are removed and replaced with code compliant buildings, the new buildings will be less prone to damage. **The assessed value for all buildings for Fiscal year 2010 was \$10,501,239,662.**

The town's codes serve as a primary means of mitigation, since they require, among other things, greater than minimum structure elevation, foundation requirements, and open space protection. The Ocean City of the future will be much better able to withstand all hazards.

The number of construction permits was slightly more in 2010 at 1,482 compared to 1,441 in 2009, but the 2010 fiscal year saw a substantial decline in the estimated value of that construction. The estimated value of construction in 2010 was \$36,499,656 compared to \$49,544,208 in 2009. The decrease in real estate values has forced several scheduled development projects to be delayed, changed in scope, or withdrawn. Investors and developers are understandably applying more conservative strategies during this economic downturn.

CHAPTER THREE

HAZARD IDENTIFICATION

Chapter III – Hazard Identification

A hazard mitigation plan should be comprehensive, in that it should consider all major hazards to the community in order to cover all potential mitigation opportunities. **This version will include hazards not related to the weather that pose potential harm to people. Hazard Plan Committee members have chosen these hazards for their apparent risk to public health and the potential for some to occur due to an unstable political environment.**

The report entitled *Maryland State Hazard Mitigation Plan Update*, published by the Maryland Emergency Management Agency (MEMA) in August, 2011, contains a comprehensive assessment of all hazards facing jurisdictions in the state. Appendix ‘_’ of this report concentrates on Ocean City. Table 5 below is a comprehensive summary the hazard risks for Ocean City.

The table shows that the highest risk hazards that Ocean City faces are floods (tidal/coastal), hurricanes/tropical storms, and epidemics. The high risk hazards are discussed in more detail below.

**Table 5
Summary of Hazard Risks for Ocean City**

Hazard	Risk
<i>Weather Related</i>	
Drought	Medium-High
Extreme Heat	Medium-Low
Extreme Cold	Medium
Floods (Flash)	Low
Heavy Rain	Medium-Low
Floods (River)	Low
Flood/Surge (Tidal/Coastal)	High
Hail	Medium-Low
Wind	Medium
Thunderstorms	Medium-Low

2011 DRAFT Ocean City, Maryland Multi-Hazard Mitigation Plan

Hurricanes/Tropical Storms	High
Lightning	Medium
Tornadoes	Medium-Low
Snow	Medium
Ice	Low
<i>Other Natural</i>	
Earthquakes	Low (August 23, 2011 - 5.8)
Epidemics	High
Expansive Soils	Low
Land Subsidence	Low
Landslides	Low
Wildfires	Medium
<i>Man Made</i>	See following page
Schools Incidents	Medium
Terrorism	High
Fuel Storage Containers targeted	Medium-High
Structure Fires	Medium-High
Explosions	Medium
Hazardous Materials - Fixed	Medium
Hazardous Materials - Mobile	Low
Airplane Accidents	Medium
Bombs	High

Data is for Worcester County, not specifically Ocean City.

In addition to addressing local response to hurricanes/tropical storms and flooding, the *Ocean City Emergency Operations Plan (EOP)* addresses responses to other manmade and natural hazards, including aircraft disasters, hazardous materials accidents, and winter snow storms.

The Emergency Operations Plan is being updated by the Emergency Services staff to address the comprehensive list of hazards.

The *State of Maryland Hazard Mitigation Plan of 2008* contains a discussion of the major natural hazards that impact Maryland. The descriptions of the major hazards facing Ocean City presented below are largely taken from that publication.

Natural Hazards

A. Flooding.

Flooding is a localized hazard that is generally the result of excessive precipitation. Floods can be generally placed in two categories: flash floods, the product of heavy localized precipitation in a relatively short time period, and general floods, caused by precipitation over a longer time period.

Flash floods occur within a few minutes or hours of heavy amounts of rainfall, from a dam or levee failure, or from a sudden release of water held by an ice jam. Flash floods can destroy buildings, uproot trees, and scour out new drainage channels. Most flash flooding is caused by slow moving thunderstorms in a local area, or by heavy rains from hurricanes, tropical storms and Noreasters. Although flash flooding often occurs in hilly areas, it can occur in urban areas like Ocean City where much of the ground is covered by impervious surfaces. Fixed drainage channels in urban areas may be unable to contain the runoff that is generated by relatively small but intense rainfall events. Overall, Ocean City has a low risk of flash flooding **but would be highly affected if it were to occur due to low topography. With limited drainage, many heavily used roads would be flooded for short periods. (See Appendix B-Historical Flooding)**

General flooding is a longer term event that may last for several days. The primary types of general flooding are coastal/tidal flooding, urban flooding and riverine flooding. Ocean City is most susceptible to coastal/tidal and urban flooding. **Many bayside streets have regular, short term flooding issues whenever high tides occur, allowing their waters to penetrate the storm drains in reverse and fill the streets with several inches of salt water. Noreasters with high tides can easily place several feet of water onto town streets for hours at a time. This last happened in 2010 during just such an event. Beaches were eroded until waves in the Atlantic Ocean reached the dunes. The dunes were able to contain the waves and spare any structural damage. The dune system has been an invaluable resource in protecting the town's infrastructure from storm damage.**

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 Noreasters during the winter and spring. Ocean City has a high risk of coastal/tidal flooding.

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.

Flood-prone areas are identified by FEMA on the Flood Insurance Rate Maps (FIRM). The FIRM for Ocean City indicates that nearly all of Ocean City is, in the vernacular of the Community Rating System, a special flood hazard area. This means that property is classified as either an 'A' zone or a 'V' zone. The A zone is a floodplain subject to rising flood waters and the V zone, on the oceanfront, is a coastal high hazard area that is also subject to storm surge and wave action.

Virtually all of Ocean City's land area is within the 100-year floodplain (see Figures 5-6). As a growth area which is already 95 percent developed, development in the 100 year floodplain cannot be avoided. Ocean City's flood protection and stormwater management regulations take into account the problems inherent in developing in the floodplain, and enforcement of these regulations should continue to be stringent.

The Community Rating System, under FEMA, has been steadily improved over the years in Ocean City and continues to earn a 15% discount on all flood insurance premiums for Ocean City property owners. Hurricane Awareness Night, town website additions, and articles in local papers continue to educate the public. This helps Ocean City to meet its objective to "Continue to participate in the Community Rating System, which provides reduced flood insurance premiums to reward stringent flood hazard protection regulations", from Chapter Seven, Sensitive Areas and Environmental Protection, in the 2006 Comprehensive Plan.

FIGURE 5
FLOODPLAINS map

FIGURE 6
URBAN AREAS map

The Town has been in the National Flood Insurance Program since June 8, 1971. Of the approximately 6,300 structures in town, 4,733 were built after 1971, and meet the specified elevation and construction requirements. There are about 800 structures with no recorded date of construction. It is safe to assume that these structures were erected prior to building codes and would qualify as not being storm-worthy. The relatively minimal damage that has been experienced in town over the years substantiates the effectiveness of the flood prevention efforts to date. The dunes and sea wall in Ocean City have been protecting the town's properties for many years. A maintenance fund assures that periodic renourishment occurs to the dunes. Each year, a total of \$2 million is placed in an account by the Town, Worcester County, and the State of Maryland. The account currently has over \$13 million in reserve. The average yearly cost of maintenance is about \$266,000. The last renourishment project was completed in December, 2010 at a cost of over \$8.6 million. [Figure 7](#) depicts the Maryland flood hazard ranking.

Figure 7 – Flood Hazard Ranking map

Figure 7

B. Storm surge.

Storm surge is a major cause of flooding and a primary threat to Ocean City. **Some level of surge can be expected within certain portions of Town where the ground is closer to sea level, particularly along the bayside.** Storm surge is defined as an abnormal local rise in sea level accompanying a tropical cyclone. The height of the storm surge is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the storm. Storm surge can be characterized as a steady rise of water on which wave action is superimposed. **While the beachfront would sustain damage, we cannot forget the low-lying properties along the bays that would suffer damages from a surge into the bays from the inlet at the south end of Ocean City. Storm surge will penetrate the bays from the south as it travels steadily north and spreads out as the bays widen. Nearly all of Ocean City would be affected by a surge. The magnitude of a surge will depend on the approaching storm. How it affects the town depends on the time of year it strikes. Timely evacuation will commence 2-3 days prior to the arrival of a storm so heavy visitation can be safely moved west of Ocean City using limited exit points. Boats, marinas, businesses, and homes would be affected as they do not have the protection of a seawall or dunes to lessen the impact of rising waters in the bays. This would be in addition to any damages sustained via flooding over the dunes along the oceanfront. It could very easily become a two-sided flood event for bayfront properties. The likelihood of such an event is medium to high due to water present around Ocean City on three sides with no flood protection in place on the west side of town.**

Areas in and around Ocean City are particularly vulnerable to severe storm surges from the Atlantic Ocean. The Ocean City Convention Center could experience building damages of \$7,606,320 and contents damages of \$2,765,128 from a Category II storm.

The Sea, Lake and Overland Surges from Hurricanes (SLOSH) model was developed by the National Weather Service to calculate potential storm surge heights from hurricanes.

Historical

storm surges in Ocean City reached 6.3 feet in the 1933 hurricane and 7.8 feet in the Noreaster of 1962.

Figure 8 shows the SLOSH model depiction of the land area in Ocean City that would be affected by a category 1, 2, 3, and 4 hurricane. According to the model:

- Category 1 hurricane would inundate 69.09 % of Ocean City;
- Category 2 hurricane would inundate 78.68 % of Ocean City;
- Categories 3 and 4 would inundate 100 % of Ocean City.

