Frederick County Hazard Mitigation Plan

2010

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CHAPTER 1- INTRODUCTION

Introduction and Purpose

The *Frederick County Hazard Mitigation Plan* has been developed for Frederick County and its municipalities. Frederick County has twelve municipalities: Brunswick, Burkittsville, Emmitsburg, Frederick, Middletown, Mt. Airy, Myersville, New Market, Rosemont, Thurmont, Walkersville, and Woodsboro (Figure 1-1). The purpose of this plan is to assess the communities' vulnerabilities to natural hazards and prepare a long-term strategy to address these hazards and prevent future damage and loss of life. The plan relies upon active participation from county and municipality officials or residents in these communities. The first plan was developed in 2004 and approved in 2005, with this update occurring in 2009.

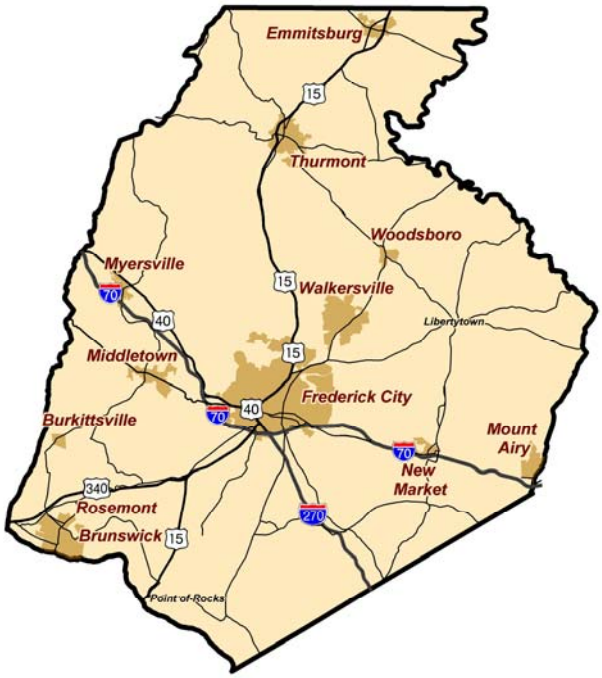


Figure 1.1: Frederick County and its Municipalities

Location

Frederick County is bound by Pennsylvania to the north, Carroll County to the east, Montgomery County to the south, Howard County to the southeast, Washington County to the west, and Virginia to the southwest. The City of Frederick is the county seat.

County Profile

Background

Frederick County is Maryland's largest county. The City of Frederick, the county seat, is intersected by five interstate and national highways that provide easy access to Baltimore (46 miles), Washington, DC (43 miles), Gettysburg, PA (32 miles), Harpers Ferry, WV (21 miles), and Leesburg, VA (25 miles). The county is home to the 5,700-acre Catoctin National Park, site of the Camp David Presidential Retreat; Fort Detrick; Mount Saint Mary's University; Hood College; the Emergency Management Institute (EMI); and the National Fire Academy (NFA).

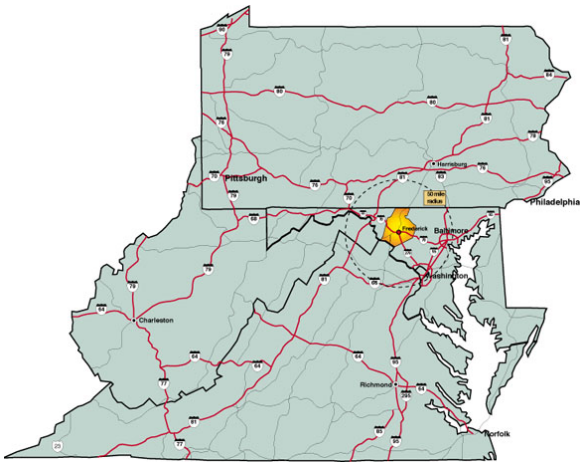


Figure 1.2: Frederick County

Population

Frederick County encompasses a total of 664.8 square miles and contains approximately 294.6 persons per square mile. Based on 2008 data from Frederick County's Planning Division, the estimated population in 2008 was 232,706, a 102.72 percent increase since 1980. Table 1.1 indicates the recent and projected change in Frederick County population from 2000 to 2030.

Table 1.1 Population Change in Frederick County

Year	Household	Population	Employment
2000	70,060	195,277	100,679
2005	79,493	220,876	122,162
2010	87,708	243,220	142,412
2015	95,923	265,566	151,456
2020	104,139	287,913	158,278
2025	111,181	307,067	163,464
2030	118,224	326,224	167,257

Table 1.2 shows the 2009 population estimates for the Frederick County municipalities, planning regions, and other small areas. The county's estimated population for 2009 was 233,439.

Table 1.2 2009 Population Estimates

Planning Regions		Municipalities		Other Small Areas	
Adamstown	10,828	Brunswick	6,052	Adamstown	2,004
Brunswick	16,153	Burkittsville	204	Ballenger Creek	16,855
Frederick	91,028	Emmitsburg	2,852	Braddock Heights	5,044
Middletown	20,987	Frederick City	61,960	Buckeystown	694
New Market	34,160	Middletown	4,198	Clover Hill	3,276
Thurmont	19,802	Mt. Airy	3,814	Discovery-Spring Garden	2,150
Urbana	19,084	Myersville	1,539	Green Valley	13,315
Walkersville	21,397	New Market	609	Jefferson	2,215
		Rosemont	313	Libertytown	1,141
		Thurmont	6,437	Linganore-Bartonsville	16,374
		Woodsboro	961	Point of Rocks	1,433
		Walkersville	5,855	Urbana	6,478

Housing

According to the US Census, the total number of households in the county in 2000 was 70,060, and the total housing units in 2006 was 84,960. Of these total housing units, approximately 76 percent were owner-occupied. The median value of these owner-occupied housing units in 2007 was $329,900. The rapid growth of Frederick County is expected to continue until at least 2020. To keep pace with this growth, annual housing construction also has risen steadily over the past few decades.

Economy

Frederick County has estimated that 89 of its nearly 5,000 businesses employ 100 or more workers. Manufacturing accounts for ten percent of total employment. The county's largest employers include Fort Detrick, the Frederick County Board of Education, Frederick Memorial Healthcare System, the Frederick County Government, Bechtel National, and SAIC.

Frederick County is also Maryland's largest dairy producer, providing one-third of the state's milk production.

Frederick County is growing increasingly attractive as a location for businesses. New development ranges from a regional headquarters for State Farm Insurance to two of the largest warehouse/industrial buildings in Maryland for Georgia Pacific and Toys "R" Us, according to *Warfield's Daily Record.* The county has experienced a significant increase in high-tech companies, allowing more residents the opportunity to work near where they live.

Transportation

The highway network in Frederick County can be best described in the following categories:

- Freeway: includes I-70, I-270, US Route 15 inside the City of Frederick, and US Route 340;
- Four-lane Rural Highway: US Route 15 north of the City of Frederick; and
- Two-lane Rural Highway: includes the state secondary highways (i.e., MD 75, MD 355, etc.), Route 15 South of 340 split, as well as county roads.

The Frederick Municipal Airport, a city owned and operated facility, is an integral component of the county's overall transportation system. The Federal Aviation Administration (FAA) has designated the Frederick Municipal Airport as a "reliever airport," which is a general aviation facility designed to reduce congestion at airports that have substantial scheduled commercial passenger service (in this case, Dulles International, Ronald Reagan Washington National, and Baltimore Washington International. The Frederick Municipal Airport is the state's busiest general airport with almost 200,000 annual operations. The airport ranks third in the state in terms of the number of aircraft based there with an estimated 263 based in Frederick. (Source: *1998 Frederick County Comprehensive Plan*).

Rail transportation includes CSX Transportation and Maryland Midland (short line service). In terms of mass transit, MARC (commuter rail) and Amtrak provide service to Washington, DC. The four MARC stations in Frederick County are Brunswick and Point of Rocks (on the Brunswick Line) and Monocacy and Frederick City (on the Frederick Line). Although there are no Amtrak stations in the county, Amtrak passes through the county on the line from Washington, DC, to Harpers Ferry, WV. Public bus transportation is available throughout the City of Frederick, connecting to other municipalities and multiple jurisdictions within the National Capital Region. The nearest major water port to the county is the Port of Baltimore.

Utilities

Electricity is provided by the Allegheny Power System and Thurmont Municipal Light Company. Natural gas is supplied by Frederick Gas Company, a division of Washington Gas. Baltimore Gas and Electric serves Mt. Airy. Rocky Ridge and Emmitsburg are served by the South Penn Gas Company. Municipal water systems are located in Brunswick, Emmitsburg, Frederick, Middletown, Mt. Airy, Myersville, Thurmont, Walkersville, Woodsboro, and 18 county-operated plants, which serve a wide geographic area. Municipal sewer systems are located in Brunswick, Emmitsburg, Frederick, Middletown, Mt. Airy, Myersville, Woodsboro, and Thurmont. The county operates 16 plants serving a wide geographic area.

Telecommunications

The predominant local carrier is Verizon Communications-MD. Long distance carriers include AT&T, MCI WorldCom, Sprint, LCI, and more than 250 additional carriers, resellers, and

providers of WATS, MTS, voice, paging systems, data, video networking, CATV, satellite communications systems, and other wireless systems. Fiber optics are available at many locations throughout the county.

Why Plan for Mitigation?

In the past, federal legislation has provided funding for disaster relief, recovery, and some hazard mitigation planning. The Disaster Mitigation Act of 2000 (DMA2K), enacted in October 2000, improved this planning process. This legislation reinforced the importance of mitigation planning and emphasized planning for disasters before they occur. As such, DMA2K established the Pre-Disaster Mitigation (PDM) program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP). DMA2K was intended to facilitate cooperation between state and local authorities, prompting them to work together, and to encourage and reward local and state pre-disaster hazard mitigation planning. The goal of the planning process was to better enable local and state governments to articulate needs for mitigation, thus resulting in faster allocation of funding and more effective risk reduction projects.

The Frederick County Hazard Mitigation Plan is a multi-jurisdictional plan (i.e., a plan that includes municipalities and unincorporated areas of the county). Any future Federal Emergency Management Agency (FEMA) funding for mitigation projects is contingent upon plan approval and adoption. Any jurisdiction that does not participate in the planning process and adopt the plan will not be eligible for pre- and post-disaster FEMA Hazard Mitigation Assistance program funds.

Purpose

Hazard mitigation is any action taken to permanently reduce or eliminate long-term risks to people and their property from the effects of natural hazards. Natural hazards come in many forms: tornadoes, floods, hurricanes, severe storms, winter freezes, droughts, landslides, and dam failures. Communities can take steps to prepare and implement mitigation techniques for almost any type of hazard that may threaten its citizens, businesses, and institutions.

This hazard mitigation plan establishes an ongoing hazard mitigation planning program by identifying and assessing potential natural hazards that may pose a threat to life and property, evaluating local mitigation measures that should be undertaken, and outlining procedures for monitoring the implementation of mitigation strategies. This plan also provides guidance to county officials and encourages activities that are most effective and appropriate for mitigating the effects of all identified natural hazards.

Consistency with State and Federal Mitigation Policies

The goals, objectives, and policies of the plan intend to implement the national and state directives for mitigation of natural hazards through local strategies.

Mitigation planning begins locally; however, the benefits accrue to the American people as a whole. According to FEMA, “mitigation efforts provide value to the American people by (1) creating safer communities by reducing loss of life and property, (2) enabling individuals to recover more rapidly from floods and other disasters, and (3) lessening the financial impact on the Treasury, states, tribes, and communities.”[1]

The following is the State of Maryland’s Hazard Mitigation Goal:

To reduce loss of life and damage to property associated with hazard events in the State of Maryland.

The state mitigation plan has seven objectives that support the mitigation goal:

1. Continue to lead, integrate, and coordinate mitigation actions and planning efforts at the state level, to include the development of a process for the continued maintenance of the *Maryland Hazard Analysis*.
2. Support the update of local hazard mitigation plans within the state.
3. Identify and explore the implementation of mitigation actions for state-owned facilities that are most at-risk to multiple hazards and most valuable in terms of use and cost.
4. Explore the continued coordination of hazard mitigation and land use policies with the Maryland Department of Planning and local government officials.
5. Continue to document mitigation successes in Maryland by 1) investigating and documenting loss avoidance for all completed mitigation projects funded through the Maryland Emergency Management Agency (MEMA) and 2) continuing to distribute the Best Practices in Hazard Mitigation to planners, emergency managers, and elected officials in order to help identify projects and promote mitigation.
6. Increase public awareness of hazard mitigation through continued outreach and education.

Where possible, the goals, objectives, and strategies selected by Frederick County should align with the state plan's goals and objectives.

Planning Process

In compliance with DMA2K requirements, public participation was encouraged throughout the Frederick County mitigation planning process. A Hazard Mitigation Planning Committee (HMPC) was formed that was comprised of various county agencies and representatives from each of the participating communities.

The HMPC was actively involved first in identifying hazards within the communities, reviewing the county's vulnerabilities to natural hazards, and making recommendations to reduce and prevent potential damage from these hazards. The committee then worked together to select the most appropriate and feasible mitigation measures.

The planning process involved four steps:

<u>Step 1 - Organize Resources</u>

Even before the HMPC was formed, the county organized their resources to ensure that they had adequate technical assistance and expertise to form a hazard mitigation committee. Once formed, the HMPC included representatives from key county agencies such as planning, emergency management, GIS, and public works as well as representatives from each of the incorporated municipalities.

Committee Membership

Select members from the local municipalities and the county were invited to serve on the HMPC, which was tasked with conducting a DMA2K-compliant hazard mitigation planning process and preparing the hazard mitigation plan. Table 1.3 identifies the members of the committee and the agencies they represent.

Table 1.3 Frederick County Hazard Mitigation Planning Committee

Name	Agency or Municipality
Seamus Mooney	Frederick County Department of Emergency Preparedness
Lynda Warthen	Frederick County Department of Emergency Preparedness
Garth C. Phoebus	Frederick County Department of Emergency Preparedness
Kathy Forrest	Frederick County Department of Emergency Preparedness
Rebekah May	Frederick County Department of Emergency Preparedness
Ann Brown	Frederick County Department of Emergency Preparedness
Shawna Lemonds	Frederick County Planning
Jim Gugel	Frederick County Planning
Dennis Superczynski	Frederick County Planning, Thurmont
Clifton Cornwell	Frederick County Public Schools
Donald Crum	Frederick County Division of Public Works
David Ennis	Frederick County Division of Public Works
Colby Ferguson	Frederick County Division of Economic Development
Denise Wyant	Frederick County Sheriff's Office
Marc McNeal	Frederick County Division of Fire and Rescue Services
Barry Titler	Mount Saint Mary's
Tom Kiniry	Mount Saint Mary's
Debbie Burgoyne	Burkittsville
James Castle	City of Brunswick
Bruce Dell	City of Brunswick
Dave Haller	Emmitsburg
Joseph Adkins	City of Frederick
Cindy Unangst	Middletown/Myersville
Kelly Ziad	Mount Airy
Monica Weierbach	Mount Airy
Mark Timberlake	New Market
Jackie Ebersole	Rosemont
Bill Blakeslee	Thurmont
Burgess Trimmer	Woodsboro
Gloria Rollins	Walkersville
Susan Hauver	Walkersville

Data Collection

The development of the mitigation plan began with data collection. A kick-off meeting was held on November 5, 2008, with the Frederick County Director of Emergency Preparedness and representatives from the County's Public Works, Planning, and Emergency Management departments. Representatives from several municipalities also were present. The planning process was discussed in detail, along with the proposed deliverables.

Community, county, state, and federal resources were identified and contacted to collect pertinent policy and regulatory information from each of the communities and the county. This information included comprehensive plans, zoning ordinances, development ordinances, and building codes. The HMPC collected information about natural hazards including past occurrences and projected frequencies of future occurrence and the anticipated risk, where available.

Step 2 - Assess Risks

The next step in the planning process was to perform a hazard identification and vulnerability assessment for the entire county. This process involved analyzing the county's greatest hazard

threats and determining its most significant vulnerabilities with respect to natural hazards. Risk was determined by looking at the total threat and vulnerability of the county for each hazard identified. The Hazard Vulnerability Assessment (HVA) was performed in large part using GIS data from the county, HAZUS-MH MR 3 (a GIS-based FEMA loss estimation software), and state sources. At the January 12, 2009, meeting, the HMPC reviewed the draft HVA of the identified hazards, including a brief history and profile of each hazard, and areas vulnerable to various hazards.