Storm Surge Area	Level of Risk
Category 1	Moderate
Category 2	High
Category 3	Extreme
Category 4	Extreme

Figure 8

C. Tropical Storms and Hurricanes.

There are three categories of tropical cyclones: 1) Tropical depression (maximum sustained surface wind speed less than 39 mph); 2) Tropical storm (maximum sustained surface wind speed from 39 mph to 74 mph); 3) Hurricane (maximum sustained surface wind speed exceeding 74 mph). The first bad storm with damage specific to Maryland was noted by Henry Norwood in January, 1649 which cut many inlets through the coast (History of Maryland Weather including Chesapeake Bay by James Dawson)

Ocean City is at high risk of experiencing each of these tropical cyclones. The Maryland Statewide Hazard Assessment report places Ocean City’s risk of being impacted by a tropical system at 0.368 events per year (about once every three years), with a historic mean damage per event, bases on National Weather Service storm data, of \$5,611,586. The event risk is the highest in the State, while the damage risk is rated medium. The report states Ocean City, however, does not have the highest mean damage in the region as one might expect. The mean damage in Ocean City was \$5.6 million whereas the highest mean damage in the eastern region (of the State) was \$19 million. The report does not offer reasons for this seeming discrepancy; it may be that the mitigation measures taken by the Town are paying dividends by reducing the damage caused by these hazards.

Tropical storms and hurricanes are cyclonic storms that originate in tropical ocean waters usually between June and the end of November, with peak activity around mid-September.

Hurricanes have the greatest potential to inflict damage as they make landfall, since they derive their strength from warm ocean water, they generally deteriorate as they move inland.

Damage from hurricanes is caused by a combination of flooding, storm surge, and wind. Hurricane intensity is measured using the Saffir-Simpson Scale, which ranks hurricanes from category 1 (minimal) to category 5 (catastrophic). See Figure 9. The scale categorizes hurricane intensity based on maximum sustained winds, minimum barometric pressure, and storm surge potential. These factors are combined to estimate the potential flooding and damage to property.

Saffir-Simpson Hurricane Scale

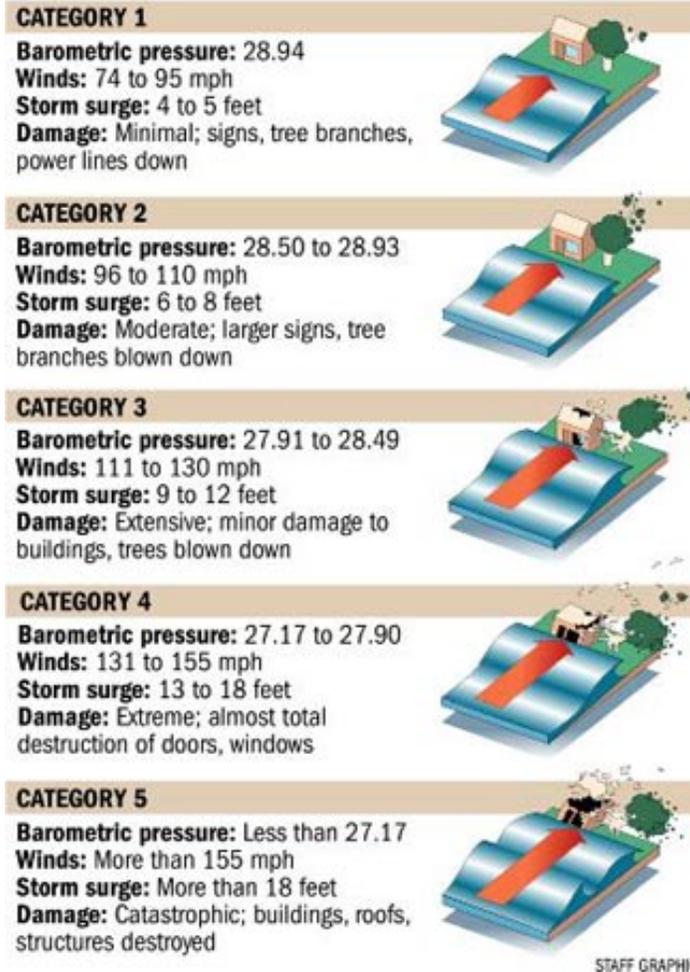


Figure 9

Over 127 years of record keeping, tropical systems have come within 60 miles of Ocean City 26 times. A hurricane has never made landfall in Maryland. Figures 10 - 21 on the following pages, taken from the *Maryland Statewide Hazard Assessment* report, show the storm tracks for hurricanes and tropical storms that have affected the Mid-Atlantic region from 1930-1996. The first one recorded was off Roanoke, Va. in 1586. The Sept. 1903 hurricane was said to have been the worst to hit Ocean City in 40 years. In February 1920, a coastal storm battered Ocean City with tides over 6.5 feet above normal. The hurricane of August 23, 1933 cut the inlet through Ocean City and effectively opened it up for tourism. This was likely the most profitable storm damage in state history, but it also left 13 dead. On March 6-7, 1962 the Storm

of the Century was probably the most destructive ever to hit our coast, devastating Ocean City and cutting two inlets through Assateague. Hurricane Bob in 1985, Gloria in 1985 and in 1992 Danielle made landfall at the mouth of the Chesapeake Bay. On September 16, 1999, Hurricane Floyd had excessive rain and on Sept. 19, 2003, Hurricane Isabel caused flooding as bad or worse than the storm of 1933. Significant

Ocean City is part of Worcester County, Maryland. There are an estimated 587 town and county-owned facilities within the coastal storm inundation zones of Worcester County. County-owned and town-owned facilities in and around Ocean City are particularly vulnerable to severe storm surges from the Atlantic Ocean. The Ocean City Convention Center could experience building damages of \$7,606,320 and contents damages of \$2,765,128 from a Category II storm. Estimates for flood depths range from 1 foot to 11 feet above normal tides. Storms could easily cause downtime delays ranging from 9 days to 30 days for businesses and services to respond. The displacement of residents from Ocean City and county areas closer to the shore are estimated to be from 54 days to 310 days. Much of Worcester County and all of Ocean City are low-lying lands that have almost no resistance to high water levels produced by storms. This is why building codes are so important to assure that all new structures are built to withstand extreme weather events.

FIGURE 10
HURRICANES 1930-1939 map

FIGURE 11

HURRICANES 1940-1949 map

FIGURE 12

HURRICANES 1950-1959 map

FIGURE 13

HURRICANES 1950-1959 map

FIGURE 14
HURRICANES 1950-1959 map

FIGURE 15

HURRICANES 1960-1969 map

FIGURE 16
HURRICANES 1970-1979 map

FIGURE 17

HURRICANES 1980-1989 map

FIGURE 18

HURRICANES 1990 – 1996 map

FIGURE 19
HURRICANES 1933-1995 map

FIGURE 20
HURRICANES cat3 – 1933-1995
map

FIGURE 21
HURRICANE TRACKS map

D. Wind.

The *Maryland Statewide Hazard Assessment* defines a wind event as having wind of 50 mph or more. Wind damage in Ocean City is generally associated with a hurricane or tropical storm, and since these are rare occurrences, Ocean City and Worcester County are classified as having a low risk of wind damage (one event per year). However, since wind can cause substantial damage in those rare occurrences, the report addresses Ocean City in some detail.

Based on structural data in the *Maryland Property View* database, which includes information about each land parcel and structure in the state, the *MSHA* report classified the following types of structures as susceptible to three wind thresholds:

- * 70 mph - mobile homes;
- * 100 mph - mobile homes plus structures which are rated low-cost or economy construction;
- * 130 mph - the above structures plus those with construction rated as fair with two or more stories.

([State maps - Figures 22-23](#)) on the following pages locate the residential structures in Ocean City by their susceptibility to these wind categories. [Figures 24-25](#) show the improved property values by location in Ocean City. This is valuable information when planning mitigation and protection measures. [Figures 26-27 depict how Ocean City would be affected by high winds during a Category One and Category Three hurricane. Figure 28 shows the State's risk of wind hazards.](#)

E. Noreasters.

Another natural hazard facing Ocean City is the Noreaster. These are extratropical cyclonic storms that occur during the colder winter months and can be slower moving than hurricanes, thus causing damage over a longer period of time.

Because of Ocean City's shoreline orientation and off-shore bathymetry, few hurricanes have caused coastal damage, while more frequent and serious damage has been caused by Noreasters. The wind speeds, storm sizes, and long durations of these storms tend to generate storm tides and waves [that damage the dunes and beachfront properties over several days of relentless churning](#). Property damage from Noreasters is more likely to be caused by flooding and storm surge than by wind, although wind is a factor. Beach erosion is a serious result of Noreasters. Much of Ocean City's dune system is lost during Noreasters. These storms often form quickly, allowing less time for preparation. However, since they occur during the winter, there are fewer people in town than during hurricane season.

FIGURE 22

HOMES SUSCEPTIBLE TO 100 MPH map

FIGURE 23

HOMES SUSCEPTIBLE TO 130 MPH map

FIGURE 24
IMPROVED PROPERTY VALUE map

FIGURE 25
IMPROVED PROPERTY VALUE map

FIGURE 26
CATEGORY 1 WIND ZONES map

FIGURE 27
CATEGORY 3 WIND ZONES map

FIGURE 28
WIND HAZARD RANKING map

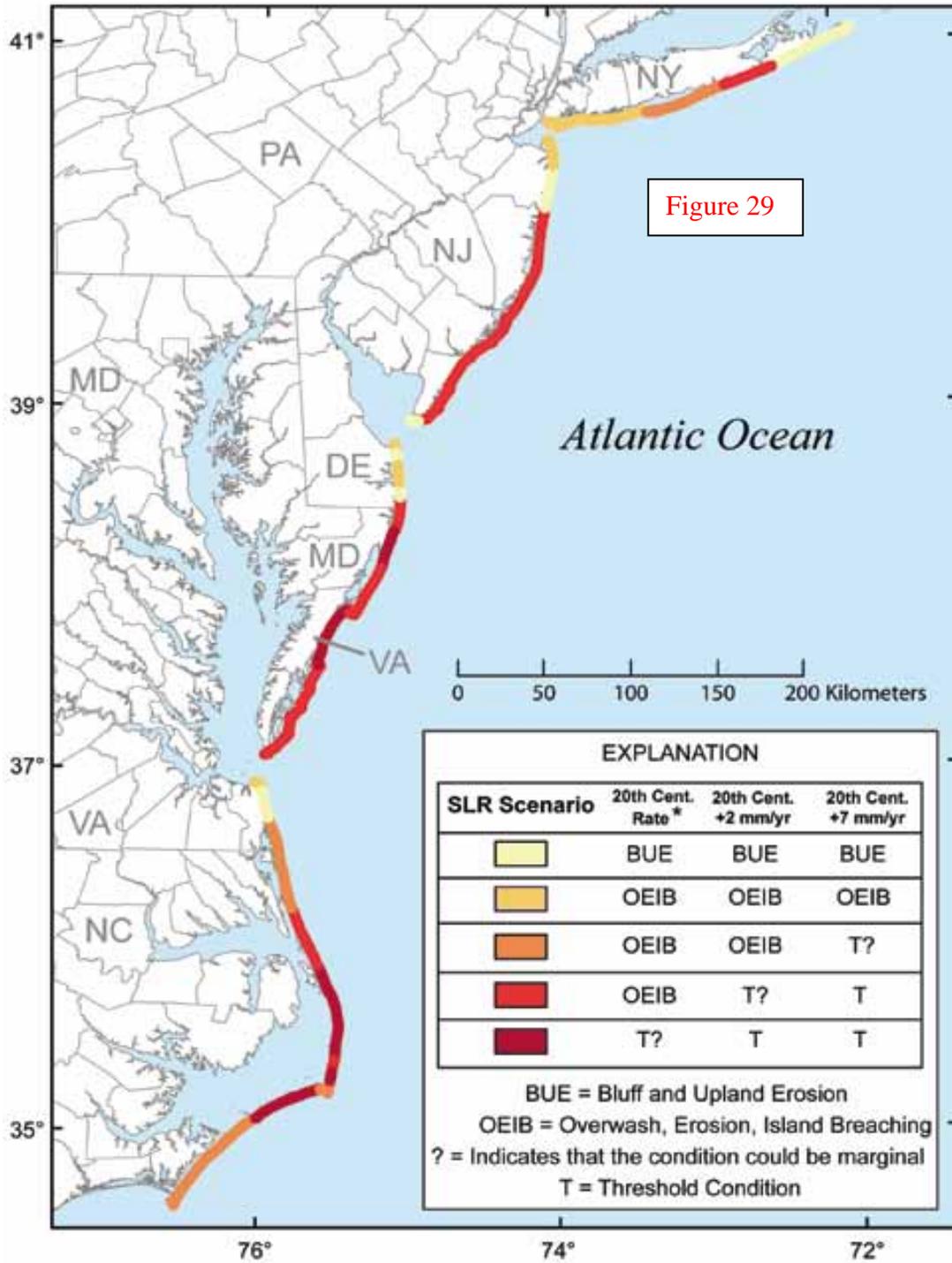
Some of the most devastating storms to affect Ocean City (1962, 1992, 1998) have been Noreasters. The March, 1962 storm generated waves estimated at 10 to 15 feet high, which persisted for several days. Superimposed on abnormally high spring tides, these waves produced tides of +7.8 feet at Ocean City, 1.5 feet higher than the previous record which occurred during the August, 1933 hurricane. The January, 1992 storm created tides of 4 to 6 feet above normal with waves reported as high as 20 feet.

F. Sea Level Rise

The effects of global warming, sea level rise, and land subsidence over the next century will potentially exacerbate the severity of coastal storms and flooding. A report published by the Coastal Zone Management Division of the Maryland Department of Natural Resources, October, 2000, entitled *A Sea Level Rise Response Strategy for the State of Maryland*, notes that sea level has risen approximately one foot in the past century in Maryland, nearly twice the global average. It is expected to rise an average of two or more feet by the year 2100. Effects of this rise will be increased coastal flooding, submerging of coastal wetlands, increased shoreline erosion, and structural damage to unprotected structures. **Measures to decrease future loss from this hazard include raising the level of local streets when major infrastructure improvements are scheduled, improving bulkheads, and constructing buildings at a higher elevation. Figure 29 indicates the potential responses from land as sea levels rise, including erosion and island breaching. To varying degrees over decades, rising sea level will affect entire coastal systems from the ocean shoreline well landward. The physical and ecological changes that occur in the near future will impact people and coastal development.**

With accelerated rise in sea level and increased intensity of storms, the vulnerability of development along the coast and risks to people will increase unless new and innovative coastal zone management and planning approaches are implemented.

Coastal storm surge from hurricanes could become higher and more intense rainfall could raise the potential for flooding from land runoff. It is difficult to relate sea-level rise and shoreline change and to reach agreement on approaches to predict how shorelines will change in response to sea-level rise. An acceleration of sea-level rise may simply increase the cost of current shore protection practices.



Potential Mid-Atlantic Landform Responses to Sea-Level Rise

Source: Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region: Lead Author: James G. Titus

G. Epidemics

A disease epidemic occurs when there are more cases of that disease than normal. An influenza pandemic may occur when a new influenza virus appears against which the human population has no immunity. With the increase in global transport, as well as urbanization and overcrowded conditions in some areas, epidemics due to a new influenza virus are likely to take hold around the world, and become a pandemic faster than before. At this time, epidemics are a high risk to Ocean City.

If an influenza pandemic were to occur today, we could expect the virus to spread rapidly due to the interconnected nature of the world and the high level of global travel.

Effective pandemic preparedness around the world is essential to mitigate the effects of a pandemic, particularly if it becomes severe.

The Worcester County Health Department has prepared a Pandemic Influenza Plan to guide their response to a future Pandemic. The plan was initially implemented during the H1N1 influenza pandemic of 2009. Additionally, an Isolation and Quarantine Plan is in place to control the spread of disease in a highly contagious outbreak or pandemic. The Health Department monitors the rates of illnesses in Worcester County, Maryland to look for increases in reports of specific diseases. The Maryland State Health Department also monitors reports of illnesses in much the same way.

There are plans for receiving and distributing the Strategic National Stockpile which can be deployed in response to an emergency requiring additional medical supplies. A Medical Surge Plan and a Mass Fatality Plan are being completed as part of a county-wide Health and Medical Emergency Preparedness Committee of which Ocean City is represented. Worcester County, Maryland and Ocean City are at risk of experiencing an epidemic due to the high volume of travelers visiting the area.

H. Lesser Hazards

Winter Storms

Several natural hazards affect Ocean City to a lesser degree, including severe winter storms, thunderstorms, and tornadoes (Figure 32). Winter storms can produce an array of hazardous conditions, including heavy snow, blizzard conditions, freezing rain, sleet and ice, and severe cold. While the frequency of major winter storms is not as high in Ocean City as in other parts of Maryland, all of these conditions have been experienced in the area. The heaviest snow accumulations are usually the result of Noreasters. Snow depths are a minimal risk to the Town due to warmer

waters surrounding the town which tend to warm approaching snow storms and cause rain to fall.

Tornadoes

A tornado is a rotating column of air that can touch the ground with winds of over 300 miles per hour. Their impact is relatively short lived, but they are one of nature's most violent storms. Ocean City very rarely has any reports of tornadoes, though tornado watches and warnings are not uncommon. The eastern seaboard is experiencing increased tornadic activity in 2011. Our mitigation approaches center around public awareness and our warning system. To know what a warning means and how to react is the initial goal to educating the public through Ocean City's website and outreach efforts. On September 15, 2011, without warning, a funnel cloud resembling a tornado formed over 75th Street in Ocean City and damaged vehicles, rooftops, and signs.



Figure 30



Figure 31

September 15, 2011

Thunderstorms

Thunderstorms are common in the area, and have occurred in all months; the most severe thunderstorms are experienced in the summer months. Thunderstorms occur often and produce hazardous lightning for beach-goers and occasional hailstones of about marble size. Hailstorms occur more frequently in late spring and early summer.

Lifeguards routinely evacuate the beaches as thunderstorms approach. Several fatalities have occurred when beachgoers were struck by lightning while standing on the beach. Ocean City's annual rainfall averages forty nine inches, which translates to approximately 200,000 gallons per acre or 23,000 gallons on a 5,000 square foot lot. Stormwater pollution has a potentially major impact on the ecology of the coastal bays. This is due to the bays' shallow depths and limited flushing capabilities. Tornadoes are rare and a minimal hazard in Ocean City. Generalized flooding results from rain, winds and tides associated with major storm events. An unconfirmed tornado struck in November, 1995, causing substantial damage in a confined area of town.

Water Spouts

Water spouts are also a possibility as storms spawn them off the coastline, putting anyone in a boat at risk. A spout is a tornado over water with high winds but little to no debris as would happen over land. Sporadic water spouts have been noted within a few miles of the Ocean City

A waterspout, like a tornado, consists of air that's rising into a cloud. Various natural forces that researchers are just learning to understand in detail have given the rising air its spinning motion. As the air rises, more air rushes in to replace it, and begins spinning and rising into the cloud.

Most of the time their winds aren't as fast as those of large tornadoes. Winds of most waterspouts rarely top 50 mph/81 kph. But you can't count on a waterspout being harmless; some have been observed with winds as fast as 200 mph/322 kph.

Waterspouts, in contrast, are attached to cumulus clouds that normally top out at 18,000 or 20,000 feet/5,486 or 6,096 m. Sometimes a waterspout's parent cloud might produce a few lightning bolts, but often there's no lightning. The heat energy of water vapor condensing to form the cloud supplies most of the energy that powers waterspouts. They don't have the energy of high-altitude winds to draw on as strong tornadoes do.