The hazards initially identified in the 2004 plan were discussed and re-prioritized at the November kick-off meeting. Using the new prioritization, updates were made to the HVA. In addition, questionnaires were provided to garner HMPC comment about past hazard events.

Step 3 - Develop a Mitigation Plan

The third step was to assess the mitigation capabilities of the county and its municipalities. A capability assessment was performed whereby the existing programs and policies addressing natural hazards were reviewed. A thorough analysis of the adequacy of existing measures was performed, and potential changes and improvements were identified. The committee reviewed the capability assessment at the second HMPC meeting conducted on January 12, 2009. At this meeting, the committee worked to identify goals and objectives for countywide mitigation efforts. These goals represent the county's and communities' vision for disaster resistance.

Next, the committee worked to identify and develop potential mitigation actions for implementation. The HMPC considered issues related to potential damage from hazard events within the county. The committee also evaluated 2004 projects and helped draft an action plan that specifies recommended projects, who is responsible for implementing the projects, and when they are to be completed.

It should be noted that the plan recommends mitigation measures that should be pursued and implemented if funding becomes available. Implementation of these recommendations depends on adoption of the plan by the Board of County Commissioners of Frederick County and each of the municipalities, and the cooperation and support of the offices and contacts designated as being responsible for each action item.

Step 4 - Implement the Plan and Monitor Progress

The county will continue to implement the plan and perform periodic reviews and revisions through on-going HMPC reviews and revisions. The Department of Emergency Preparedness will conduct an annual planning review of the mitigation plan, and public meetings will be held during the five-year review/update period.

Public Involvement

The public involvement element of the planning process involved two public meetings. The first public meeting (January 12, 2009) was held at the C. Burr Artz Trust Conference Room at the C. Burr Artz Library. Newspaper notices of this meeting were published in the Frederick News-Post Classified section on December 27, 2008, and January 3, 2009 (Appendix D). Information from the draft HVA was available for review by the public. In addition, representatives from Frederick County Office of Emergency Preparedness were available to address questions and solicit input regarding the type of mitigation measures the HMPC should pursue.

A second public meeting was conducted on March 25, 2009, at the City of Frederick Municipal Office Annex to present the final draft of the plan to the public and surrounding communities and to garner their input and comments. Notification was sent to the local newspapers (Frederick News-Post) informing them of the public meeting and that the draft plan would be available for review at the Frederick County Department of Emergency Preparedness after the meeting. These notices were published on March 14, 2009, and March 21, 2009 (Appendix D).

The MEMA serves as the state review agency of this mitigation plan. The following agencies also received a draft of the plan for review and comment:

- FEMA Region III;
- Maryland Department of Natural Resources;
- Maryland Department of the Environment (MDE);
- Maryland Municipal League:
- American Red Cross – Frederick County Chapter;
- Fort Detrick;
- Frederick County Division of Economic Development;
- Frederick County Emergency Management Policy Advisory Committee; and
- Frederick County Planning Commission.

The MEMA presentations to the Maryland Municipal League and the Frederick County Planning Commission were televised and are available for additional public viewing.

Organization of the Report

The next chapters comprise the Hazard Mitigation Plan. Chapter 2 identifies and profiles the hazards that could impact Frederick County. Chapter 3 presents the Vulnerability Analysis/Loss Estimation. Chapter 4 includes the goals and objectives for the plan. Chapter 5 discusses the mitigation projects that support achievement of the goals and objectives. Chapter 6 contains the Action Plan for plan implementation and maintenance.

CHAPTER 2 – HAZARD IDENTIFICATION

Introduction

Risk assessment involves four major steps. This chapter discusses the first two steps—hazard identification and hazard profiling, and Chapter 3 discusses the second two steps—vulnerability assessment and loss estimation.

Hazard identification for Frederick County was performed through investigation of various types of natural hazards faced by the county during the past several decades. Information of past hazards was based on history and research from historical documents and newspapers, county plans and reports, conversations with county residents and public officials, and internet websites. Data and maps were gathered online from sources such as the U.S. Geological Survey (USGS), Spatial Hazard Events and Losses Database for the United States (SHELDUS), and the National Weather Service.

Hazard profiling involves determining the frequency or probability of future events, their severity, and factors that may affect their severity. Each hazard type has unique characteristics that determine its impact. For example, no two flood events will impact a community in the same manner. Also, the unique characteristics of the community (geography, development, population distribution, age of buildings, etc.) influence the potential impact of the hazard. Developing hazard event profiles enables us to anticipate the potential extent of impact of each hazard.

Hazard Identification

The following natural hazards have been documented in Frederick County and assessed as risks for the purpose of the 2009 update; they have been categorized as follows: atmospheric, wildfire, hydrologic, and geologic. It should be noted that for the purposes of this HIRA, it was established that Frederick County has the same level of vulnerability county-wide for the following hazards: hail, lightening, and drought.

Below is the list of hazards covered in this plan, listed in no particular order.

Atmospheric Hazards
- Extreme Heat
- Extreme Wind Events
- Hailstorms
- Lightning
- Severe Winter Storms
- Thunderstorms
- Tornadoes
- Tropical Storm/Hurricanes

Hydrologic Hazards
- Drought
- Floods

Wildfire Hazards
- Urban Interface Fires
- Wildfires

Geologic Hazards
- Earthquakes
- Land Subsidence
  - Landslide
  - Sinkholes/Karst Topography

Table 2.1 presents presidential declared disasters and other notable events that have occurred in Frederick County. This table was provided by the Frederick County Department of Emergency Preparedness.

Table 2.1 Presidential Declared Disasters and other Major Events

Presidential Disaster Declaration	Event Type	Date
	Flooding, Severe Storm	8/17/1971
Tropical Storm Agnes	Flooding, Heavy Rains	6/23/1972
	Flooding, Heavy Rains	10/4/1975
	Flooding, Severe Storm	10/14/1976
	Flooding, Severe Storm, Tornado	9/14/1979
	Severe Winter Storm	3/16/1994
	Blizzard	1/11/1996
	Flooding, Severe Storm	1/23/1996
Tropical Storm Fran	Flooding	9/30/1996
	Severe Winter Storm	4/10/2000
	Terrorist Attacks	9/11/2001
	Anthrax Mailings	9/18/2001
	Cruise Missiles	10/5/2001
	Drought	4/2/2002
DC Snipers	Terrorism	10/3/2002
Snow Storm	Severe Snowfall	2/14/2003
Tropical Storm Isabel	Flooding, Severe Storms, Wind	9/19/2003
Tropical Storm Ivan	Tornadoes	9/24/2004
Hurricane Katrina	Sheltering	9/13/2005
	Flash Flooding	6/27/2006

Atmospheric Hazards

Extreme Heat

Overview

Temperatures that hover ten degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat. A heat wave is primarily a public health concern. During extended periods of very high temperatures or high temperatures with high humidity, individuals can suffer a variety of ailments, including heat stroke, heat exhaustion, heat syncope, and heat cramps.

- Heat stroke, in particular, is a life threatening condition that requires immediate medical attention. It exists when the body's core temperature rises above 105°F as a result of environmental temperatures. Patients may be delirious, stuporous, or comatose. The death-to-cure ratio in reported cases in the United States averages about 15 percent.
- Heat exhaustion is much less severe than heat stroke. The body temperature may be normal or slightly elevated. A person suffering from heat exhaustion may complain of dizziness, weakness, or fatigue. The primary cause of heat exhaustion is fluid and electrolyte imbalance. The normalization of fluids will typically alleviate the situation.
- Heat syncope is typically associated with exercise by people who are not acclimated to exercise. The symptom is a sudden loss of consciousness. Consciousness returns promptly

- when the person lies down. The cause is primarily associated with circulatory instability as a result of heat. The condition typically causes little or no harm to the individual.
- Heat cramps are typically a problem for individuals who exercise outdoors, but are unaccustomed to heat. Similar to heat exhaustion, heat cramps are thought to result from a mild imbalance of fluids and electrolytes.

In 1979, R.G. Steadman, a meteorologist, developed the heat index, which is shown in Table 2.2, to illustrate the risk associated with extreme summer heat.

Table 2.2 - Heat Danger Categories

Danger Category	Heat Disorders	Apparent Temperature (°F)
IV Extreme Danger	Heatstroke or sunstroke imminent.	>130
III Danger	Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible with prolonged exposure and physical activity.	105-130
II Extreme Caution	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and physical activities.	90-105
I Caution	Fatigue possible with prolonged exposure and physical activity.	80-90

Historic Activity

Based on data from the National Climatic Data Center (NCDC), there have been 30 incidents of extreme heat between 1950 and 2008. Some of these occurrences since 2004 are described below (additional events are described in Appendix A):

- On July 17 and 18, 2006, a hot and very humid air mass seeped into the mid-Atlantic. The heat index value climbed to 105 degrees both afternoons. Emergency response officials reported sporadic incidents of heat-related illness, such as shortness of breath and heat exhaustion, throughout the Washington/Baltimore Metropolitan region. Three deaths were attributed directly to this heat wave.
- Between August 1 and 3, 2006, excessive heat conditions occurred across much of Maryland. Afternoon heat index values ranged between 105 to as high as 115 degrees. Six people died in central Maryland due to the excessive heat conditions during this heat wave. Five people, including one player, were rushed to the hospital during a baseball game due to heat-related illnesses.
- On August 27, 2008, high temperatures and relative humidity produced heat index values exceeding 105. A hot and humid air mass developed over the mid-Atlantic ahead of a strong cold front on August 25. Temperatures climbed into the mid 90s by noon. These temperatures combined with high humidity created heat index values of 105.

Profile

In addition to posing a public health hazard, periods of excessive heat usually result in high electrical consumption for air conditioning, which can cause power outages and brownouts. The elderly, disabled, and debilitated residents of the county are especially susceptible to heat stroke. Large urbanized areas such as the City of Frederick can create an island of heat that can raise the temperature by three to five degrees F. Therefore, urban communities with substantial populations of elderly, disabled, and debilitated people could face a significant medical emergency during an extended period of excessive heat.

Extreme Wind Events

Overview

Extreme wind events occur when there is a large difference in atmospheric pressure over a short distance, called a pressure gradient. The larger the pressure gradient over a certain area, the stronger the winds will generally be. Strong cold fronts and low pressure systems separating two distinctly different air masses lead to strong winds. Typically, non-thunderstorm strong wind events occur most often in autumn, winter, and spring when the temperature difference between air masses is the greatest.

The National Weather Service issues the following wind alerts:

- Wind Advisory—when sustained non-thunderstorm winds range from 25 mph to 39 mph and/or gusts to 57 mph.
- High Wind Watch—when there is the potential for non-thunderstorm high wind speeds to develop and pose a hazard, or otherwise be life-threatening.
- High Wind Warning—when non-thunderstorm high wind speeds are occurring and may pose a hazard or are life-threatening. For a High Wind Warning to be issued, non-thunderstorm winds either must be sustained at 40 mph or greater for one hour or longer or be equal to or greater than 58 mph for any duration.

Extreme wind events pose a danger to Frederick County because they can result in localized or widespread power outages, property damage, falling trees, injury or even death to people. These wind events also can blow over tractor trailers on the highway and make driving difficult in a high-profile vehicle or lightweight vehicle. Severe wind events can turn trash cans, lawn and patio furniture, and other property into projectiles resulting in further property damage.

Most people are killed in extreme wind events from falling trees. Trees have fallen onto cars or on homes, and have injured and killed people. Dead trees or trees weakened by drought, disease, rotting, or pest infestations are the most susceptible to falling.

Historic Activity

There have been 37 reports of extreme wind events from 1993 to 2008, when the National Weather Service began keeping track of these occurrences. Frederick County averages between two and three extreme wind events each year. Descriptions of events prior to 2004 can be found in Appendix A; descriptions of significant events that occurred after 2004 are provided below:

- A large low pressure system and associated cold front moved through the county on Thanksgiving Day, November 22, 2005, with wind gusts reported over 50 mph. Downed trees and power outages were reported across the county.

- Tens of thousands of people were without power for an extended period of time on January 14, 2006, as a strengthening low pressure area moved up the northeast coast. Widespread damages and power outages occurred throughout Maryland with this event. Winds gusted to over 60 mph, and $1.8 million in property damage was reported.

- A strong cold front brought very strong winds to the county on February 17, 2006. Wind gusts were reported of over 50 mph with scattered power outages from downed trees and power lines. Property damage exceeded $140,000.

- Large trees were knocked down by 55 mph wind gusts from a strong cold front on December 1, 2006. Trees were downed along Gashouse Pike east of the City of Frederick and along Rocky Springs and Yellow Springs Roads to the north of the city. Property damage was estimated to be $30,000.

- Thousands of people were left without power as a powerful low pressure area moved up the mid-Atlantic Coast on April 16, 2007. A wind gust of 58 mph was reported in the county with property damages exceeding $10,000.

- On December 16, 2007, wind gusts over 60 mph knocked out power, and Frederick County Emergency Management reported nearly 30 reports of trees down across the county. Damages were intensified in areas that had significant ice accumulations. Property damages approached $10,000.

- A tree fell on Devilbiss Bridge Road on May 12, 2008, causing power outages in the area. Winds were reported to have gusted to over 45 mph.

Hailstorms

Overview

Hailstorms are violent and spectacular phenomena of atmospheric convection, always associated with heavy rain, gusty winds, thunderstorms, and lightning. Hail is a product of strong convection and occurs only in connection with a thunderstorm where the high velocity updrafts carry large raindrops into the upper atmosphere (where the temperature is well below the freezing point of water).

Hailstones grow in size when the frozen droplet is repeatedly blown into the higher elevations. The hailstone ascends as long as the updraft velocity is high enough to hold the hailstone. As soon as the size and weight of the hailstone overcome the lifting capacity of updraft, it begins to fall freely under the influence of gravity. The falling of hailstones, under thunderstorm conditions, is accompanied with a cold downdraft of air.

Most of the "damaging" hailstones vary between the size of a golf ball ("severe") to the size of a softball or larger ("oversized"). According to the National Weather Service, most parts of the United States experience "severe" and "oversized" hailstorms. The largest recorded hailstone in the United States fell in Coffeyville, Kansas, on September 3, 1970, and measured more than 7.0 inches in diameter and weighed 1.7 pounds, generating an impact force of 578 pounds per foot. Hailstorms occur year round at all times of day, but are more frequent in the summer months, in the evenings, and after sunset.

Historic Activity

A total of 37 hailstorms were reported in the county between 1950 and 2008. One recent report of hail is described below (events prior to 2004 are described in Appendix A):

- On July 16, 2007, penny and nickel sized hail were spotted in Brunswick. Numerous showers and thunderstorms developed across the region during the afternoon of July 16. Many of these storms became severe, producing large hail and damaging winds that downed large trees and power lines.

Lightning

Overview

Lightning is defined as a sudden and violent discharge of electricity from within a thunderstorm due to a difference in electrical charges. It represents a flow of electrical current from cloud-to-cloud or cloud-to-ground. Nationally, lightning causes extensive damage to buildings and structures, kills or injures people and livestock, starts untold numbers of forest fires and wildfires, and disrupts electromagnetic transmissions. Lightning is extremely dangerous during dry lightning storms because people remain outside due to the lack of precipitation; however, lightning is still present during the storm.

Simultaneously, there are nearly 2,000 thunderstorms in progress over the earth's surface. At least 100,000 thunderstorms occur annually throughout the United States.

To the public, lightning is often perceived as a minor hazard. However, lightning-caused damage, injuries, and deaths make lightning a significant hazard associated with any thunderstorm in any area of Maryland.

Damage from lightning occurs four ways: (1) electrocution/severe shock of humans and animals; (2) vaporization of materials along the path of the lightning strike; (3) fire caused by high temperatures associated with lightning (10,000-60,000°F); and (4) sudden power surge that can damage electrical/electronic equipment. Large outdoor gatherings (e.g., sporting events, concerts, campgrounds, etc.) are particularly vulnerable to lightning strikes that can result in injuries and deaths.

Historic Activity

There have been 27 major lightning events in Frederick County between 1950 and 2008; two of the more notable events after 2004 are described below (additional pre-2004 occurrences are documented in Appendix A):

- On June 7, 2008, a local newspaper reported a lightning-sparked fire on the 2300 block of Ballenger Creek Pike in the unincorporated city of Adamstown. A very warm, humid air mass was entrenched across the mid-Atlantic during the late afternoon and evening hours of June 7. As an upper level disturbance moved across the area, scattered strong to severe thunderstorms developed. Damaging winds brought down some trees and power lines throughout Maryland.

- On June 10, 2008, a local newspaper reported a lightning-sparked basement fire on Kemptown Court in New Market. Cool, drier air behind the front clashed with very warm and moist air ahead of it, resulting in scattered to numerous strong to severe thunderstorms. Storms that became severe brought down trees and power lines throughout the state.

Severe Winter Storms

Overview

Winter storms can vary in size and strength and include heavy snowstorms, blizzards, freezing rain, sleet, ice storms, and blowing and drifting snow conditions. Extremely cold temperatures accompanied by strong winds can result in wind chills that cause bodily injury, such as frostbite and death. A variety of weather phenomena and conditions can occur during winter storms. For clarification, the following are National Weather Service approved descriptions of winter storm elements:

- Heavy snowfall - the accumulation of six or more inches of snow in a 12-hour period or eight or more inches in a 24-hour period.
- Blizzard - the occurrence of sustained wind speeds in excess of 35 miles per hour accompanied by heavy snowfall or large amounts of blowing or drifting snow.
- Ice storm - an occurrence where rain falls from warmer upper layers of the atmosphere to the colder ground, freezing upon contact with the ground.
- Freezing drizzle/freezing rain - the effect of drizzle or rain freezing upon impact onto objects that have a temperature of 32 degrees Fahrenheit or below.
- Sleet - solid grains or pellets of ice formed by the freezing of raindrops or the refreezing of largely melted snowflakes. Sleet does not cling to surfaces.
- Wind chill – a calculated temperature index that describes the combined effect of wind and low air temperatures on exposed skin.

Maryland's greatest winter storms are nor'easters. For nor'easters to occur in Maryland, an arctic air mass must usually be in place. While high pressure builds over New England, cold arctic air flows south from the high-pressure area. The dense cold air is unable to move west over the Appalachian Mountains, and so it funnels south down valleys and along the Coastal Plain. Winds around a nor'easter's center can become intense. The strong northeast winds that rack the coast and inland areas give the storm its name. The wind builds large waves that batter the coastline and sometimes pile water inland, causing major coastal flooding and severe beach erosion. Unlike hurricanes, which usually pass within one tide cycle, the nor'easter can linger through several tides, each one piling more and more water on shore and into the bays, dragging more sand away from the beaches.

The entire county is vulnerable to the effects of winter storms. These storms may include snowstorms, sleet storms, ice storms, and blizzards. Major winter storms and occasional blizzard conditions bring bursts of heavy snow accumulating 3-6 inches in short periods or 1-2 feet in 12-24 hours. Blizzard conditions develop with winds over 35 mph. Freezing rain and drizzle create a coating of ice that is hazardous to walk or drive on. Other impacts include hazardous conditions caused by falling trees and power lines; requirement of additional manpower to clear debris, remove snow, and salt roads; large scale use of public shelters; and traffic delays.

Historic Activity

There have been at least 91 major winter storm incidents in Frederick County between 1950 and 2008. Major events since 2004 are described below:

- On February 11 and 12, 2006, a historic snowstorm occurred across the mid-Atlantic. Storm total snowfall in Maryland ranged between 8 and 14 inches. A period of thundersnow occurred overnight and early in the morning of February 12 throughout areas of the northern Washington, DC, suburbs and the Baltimore suburbs, where localized snowfall ranged between 14 to 22 inches. There were also numerous reports of downed trees and power lines, causing significant power outages. Local utility companies reported total power outages of around 300,000 customers in the Washington/Baltimore region. Amtrak reported major delays and cancellations along the northeast rail corridor, which passes through both Baltimore and Washington, DC. Damages were estimated at $230,000.
- On January 17, 2008, a snowstorm passed through Maryland, resulting in an accumulation of nearly six inches of snow and sleet in Frederick County.

Thunderstorms

Overview

A thunderstorm is a convective rain or snow shower accompanied by lightning and thunder.[2] As the warm air rises, thunderhead clouds (cumulonimbus) form causing the strong winds, lightning, thunder, hail, and rain associated with these storms. Instability can be caused by surface heating or upper tropospheric (~50,000 feet) divergence of air (rising air parcels can also result from airflows over mountainous areas). Generally, the surface-heating "air mass" thunderstorms form on warm season afternoons and are not severe. The upper tropospheric "dynamically-driven" thunderstorms generally form in association with a cold front or other regional-scale atmospheric disturbance. These storms can become severe, producing strong winds, frequent lightning, hail, downbursts, and occasionally tornadoes.

The National Weather Service defines a thunderstorm as a local storm accompanied by lightning and thunder, produced by a cumulonimbus cloud, usually with gusty winds, heavy rain, and often hail. Non-severe thunderstorms rarely have duration exceeding two hours. The National Weather Service considers a thunderstorm severe if it produces three-quarters of an inch diameter hail, has winds exceeding 58 miles per hour, and/or produces a tornado. Severe thunderstorms are distinguished by stronger winds and heavier rain than the normal thunderstorm. These severe storms have the potential to initiate flash flooding. Thunderstorms may occur singly, in clusters, or in lines. Some of the most severe weather occurs when a single thunderstorm stalls over one location for an extended time.

Other hazards associated with thunderstorms include downbursts, or strong downdrafts. Downdrafts induce outbursts of straight-line winds on or near the ground. They may last anywhere from a few minutes during small-scale microbursts to periods of up to 20 minutes in larger, longer macro-bursts. Wind speeds in downbursts can reach 150 mph and, therefore, can result in damages similar to tornado damages (discussed below).

Thunderstorms affect relatively small areas when compared with hurricanes and winter storms. The typical thunderstorm is 15 miles (24 kilometers) in diameter and lasts an average of 20 to 30 minutes. Of the estimated 100,000 thunderstorms occurring each year in the United States, only ten percent are classified as severe. Downbursts and straight-line winds associated with thunderstorms can produce winds of 100 to 150 miles (161 to 241 kilometers) per hour—enough to flip cars, vans, and pickup trucks. The resulting damage can equal the damage of most tornadoes.[3]

Many strong thunderstorms produce hail. Large hail, and the glass it may break, can injure people and animals. Hail can be smaller than a pea, or as large as a softball, and can be very destructive to automobiles, glass surfaces (e.g., skylights and windows), roofs, plants, and crops.[4] The size of hailstones is a direct function of the severity and size of the storm. Hailstorms occur more frequently in the late spring and early summer and are more common in the Midwest. The land area affected by individual hailstorms is not much smaller than that of a parent thunderstorm, an average of 15 miles in diameter around the center of a storm.[5]

Historic Activity

According to the NCDC, approximately 243 thunderstorm and high wind events were reported in Frederick County, Maryland, between January 1950 and December 2008. The following events that occurred after 2004 are worthy of mention (additional significant events are documented in Appendix A):

- On February 4, 2006, a newspaper report indicated significant damage to a log house near Libertytown in Frederick County. A large old oak tree was downed, as well as a few other smaller trees. Trees and power lines also were downed near Ridgeville and Westminster. Damages were reported to approach $100,000.

- On March 5, 2008, Frederick County Emergency Management reported a barn roof and garage collapse. Three telephone poles were downed in the unincorporated city of Adamstown. Several lines of thunderstorms crossed the region from the evening of March 4 through the early morning of March 5. Heavy rain led to several road closures due to flooding and also caused several basements to flood. Wind gusts in excess of 50 mph were measured at several locations statewide. There were numerous reports of trees and power lines down across northern and central Maryland.

- On June 4, 2008, a local newspaper reported several roofs blown off barns on Brentland Road. A stalled front resided across the mid-Atlantic during the afternoon and evening of June 4, allowing moisture and instability to pool along the boundary. This combined with several strong upper level disturbances resulted in numerous thunderstorms during the afternoon and evening. Many of these thunderstorms became severe. Damages were reported at $50,000.

<u>Tornadoes</u>

Overview

A tornado is a relatively short-lived storm composed of an intense rotating column of air, extending from a thunderstorm cloud system. Average winds in a tornado, although never accurately measured, are thought to range between 100 and 200 miles per hour, but some may have winds exceeding 300 miles per hour. The following are National Weather Service definitions of a tornado and associated terms:

- Tornado - A violently rotating column of air that is touching the ground.
- Funnel cloud - A rapidly rotating column of air that does not touch the ground.

Tornadoes are classified on a scale of 0 to 5 by the degree of damage they cause. This tornado classification, shown in Table 2.3, is called the Fujita Scale. On February 1, 2007, a team of meteorologists and wind engineers updated the Fujita Scale to more accurately reflect the

estimated winds speeds in a tornado. These professionals agreed that it does not take as strong winds as originally thought to cause serious structural damage. It is important to note the Enhanced F-Scale is still a set of wind estimates (not measurements) based on damage.

Table 2.3 Tornado Damage Scale[6]

Enhanced Fujita Scale	Wind Speeds	Scale	Wind Speeds	Damage	Frequency
EF0	65-85 MPH	F0	40 to 72 MPH	Some damage to chimneys, TV antennas, roof shingles, trees, and windows	29%
EF1	86-110 MPH	F1	73 to 112 MPH	Automobiles overturned, carports destroyed, trees uprooted	40%
EF2	111-135 MPH	F2	113 to 157 MPH	Roofs blown off homes, sheds and outbuildings demolished, mobile homes overturned	24%
EF3	136-165 MPH	F3	158 to 206 MPH	Exterior walls and roofs blown off homes. Metal buildings collapsed or severely damaged. Forests and farmland flattened.	6%
EF4	166-200 MPH	F4	207 to 260 MPH	Few walls, if any, standing in well-built homes. Large steel and concrete missiles thrown far distances.	2%
EF5	Over 200 MPH	F5	261 to 318 MPH	Homes leveled with all debris removed. Schools, motels, and other larger structures have considerable damage with exterior walls and roofs gone. Top stories demolished.	Less than 1%

Nearly 70 percent of the deaths from tornadoes happen to people located in residential structures. Of these, over 40 percent are located in mobile homes, which are easily overturned and destroyed due to the low wind resistance of the structures.

A tornado path averages four miles, but may reach up to 300 miles in length. Widths average 300-400 yards, but severe tornadoes have cut swaths a mile or more in width, or have formed groups of two or three funnels traveling together. On the average, tornadoes move between 25 and 45 miles per hour, but speeds over land of up to 70 mph have been reported. Tornadoes rarely last more than a couple of minutes over a spot for more than 15-20 minutes in a ten-mile area, but their short duration does not limit their devastation of an area. The destructive power of a tornado results primarily from its high wind velocities and sudden changes in pressure. Damages from tornadoes result from extreme wind pressure and windborne debris. Since tornadoes are generally associated with severe storm systems, they are often accompanied by hail, torrential rain, and intense lightning. Depending on their intensity, tornadoes can uproot trees, bring down power lines, and destroy buildings. Flying debris is the main cause of serious injury and death.

Downbursts are characterized by straight-line winds. Downburst damage is often highly localized and resembles that of tornadoes. There are significant interactions between tornadoes and downbursts; a tornado's path can be directed by downbursts. The path of a tornado can be very unpredictable, including veering right and left or even a U-turn.

FEMA's publication *Design and Construction Guidance for Community Shelters* July 2000, presents a map of four wind zones in the United States (consistent with ASCE 7-98) and provides design wind speeds for shelters and other critical facilities. Zone IV shows the areas of highest wind activity, which are generally in the Midwest and "Tornado Alley," while Zone I shows the areas of lowest activity, which are in the western part of the United States. Frederick County falls in Zone III, with design wind speeds up to 200 mph.

Historic Activity

Data from the NCDC shows that Frederick County experienced 26 tornado events between 1950 and 2008. Events prior to September 2004 are described in Appendix A. An event that occurred in 2004 is described below:

- On September 17, 2004, three tornadoes touched down in Frederick County. An F1 tornado produced structural damage to several homes near Brunswick. A few structures and outbuildings were destroyed. Other structures sustained roof damage, and trees were downed or stripped. The tornado continued to cause damage to the north along Route 17 for approximately three miles before lifting at Burkittsville. A second F1 tornado touched down in south central Frederick County, just east of Adamstown. The storm traveled north and produced minor structural damage. It blew out windows, tore shingles off several roofs, and caused one chimney collapse. The tornado also uprooted and sheared several large softwood and hardwood trees. Finally, an F2 tornado touched down in far northwest Frederick County, on the northwest edge of Catoctin Mountain Park. A thickly forested stand of hardwoods was snapped off above their bases. Total damage from the tornadoes was $255,000.

Although the magnitude and location of tornadoes are unpredictable, most of those that occurred in the county during the last 50 years have been classified as low intensity (F1). There were two cases of F2 tornadoes and one F3 tornado event. Although these tornadoes caused no fatalities, they resulted in roadblocks, delays, and the nuisance and cost of clearing fallen trees and debris.

Tropical Storm/ Hurricanes

Overview

Hurricanes and tropical storms, as well as tropical depressions, are tropical cyclones defined by the National Weather Service's National Hurricane Center as warm-core non-frontal synoptic-scale cyclones, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation around a well-defined center. Once formed, tropical cyclones maintain themselves by extracting heat energy from the ocean at high temperatures and releasing heat at the low temperatures of the upper troposphere. Hurricanes and tropical storms bring heavy rainfall, storm surge, and high winds, all of which can cause significant damage. These storms can last for several days and, thus, have the potential to cause sustained flooding, high wind, and erosion. In coastal areas, storm surge also can cause significant damage.

Tropical storms and hurricanes are classified using the Saffir-Simpson Hurricane Scale (Table 2.4), which rates the intensity of hurricanes based on wind speed and barometric pressure measurements. The scale is used by the National Weather Service to predict potential property damage and flooding levels from imminent storms.

Table 2.4 Saffir-Simpson Scale and Typical Damages

CATEGORY	SUSTAINED WIND SPEEDS (MPH)	SURGE (FT)	PRESSURE (MB)	TYPICAL DAMAGE
Tropical Depression	<39	--	--	
Tropical Storm	39-73	--	--	
Hurricane 1	74-95	4-5	> 980	*Minimal* – Damage primarily to shrubbery and trees, unanchored manufactured homes damaged, some signs damaged, no real damage to structures on permanent foundations.
Hurricane 2	96-110	6-8	965-980	*Moderate* – Some trees toppled, some roof coverings damaged, major damage to manufactured homes.
Hurricane 3	111-130	9-12	945-965	*Extensive Damage* – Large trees toppled, some structural damage to roofs, manufactured homes destroyed, structural damage to small homes and utility buildings.
Hurricane 4	131-155	13-18	920-945	*Extreme Damage* – Extensive damage to roofs, windows, and doors; roof systems on small buildings completely fail; some curtain walls fail.
Hurricane 5	> 155	> 18	< 920	*Catastrophic Damage* – Roof damage considerable and widespread, window and door damage severe, extensive glass failures, some buildings fail completely.

Historic Activity

According to the NCDC, the National Oceanic and Atmospheric Administration (NOAA), and referencing the list of presidentially declared disasters, six tropical storm events have occurred in Frederick County since 1972: tropical storms Agnes, Fran, Ivan, Isabel, Katrina, and Hanna. Most recently, on September 6, 2008, Tropical Storm Hanna entered Maryland resulting in heavy rain and severe winds within Frederick County. Additionally, the impact of Hurricanes Agnes and Isabel resulted in very strong local winds and flooding. During Agnes, two houses in the City of Frederick were flooded by an inadequate drainage ditch. The city spent more than $400,000 to purchase and demolish the structures, and clear asbestos and spilled heating oil from the properties.

Hydrologic Hazards

Drought

Overview

Drought is a condition of climatic dryness that is severe enough to reduce soil moisture and water and snow levels below the minimum necessary for sustaining plant, animal, and economic systems. Drought is a complex physical and social process of widespread significance. It is not usually a statewide phenomenon; differing conditions in the state often make drought a regional issue. Despite all of the problems that droughts have caused, drought has proven to be difficult to define, and there is no universally accepted definition. Drought, unlike a flood, is not a distinct event. It is often the result of many complex factors and typically has no well-defined start or end. In addition, its impacts vary by affected sector.