Earthquakes and Soil Movement

An earthquake is the sudden shaking of the ground due to energy released in the earth's crust. Vertical and horizontal ground motions are caused by the seismic waves that radiate from the epicenter of the event. The only notable event within recent history was in August of 2011 when a 5.8 magnitude quake struck from northern Virginia. The quake had dissipated by the time it reached Ocean City. Many people felt buildings move once the seismic energy reached Delmarva. No reports of damage were filed. Buildings built to withstand an earthquake are not part of the normal architecture in

Ocean City. Earthquakes are so rare here that standards addressing quakes do not apply to new buildings on the east coast of Maryland.

Expansive soils are soils that undergo volumetric changes due to gain or loss of moisture. These changes can weaken and crack building foundations, damage highways, streets, and utilities. Ocean City can experience these conditions during the year either during droughts in summer or rainfall during the spring months.

Land subsidence is the lowering of the ground surface due to the loss of subsurface support. It is caused mainly by activities such as underground mining and pumping of subsurface fluids. Ocean City does not normally experience these conditions.

Public Notification

Ocean City has an existing network of sirens placed in strategic locations to allow for clear and audible notification to the public of any impending or existing emergency. (Figure 33). Police and fire personnel also alert the public with automobile-based address systems. There are public access channel alerts on television and reverse 911 calls alert residents.

FIGURE 32

Tornado hazard map

FIGURE 33

Siren Locations map

Man-Made Hazards

Non-weather related hazards affecting Ocean City are numerous and pose particular challenges to protect its population from their effects. The following hazards were identified by the Hazard Mitigation Planning Committee as worthy of mentioning. Terrorism and technological disasters can strike not just in large cities, but in any community of any size. No amount of planning and mitigation can remove 100% of the risk from terrorism or technological emergencies, a thorough hazard identification process will help in prioritizing the community's needs and allocating its resources effectively.

A. Above Ground Storage Tanks

The locations of above ground storage tanks throughout the State of Maryland are contained in the ground fuel tanks. Many of these tanks serve adjacent generators at various commercial establishments and marinas within the town. The location of these tanks has been mapped by the Town of Ocean City's GIS Coordinator, who has supplied data layers to Ocean City Police, Fire, Fire Marshals, and Emergency Services personnel. These storage containers pose a risk in that they could be damaged through accidents or intentionally by human actions.

B. Underground Storage Tanks Dataset

The locations of underground storage tanks throughout the State of Maryland are contained in the shapefile entitled *ust97_83m.shp*. This data was provided in shapefile format by the Maryland Department of the Environment Oil Control Program and is in Maryland Stateplane NAD83 meter coordinates. Ocean City has 45 underground fuel tanks. The location of these tanks has been mapped by the Town of Ocean City's GIS Coordinator, who has supplied data layers to Ocean City Police, Fire, Fire Marshals, and Emergency Services personnel. The map will not be part of this Plan for security reasons. These containers pose much less of a risk as they are protected from above ground threats. Nevertheless, indicating their exact position on a map is deemed unnecessary.

C. Weapons of Mass Destruction/Radiation

Nearly any location is a target for a bomb. Ocean City has many sites where large crowds are encouraged to congregate, such as the boardwalk, the Convention Center, or Jolly Rogers Amusement Park. City Hall is a central point for acquiring permits and licenses. The police station at 65th Street is the hub for security and court hearings. The selection of specific targets depends on the goals of the user of the bomb. With the improved and strengthened security for diplomatic and military facilities, the committee recognizes the shift in terrorist targeting and methodology, to include random attacks on tourists. Fortunately, Ocean City has not been



Calvert Cliffs power plant in Lusby, Maryland is the only operating nuclear power plant in the state

Figure 34

identified as the highest risk for a conventional bomb attack. Nevertheless, safety measures are in place to respond to any perceived threat to any location within the town's borders.

The Fire Marshal's Division of the Ocean City Fire Department has several staff members who are trained in bomb handling and disposal techniques. The Ocean City Police Department also has several individuals who are trained and are instructors in techniques to prevent and deter terrorist acts, as well as other related topics. The officers were respectively trained in these areas. The Police Department also has individuals assigned to both a tri-county intelligence unit and a federal task force to enhance information and intelligence to deter various criminal and terrorist activities.

While we recognize the preferred attack method is still conventional weapons and explosives, we have also considered that in the past few years, the capability for a terrorist to carry a small nuclear device into Ocean City has improved dramatically. Although not a high priority target for lack of any military presence or equipment, there are those who could transport such a device into Ocean City for any number of reasons, including random attacks on highly populated areas.

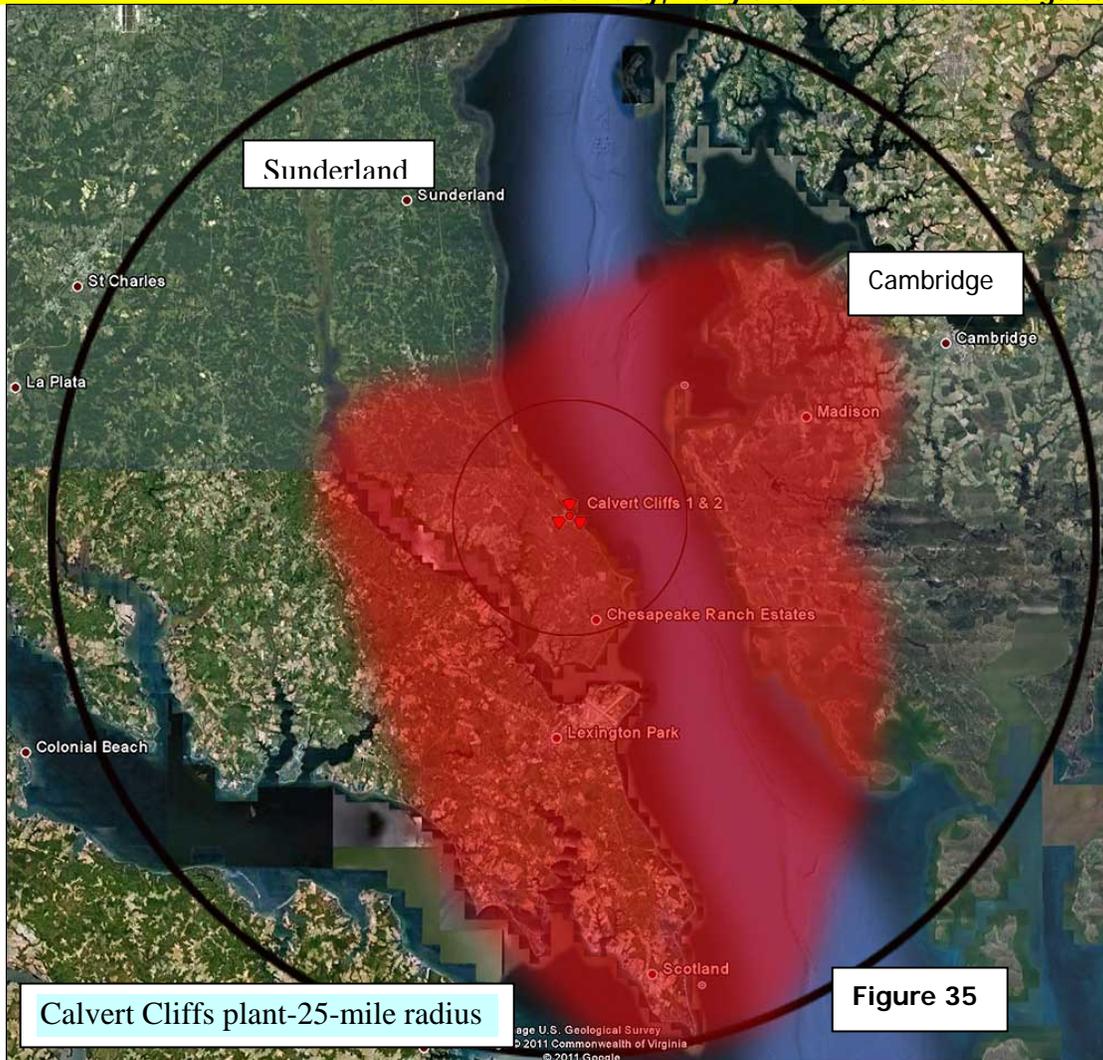
Mass casualties and substantial property destruction would result from the detonation of a nuclear bomb. Long term health hazards would result until the affected area could be decontaminated.

The priority locations for a bomb attack in Maryland are military and federal facilities. Ocean

City has the United States Coast Guard Station near the inlet as its only federal facility. Unfortunately, the distance between the Coast Guard Station and the well-attended attraction of Trimpers Amusements is less than 425 feet, the separation of one parking lot.

Local and state governments, federal agencies, and the electric utilities have emergency response plans in the event of a nuclear power plant incident (Figure 34) The plans define two “emergency planning zones.” One zone covers an area within a 10-mile radius of the plant, where it is possible that people could be harmed by direct radiation exposure. The second zone covers a broader area, usually up to a 50-mile radius from the plant, where radioactive materials could contaminate water supplies, food crops, and livestock.

The potential danger from an accident at a nuclear power plant is exposure to radiation. This exposure could come from the release of radioactive material from the plant into the environment, usually characterized by a plume (cloud-like formation) of radioactive gases and particles. The major hazards to people in the vicinity of the plume are radiation exposure to the body from the cloud and particles deposited on the ground, inhalation of radioactive materials, and ingestion of radioactive materials. At Calvert Cliffs power plant in Lusby, Maryland, officials have designated a 25-mile radius around the plant to be notified of any problems (Figure 35) .In addition to the threat or danger from a nuclear or “dirty bomb” scenario on Ocean City, our community has considered the indirect repercussions of such an attack on the surrounding major metropolitan areas. It is quite possible that residents from those communities own property in Ocean City and would come to this area to escape the outcomes related to that type of attack. While Ocean City’s infrastructure could support an influx of individuals escaping the aftermath, the Town could only support so many. For instance, this type of migration would certainly paralyze our medical community, since Ocean City is primarily serviced by the one hospital in Worcester County, Atlantic General Hospital, which is located in Berlin, Maryland.



D. Intentional Human-Caused Events/Terrorism

The potential for negative events to occur that are human-caused is always present. Predictability increases following certain incidences that may trigger a response from organizations sponsoring terrorism. Outdoor events and activities are unlikely to be targets because of their open air conditions. Ports and marinas might be used as a means to transport radiological agents into an area, they are unlikely to be the specific targets of such an attack. Ocean City Police, Firemen, and Fire Marshals are always on duty and ready to respond to such events. Overall, we can observe the new National Terrorism Advisory System for all current alerts.

Anti-terrorism plans have been arranged through the Ocean City Police Department in

cooperation with other law enforcement agencies. Details of these arrangements are classified.

Ocean City hosts and sponsors a significant number of special events. Staff members from the various City Departments have developed Incident Action Plans for the majority of the events. The IAP contains an analysis for each event, a traffic management plan and a security plan, with the purpose of deterrence, prevention and mitigation of any threatening incidents.

E. Civil Disturbances

The Police Department has also received training regarding civil disturbances and tactics used during protests. Previously, there have been peaceful activist groups in Ocean City to draw attention to local and national ideologies. They use our tourist season, which is heavily populated, to increase the public and media attention for their cause. This type of demonstration taxes public safety resources and hinders the local infrastructure. Fortunately, it only occurs, at the most, once a year.

“Terrorism” refers to the use of Weapons of Mass Destruction (WMD), including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous materials releases; and “cyberterrorism.”

The Ocean City Police Department, the Fire Marshals office, and the Coast Guard are in constant training to respond to any of these types of terrorism; except, cyberterrorism.

Counterterrorism deals with offensively managing the threat of terrorism, while *antiterrorism* refers to defensive efforts to protect people and property.

F. Aircraft Disasters

Aircraft flying over Ocean City are a regular occurrence. Commercial “banner” planes tow large flexible signs behind them along the beachfront. The opportunity for a strong crosswind to push one of these planes from the sky is high. Their base of operations is several miles west of Ocean City on the mainland. Only the company owner’s investment in maintenance of their aircraft helps to lower their chances for accidents.

The United States Coast Guard is located on the southern end of the town and routinely flies a helicopter along the coastline. These highly-skilled operators are the safest aircraft users in the area with zero accidents reported. The Ocean City Municipal Airport is located about a mile from the southern end of Ocean City. Airplane rides are a normal part of the visitor experience which take riders over the town in small private planes. The risk for accidents is higher for these aircraft as increased flights allow for increased accidents, as was the case a few years ago

when one fell into the Atlantic Ocean, killing its two occupants. Local news reporters in helicopters can be seen hovering over Ocean City when a sports event or an unusual accident occurs, such as a bridge closure following an automobile accident.

Each June, an air show takes place involving civilian and military aircraft. The opportunity for an accident involving one or more of these machines is a real possibility due to the number of aircraft in the air at one time and the high speeds involved. Ocean City Emergency Services staff, police and fire staff are all in ready mode prior to each air show to handle any mishap. Commercial flight paths bring commercial airlines over Ocean City as they travel north and south along the United States east coast. One incident or less per year occurs in or around the Ocean City area involving an aircraft.

G. Hazardous Materials/Hazardous Spills or Leaks

Maryland is home to one nuclear power plant, the Calvert Cliffs Nuclear Power Plant (Figure 34) in Calvert County. Another – the Peach Bottom Atomic Power Station – is in southern Pennsylvania, just three miles from the state line. All or parts of the Plume Exposure Zones – a 10 mile radius from the plant – are in Maryland. Additionally, parts of the state are less than 50 miles, or in the Ingestion Pathway Zone, from four other plants: Three Mile Island Nuclear Station and Limerick Generating Station in Pennsylvania, Salem/Hope Creek Generating Stations in New Jersey and North Anna Power Station in Virginia.

The Ocean City sewage treatment plant on 64th Street contains several dangerous chemicals used in the breakdown process. A siren can be activated should any of these chemicals be improperly discharged which would alert anyone within listening distance to take shelter. Chemicals include chlorine, sulphur dioxide, liquid caustic soda, sulfuric acid, sodium hypochlorite (dry & liquid), sodium metabisulfite, hydrated lime, liquid oxygen, liquid polymer and lubricants. A spill would initiate a response that would include clean up and or leak containment by the wastewater and fire department haz-mat teams and evacuations by the police department, if necessary.

Ocean City is also susceptible to hazardous spills off her coastline resulting from ships carrying materials along the Atlantic seaboard. Oceanic tides could easily transport spilled chemicals or lost cargo many miles westward and deposit them on Ocean City's beaches and in her bays and marinas on the incoming tides. If this were to occur, the local wildlife could be impacted, sunbathers and swimmers would be banned from the shores, and the fishing industry would suffer tremendous damage in terms of lost revenue and tourism.

A spill within the wastewater facility would initiate a response plan that includes clean up and or leak containment by the wastewater and fire department haz-mat teams and evacuations by

the police department if necessary. Routine drills serve as exercises to prepare the staff for actual events.

National Terrorism Advisory System

The National Terrorism Advisory System, or NTAS, replaces the color-coded Homeland Security Advisory System (HSAS). This new system will more effectively communicate information about terrorist threats by providing timely, detailed information to the public, government agencies, first responders, airports and other transportation hubs, and the private sector.

It recognizes that Americans all share responsibility for the nation's security, and should always be aware of the heightened risk of terrorist attack in the United States and what they should do.

Each alert provides information to the public about the threat, including, if available, the geographic region, mode of transportation, or critical infrastructure potentially affected by the threat; protective actions being taken by authorities, and steps that individuals and communities can take to protect themselves and their families, and help prevent, mitigate or respond to the threat. Citizens should report suspicious activity to their local law enforcement authorities. The "If You See Something, Say Something™" campaign across the United States encourages all citizens to be vigilant for indicators of potential terrorist activity, and to follow NTAS Alerts for information about threats in specific places or for individuals exhibiting certain types of suspicious activity.

NTAS Alerts will be issued through state, local and tribal partners, the news media and directly to the public via the following channels:

- Via the official DHS NTAS webpage – <http://www.dhs.gov/alerts>
- Via email signup at – <http://www.dhs.gov/alerts>
- Via social media
 - Facebook – <http://facebook.com/NTASAlerts>
 - Twitter – <http://www.twitter.com/NTASAlerts>
- Via data feeds, web widgets and graphics
 - <http://www.dhs.gov/alerts>

The public can also expect to see alerts in places, both public and private, such as transit hubs, airports and government buildings.

CHAPTER FOUR

Vulnerability Analysis, Loss Estimation, Flood Prone Locations

Chapter IV – Vulnerability Analysis, Loss Estimation, Flood Prone Locations

Two methods of identifying the most flood-prone areas in Ocean City are to examine the FIRM published by FEMA and identify the locations of repetitive loss properties. **Periodic changes are made to the repetitive loss properties list as flood insurance policies change, flood losses are reported, and improvements are made to some of the higher-reported loss sites, thereby decreasing their susceptibility to flooding.**

A. Flood Insurance Rate Map (FIRM).

Figure 4, derived from the FIRM, shows the location of the 100 year floodplain (special flood hazard area) in Ocean City. With the exception of two small areas (between 63rd Street and 67th Street, and between 119th Street and 124th Street) which are in flood zone 'B', all of Ocean City is in the 'V', 'A', or 'A0' flood zones, which are the designations for the 100-year floodplain. (These two 'B' zone areas are on the FIRM, even though several years ago FEMA informed the town that they were to be changed to 'A' zones. For the purposes of this plan, the 'B' zones are shown.) Ocean City's Geographic Information System allows for quick access to the latest FEMA flood zones data for any planning purpose. (Figures 36 & 37)

B. Repetitive Loss Properties.

FEMA has developed a system of classifying repetitive loss properties. FEMA defines a repetitive loss property as a property that has experienced two or more flood losses, with claims of \$1,000 or more on each loss, within the past ten years. The losses must have occurred at least ten days apart. Mapping the locations of repetitive loss properties and analyzing the losses can enable communities to identify geographic locations at risk of flooding and, more specifically, assist individual properties to avoid future flood losses. The Maryland Department of the Environment has made an inventory of repetitive loss properties throughout the State. The goals of this project are to:

1. Target and prioritize projects for funding from State and Federal sources.
2. Develop a Hazard Mitigation Plan.
3. Reduce/eliminate loss of human life and property damage.
4. Educate the public.