The most commonly used drought definitions are based on meteorological, agricultural, hydrological, and socioeconomic effects:

- Meteorological drought is often defined by a period of substantially diminished precipitation duration and/or intensity. The commonly used definition of meteorological drought is an interval of time, generally on the order of months or years, during which the actual moisture supply at a given place consistently falls below the climatically appropriate moisture supply.
- Agricultural drought occurs when there is inadequate soil moisture to meet the needs of a particular crop at a particular time. Agricultural drought usually occurs after or during meteorological drought, but before hydrological drought. It can also affect livestock and other dry-land agricultural operations.
- Hydrological drought refers to deficiencies in surface and subsurface water supplies. It is measured as streamflow, snowpack, and as lake, reservoir, and groundwater levels. There is usually a delay between lack of rain or snow and less measurable water in streams, lakes, and reservoirs. Therefore, hydrological measurements tend to lag behind other drought indicators.
- Socioeconomic drought occurs when physical water shortages start to affect the health, well-being, and quality of life of the people, or when the drought starts to affect the supply and demand of an economic product.

Droughts result from prolonged periods of dry weather accompanied by extreme heat and usually occur during the summer months (July and August). The warmest time of the year in Frederick County is July when maximum temperatures average 89 degrees. Extreme temperatures of 100 degrees occur occasionally. The occurrence of drought cannot be predicted.

When drought begins, agriculture is usually first to be affected because of heavy dependence on stored soil moisture. Soil moisture can be rapidly depleted during extended dry periods. Dryland farming and ranching are the most at risk from drought. Water uses that depend on in-stream flows are at high risk but less exposed; these include irrigated farms; aquatic, wetland, and riparian environmental communities; and recreational activities. Urban and agricultural water users who rely on reservoirs and wells that are not dependent on high rates of aquifer recharge are the last to experience drought.

Drought also has a major impact on livestock and crops. Approximately half of Frederick County is dedicated to agriculture, comprising ten percent of the state's farm area. Of the 202,087 acres of farmland in Frederick County, 143,661 acres are in cultivated crops. The main crops are forage, corn, wheat, and soybeans. Airborne viruses, bacteria, and fungi could destroy some or all of Frederick's annual harvest.

There are 1,442 farms in Frederick County. The livestock on these farms, according to the U.S Department of Agricultures' 2007 Census, include a total of the following[7]:

Table 2.5 Number and Types of Livestock Farms

Livestock Type	Number of Farms Reporting	Inventory (animals)
Cattle and Calves	624	40,612
Hogs and Pigs	41	5,045
Poultry	176	12,704
Sheep and Lambs	111	2,594
Goats	154	2,529
Horses and Ponies	372	3,653

Table 2.6- Number and Types of Crop Farms

Crop Type	Number of Farms Reporting	Inventory (acres)
Barley	88	4,002
Corn	432	45,523
Forage	848	48,178
Oats	14	205
Sorghum	1	Not disclosed
Soybeans	195	22,207

Historic Activity

Data reveals that Frederick County experienced 11 drought periods from 1950 to 2008. Two recent droughts are detailed below:

- Much of 2007 was extremely dry across Maryland as well as in Frederick County. In early October 2007, rainfall deficits across the county reached nearly ten inches for the year. A strong ridge of high pressure was anchored over the Eastern Seaboard throughout much of the year resulting in little moisture from cold fronts. Most of the county was classified under extreme drought conditions by the United States Drought Monitor. Many towns, cities, and counties across Maryland enacted mandatory and voluntary water restrictions. Area streams and rivers experienced all-time record low water levels, especially in the late summer and early fall due to the extreme hydrological drought. Many farmers in the county had very poor yields in crop production due to the extreme dryness. Damage estimates from the 2007 drought are not available (NCDC.gov).
- The period between September of 2001 and August of 2002 was the second driest 12 months in Maryland history. By August of 2002, groundwater levels had reached record lows. Along with several other eastern states, Maryland was in a state of “extreme drought” as defined by the United States Drought Monitor, characterized by major crop/pasture losses, extreme fire danger, and widespread water shortages. Above normal rainfall in October of 2002 helped alleviate drought conditions and reduced drought conditions to abnormally dry. By February of 2003, water restrictions were lifted in most of the state, including Frederick County (umd.edu).

Flash Floods and Flooding

Overview

Flash floods, as the name suggests, occur suddenly after a brief but intense downpour. They move fast and terminate quickly. Although the duration of these events is usually brief, the damages can be quite severe. Flash floods also result as a secondary effect from other types of

disasters, including large wildfires and dam breaks. Wildfires remove vegetative cover and alter soil characteristics, increasing the quantity and velocity of storm water runoff, and dam breaks release large quantities of water into receiving drainage ways in a very short timeframe. Flash floods are the primary weather-related killer, with approximately 140 deaths recorded in the United States annually.

Riverine floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. Flood studies use historical records to determine the probability of occurrence for different extents of flooding. The probability of occurrence is expressed as the percentage chance that a flood of a specific extent will occur in any given year. On the other hand, flash floods cannot be predicted accurately and happen whenever there are heavy storms (Table 2.7).

Table 2.7 Causes of Flooding versus Flash Flooding

Causes of Flooding	External Issues that Exacerbate Flash Flooding
Low lying, relatively undisturbed topography	Hilly/mountainous areas
High water tables	High velocity flows
Soil characteristics	Short warning times
Constrictions in the floodway or floodplain (filling)	Steep slopes
Obstructions in the floodway or floodplain (bridges)	Narrow stream valleys
Excess paved surfaces	Parking lots and other impervious surfaces
Poor drainage	Improper drainage

In support of the National Flood Insurance Program (NFIP), FEMA identifies and maps areas of flood risk. One of these areas is the Special Flood Hazard Area (SFHA), which is defined as an area of land that will be inundated by a flood having a 1-percent chance of occurring in any given year. This flood is often referred to as the “base flood” or “100-year flood.” However, the term "100-year flood" is misleading. It is not the flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1-percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the standard used by most federal and state agencies, is used by the NFIP as the standard for floodplain management and to determine the need for flood insurance. A structure located within an SFHA shown on an NFIP map has a 26-percent chance of suffering flood damage during the term of a 30-year mortgage. Smaller floods occur more often than larger and more widespread ones. Please see Appendix C, Map 1, for the Frederick NFIP map.

Flood damage to residences can be devastating, both emotionally and financially. Flood damage to businesses could result in loss of income, wages, and tax revenues. Other effects include outbreaks of diseases, widespread animal illnesses, disrupted utilities, water pollution, fire, and washed out roads and culverts.

Historic Activity

According to the NCDC, 69 flood events were reported in Frederick County, Maryland, from January 1950 to September 2008. The major flood event of 2006 is described below; events prior to 2004 are described in Appendix A:

- On June 27, 2006, waves of low pressure rode along a stationary front parked just to the west of the region. Clusters of strong thunderstorms trained over the county in a tropical air mass. Reports of four to seven inches of rain in a short amount of time turned normally small streams into raging torrents of water. Three people died from drowning in the bed of a pickup truck driving through flooded roads east of Myersville along Middle Creek. Two teenagers died near Little Pipe Creek. It is believed the teenagers were swept away while swimming in the raging creek. MARC Commuter Rail experienced numerous disruptions with underground tunnels being filled up with water. Numerous roads were closed across the county due to high water or mud slides. Damage from the flash flooding was estimated at $500,000.

Wildfire Hazards

Wildfires and Urban-Wildland Interface Fires

Overview

A wildfire is an uncontrolled fire spreading through vegetative fuels, such as brush, marshes, grasslands, forests, or fields, exposing and possibly consuming structures. They often begin unnoticed and spread quickly, usually signified by dense area-wide smoke. Wildfires are sometimes called “forest fires”; however, this analysis will use “wildfire.” Wildfire causes include lightning, human carelessness, and arson. The urban-wildland interface fire is a wildfire in a geographic area where structures and other human development meet or intermingle with wildland or vegetative fuels.

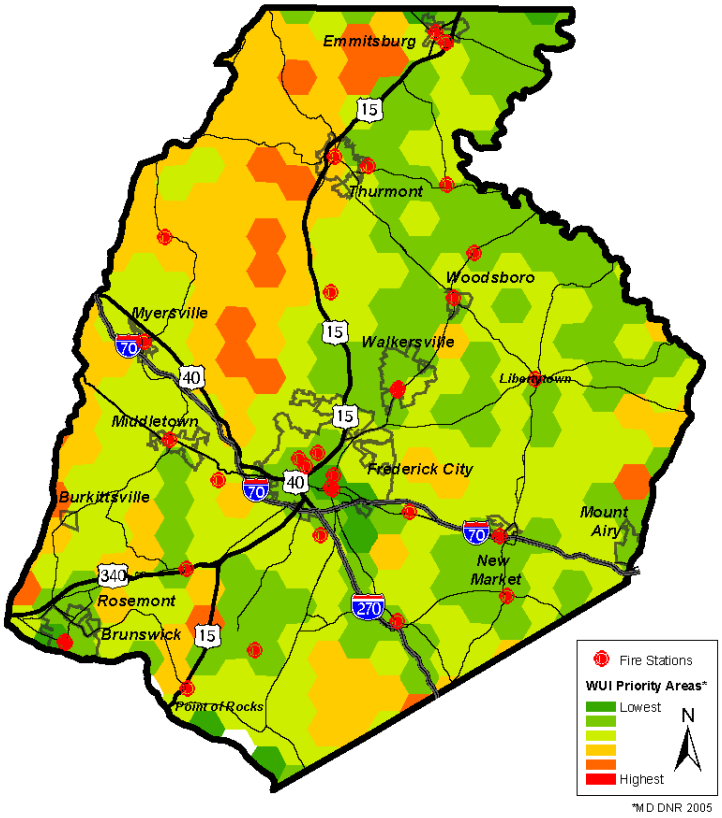
Fires can be rated based on their degree of combustion as noted in Table 2.8.

Table 2.8 Fire Danger Rating Descriptions

Rating	Description
Low	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or decayed wood. Fires in open cured grasslands may burn freely for a few hours after rain, but woodland fires spread slowly by creeping or smoldering, and burn in irregular fingers. There is little danger of spreading.
Moderate	Fires can start from most accidental causes, but with the exception of lightning, the number of starts is generally low. Fires in open cured grasslands will burn briskly and rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
High	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to become uncontrolled. Fires spread rapidly and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.
Very High	Fires start easily from all causes and immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.

Wildfires can occur at any time of day and during any month of the year, and the season length and peak months may vary appreciably from year to year. Land use, vegetation, amount of combustible materials present, and weather conditions such as wind, low humidity, and lack of precipitation are the chief factors determining the number of fires and acreage burned. Generally, fires are more likely when vegetation is dry from a winter with little precipitation and/or a spring and summer with sparse rainfall. Wildfires are capable of causing significant injury, death, and damage to property. The potential for property damage from fire increases each year as more recreational and full-time residential properties are developed on wooded land. Fires can extensively impact the economy of an affected area, especially the recreation and tourism industries, upon which Frederick County depends. Major direct costs associated with forest fires or wildfires are fire suppression, subsequent salvage and removal of downed timber and debris, and restoration of the burned area. If burned woodlands and grasslands are not replanted quickly to prevent widespread soil erosion, landslides, mudflows, and floods can follow, compounding the damage.

Figure 2.1: Fire Hazard Potential in Frederick County



Historic Activity

Data from the Maryland Department of Natural Resources indicates that the county experienced 331 wildfires between 1994 and 2003. The largest occurrence was experienced during 1999 (80 fires) while there were only four incidents in 2003. Data on fires since 2003 was not available. Figure 2.1 (also shown in Appendix C) shows the fire hazard potential in Frederick County according to the Maryland Department of Natural Resources. The areas in green indicate the lowest combined wildfire/ urban interface fire hazard vulnerability, and red indicates the highest vulnerability to wildfire/ urban interface fire.

Geologic Hazards

Earthquakes

An earthquake is a shaking or violent trembling of the earth that results from the sudden shifting of rock beneath the earth's crust. This sudden shifting releases energy in the form of seismic waves or wave-like movement of the earth's surface. Earthquakes can strike without warning and may range in intensity from slight tremors to great shocks.

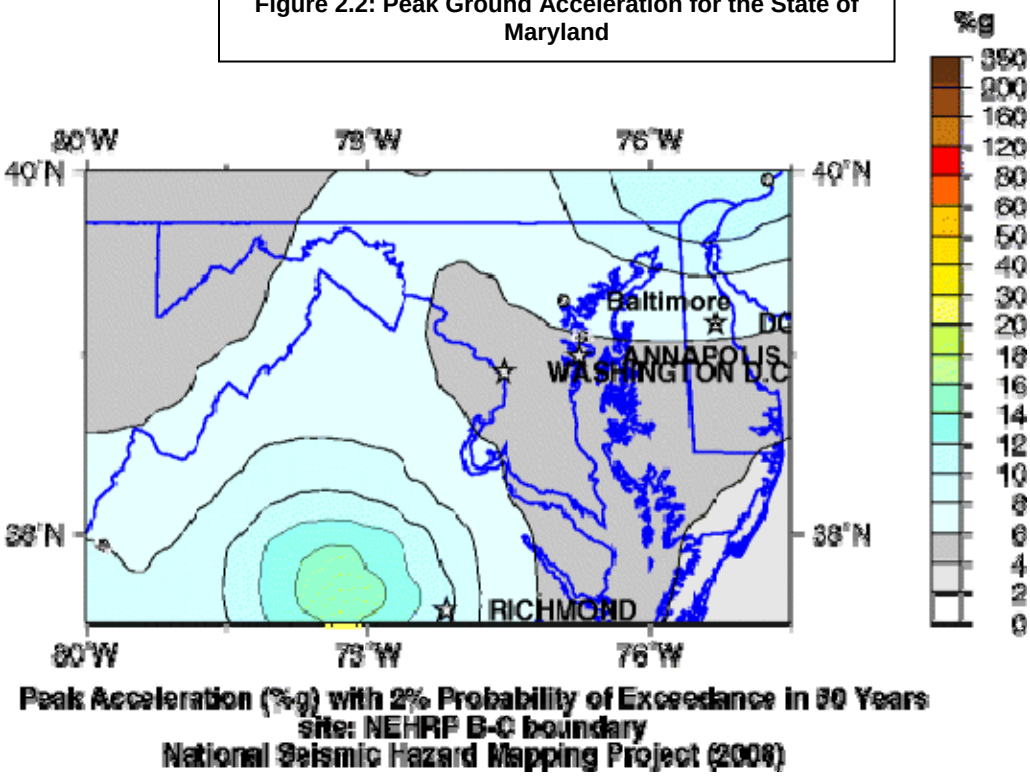
Earthquakes are measured by two principal methods: seismographs and human judgment. The seismograph measures the magnitude of an earthquake and interprets the amount of energy released on the Richter scale. An earthquake measuring 6.0 on the Richter scale is ten times more powerful than a 5.0 and one hundred times more powerful than an earthquake measuring

4.0. This is a measure of the absolute size or strength of an earthquake and does not consider the effect at any specific location. Figure 2.2 shows the peak ground acceleration for the state of Maryland, as provided by the USGS.

The Modified Mercalli Intensity (MMI) Scale is an intensity scale expressed in Roman numerals, which reports the amount of shaking and effects at a specific location based on expert judgment. The scale has twelve classes and ranges from I (not felt) to XII (total destruction).

Another way of measuring the potential damage of an earthquake is the peak ground acceleration (PGA). The PGA is measured as a percentage and refers to the maximum percentage of acceleration of the movement of the ground. A higher PGA means a more rapid movement of the ground and a higher probability of structural damage. Table 2.9 correlates the MMI scale with the PGA method.

Figure 2.2: Peak Ground Acceleration for the State of Maryland



Earthquakes can last from a few seconds to more than five minutes, and they may also occur as a series of tremors over a period of several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties may result from falling objects and debris, because the tremors shake, damage, or demolish buildings and other structures. Disruption of communications, electrical power supplies, and gas, sewer, and water lines should be expected. Earthquakes may trigger fires, dam failures, landslides, or releases of hazardous material, compounding their disastrous effects.

Historic Activity

No significant earthquake incidents have been recorded in Frederick County since 1950. The most memorable earthquake in the county was in January of 1885. This earthquake was rated a V on the Mercalli scale, and vibrations were felt 3,500 miles away.

Table 2.9 Modified Mercalli Intensity Scale and Peak Ground Acceleration Comparison

MMI	Acceleration (%g) PGA	Perceived Shaking	Potential Damage
I	<0.17	Not Felt	None
II-III	.17-1.4	Weak	None
IV	1.4-3.9	Light	None
V	3.9-9.2	Moderate	Very Light
VI	9.2-18	Strong	Light
VII	18-34	Very Strong	Moderate
VIII	34-65	Severe	Moderate to Heavy
IX	65-124	Violent	Heavy
X-XII	>124	Extreme	Very Heavy

Source: USGS (Excerpted from FEMA Publication 386-2, "Understanding Your Risks" August 2001

Land Subsidence

Overview

Land subsidence occurs when large amounts of groundwater have been withdrawn from certain types of rocks, such as fine-grained sediments. The rock compacts because the water is partly responsible for holding the ground up. When the water is withdrawn, the rock falls in on itself.

Common causes of land subsidence from human activity are pumping water, oil, and gas from underground reservoirs; dissolution of limestone aquifers (sinkholes); collapse of underground mines; drainage of organic soils; and initial wetting of dry soils (hydrocompaction). Land subsidence occurs in nearly every state.

For the purposes of this plan, land subsidence will be profiled as two separate hazards: landslides and sinkholes/ karst.

Landslides

Overview

Landslides include a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over-steepened slope is the primary reason for a landslide, there are other contributing factors:

- Erosion by rivers, glaciers, or ocean waves creates over-steepened slopes
- Rock and soil slopes are weakened through saturation by snowmelt or heavy rains
- Earthquakes create stresses that make weak slopes fail
- Earthquakes of magnitude 4.0 and greater have been known to trigger landslides
- Volcanic eruptions produce loose ash deposits, heavy rain, and debris flows
- Excess weight from accumulation of rain or snow, stockpiling of rock or ore from waste piles or from man-made structures may stress weak slopes to failure.

Slope material that becomes saturated with water may develop a debris flow or mud flow. The resulting slurry of rock and mud may pick up trees, houses, and cars, thus blocking bridges and tributaries and causing flooding along its path. Landslides occur in every state and United States territory. Any area composed of very weak or fractured materials resting on a steep slope can and will likely experience landslides.

Landslides are often prompted by the occurrence of other disasters. Floods or long duration precipitation events create saturated, unstable soils that are more susceptible to failure. The forces of earthquakes can also cause landslides.

Landslides constitute a major geologic hazard because they are widespread, occurring in all 50 state, and causing $1-2 billion in damages and more than 25 fatalities annually. Landslides pose serious threats to highways and structures that support fisheries, tourism, timber harvesting, mining, and energy production as well as general transportation. Landslides commonly occur with other major natural disasters such as earthquakes and floods that exacerbate relief and reconstruction efforts. Expanded development and other land uses have increased the incidence of landslide disasters.

Based on the Landslide Overview Map of the Conterminous United States from the USGS, Frederick County is in an area of high susceptibility and moderate incidence.[8] Please see Appendix C, Map 2, for the Frederick Landslide Susceptibility Map.

Historic Activity

No records of past landslides have been found for Frederick County since 1950.

Sinkhole/ Karst

Overview

In Frederick County, the zone of influence around a sinkhole is a 1-mile radius for groundwater withdrawal. Based on information from the Maryland Department of the Environment, Mining Program,

> There are certain regions of the state where dewatering of surface mines may interfere with water supply wells and may contribute in some instances to sudden subsidence of land known as sinkholes. It is the intent of the surface mine law (Environment Article 15-801--15-834) to provide an added measure of protection to those property owners that may be impacted by the surface mine operations by establishing a zone of influence around the quarry.[9]

Land subsidence is usually not observable because it occurs over a large area. When land subsidence is isolated in a small area, it appears as sinkholes. Parts of western Maryland that include Frederick County have begun to see sinkholes as a common natural hazard.

History

Frederick County has been known to have a number of sink holes. In 2002, a study titled *Stratigraphy-Karst Relationships in the Frederick Valley of Maryland* was conducted by David K. Brezinski and James P. Reger of the Maryland Geological Survey. The following information has been extracted from this study.[10]

> Karst features are present in strata of Triassic, Ordovician, and Cambrian age in the Frederick Valley of Maryland. The Frederick Valley of Maryland's western Piedmont represents the state's second largest karst terrain. Although the largest is located in eastern Washington County and is known as the Hagerstown Valley or Great Valley, the Frederick Valley has had more incidences of catastrophic collapse and active subsidence

than its larger neighbor. The Frederick Valley is a lowland region that stretches from the Potomac River northward to Woodsboro in northern Frederick County, an area of approximately 400 square kilometers. The Maryland Geological Survey, in conjunction with the Maryland State Highway Administration, has been conducting detailed geologic mapping along with karst feature identification. This report is the preliminary results of that study which is currently in progress.

This study recognized and recorded three types of karst features: closed depressions, active sinkholes, and karst springs. By far the most common feature recognized were closed depressions, otherwise known as dolines. Dolines are defined as features that are recognizable topographic lows towards which the surrounding area is inclined and can be from a few meters to 100 meters in width. The second category of karst features recorded is active sinkholes. These features are differentiated from depressions by the recognition of recent activity, or an open throat. The third category of karst features is springs. Depressions are by far the most common feature recorded, making up nearly 74 percent of all the readings. While active sinkholes comprised nearly 25 percent of the features, springs were a distant third making up only 1.3 percent of all karst features.Approximately 1,179 karst features have been identified in the southern part of the Frederick Valley (Buckeystown, Point of Rocks and Frederick 7.5 minute quadrangles).

The frequency of sinkholes that impact Frederick County has increased in recent years. Heavy rains that followed Hurricane Isabel caused a 110-foot long, 35-foot deep sinkhole along I-70 at the interchange with South Street. This caused temporary closure of South Street and the MARC rail line, knocking out power and putting backpressure on sewer treatment plants.

The Frederick County Division of Public Works (DPW) has identified and repaired hundreds of sinkholes along county roads during the past 10 years. One of the largest sinkholes occurred on New Design Road in June 2003. The sinkhole, 12 feet deep and 30 feet in diameter, opened across both northbound lanes and cost nearly $2M to repair. DPW is currently developing a sinkhole inspection program to map areas of sinkhole incidence and to establish a regular review program.

Another sinkhole formed in a local farmer's field in March 2003. Others appeared at the East Gate Shopping Center and in Sagner Park in April and September 2003, respectively. On average, they were seven to eight feet deep and four to five feet in diameter.

A sinkhole closed the westbound side of I-70 just to the east of Frederick on April 24, 2008. The sinkhole was 20 feet across and 35 feet deep. It was found by a Maryland State Trooper traveling westbound on I-70 who reported it to the Maryland State Highway Administration. There were no injuries.[11]

Twelve sinkholes formed after Tropical Storm Hanna dropped several inches of rain on the county. The sinkholes were found near MD 85 in the southern portion of the county; the largest was 20 feet in diameter.[12]

Between 2004 and 2009, the Maryland State Highway Administration identified between 250 and 300 sinkholes within Frederick County. Two sites in particular have experienced numerous, and sometimes large, sinkholes. In June 2008, a large sinkhole formed on I-70 near Patrick Street and Market Street, closing the highway. The second area is near South Street on I-70. One particular sinkhole that appeared in this area was so large that the depth of the hole was never

actually determined. The Maryland State Highway Administration placed 60 feet of rope down the hole to determine its depth and was unable to identify solid rock bed at that depth.

Climate Change as an Amplifier of Natural Hazards

Overview

Governments throughout the United States share a common goal of ensuring the safety, health, and welfare of their communities. Meeting this goal and maintaining the integrity of essential public services requires that governments anticipate trends and changes that could affect their environment, economy, and community wellbeing. Climate change may eventually affect communities and government functions in a variety of ways; government services, assets, operations, and policy areas may all be impacted to some extent. More obvious impacts may include an increased risk for extreme events such as drought, storms, flooding, landslides, and wildfires; more heat-related stress; the spread of existing or new vector-born disease into a community; and increased erosion and inundation of low-lying areas along coastlines.[13] Working proactively to address the anticipated impacts to these extreme events can help mitigate against future damages to both infrastructure and human life.

According to the American Planning Association, new conditions and certain extreme experiences in recent years have brought the issue of climate change into the forefront for planners, lawmakers, and the public. Clear evidence exists of climate change leading to specific, measurable effects ranging from arctic melting and sea rise to heightened storm and drought frequency and/or severity. These conditions make it imperative that planners and policymakers work immediately to implement new policies to address climate change.[14]

The effects of climate change may be felt through any of the atmospheric, wildfire, hydrologic, and geologic hazard categories detailed within this hazard mitigation plan. It can increase the hazards that currently exist and introduce new hazards not previously experienced in the county. As such, it is imperative that Frederick County continue to be progressive by including climate change as an amplifier that may exacerbate natural hazards.

Regional Initiatives

Frederick County has a unique opportunity to address the issue of climate change and the potential affects it may have on the county. Both Maryland and the Metropolitan Washington Council of Governments (MWCOG) are engaged in climate change initiatives that Frederick County may ultimately join. On April 20, 2007, Governor Martin O'Malley signed Executive Order 01.01.2007.07 establishing the Maryland Climate Change Commission (MCCC).[15] One of the early successes of the Commission was the publication of the Climate Action Plan in August 2008. This report summarizes the impact of climate change on the state, establishes a greenhouse gas and carbon footprint reduction strategy, and discusses ways to decrease Maryland's vulnerability to climate change. Although much of the report's focus is on sea level rise and the potential impact to Maryland's coastal communities, the report also examines the issues surrounding Maryland's agricultural and forested communities as well. This part, in particular, applies directly to Frederick County.

Subsequently, on November 12, 2008, the Board of Directors for the MWCOG voluntarily adopted stringent goals outlined in the *National Capital Region's Climate Change Report*, prepared by the MWCOG Climate Change Steering Committee. MWCOG's decision, one of the few in the country to affect a multi-state region, proposes to return to 2005 levels of regional greenhouse gas emissions by 2012. The report is one of the nation's first initiatives to address local greenhouse gas emissions on a regional level. While a growing number of individual cities and counties are moving forward to address climate change, this is one of the first programs to

involve localities over an entire metropolitan area. The region's elected officials view this approach as one that will provide a catalyst for improving the environment and provide for a prosperous and sustainable future.[16]

Profile

As stated in *Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments*, an increasing amount of physical evidence points to the fact that climate change is already in motion as a result of the greenhouse gases accumulated in the atmosphere to date, particularly since the 1950s. It is projected that the climate through the middle of the 21st century will be driven by present-day greenhouse gas concentrations. Given these projections, reducing greenhouse gas emissions will limit the severity of long-term future impacts, but will do little to alter the near-term changes already set in motion.[17]

Several sectors of Frederick County may be directly impacted by the effects of climate change. These sectors may include: hydrology and water resources, agriculture, biodiversity, forests, recreation, energy, transportation, and human health and welfare. When assessing the county's risk and vulnerability to the natural hazards mentioned in this plan, the county should consider the potential impacts from exacerbated weather events on the sectors above. The *National Capital Region's Climate Change Report* looked specifically at jurisdictions in Maryland and rated the risks associated with severe weather events potentially worsened by climate change.[18] As shown in Table 2.10 below, Frederick County is ranked high or medium-high for risks associated with severe weather events (except tidal/coastal flooding). Each of these events are also analyzed and prioritized as hazards chosen by the Frederick County HMPC for inclusion in this plan.

Table 2.10 Risks by Jurisdiction in Maryland Associated with Severe Weather Events Potentially Exacerbated by Climate Change

Event	High Risk	Medium-High Risk
Drought	**Frederick**, Montgomery, Howard, Carroll, Baltimore City and County, Harford	None
Extreme Heat	Baltimore City	**Frederick**, Prince George's, Charles, Calvert, Howard, Anne Arundel, Harford
Flash/River Flooding	**Frederick**	Montgomery, Carroll, Baltimore County, Anne Arundel
Thunderstorm	**Frederick**, Montgomery, Anne Arundel	Prince George's, Carroll, Howard, Baltimore County, Harford
Tornado	**Frederick**, Anne Arundel	Prince George's, Charles, Carroll, Baltimore County, Harford
Winter Weather (Snow and Ice)	None	**Frederick**, Montgomery, Prince George's, Anne Arundel, Howard, Carroll
Tidal/ Coastal Flooding	None	Anne Arundel, Calvert

Future Trends

Temperatures in the Washington region have increased at a much faster rate in the last fifty years compared to the last hundred years. A comparison of trends in the annual average temperature during these two periods reveals that the rate of annual temperature increase of 0.027°F (0.015°C) in the last fifty years (1955–2005) is three times the annual rate of increase of 0.009°F (0.005°C) during 1893–2005. Five of the last ten years have ranked as the top ten warmest in the United States, since record keeping began in the late 19th century.[19] Given this local trend, Frederick County and the National Capital Region should strongly consider climate change, and rising temperatures, and their associated effects in future planning initiatives.

The Maryland Commission on Climate Change reported in their *Comprehensive Assessment of Climate Change Impacts to Maryland* that if emissions do not decrease, annual precipitation changes will be felt during both summer and winter seasons, with heavier downfall occurring in the winter, and longer and dryer summer seasons occurring with decreased rainfall. The most noticeable percentage increase will occur during the winter months as can be seen in Figure 2.3 below.

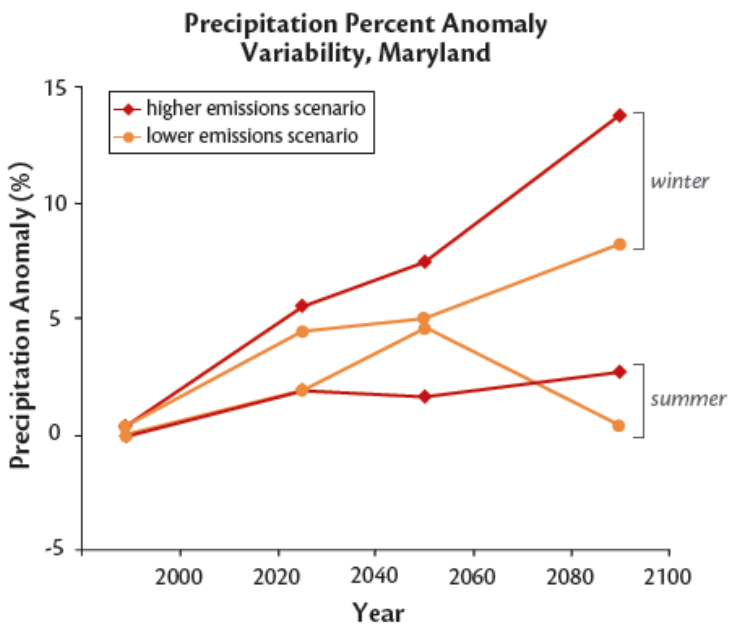


Figure 2.3 – Precipitation Percent Anomaly Variability, Maryland

The projected change in the climate has significant global effects as well. Some of the concerns are as follows:

- The risk of drought and the frequency, intensity, and duration of heat waves are expected to increase;
- More extreme precipitation is likely, increasing the risk of flooding; and
- If the world's average temperature warms only an additional 2.7 to 4.5 degrees Fahrenheit above pre-industrial levels, an estimated 20 to 30 percent of known plant and animal species would be at increasingly high risk of extinction.[20]

Climate Change Adaptation Measures for Frederick County

Water Resources

As the climate changes, one of the more immediate impacts will be the change in Frederick County's water resources. Not only might it affect the overall water supply, it might also affect water quality and increase flood risks. According to the U.S Environmental Protection Agency, evaluating the impacts of climate change on water resources is challenging because water availability, quality, and stream flow are sensitive to changes in temperature and precipitation. Additionally, seasonal fluctuations are a major factor in availability and stream flow in Frederick County. Other important factors include increased demand for water caused by population growth, changes in the economy, development of new technologies, changes in watershed characteristics, and water management decisions.[21] Some possible mitigation measures to reduce the potential impact to water resources are:

- Revising water storage and release programs for reservoirs;
- Adopting crops and cropping practices that are robust over a wider spectrum of water availability;
- Adjusting water prices to encourage conservation and the expansion of water supply infrastructure; and
- Supporting water transfer opportunities.[22]

Flooding

As global temperatures increase, the atmosphere will contain larger amounts of moisture. This increase in moisture will likely enhance the intensity of heavy downpours.[23] Adversely, more intense rainfall may increase peak flooding in urban environments, including areas of Frederick County.[24] An increase in rainfall may negatively affect storm water runoff, crop irrigation systems, the transportation network, local housing developments, amongst others. Some mitigation measures to reduce the potential impact to flooding would be to:

- Conduct a detailed risk assessment of flood hazards modeling the potential effects of climate change;
- Analyze storm water management plans and predict changes in flood impacted areas; and
- Develop "future conditions" floodplain maps for climate change scenarios and use those maps for zoning and planning.