FIGURE 36
FEMA FLOOD ZONES
SOUTH END MAP

FIGURE 37
FEMA FLOOD ZONES
NORTH END map

5. Save money.

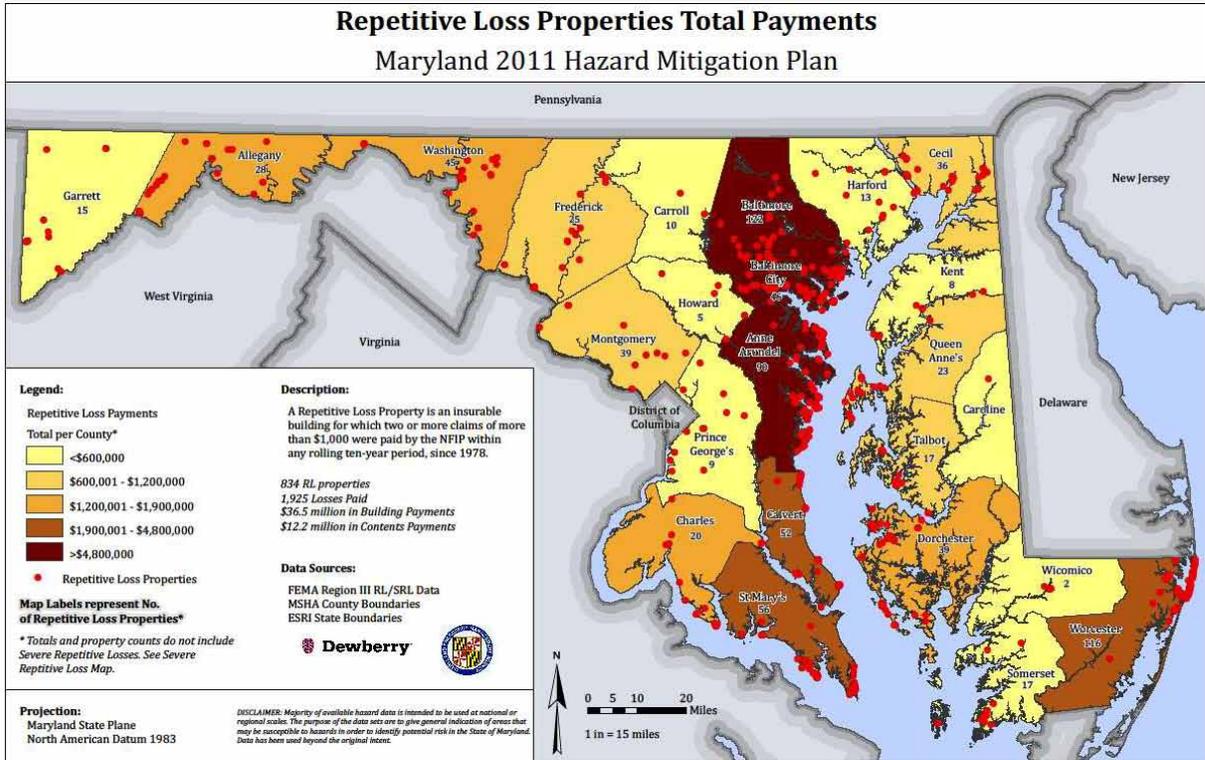


Figure 38

The newly-released State Hazard Mitigation Plan indicates Ocean City’s flood loss payments have been in the range of \$1.9m to \$4.8m (Figure 38). The Maryland Department of the Environment has determined that there are **373?** repetitive loss properties in Maryland, **31** of which are in Ocean City (**_%** of the State total). By comparison, as of May 31, 2001, there are **69,655** flood insurance policies in the State, and **27,460** of them are in Ocean City (49% of the State total). A comparison of Ocean City’s share of policies to the share of repetitive loss properties shows that past and current local mitigation efforts have been relatively effective. Improving mitigation measures to specifically address the repetitive loss properties and their causes of damage will further reduce damage potential. **Much more public outreach is needed to notify these owners that they can lower their chances of another flood loss with some simple steps to elevate their utilities and improve their home’s ability to resist flood waters.** Table 6 identifies the targeted repetitive loss properties in Ocean City, as of June, 2010.

Repetitive Loss Properties in Ocean City, 2010
102 St. Louis Avenue
106 South Philadelphia Avenue
107 Wicomico Street
109 Atlantic Avenue
1105 Atlantic Avenue
111 Wicomico Street
1209 Atlantic Avenue
1211 Atlantic Avenue
1215 Atlantic Avenue
12505 Wight Street
12507 Wight Street
1510 Baltimore Avenue
1913 Atlantic Avenue, Bdg. B
201 Philadelphia Avenue
205 Somerset Street, Bdg. B
209 Dorchester Street
210 Worcester Street
2100 Baltimore Avenue
211 Caroline Street
218 Somerset Street
3 St. Louis Avenue
304 South Philadelphia Avenue
306 Dorchester Street
309 Atlantic Avenue
3701 Coastal Highway
604 South Pacific Avenue
6901 Atlantic Avenue
7204 Coastal Highway
7601 Atlantic Avenue
7721 Atlantic Avenue
8005 Atlantic Avenue

TABLE 6

C. Critical Facilities.

Critical facilities deserve special attention as flood-prone areas (see Figure 39). Overall, Worcester County, Maryland ranks fourth in the state, among counties, with their total critical facility value standing at \$891,466,997, according to the newly-released 2011 Maryland State Hazard Mitigation Plan Update. FEMA defines “critical facilities” as including:

1. Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic and/or water-reactive materials.
 - In Ocean City there are many LP gas tanks - private ones from 4 to 1,000 gallons and commercial tanks up to 33,000 gallons. There are **underground fuel tanks at the Town’s service center at 65th Street, at the private gasoline stations, and near large hotels with their own generators. Marinas also have fuel facilities. While not located within the Town limits, the Ocean City Airport has fueling facilities**

2. Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a flood.
 - There are no such facilities in Ocean City. **The Town’s Transportation Department maintains a list of residents who are registered under the American Disabilities Act (ADA) for needing specialized transportation services. The Paratransit service offers origin to destination on ADA compliant vehicles and drivers will assist with boarding or alighting. Ocean City Transportation does not offer any type of medical transport. This list is available for use during hazard situations.**

3. Police stations, fire stations, **employee and public transportation services**, vehicle and equipment storage facilities, and emergency operations centers that are needed for flood response activities before, during, and after a flood.
 - All Ocean City public facilities (including water plants, wells, wastewater treatment plant, the Public Safety Building, the Public Works Complex, City Hall, the Northside Park building, and the Roland E. Powell Convention Center) are considered critical facilities.
 - **Ocean City has volunteer fire fighters, career fire fighters, and fire marshal staff who provide high quality fire and rescue protection, medical care, fire prevention, and fire safety education. These town employees are constantly training to be prepared for any situation. Many are not the first generation to**

serve from their families.

- The Ocean City Police Department is well staffed and equipped to respond to any incident and serves to protect the town's residents and visitors at any time. Crime units are specially trained to detect most dangers posed to anyone within the town. Additional staff are hired in the busiest season from May to August to augment the year-round force. A town grants coordinator assists them with acquiring modern equipment through grant awards.
- The Ocean City Beach Patrol is an extremely dedicated group of life-saving staff who are tasked with preventing careless activities on the beaches and rescuing those who find themselves in harm's way. Extensive training and screening assures that these individuals are capable of performing difficult rescues in a moment's notice.
- Ocean City Transportation operates a public transit system year round. Connections to Shore Transit, Greyhound, and DART can be made through our system. DART connects at our north end transit center and operates a seasonal route along Route 1 servicing the beaches. Shore Transit and Greyound connections are made at our Park & Ride in West Ocean City during the months of May through September. In October through April (off-season) Shore Transit riders connect at our south end transit center Shore Transit services Worcester, Somerset, and Wicomico Counties. All transit vehicles are ADA compliant and drivers are trained to assist passengers. Transportation employees attend an annual in-service classroom training session for Crime and Counter Terrorism Prevention, Customer Relations and Passenger Assistance, Wheel Chair Lift Operations and Securement, Title VI, ADA, Human Resource Materials, Substance Abuse, and many other topics.
- The Emergency Services staff seek better ways through technology to increase safety awareness. To improve communication the Town of Ocean City has installed an AM emergency advisory radio station. The frequency of the station is 1670 KHz on the AM dial.

The primary use of this station is to inform the public of emergency conditions in the area and how to respond to them.

FIGURE 39
CRITICAL FACILITIES map

4. Public and private utility facilities that are vital to maintaining or restoring normal services to flooded areas before, during, and after a flood.

In addition to the public facilities identified above, utilities such as Connective electric, Comcast cable television, Eastern Shore Gas, telephone and other communications facilities are critical in emergency situations.

- Transportation continues to be one of the issues concerning evacuations.

With only two bridges in and out of the town and an option to travel through lower Delaware to exit the town, there is a reliance on public transportation to move the masses around Ocean City. There is a transportation system in place that can transport thousands of riders each day to various points within town. These buses will be used to evacuate the population in an impending crisis. A plan is in place to evacuate foreign students to Salisbury to connect with the Maryland Transit Administration (MTA) if so ordered. Following this phase, buses would be able to move residents and visitors west of town to sites deemed safe.

- A tram system exists along the boardwalk which carries passengers north and south to pre-designated stopping points on the eastern side of the town. A small fee is charged to riders on a daily basis. A highly-regulated taxi cab network is available to take riders around town or as far away from town as needed. A medallion program is in use to regulate the number of taxi cabs in service. The local government administers the medallion program.

It is important to protect critical facilities from damage, because when such facilities are damaged, they may not be operable during an emergency, and they may contribute to pollution of flood waters through the release of hazardous materials. The facilities include a convention center, City Hall, fire stations, water plants, storage tanks, pumping stations, a public safety building, a public works complex, and off-island facilities at the airport, the golf course, and a property on Keyser Point Road. These structures have experienced mostly wind damage through the years.

D. Damage-prone Buildings

Since nearly all of Ocean City is located in the special flood hazard area (FIRM zones 'A' and 'V'-see Figures 27-28), virtually all buildings are prone to damage from the hazards described above. An approximate number of buildings, derived from water meter records, is listed below. Pre-FIRM refers to structures built before the Town 's entry into the NFIP (June 8,

1971); Post-FIRM refers to structures built after that date. This distinction is made to estimate the number of buildings that may or may not be subject to flood damage, assuming that some, if not all, Pre-FIRM buildings may not have been constructed to the standards now required by FEMA and more recent building and zoning codes.

Total number of buildings	7,000
Pre-FIRM	1,700
Post-FIRM	5,300
Residential	6,100
Commercial	900

Also of interest is the number of properties in Ocean City. This is different, and probably more pertinent, than the number of buildings, because there are often many properties in a building, as in the case of condominiums. For flood insurance purposes, in addition to buildings that may be insured, properties within buildings may also be insured. These counts are presented below.

Total Properties	27,220
Residential Uses	25,632
Commercial Uses	1,340
Pre-FIRM	4,957
Post-FIRM	22,263

Because of the large number of multiple family buildings in Ocean City, there are many more housing units than there are buildings. According to the 2010 Census, Ocean City's housing stock has the following characteristics:

Total housing units	28,085	ALARM !
Occupied units	3,750 (14.2%)	
Vacant units	22,567 (85.8%)	verifying with MDP
Vacant, seasonal use	14,287 (54.3%)	

Obviously, the large number of vacant units reflects on the time of year that the Census is taken (March). It does indicate the disparity between Ocean City's permanent, year-round population (7,102) and the peak seasonal population (300,000+).

Figures 20-21 presented earlier illustrate the locations of damage prone properties based on their wind resistant characteristics. All properties in the floodplain are susceptible to flood damage.

E. Natural areas providing beneficial functions.

Certain natural areas provide hazard protection functions. *The Comprehensive Plan for Ocean City, Maryland (2006)* discusses several of these areas and contains goals and objectives for their protection. The overall goal of Chapter 7 - Sensitive Areas and the Environment, is ATo protect the quality of the air, water, and land from the adverse effects of development and growth and, where feasible, to enhance the quality of the natural environment and sensitive areas@.

1. The Beach - The first line of defense against flood damage from the ocean during storms is the beach system, including dunes. An objective of the Comprehensive Plan states that the beach system should continue to be preserved and enhanced through the Beach Replenishment Program. The plan also recommends that the Beach Replenishment Project should be maintained to provide storm protection and recreational uses, and that no construction or structures should be permitted on the reestablished primary dune and beach. **A summary of replenishment projects was mentioned in a previous chapter.**
2. Wetlands - Wetlands serve many important natural functions. An objective of the Comprehensive Plan states that wetlands should be protected and preserved due to their value as spawning areas and their benefits to water quality, shoreline stabilization, and wildlife habitat. Wetlands also provide a measure of flood protection by serving as a storage area for rising water on the bayside of the island.
3. Habitat for Fish and Wildlife - Creating and maintaining habitat provides areas for fish and wildlife to thrive, and also provides open space for flood protection. The Comprehensive Plan encourages landscaping for wildlife, habitat enrichment programs such as planting submerged aquatic vegetation, and taking appropriate measures to protect rare, threatened and endangered species.

CHAPTER FIVE

MITIGATION STRATEGY

Chapter V – Mitigation Strategy

The AUnified National Program for Floodplain Management@ (FEMA Publication 248, 1994) identifies strategies and tools to prevent or reduce losses due to flooding. These are summarized in **Table 7**. Ocean City should employ these tools as applicable to mitigate flood damage.

Mitigation Tools and Techniques

Many activities are available to the public and private sectors to mitigate the potential damage from natural hazards. The Town of Ocean City has already undertaken many of them, but there is plenty of room for improvement. This section of the plan will generally describe the possible activities and specifically discuss those currently being practiced or proposed for Ocean City. Later in the plan, site specific recommendations will be offered for repetitive loss properties.

The information presented in **Table 8** was developed by FEMA and its Community Rating System. It lists and categorizes floodplain management activities that can be used as flood mitigation tools.

A. Preventive activities avoid flooding and other impacts of hazards or lessen their impacts. These activities usually take the form of the planning and implementation of development regulations. Examples include land use planning, zoning, subdivision regulations, building code regulations, floodplain regulations, open space preservation, stormwater management, dune and beach maintenance, and drainage system maintenance.

Ocean City uses most of the available development regulations. *The Comprehensive Plan for Ocean City - 2006* is the framework for all land development. It contains the goals, objectives, policies and recommendations which guide the growth and development of the town. It is comprehensive in that it considers all physical, social, economic, and natural factors influencing, or influenced by, development. This is crucial to adequately planning for hazard mitigation.

In addition to the normal regulatory practices (planning and zoning, building code enforcement, floodplain regulations, etc.), Ocean City=s codes contain some techniques and standards that provide additional protection, including:

1. Elevation requirements - Ocean City requires most buildings to be elevated in excess of the minimum requirements of FEMA. Oceanfront buildings in the V zone are required to be elevated a minimum of 16.5 feet above mean sea level. Most other structures in the flood hazard zones are required to be elevated two or three feet above the base flood elevation as determined by the FIRM. (The exception is

the downtown area south of 3rd Street, where structures are not required to be elevated above the BFE). This exception recognizes the pedestrian-oriented nature of this area, where a requirement to elevate two feet above the BFE would create redevelopment problems and great difficulty providing handicap access. In addition to reducing susceptibility to flood damage, these elevation requirements attempt to recognize the potential of sea level rise. The elevated structures should remain above future sea levels. The Town of Ocean City is discussing an appropriate response to sea level rise relating to public infrastructures such as sidewalks, streets, and utilities.

2. Foundation requirements - Ocean City requires more substantial foundations for buildings in the more flood prone locations. Structures east of Baltimore Avenue, Philadelphia Avenue, and Coastal Highway are required to be supported by a foundation of pilings, reinforced concrete piers or monolithic concrete foundations. Foundations on oceanfront properties must extend a minimum of 8.5 feet below sea level.
3. Oceanfront building limit line - Ocean City and the State of Maryland have imposed a building setback line from the beach, and prohibit construction east of that line. **This requirement helps Ocean City meet its objective of “Utilizing development standards for the location and construction of structures to minimize the impacts of flooding and to mitigate major flood hazards” in Chapter Seven of the 2006 Comprehensive Plan.**
4. Ocean City uses the **2009** International Building Code and the **2009** International Residential Code, **including requiring the sprinkling of single family homes**, to mandate the building construction standards that provides for structural integrity capable of resisting the effects of winds from Noreasters and hurricanes. **The International Construction Code, 2008, is also used for the Standards for Residential Construction in High Wind Areas.** There are chapters discussing methods of construction standards to resist wind loads. Performance requirements for roof materials are sufficient to withstand specific wind speeds. Similar sections of the codes address rain, flood, and earthquake loads, as well as seismic activity.

Open space is preserved through an extensive system of parks, and also through enforcement of the building limit line, which preserves the beach and dunes from development, thus preserving their storm protection capabilities. As discussed later, the beach and dune system is continually maintained to preserve its storm protection capabilities.

Ocean City has adopted new stormwater management regulations that are consistent with the requirements of the State of Maryland. These regulations make considerable use of alternative,

environmentally sensitive best management practices.

B. Property protection activities are usually undertaken by property owners on an individual basis. These activities include relocation, acquisition, building elevation, flood proofing, and insurance (including flood insurance). The Town currently provides technical assistance to property owners who are interested in pursuing such improvements. One of the intended results of this Hazard Mitigation Plan is to expedite such improvements. The Town will become more proactive in pursuing these protection activities, especially with owners of repetitive loss properties.

The Town, through its comprehensive Risk Management program, continually searches for and implements measures to protect public property and infrastructure. All new structures are built to the highest standards to withstand our most common threats, wind and flooding. Recent renovations to City Hall have decreased flood damage potential to the structure and equipment. The Public safety Building, which serves as the Emergency Operations Center, was built to withstand Category 4 hurricane force winds and flooding. The recent expansion of the bayfront Convention Center also recognized the importance of protecting this important economic asset from damage through construction techniques and building elevation.

As mentioned above, the Town is beginning to address the threat of sea level rise to public facilities and infrastructure. Public and private construction projects are required to be elevated above the base flood elevation, which will protect them from rising sea levels for the next few decades. There is a threat to sidewalks, streets and other infrastructure that will be more difficult to solve. A policy has been drafted by the City Council that should increase the elevation of streets whenever possible during periods of local improvements.

C. Natural resource protection activities protect and restore natural areas or the natural functions of floodplain and watershed areas. These activities include protection of wetlands, sediment and erosion control, protection of wildlife habitat, stormwater management, and forest conservation. The Town is actively involved in all of these activities.

Ocean City is also an active partner in the Maryland Coastal Bays Program, which is a National Estuary Program whose purpose is to improve and protect the environmentally sensitive coastal bays. Many of the activities in the *Comprehensive Conservation and Management Plan for Maryland's Coastal Bays* (CCMP) address flood protection and emergency management, specifically:

Challenge FW 3.1 - Conservation of wetland resources. Solution - ATo protect existing and new wetlands and increase the amount of wetlands by 10,000 acres in order to improve

water quality, replace lost function of wetlands, and improve habitat for living resources@.

D. Emergency services activities take place before, during and after a hazard situation to minimize its impact and protect life and property. Ocean City has an adopted *Emergency Operations Plan* which sets forth policies and procedures for such situations. Activities included in the *E.O.P* include warning, response, evacuation, damage assessment, communications, and identification of emergency shelters. The CCMP also promotes emergency planning:

Challenge CE 2.3 - Enhance natural disaster planning. Attention to public safety during short and long-term planning and land use decision making will minimize the impacts of natural and man made hazards. Consideration of emergency response times, evacuation and property protection measures, Federal Emergency Management Agency (FEMA) requirements, and the need for comprehensive disaster and hazard mitigation plans can reduce long-term financial costs for local governments and the community as a whole. Furthermore, adequate planning and incorporation of proper safety measures can minimize the negative impacts of disasters when they occur.

E. Structural projects keep hazards away from an area. The most important protective structure in Ocean City is the beach and dune system. Over the years, a variety of beach stabilization efforts have been attempted in Ocean City to combat erosion. In 1985, several alternatives were studied and it was decided that the most potentially successful and cost effective solution would be a combination beach replenishment and seawall construction project. The sea wall has performed amazingly well through several large coastal storms. Beach sand replenishment is performed on a four-year cycle by the Army Corps of Engineers.