Agriculture

As mentioned previously in the drought section, Frederick County has a significant agricultural community. The impacts of climate change on the agricultural community of Frederick County could be economically devastating. Crop production may increase initially, but then decline later in the century if emissions are not reduced and more intense droughts occur. The longer growing season and higher carbon dioxide levels in the atmosphere are likely to increase crop production modestly during the first half of the century. Later, crop production is likely to reduce due to heat stress and summer drought.[25] As temperatures rise, some crops may experience a decrease in the length of the growing season resulting in less revenue for the county and its citizens. Increased temperatures also may increase crop water demand putting extra strain on the county's water resources. Prolonged periods of drought may negatively impact the growing season of some Frederick County crops, as well.

To mitigate against the possible effects of climate change on the agricultural community in Frederick County, it is suggested that the following mitigation measures be considered:

- Conduct a detailed drought risk assessment accounting for the potential effects of climate change;
- Educate about the benefits of growing crops that are more drought resistant;
- Adopt crops and cropping practices that are robust over a wider spectrum of water availability; and
- Expand and adjust crop insurance programs (such as the Multi-Peril Crop Insurance program's Prevented Planting Provision).

Transportation Infrastructure

An area of public service that may be overlooked when mitigating against the impacts of climate change is transportation infrastructure. As temperatures rise and the severity and frequency of storm events increase, storm runoff may overwhelm various culverts and bridges throughout Frederick County. This would make roads and bridges that were once passable, no longer passable. Strategies to help mitigation against future damages to the transportation infrastructure are as follows:

- Consider climate change impacts on natural hazards in establishing design levels for new and replacement infrastructure;
- Perform routine maintenance and replacement of infrastructure components damaged by extreme temperatures and storms;
- Provide opportunities to shift passenger trips from cars to public transportation, biking, and walking, and freight trips from trucks to rail (and possibly ships) to help to reduce on-road travel;
- Develop infrastructure for cleaner and more climate friendly fuels and engine technologies.[26]

Human Health and Welfare

A warmer climate could also result in increased cases of vector-borne diseases, such as West Nile virus, and stronger, more frequent heat waves. Also, locally, there is a correlation between heat waves and the occurrence of high ozone days. Generally, the hotter the temperature, the more favorable the conditions are for ozone-producing chemical reactions in the air, which can lead to an increase in asthma cases and exacerbation of chronic respiratory diseases. Mitigation measures to consider should include:

- Encouraging private transportation users to reduce emissions of greenhouse gases;
- Increasing public health training and installing more effective surveillance and emergency response systems, and sustainable prevention and control programs, to include training for health care practitioners;[27]
- Providing public education programs to warn of the dangers of extreme heat and high ozone conditions;
- Monitoring the health status of the community; and
- Establishing "cooling centers" for at-risk populations for periods of extreme heat.

Table 2.11 cross-references the sectors discussed above to the natural hazards that may be exacerbated by climate change. The table shows how exacerbated hazards may manifest themselves into vulnerabilities for Frederick County.

Table 2.11 Climate Change Risks and Vulnerabilities

Natural Hazard	Relative Risk	Sector			
		Water Resources	Agriculture	Transportation Infrastructure	Human Health and Welfare
Drought/ Extreme Heat	High	• Strains on water supply • Adverse water quality affects	• Shorter growing season • Reduced crop yield	• Increase roadside erosion • Failure of roadway asphalt	• Increase food costs • Food shortages • Heat strokes • Respiratory problems • Reduced air quality
Flash/ River Flooding/ Thunderstorm	High	• Adverse water quality affects	• Damage to crops • Damage to irrigation systems	• Increase roadside erosion • Failure of roadway asphalt	• Flooding deaths • Injury from debris • Population displacement
Winter Weather (Snow & Ice)	Med-High	• Groundwater availability	• Damage to crops	• Failure of roadway asphalt	• Injury from debris • Population displacement

Summary of Events

As shown in Table 2.12, the county has experienced approximately 1,207 natural hazard events from 1950 to 2008.[28] These events include atmospheric, hydrologic, wildfire, and geologic hazards. Wildfire and sinkholes/karst are the most common occurring hazards in the county, followed by thunderstorms and winter storms. The total property damage to the county by all of the profiled hazards during this period was almost $88.50 million and total crop damage was approximately $94.4 million.

Table 2.12 Summary of Hazard Events (January 1950 - December 2008)

Hazard Event	Total Events	Injured	Property Damage ($)	Crop Damage
Atmospheric				
Extreme Heat	30	427	$30,000	$28,000
Extreme Wind Events[29]	37	0	0	0
Hail	37	0	$5,000	$10,000
Lightning	27	5	$1.809 million	0
Severe Winter Storms	91	16	$9.06 million	$20,000
Thunderstorms	243	13	$8.558 million	$561,000
Tornadoes	26	1	$2.01 million	$50,000
Tropical Storm/ Hurricanes	5	0	0	0
Wildfires				
Wildfires and Urban Interface Fires	331*	0	0	0
Hydrologic				
Drought	11			$93.72 million
Flood/Flashfloods	69		$67.03 million	$10,000
Geologic				
Earthquakes	0	0	0	0
Land Subsidence: Landslide	n/a	n/a	n/a	n/a
Land Subsidence: Sinkholes/Karst	300	n/a	n/a	n/a
Total	**1,207**	**462**	**$88.50 million**	**$94.4 million**
*10 years of data				

Conclusion

Based on the hazard history and profiles of the aforementioned hazards for the 2009 plan update, the hazard frequency was determined (Table 2.13). The hazard frequency was calculated by dividing the number of events observed by the number of years. For example, 37 hailstorms divided by 58 years indicates that on average in any given year, Frederick County has a 64-percent chance of experiencing a hailstorm.

Table 2.13 Probability of Occurrence (January 1950 - December 2008)

Hazard	Total Events	Years in Record	Frequency/ Probability per Year
Atmospheric Hazard			
Extreme Heat	30	58	0.52
Extreme Wind Events	37	15	2.47
Hail	37	58	0.64
Lightning	27	58	0.47
Severe Winter Storms	91	58	1.57
Thunderstorms	243	58	4.19
Tornadoes	26	58	0.45
Tropical Storms/ Hurricanes	5	58	0.09
Wildfire Hazard			
Wildfires and Urban Interface Fires	331*	10	33.1

Hydrologic Hazard			
Drought	11	54	0.20
Flood/Flashfloods	69	58	1.18
Geologic Hazard			
Earthquakes	0	0	0
Land Subsidence: Landslides	n/a	n/a	n/a
Land Subsidence: Sinkholes/Karst	300	14	21.4
*10 years of data			

The natural hazards addressed in this section have been ranked as low, medium, or high priority, as shown in Table 2.14. The hazards have been prioritized based on several factors including the frequency of occurrence, amount of damage caused, potential for significant damage, and the committee's interest in including the hazard as part of the analysis. Although wildfires had a high probability of occurrence, the committee classified it as a medium priority hazard. In Chapter 3, Frederick County's vulnerability to the high priority hazards, such as winter storms, floods, and sinkholes/karst, will be analyzed. The chapter will also discuss certain medium priority hazards that due to their nature, lend themselves to a vulnerability analysis.

Table 2.14 Hazard Priority

2009 Update Hazard List	Priority Level
Extreme Wind Events	High
Flooding and Flash Floods	High
Severe Winter Storms	High
Land Subsidence: Sinkholes/Karst	High
Thunderstorms	High
Tornadoes	High
Drought	Medium
Hailstorms	Medium
Lightning	Medium
Tropical Storm/Hurricane	Medium
Wildfire	Medium
Wildland Urban-Interface Fires	Medium
Earthquake	Low
Extreme Summer Heat	Low
Land Subsidence: Landslides	Low

2009 Hazard Priorities Update

During the 2009 update kick-off meeting, committee members were asked to re-prioritize the list of hazards in the *2004 Frederick County Hazard Mitigation Plan* based upon recent hazard occurrences since the 2004 plan was published. Based upon discussions, the following changes were agreed upon and finalized for the 2009 update as is seen in Table 2.14:

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CHAPTER 3 - VULNERABILITY ANALYSIS/LOSS ESTIMATION

Overview

As discussed in Chapter 2, steps three and four of risk assessment are the vulnerability assessment and loss estimation. A detailed explanation of each step can be found below.

Vulnerability Assessment

The hazard identification for Frederick County indicates that some of the hazards warrant a vulnerability assessment because of their frequency of occurrence or because they have caused major damage in Frederick County and its municipalities. The vulnerability assessment uses the information generated in the hazard identification to identify locations in which residents of Frederick County could suffer the greatest injury or property damage in the event of a disaster. This assessment identifies the effects of hazard events by estimating the relative exposure of people, buildings, and infrastructure to hazardous conditions.

Of the 12 hazards that were identified and profiled in the 2004 plan, it was determined that the hazards with a ranking of high and some with a medium ranking should be selected for further review because the county is potentially more vulnerable to these hazards, although in varying degrees. Information for each hazard has been updated to reflect 2009 information. These hazards are:

- Severe Winter Storms
- Flooding and Flash Floods
- Tornadoes
- Extreme Wind Events
- Land Subsidence: Sinkholes/ Karst
- Wildfires
- Drought
- Tropical Storm/ Hurricane

Loss Estimation

The last step of the risk assessment, loss estimation, involves estimating losses from hazard events and requires a full range of information and accurate data. The loss estimation process helps answer the question “How will the community’s assets be affected by the hazard event?” The most convenient way to express the expected losses is in terms of dollars. Rough estimates are provided where available.

There are a number of site-specific and structure-specific characteristics that determine a building’s ability to withstand hazards. Site-specific characteristics that have a direct impact on losses incurred can depend on the exposure to hazards, first-floor elevation, number of stories, construction type, foundation type, age and condition of structure, use of structure, and contents within the structure.

Note: Areas and total structures that are vulnerable to various hazards have been calculated based on available county data.

County Overview

Frederick County is approximately 664.8 square miles and contains 32 census tracts. According to the 2006 Census Bureau estimates, there are 84,960 households in the county with a total population of 232,706 (2008 Frederick County Planning Division). There are an estimated 70,675 buildings in the county with a total building replacement value (excluding contents) of $26.39 billion (2007 dollars). In 2007, approximately 91 percent of the buildings were residential housing (Table 3.1), with the dollar exposure estimated at more than $11 billion. Commercial buildings in the county have a total dollar exposure of approximately $2.3 billion as displayed in Table 3.2.

Table 3.1 Building Count by Occupancy

Building Count by Occupancy		
Occupancy	**Count**	**% of Total**
Residential	68,796	91.13%
Commercial	3,996	5.29%
Industrial	1,439	1.91%
Agricultural	517	0.68%
Religious	421	0.56%
Government	187	0.25%
Education	136	0.18%
Total	**75,492**	**100.00%**

Table 3.2 Building Exposure by Occupancy

Building Exposure by Occupancy ($1,000 2006 dollars)		
Occupancy	**Exposure**	**% of Total**
Residential	$11,714,600	73.90%
Commercial	$2,365,868	14.92%
Industrial	$944,625	5.96%
Agricultural	$86,810	1%
Religious	$349,964	2.21%
Government	$169,529	1.07%
Education	$221,455	1.40%
Total	**$15,852,851**	**100.00%**

These buildings have also been categorized by construction type as shown in Table 3.3. Steel and reinforced masonry structures are considered strong and more resistant to the forces of nature, but wood and unreinforced masonry structures are more vulnerable to high winds and other hazards. According to 2007 HAZUS-MH MR 3 data, approximately 67 percent of the county's building stock are wood structures, with a total exposure of $8.67 billion. Exposure data can be found in Table 3.2 and 3.4. Unreinforced and reinforced masonry buildings constitute 27 percent of buildings. The total exposure for masonry buildings in Frederick County (reinforced and unreinforced) is $4.45 billion.

Table 3.3 Building Count by Type

Building Count by Type		
Building Type	**# Buildings**	**% of Total**
Concrete	751	1.06%
Manufactured Housing	306	0.43%
Precast	Not Available	Not Available

Reinforced/Unreinforced Masonry	19,094	27.00%
Steel	2,782	3.94%
Wood	47,752	67.57%
Total	**70,675**	**100.00%**

Table 3.4 Building Exposure by Type

Building Stock Exposure by Type ($1,000 2006 dollars)		
Building Type	**Exposure**	**% of Total**
Concrete	$703,426	4.44%
Manufactured Housing	$26,689	0.17%
Masonry	$4,453,973	28.10%
Steel	$1,999,193	12.61%
Wood	$8,668,940	54.69%
Total	**$15,852,221**	**100.00%**

Critical Facilities

To assess Frederick County's vulnerability, an inventory of its structures and critical facilities was performed. Critical facilities are those that warrant special attention in preparing for a disaster and that are vital in maintaining the functioning of the community. Frederick County has prepared an inventory of critical facilities that includes emergency response facilities such as: police stations, fire departments, and emergency medical services (EMS) stations; hospitals and nursing homes; schools; local government buildings; and important transportation facilities, including airports, water treatment plants, and septic treatment plants.

Table 3.5 indicates a total of 473 facilities in Frederick County and its municipalities that are deemed critical in nature. Of these, 134 facilities are located in the City of Frederick, and 205 facilities are dispersed in the unincorporated areas of the county. In terms of facility type, there are 28 nursing and health care related facilities in the county and approximately 64 public schools. This information was derived from the Frederick County Office of Emergency Preparedness.

Table 3.5 Frederick County Critical Facilities

	Police	Fire/ EMS*	Public School	Post Office	Library	Public Facility	Nursing Facility & Care	Parks	Trans - portation	WTP/ WWTP	Total
Brunswick	1	2	3	1	1	4		6	1	3	**22**
Burkittsville				1		2					**3**
Emmitsburg	1	2	1	1	1	2	2	5			**15**
Frederick City	2	5	16	3	1	27	11	63	2	4	**134**
Middletown	1	1	4	1	1	2		10		1	**21**
Mt. Airy			1					3			**4**
Myersville	1	1	1	1		2		4		2	**10**
New Market		1	1	1		1		3			**7**
Rosemont											**0**
Thurmont	1	2	3	1	1	1		8			**17**

Walkersville	1	2	4	1	1	2	1	5		1	**18**
Woodsboro		1	1	1		1		3		2	**7**
Not in towns		15	29	12	2	6	14	55	2	54	**189**
TOTAL	**8**	**32**	**64**	**24**	**8**	**50**	**28**	**165**	**5**	**67**	**447**

Lifeline Inventory

Table 3.6 shows the Transportation System Lifeline Inventory that was derived from the HAZUS-MH MR 3 database. The replacement value for highways in the county was approximately $2 billion and for airports, $322 million. The total transportation system lifeline replacement value was estimated at $2.4 billion.

HAZUS-MH MR 3 categorizes each of the lifelines in the following manner:

- A highway transportation system consists of roadways, bridges, and tunnels.
- A railway transportation system consists of tracks, bridges, tunnels, stations, fuel, dispatch, and maintenance facilities.
- A light railway transportation system consists of tracks, bridges, tunnels, stations, fuel, dispatch, and maintenance facilities. The major difference between light rail and rail systems is the power supply, where light rail systems operate with direct current substations.
- A bus transportation system consists of urban stations, fuel facilities, and dispatch and maintenance facilities.
- Port and harbor transportation systems consist of waterfront structures, cranes/cargo handling equipment, warehouses, and fuel facilities.
- A ferry transportation system consists of waterfront structures, passenger terminals, warehouses, fuel facilities, and dispatch and maintenance facilities.
- An airport transportation system consists of control towers, runways, terminal buildings, parking structures, fuel facilities, and maintenance and hanger facilities.

Table 3.6 Transportation System Lifeline Inventory

Transportation System Lifeline Inventory			
System	**Component**	**Locations/Segments**	**Replacement Value ($1,000)**
Highway	Bridges	152	$197,782
	Segments	126	$1,803,406
	Tunnels	0	$0
	Sub Total	278	$ 2,001,187
Railways	Bridges		
	Facilities	1	Unavailable
	Segments	78	$107,119
	Tunnels	2	Unavailable
	Sub Total	78	$107,119
Light Rail		0	0
Bus		1	$2,158
Ferry		0	$0
Port		0	$0
Airport	Facilities	8	$43,164
	Runways	9	$276,923
	Sub Total	18	$ 322,245
Total		**375**	**$2,430,551**

Table 3.7 shows the Utility System Lifeline Inventory that was derived from the Frederick County Division of Utilities and Solid Waste Management and the HAZUS-MH MR 3 database. The replacement value for the potable water system in the county was approximately $66 million and that of wastewater was $1.5 billion. The total utility system lifeline replacement value was estimated near $ 1.7 billion.

Utility systems addressed in HAZUS-MH MR 3 methodology include potable water, wastewater, natural gas, oil, electrical power, and communication systems, which are defined as follows:

- A potable water system consists of pipelines, water treatment plants, control vaults and control stations, wells, storage tanks, and pumping stations.
- A wastewater system consists of pipelines, wastewater treatment plants, control vaults and control stations, and lift stations.
- A natural gas system consists of pipelines, control vaults and control stations, and compressor stations.
- An oil system consists of pipelines, refineries, control vaults and control stations, and tank farms.
- An electrical power system consists of generating plants, substations distribution circuits, and transmission towers.
- A communication system consists of communications facilities, communications lines, control vaults, switching stations, radio/TV stations, weather stations, or other facilities.

Table 3.7 Utility System Lifeline Inventory

Utility System Lifeline Inventory			
System	**Component**	**Locations/Segments**	**Replacement Value ($1,000)**
Potable Water	Distribution Lines	0	0
	Facilities	69	$125,000,000
	Pipelines	284 miles	0
	Sub Total	2	$119,000,000
Waste Water	Distribution Lines	Unknown	$244,000,000
	Facilities	34	$8,300,000
	Pipelines	344 miles	$134,000,000
	Sub Total	23	$142,300,000
Natural Gas	Distribution Lines	0	0
	Facilities	0	0
	Pipelines	54.435	Unknown
	Sub Total	0	0
Oil Systems	Facilities	0	0
	Pipelines	0	0
	Sub Total	0	0
Electrical Power	Facilities	1	$108,900
Communication	Facilities	11	$1,089
Total			**$1,692,405**

Vulnerability Analysis

Extreme Wind Events

Background

The primary hazard caused by winds is the transport of debris, which can cause casualties and property loss or even the dislodging of mobile homes from their structures or vehicles. High winds may also cause damage to poles and lines carrying electric, telephone, and cable television service. As mentioned earlier, older structures built before 1940 could be more susceptible to wind damage**.**

Older critical facilities are vulnerable to wind damage due to the age of construction and possible poor condition, especially in the more rural and isolated areas of the county. It is important to identify specific critical facilities and assets that are most vulnerable to the hazard. Evaluation criteria include the age of the building (and what building codes may have been in effect at the time of construction), type of construction, and condition of the structure (i.e., how well the structure has been maintained).

Future Trends

As development in the county and population density increase, wind may present an increased threat to the people and structures in the county.

Mitigation Measures

The entire county can be affected by wind hazards. Strong winds can rip roofs off houses, overturn buildings, and cause total failure of poorly constructed structures. Certain structures are particularly susceptible to damage and overturning in extreme wind events, including:

- Aged, dilapidated, and poorly constructed buildings
- Buildings not constructed to applicable building codes
- Manufactured housing units
- Houses with gable-ended roofs

Special attention should be paid to securing these structures by strapping and anchoring foundations.

Loss Estimation

The HAZUS-MH MR 3 Hurricane Model from FEMA's loss estimation software was used to determine losses to Frederick County from an extreme wind event caused by a hurricane that made landfall on the East Coast. HAZUS-MH MR 3 was run to obtain annualized losses data.

In terms of general building stock damage, Frederick County would incur an annualized loss of $423,000 in direct building damages (estimated costs to repair or replace the damage caused to the building and its contents) based on the hurricane event itself. Also, the annualized loss due to business interruption (inability to operate a business due to damages sustained by the hurricane) is estimated to be $18,000. Based on the HAZUS-MH MR 3 model, no sheltering would be required.

Based upon the maximum sustained wind speeds provided by FEMA's Benefit Cost module, it can be assumed that Frederick County has a 5-percent chance of experiencing tropical storm force winds annually. There is a 2.5-percent chance of experiencing a Category 1 hurricane in a given year, and a .02-percent chance of experiencing anything greater than a Category 1.

It should be noted that HAZUS-MH MR 3 is considered one of many planning tools used by states and local governments. Other tools should be considered in developing the hazard analysis and risk assessment for local communities. In some cases, other tools and methodologies may offer more usefulness than HAZUS in the performance of a measure hazard analysis and risk assessment.

Flash Floods

Background

Vulnerability to flash flooding is difficult to determine because local terrain, soil conditions, and construction play a role in how much storm water can percolate into the soil, be accommodated by waterways, or cause flash flooding. Flood vulnerability is described in terms of the community assets that lay in the path of floodwaters.

Critical facilities are vulnerable to flash flooding, but their vulnerability is dependent on their siting relative to specific terrain and soil type and the amount of excess runoff from neighboring and upstream areas. Since flash floods frequently occur outside of delineated SFHAs, there is no absolute certainty that future development in a specific location in the county would not be subject to flash floods.

Mitigation Measures

Flash floods have been and will continue to be a significant threat to the economic and social well-being of the more developed areas of Frederick County such as Frederick City and Mt. Airy. In particular, the towns that have more population and economic assets are vulnerable to flood damages. Most flash flood events result in direct damage to structures and infrastructure in

developed areas. The location and occurrence of flash floods is difficult to predict and is dependent on local conditions of terrain, land use, and percent of impervious cover. As a result, actions should focus on corrective measures for drainage in all future development plans in these areas.

Data Limitations

First floor elevations and structure replacement values are useful for loss estimation. Replacement value is a necessary component in estimating the dollar amount of losses in a flood and, when combined with a range of flood probabilities from the 100- to 500-year flood depths, can help in describing the benefits and costs of mitigation actions in monetary terms. However, this information was not readily available.

Localized Flooding

As discussed in the Hazard Identification chapter of this plan, Frederick County periodically experiences flooding from seasonal rainstorms, flash floods, and hurricanes. There are two types of floods experienced in the area. During a riverine flood, water slowly climbs over the edges of a stream or riverbed and spreads to the surrounding area. Flash flooding, the more dangerous type of flooding, is discussed above. Localized flooding results when constant and sometimes heavy rains occur, overloading drainage ways and flowing into streets and low-lying areas. A map of frequently flooded roadways in Frederick County can be found in Appendix C.

Observing the slow rise of water along with an area-wide flood warning usually gives adequate time to evacuate. However, because the rainfall associated with flash flooding is so intense and fast moving, it is not as easy to predict when a flash flood will occur. Frederick County has a network of emergency management partners who keep the public informed of hazardous situations and the need to evacuate. The National Weather Service's Doppler radar, which can track rainfall over very small areas, is also an invaluable resource available to those living or working near flood hazards.

As discussed in Chapter 2, areas identified as vulnerable to flooding are depicted on the effective Frederick County and Incorporated Areas (2007) NFIP maps, which were adopted by the county and incorporated communities. The FEMA flood zones represent the areas susceptible to the 1-percent annual chance flood (often referred to as the "100-year flood"), and the 0.2-percent annual chance flood ("500-year flood"). The 1-percent annual chance flood, also known as the "base flood," has at least a 1-percent chance of occurring annually and at least a 26-percent chance of occurring over the life of a typical 30-year mortgage. FEMA designates this area as the SFHA and requires flood insurance for properties in this area as a condition of a mortgage backed by federal funds. The county's rivers, 1-percent annual chance floodway[1], and 1-percent and 0.2-percent annual chance flood areas are available for review at www.co.frederick.md.us/planning. As noted before, a map of Frederick County's floodplain can be found in Appendix C, Map 1.

Frederick County and several of its incorporated communities have developed strong floodplain management programs that exceed the minimum NFIP regulatory standards. Most notably, within the unincorporated areas of the county, new development is not permitted within the county's designated floodplains unless approved by the County Board of Appeals. While new

[1] The 1-percent annual chance regulatory floodway is the area identified on an NFIP map that represents the portion of the floodplain that carries the majority of the flood flow and often is associated with high velocity flows and debris impact. It is the part of the stream channel plus that portion of the overbanks that must be kept free from encroachment in order to discharge the 1-percent-annual-chance flood without increasing flood levels by more than 1.0 foot (some states specify a smaller allowable increase).

development is being guided away from known areas at risk of flooding, Frederick County, nonetheless, has existing neighborhoods that periodically flood.

Geographic Information Systems (GIS), digital FEMA Flood Insurance Rate Maps (DFIRMs), FEMA's HAZUS-MH, and other modeling tools have been used to identify structures in the county at risk of flooding. The key results of these analyses are summarized in the sections that follow. All estimates of population, buildings, and infrastructure at risk, as well as loss estimates that follow are based on modeling and data from HAZUS-MH MR 3. Due to population growth and increased development all estimates of the numbers of vulnerable structures and losses may under-estimate risk at the present time.

1-percent Annual Chance Flood

According to HAZUS-MH MR 3, approximately 457 buildings (5 commercial and 452 residential) would be damaged by a 1-percent annual chance flood. The total building-related losses would be $216.38 million. One percent of the estimated losses was related to the business interruption of the region. Damage to residential structures made up 48.07 percent of the total loss. Given an average household size of 2.72 and 452 residential structures affected, approximately 1,229 people would be impacted by a 1-percent-annual-chance flood.

0.2-percent Annual Chance Flood

According to HAZUS-MH, approximately 655 buildings (8 commercial and 647 residential) would be damaged by a 0.2-percent annual chance flood. The total building-related losses would be $282.91 million. Two percent of the estimated losses was related to the business interruption of the region. Damage to residential structures made up 48.95 percent of the total loss. Given an average household size of 2.72 and 647 residential structures affected, approximately 1,759 people would be impacted by a 0.2-percent-annual-chance flood.

Critical Facilities and the Floodplain

A critical facility is a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the county, or fulfills important public safety, emergency response, and/or disaster recovery functions.

The NFIP regulations require elevation of structures located in SFHAs only to the base (1-percent-annual-chance) flood elevation (BFE), regardless of the function they serve. Many public and commercial facilities serve vital functions for communities, which, if interrupted due to flooding, would severely impact citizens. Also, some facilities house large numbers of people who would experience difficulty if required to evacuate before or during a severe flood. Special consideration should be given to requiring a higher level of protection from flooding for such facilities.

Since flooding can prevent access to a critical facility even if the facility is elevated or floodproofed above the flood level, knowing what facilities are located within existing flood hazard areas and avoiding building any new critical facilities in flood hazard areas is critically important to ensuring public safety. Sixteen critical facilities within Frederick County are located within the 1-percent-annual-chance floodplain, as shown in Table 3.8.

Table 3.8 Critical Facilities in a Floodplain

Police	Fire/ EMS*	Public School	Post Office	Library	Public Facility	Nursing Facility & Care	Parks	Trans - portation	WTP/ WWTP	Total
0	1	0	1	0	3	0	N/A	2	9	**16**

The Frederick County critical facilities located in a FEMA-designated SFHA are as follows:

Fire/EMS	Independent Hose Company
Post Office	Buckeystown
Public Facility	Thurmont Town Hall Management Services Carpentry/ Lock Smith Shop - Pine Ave DUSWM Operations Center - Marcies Choice Lane
Transportation	Brunswick MARC Station Point of Rocks MARC Station
Water Treatment Plant (WTP)/ Waste Water Treatment Plant (WWTP)	Brunswick WWTP Fort Detrick WWTP Middletown WWTP Woodsboro WWTP Crestview Estates WWTP Eastalco Aluminum Company WWTP Fountaindale WWTP Point of Rocks WWTP Thurmont WWTP

Flood Insurance Coverage

As of November 20, 2008, there were 468 flood insurance policies in effect throughout the county, with an annual premium of $270,000 covering more than $78 million in property. The majority of these policies are for properties in the unincorporated areas of Frederick County. The loss statistics from FEMA's NFIP database for the county indicate that there were 172 flood insurance claims processed by the NFIP between January 1, 1978, and November 20, 2008. These statistics are summarized in the Flood Insurance Policies Statistics tables (Table 3.9 and 3.10) that follow.

Table 3.9 Policy Statistics

Policy Statistics as of 11/20/2008			
Community Name	**No. of Policies**	**Total Premium**	**Total Coverage**
BRUNSWICK, CITY OF	10	$ 3,547	$ 2,018,000
EMMITSBURG, TOWN OF	19	$ 7,789	$ 3,699,400
FREDERICK COUNTY	321	$ 270,465	$ 78,583,400
FREDERICK, CITY OF	84	$ 72,183	$ 21,093,000
MIDDLETOWN, TOWN OF	3	$ 2,599	$ 666,000
THURMONT, TOWN OF	10	$ 4,856	$ 2,490,900
WALKERSVILLE, TOWN OF	19	$ 9,045	$ 5,119,900
WOODSBORO, TOWN OF	2	$ 740	$ 700,000

Source: FEMA.gov/nfip

Table 3.10 Flood Insurance Claims Statistics

Policy Statistics as of 11/20/2008		
Community Name	**Total Losses**	**Total Payments**
BRUNSWICK, CITY OF	6	$22,023
EMMITSBURG, TOWN OF	10	$33,736
FREDERICK COUNTY	133	$1,278,691
FREDERICK, CITY OF	22	$96,034
MIDDLETOWN, TOWN OF	1	$0
THURMONT, TOWN OF	0	$0
WALKERSVILLE, TOWN OF	0	$0
WOODSBORO, TOWN OF	0	$0

Source: FEMA.gov/nfip

Flood insurance is available to anyone in the county, including structures outside of the mapped SFHA, provided they are located in an NFIP-participating community. Therefore, in some cases, the number of policies includes policies for structures that are outside the mapped SFHA.

Repetitive Loss Areas

A "repetitive loss property" is one for which two flood insurance claim payments of at least $1,000 have been paid by the NFIP within any 10-year period since 1978 (e.g., two claims during the periods 1978–1987, 1979–1988, etc.). These properties are important to the NFIP because they cost $200 million per year in flood insurance claim payments nationwide. Repetitive loss properties represent only one percent of all flood insurance policies, yet, historically, they account for nearly one-third of the claim payments (over $4.5 billion to date). Mitigation of the flood risk to these repetitive loss properties will reduce the overall costs to the NFIP as well as to individual homeowners.

FEMA programs encourage communities to identify the causes of their repetitive losses and develop a plan to mitigate the losses. Frederick County intends to apply to participate in the NFIP's Community Rating System (CRS). Since there are repetitive loss properties in Frederick County, the county must complete specific tasks to be eligible for CRS participation. These include:

- Review and describe its repetitive loss challenges;
- Prepare a map of the repetitive loss area(s);
- Prepare a list of the addresses of all insurable properties in the repetitive loss areas; and
- Undertake an annual outreach project to the repetitive loss area(s) and submit a copy of the outreach project with its CRS application and each year's recertification.

There are 25 repetitive flood loss properties in Frederick County based on the list provided by FEMA. Of the properties, 20 are located in the unincorporated areas of the county, three are located in the City of Frederick, and two are located in the Town of Thurmont. Fourteen of the properties are no longer considered repetitive loss properties because they have been mitigated by the removal of the structure. With the removal of these 14 buildings from the list, six buildings remain on the unincorporated areas of Frederick County's repetitive loss list, three remain within the City of Frederick, and two remain within Thurmont. Table 3.11 shows the date of the losses, the source of flooding, and some general information on each of the buildings.