In 1992, the Atlantic Coast of Maryland Shoreline Protection Project was completed at a total cost of \$45,000,000, which was shared by the federal government, the State of Maryland, Worcester County and the Town of Ocean City. The project consisted of a steel sheetpile seawall in front of the boardwalk from 4th Street to 27th Street; the construction of a wider (220 feet) beach; and the establishment of a protective dune which is 25 feet wide at its crest and 85 feet wide at its base, and vegetated with 65 acres of dune grass. It was designed to prevent damage associated with waves and erosion resulting from a 100-year storm event. **Volunteers regularly replant dune grasses to assure that sufficient cover holds sand in its place. Sand fencing is also maintained by the town for the same reason.**

In the two months immediately following the completion of the project, four powerful storms

hit the Ocean City area. The project proved its value by absorbing the ocean=s impact and protecting buildings and the boardwalk. The U, S. Army Corps of Engineers estimated the project prevented up to \$256,600,000 in damages in the two month period, more than justifying its cost.

A maintenance fund has been established which pays for periodic renourishment and repairs to the beach dune and seawall. Each year a total of \$2 million dollars is placed in this account by the Town of Ocean City, Worcester County and the State of Maryland. The account currently has a balance in excess of \$13 million.

The average yearly cost of maintenance is \$266,564; a total of \$4.4 million has been spent in maintenance.

Four major renourishment projects have been completed in 1998 (\$8,866,361), 2002 (4,998,219), 2006 (\$7,120,660), and 2010 (\$8,680,992).

F. Public information activities advise residents, property owners and visitors about the natural hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of the natural environment. Ocean City uses a number of these activities including outreach projects, technical assistance to property owners, disseminating map information, and public education efforts. The Town publishes a newsletter twice a year that is mailed to all property owners and registered voters. Each issue contains at least one and usually two articles discussing flood hazards, property protection, and hurricane safety measures. This information is also posted on the Town=s web site (www.town.ocean-city.md.us).

G. Participation in the National Flood Insurance Program (NFIP) - The Town entered the NFIP on June 8, 1971, and since then has enforced flood protection regulations developed by FEMA. The Town also participates in the Community Rating System, which encourages and recognizes local efforts to address flood hazard management. The Town=s class 7 classification results in a 15% reduction in flood insurance premiums for local property owners.

Table 9, from the *Maryland Hazard Mitigation Manual*, presents a more extensive array of mitigation tools available to localities which address several hazards in addition to flooding. The Town is committed to using appropriate tools to address the comprehensive list of hazards.

CHAPTER SIX

ACTION PLAN

Chapter VI – Action Plan

A. Repetitive Loss Properties.

As discussed previously, the Maryland Department of the Environment conducted an analysis of the repetitive loss properties in the Town of Ocean City. According to FEMA,

AA property is considered a repetitive loss property when there are two or more losses reported which were paid \$1,000 or more on each loss. The two losses must be within 10 years of each other and be at least 10 days apart.@

These are the properties in most need of some type of flood protection measures to prevent further flood damage. There are 373 repetitive loss properties in the State of Maryland, 28 of which (7%) are in Ocean City. By comparison, as of May 31, 2001, there are 49,911 flood insurance policies in the State, and 24,540 of them are in Ocean City (49% of the State total). A comparison of Ocean City=s share of policies to the share of repetitive loss properties shows that the past and current local mitigation efforts described in this plan have been quite effective. Improving mitigation measures to specifically address the repetitive loss properties and their causes of damage will further reduce damage potential.

Table 6 lists repetitive loss information for the **28 properties** in Ocean City.

The repetitive loss properties are divided into four categories based on their flood zone, their dollar amount of losses, and their current compliance with flood regulations. Within each category the properties are ranked as low, medium or high priority for mitigation measures needed. The categories are:

Category 1 includes six properties which are in the V7 flood zone, all of which are classified as high priority for mitigation.

Category 2 includes nine properties in the A6 flood zone with losses greater than \$15,000; four are rated high priority and five are rated medium.

Category 3 includes six properties in the AO (depth 1 ft.) zone that are adjacent to the Boardwalk. Three properties are rated high priority, two are medium, and one is low.

Category 4 includes seven properties in the A6 zone with losses less than \$15,000; one has a high priority, two are rated medium, and four are rated low.

The Chief Building Official and his staff, **together with the planning staff**, will be responsible

for assisting these properties with their mitigation efforts, including providing technical assistance and coordinating funding sources.

B. Other Activities

The mitigation activities proposed for the specific repetitive loss properties will be employed elsewhere as needed. In addition, several other efforts must be addressed.

1. Beach and dune system. The beach and dune system will continue to be maintained and enhanced as needed to provide the first line of defense against storm damage from the ocean. This effort is the responsibility of the town, the State of Maryland (Department of Natural Resources), and the federal government (Corps of Engineers).
2. Stormwater management. The town has adopted and is enforcing the 2007 Maryland Stormwater Design Regulations. Effective stormwater management is essential to reducing urban and coastal flooding. Code amendments to increase permeable surfaces, for example by using more permeable paving materials, are needed. This effort is primarily the responsibility of the Ocean City Engineering Department.
3. Underground utilities. The town and local utilities have relocated overhead utility lines underground when street reconstruction and development projects have presented the opportunity. The Mayor and City Council have adopted a policy which provides guidelines for future undergrounding projects. Since underground utilities are less susceptible to damage in storm and flood situations, this practice should continue. Funding assistance is necessary for this project to be successful. The Ocean City Public Works Director is primarily responsible for this effort.
4. Maryland Coastal Bays Program. This multi-jurisdictional effort has produced *The Comprehensive Conservation and Management Plan for Maryland's Coastal Bays*, which is a study of the condition of the bays and an action plan to restore and improve them. Several of the actions identified in the CCMP, as described above, are related to hazard mitigation and response. The Town of Ocean City, Worcester County, the State of Maryland, and the U.S. Environmental Protection Agency are responsible for the preparation and implementation of the CCMP. The Ocean City Director of Planning and Community Development is primarily responsible for coordinating the Town's efforts. Other staff with responsibilities include the City Engineer and his staff and the Director of Emergency Management.
4. Emergency operations. The existing *Emergency Operations Plan* will be updated on a regular basis, especially as technology allows better hazard response

capabilities and evacuation planning. Special attention should be given to terrorist

threats. The Ocean City Director of Emergency **Services** has primary responsibility for this task.

6. Post-disaster planning. The next component of emergency planning that Ocean City needs to undertake is to develop a post-disaster plan that addresses recovery efforts, both public and private. This plan should include procedures for reconstruction of damaged or destroyed structures, including permitting processes and code compliance issues. **Following the in the wake of Hurricane Irene (August, 2011), a report will be completed describing how the town prepared for and responded to the two-day storm. Aside from some minor flooding and siding loss, Ocean City was spared most of the expected damages predicted from this Category One hurricane.**

It should also address public sector recovery. The Director of Planning **and the City Planner** will assume primary responsibility for this effort, with input from the Director of Emergency **Services**, Director of Public Works, and the City Engineer, the Zoning Administrator and the Chief Building Official.

CHAPTER SEVEN

EVALUATION

Chapter VII. Evaluation and Revision Process

This Hazard Mitigation Plan should be considered a work in progress. The activities identified above should begin to be implemented immediately, as funds and staff time allows. The Town should also be aware of opportunities that may arise due to funding changes, federal, state or local initiatives, or even as a result of storm events.

The Hazard Mitigation Planning Committee is comprised of the following Town of Ocean City officials and departments:

- Director of Planning and Community Development
- City Manager
- Director of Emergency Management & **Emergency Planner**
- Director of Public Works
- City Engineer
- Chief Building Official
- Zoning Administrator
- Fire Marshal
- Police Department
- City Planner

This committee was responsible for the preparation of this plan, and will meet quarterly to review progress and propose amendments to the plan when appropriate. A progress report will be submitted to the Mayor and City Council by September 1 of each year.

As a Category C repetitive loss community (more than 10 repetitive loss properties), the Town will also submit the progress report with the annual CRS recertification.

REFERENCES

Federal Emergency Management Agency, National Flood Insurance Program, Community Rating System, *CRS Coordinator's Manual*, 2007.

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IEP, Inc. and L.R. Johnston Associates, *Reducing the Flood Damage Potential in Ocean City, Maryland*, prepared for Maryland Department of Natural Resources, April, 1984.

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Maryland Coastal Bays Program, *Today's Treasures for Tomorrow: Towards a Brighter Future. The Comprehensive Conservation and Management Plan for Maryland's Coastal Bays*.

Maryland Department of the Environment and Maryland Emergency Management Agency, *Maryland Hazard Mitigation Manual*.

New Jersey Department of Environmental Protection, *Coastal Storm Hazard Mitigation*, 1985.

Titus, James G., U.S. Environmental Protection Agency, *Potential Impacts of Sea Level Rise on the Beach at Ocean City, Maryland*, October, 1985.

Town of Ocean City, Maryland, *The Comprehensive Plan for Ocean City, Maryland*, 1997, 2006.

Town of Ocean City, Maryland, *Comprehensive Annual Financial Report for the Year Ended June 30, 2010*, prepared by Ocean City Finance Department, 2010.

Town of Ocean City, Maryland, *Emergency Operations Plan*, June, 1993.

[History of Maryland Weather including Chesapeake Bay by James Dawson](#)

APPENDIX A

Public Hearing Comments

Public Hearing Comments
Planning and Zoning Commission Public Hearing
Tuesday, September 20, 2011 7:00 P.M.

Present: Planning and Zoning Commission & ___ public

Comments:

A)

B)

C)

Public Hearing Comments
Mayor and City Council, Public Hearing
Monday, December __, 2011 6:00 P.M.

Present: The Mayor of Ocean City, Maryland and City Council members &
__ public

Comments:

A)

B)

C)

APPENDIX B

Hazard Mitigation Planning Committee Minutes