Table 3.11 Repetitive Loss Structures

Community	Zip Code	Use	Flooding Source	Date of Claim	Year Built	Comment
Frederick (City)	21701	Commercial	Carroll Creek	85, 84		Located in City of Frederick
Lilypons	21710	Commercial	Bennett Creek	96, 88, 85, 84, 79, 79		
Frederick (city)	21701	Commercial	Tributary No. 10 to Monocacy River	79, 79, 78		Located in City of Frederick
Frederick (uninc. area)	21777			96, 96, 85, 84, 79		Owned by U.S. Park Service. Demolished
Point of Rocks	21777			96, 96, 85		Acquired and demolished by County. Returned to open space w/deed restrictions
Point of Rocks	21777	Commercial	Potomac River	96, 96, 85	1904	Acquired and demolished by County. Returned to open space w/deed restrictions
Point of Rocks	21777			96, 96, 85		Acquired and demolished by County. Returned to open space w/deed restrictions
Point of Rocks	21777			96, 96, 85	1883	Acquired and demolished by County. Returned to open space w/deed restrictions
Point of Rocks	21777			96, 96, 85	1891	Acquired and demolished by County. Returned to open space w/deed restrictions
Point of Rocks	21777			96, 96, 85	1891	Acquired and demolished by County. Returned to open space w/deed restrictions
Point of Rocks	21777	Residential	Potomac River	96, 96	1897	Acquired and demolished by County. Returned to open space w/deed restrictions
Point of Rocks	21777	Residential	Potomac River	96, 96	1885	Acquired and demolished by County. Returned to open space w/deed restrictions
Point of Rocks	21777			96, 96	1898	
Point of Rocks	21777			96, 96	1889	Acquired and demolished by County. Returned to open space w/deed restrictions
Point of Rocks	21777	Commercial	Potomac River	96, 96		
Frederick	21701	Residential	Monocacy River	96, 96	1910	
Point of Rocks	21777			96, 96	1891	Acquired by County. To be demolished.

Frederick (uninc. area)	21701	Residential	Israel Creek	96, 96	1880	
Point of Rocks	21777	Residential	Potomac River	96, 96	1920	
Point of Rocks	21777			96, 96		Acquired and demolished by County. Returned to open space w/deed restrictions
Thurmont	21788	Residential	Hunting Creek	96, 96	1955	Located in Town of Thurmont
Thurmont	21788	Residential	Hunting Creek	96, 96	1920	Located in Town of Thurmont
Point of Rocks	21777	Residential	Potomac River	96, 96	1870	Owned by Department of Transportation. No Structure remains
Point of Rocks	21777	Residential	Potomac River	96, 96	1882	Acquired and demolished by County. Returned to open space w/deed restrictions
Frederick (City)	21701	Commercial	Unknown	00, 98		Possible storm water Issue. Located in the City of Frederick

Mitigation Measures

As reflected in Table 3.11, numerous mitigation projects have been completed in recent years that have resulted in the acquisition and demolition of several of the county's most flood-prone properties. In addition, drainage improvement projects have been completed that reduce the threat of flooding to the City of Frederick's downtown area. These two projects and the efforts that will be taken in 2009 to more fully identify properties within the unincorporated areas of Frederick County that experience recurring and costly flooding damage are discussed below.

Point of Rocks Mitigation Project: Frederick County made purchase offers to the owners of properties in Point of Rocks that had sustained complete first floor and partial second floor flooding three times in six years. The offers were based on the average of two appraisals. The Point of Rocks Flood Mitigation Project benefited the community by removing 18 homes from harm's way and protecting 75 people. The project permanently eliminated the risk of loss of life, injury, and property damage associated with flooding of these residences. In addition, the project saves approximately $350,000 in physical damages and $100,000 in response services for each flood event. Additional project benefits include public recreation space and additional parking areas.

Carroll Creek Mitigation Project: After Carroll Creek flooded much of the historic downtown business district in 1976, the City of Frederick invested in a $60 million, ten-year flood control project. Carroll Creek was channelized, and four underground concrete conduits, each wider than a city bus, were built to accommodate the 1-percent-annual-chance flood. As a result, FEMA no longer considers hundreds of valuable downtown properties to be in a mapped floodplain, saving businesses and residents millions in flood insurance.

Repetitive Loss Area Analyses: In conjunction with the unincorporated areas of Frederick County's application to join FEMA's CRS program, county staff will begin area analyses in 2009. The objective will be to gain a better understanding of the flooding problems faced by the repetitive loss buildings and neighboring properties, and to identify and share mitigation options with the affected property owners and lessees.

Severe Winter Storms

Background

Vulnerability to the effects of winter storms on buildings depends on the age of the building (and the building codes in effect at the time of construction), type of construction, and condition of the structure (i.e., how well it has been maintained, materials used, etc.).

The entire county can be impacted by snow, ice and extreme cold. Severe winter storms result in the loss of utilities, increases in traffic accidents, impassable roads, and lost income since normal commuting can be hindered.

Snow and ice can be extremely hazardous because visibility is reduced and surface accumulation reduces traction and strains power lines, roofs, and other structures. Severe winter storms have been and will continue to be a significant threat to the economic and social well-being of Frederick County. Disruptions of emergency and other essential services and critical facilities are the main threats to people and property.

Severe storm activity poses a significant threat to unprotected or exposed lifeline systems. Generally, commercial power networks are very susceptible to interruption from snow and ice conditions. Other utilities, including underground pipelines, may be impacted if not protected from exposure.

All critical facilities in the county are vulnerable to the effects of severe winter storms due to the potential disruption of services and transportation systems as well as possible structure failure due to heavy snow loads.

Approximately 12.2 percent of the occupied housing units were built prior to 1940 according to the 2007 American Community Survey. Based on 2000 Census data, over 40 percent of the structures in Census Tracts 750100 (Frederick City), 750200 (Frederick City), 750300 (Frederick City), 750900 (east of Frederick City), 752400 (Rosemont/Brunswick), and 753200 (Emmitsburg) were built prior to 1940. These may be in well-preserved, older neighborhoods. However, some of the older structures may not be in a condition to weather these storms due to poor building quality, antiquated plumbing, etc., and would require adequate measures to ensure that they are brought up to code to mitigate severe storms.

Mitigation Measures

- Stocking adequate quantities of salt and sand expedites and improves road clearing.
- Public education concerning safe driving and driving only if it is required, and also stocking up on food, water, batteries, and other supplies will prepare people for storms.

Land Subsidence: Sinkholes/Karst

Background

Where sinkholes exist, runoff, spills, or pesticides and fertilizers from lawns and farms can leak through the many spaces in the rock, unfiltered by the soil, enter the groundwater system, and leak into water resources. Since thousands of residents in this region get their water from private home wells, these areas would be especially susceptible to immediate pollution. The Frederick

Quarry is another major cause of sinkholes in the area; quarry owners are required to repair all sinkholes within a mile radius.

The Maryland State Highway Administration conducted a study of the extent of sinkholes near major transportation routes in Frederick County. Fifteen sinkholes more than six feet deep were located throughout the county. Of these, six were near/in Frederick City, two were near US 15, and three were near MD 194. Two sinkholes more than 10 feet deep were found south of Frederick City, one near I-70 and the other near I-270.

Future Trends

Increased population in the Frederick County region will increase demands on groundwater supplies; this will cause more land subsidence in areas already experiencing sinkholes, as well as new subsidence in other areas. In the past, major subsidence areas have been in agricultural settings where groundwater has been pumped for irrigation.

In the future, increasing population may result in problems in metropolitan areas where damage from subsidence can be significant. Numerous sinkholes have occurred in close proximity to I-70, resulting in road closures of the interstate and other major arterial roads. Sinkhole occurrence is expected to increase because the City of Frederick is tapping underground wells for water. The mayor and Board of Aldermen recently passed a sinkhole liability plan to establish a procedure to deal with potential sinkholes due to well pumping.

Mitigation Measures

Several county and local governments in other states have legislated special water-management practices for industrial or commercial sites located in karst areas that require:

- Refraining from dumping anything onto a parking lot, storm drain, or down a sinkhole;
- Diverting water runoff away from sinkholes;
- Remediating sinkholes that receive runoff, as soon as possible;
- Maintaining vegetation on steep slopes to keep soil in place;
- Identifying the best practices for dispersed storm water management in karst areas; and
- Working with the local health department to select the best septic system for each site and contacting the local health officials if there is a reason to believe the system is malfunctioning.

Under a 1991 Amendment to Maryland's Surface Mining Law, the MDE is required to establish and define Zones of Influence (ZOI) around limestone and marble quarries in Baltimore, Carroll, Frederick, and Washington Counties. A quarry's ZOI is based on local topography, watersheds, and geologic and hydrologic factors. When establishing ZOIs, MDE conducts field investigations and evaluates any available information (e.g., groundwater studies and well monitoring data).

Loss Estimation

Based on 2009 information from the City of Frederick's Public Works Department, sinkholes along a roadway could cost as much as $6,000 to fix, including materials and labor.

Tornadoes

Background

Tornadoes have occurred in Frederick County in the past and are expected to occur in the future. Tornadoes often result in buildings with missing roofs, uprooted road signs, fallen power lines

and trees, destroyed homes and water towers, and damaged cars. For example, the tornado that hit the county in August 1999 did extensive damage to trees in Eastview, Walnut Springs, Shookstown, and Fort Detrick. Some trees fell onto cars and houses, and a few homes under construction were damaged. Yellow Springs Road was closed for several hours until power and telephone poles blocking the road could be cleared.

Future Trends

The impact of tornadoes primarily depends upon their occurrence in developed areas; tornadoes in undeveloped areas may cause damage only to a few trees and often are unreported. As development and population in the county increase, a larger number of structures and people may be subject to tornadoes.

Mitigation Measures

The most important factor to vulnerability assessment is how likely structures are to fail when subjected to wind loads that exceed their design or to flying debris that penetrates the building. In general, building damages can range from cosmetic to complete structural failure, depending on wind speed and location of the building with respect to the tornado path, and can be analyzed by a structural engineer. Measures to reduce damages from tornadoes include proper anchoring and strapping of buildings to their foundations, and designing shelters and other critical facilities for appropriate wind speeds.

Loss Estimation

There are not any standard loss estimation models and tables for tornadoes. Exposure data estimates the number of structures at risk. Manufactured homes are particularly vulnerable to tornadoes. According to the 2007 American Community Survey, 0.6 percent of the occupied housing stock in Frederick County was a mobile home or other type of manufactured housing. According to the 2000 Census, there are a total of 595 manufactured homes in Frederick County, with a dollar exposure of approximately $23 million (Table 3.12). Manufactured homes are particularly vulnerable to tornadoes and high-wind hazards. Census tracts 751000 (south Frederick City), 751600, 751700 (Libertytown), 752500 (Burkittsville), and 753100 (east of Thurmont) have more than 35 manufactured homes each. In terms of calculating human losses, shelters throughout the community should be assessed for their locations, capacities, and strengths in order to ensure they are able to house residents and withstand the design wind speed.

Table 3.12 Dollar Exposure of Manufactured Homes

Manufactured Homes		
Census Tract	Count	Dollar Exposure
24021750600	2	$196,000
54021751000	81	$2,743,000
24021751200	4	$295,000
24021751300	9	$330,000
24021751500	1	$162,000
24021751600	44	$1,541,000
24021751700	38	$1,398,000
24021751800	25	$1,049,000
24021751900	32	$1,169,000
24021752000	22	$753,000
24021752100	16	$606,000
24021752200	10	$486,000
24021752300	9	$488,000
24021752400	31	$1,202,000
24021752500	87	$3,181,000
24021752600	29	$1,105,000
24021752700	4	$137,000
24021752800	33	$1,286,000
24021752900	21	$1,136,000
24021753000	23	$860,000
24021753100	55	$2,091,000
24021753200	19	$855,000
Total	595	$23,069,000

Drought

Background

Those who rely on surface water (reservoirs and lakes) and subsurface water (groundwater) are usually not adversely affected by a drought. A short-term drought that persists for three to six months may have little impact on these areas, depending on the characteristics of the hydrologic system and water use requirements. Droughts of longer duration affect areas that are dependent on stored surface or subsurface supplies while the impacts of a drought may be less in agricultural areas as rain quickly replenishes soil moisture. Groundwater users who are often the last to be affected by drought during its onset may also be the last to experience a return to normal water levels. The length of a recovery period is a function of the intensity of the drought, its length, and the quantity of precipitation received as the drought ends.

Future Trends

As business and population growth continues in Frederick County, the potential impacts of a prolonged drought grow significantly. Continued residential and commercial development in the towns coupled with the need to acquire additional sources of water will result in a diminishing supply of water.

If the county becomes unsuccessful in attracting the majority of its new growth to the more developed areas, new development could encroach into rural areas. This potential conversion of rural land for residential use would be of great concern to the county due to its implications for loss of agricultural and forest land, open space, and rural character, and the need for additional sources of water.

Mitigation Measures

Identifying the first stages of drought and helping to conserve water will help mitigate drought to an extent. In the future, there is also the potential for limiting population growth and development dependent on groundwater. Mitigation management for drought is a proactive process. However, most of the process has occurred at the state level.

In Maryland, the Governor's Water Conservation Advisory Committee recommended actions for the four drought stages:

Stage 1: Normal Conditions (green)

Stage 2: Watch (Yellow) 5 -10-percent reduction goal

- Drought conditions evaluated biweekly
- MDE media office works with local TV and radio stations to issue frequent drought updates to public
- MDE increases monitoring of any problems incurred by water systems
- Utilities or local governments may impose restrictions more stringent than the state guidelines
- Water systems activate Water Conservation Plans
- Water systems aggressively pursue leak detection surveys and repair programs
- Reduce water usage for main flushing, street flushing, and park irrigation
- Business and industries activate water emergency plans
- Homeowners, government facilities, business, and industry should reduce water use for irrigation purposes

Stage 3: Warning (Orange) 10 -15-percent reduction goal

- Drought conditions evaluated on a weekly basis
- Residences, businesses, and industry voluntarily comply with nonessential water use restrictions
- MDE media office works with local TV and radio stations to issue periodic notification of drought measures, and to increase public awareness of water conservation
- MDE continues to monitor problems incurred by water systems
- Utilities or local governments may impose restrictions more stringent than the state guidelines
- Water systems actively implement water conservation measures
- Water systems individually contact industrial users to reduce water usage
- Water systems discontinue flushing water lines, fire hydrants, and distribution equipment
- Facility managers for government buildings identify leaks and accelerate maintenance and/or repairs
- Encourage business and industry to irrigate with treated wastewater in accordance with health guidelines

Stage 4: Emergency (Red) 15 – 20-percent reduction goal

- Drought conditions evaluated at least weekly
- Implement mandatory restrictions on nonessential water uses
- MDE media office works with local TV and radio stations to issue daily drought updates to public
- Establish Drought Hotline
- Utilities or local governments may impose restrictions more stringent than the state guidelines
- MDE and water systems notify consumers of severity of water shortage
- Water systems conduct field surveillance of abuses, leaks, etc.
- Local police and/or water systems execute enforcement of water conservation restrictions
- Water systems verify availability of alternate water source or interconnection
- Residences comply with mandatory nonessential water use restrictions
- Business and industry comply with water conservation plans to reduce water use by at least 10 percent
- Business and industry evaluate need for reduced hours of operation[30]

Loss Estimation

Agriculture is highly vulnerable to drought. According to the Frederick County Office of Economic Development, there is approximately 195,827 acres of farmland in the county, accounting for more than 10 percent of Maryland's agriculture. There are more than 1,400 farms in the county, and the county ranks second in the state for the number of equine facilities (2,180) and the number of acres devoted to equine purposes (22,000). Frederick County also ranks third in Maryland for the number of equine (8,290). Additionally, dairy farmers in Frederick County sell more than $50 million of dairy products each year, making the county one of the top 75 counties in the country for production of dairy products. Frederick County farmers produce nearly $100 million of agricultural products annually.

Wildfires and Urban-Interface Fires

Background

Future wildfires and urban-interface fires could cause substantial loss of property along with direct and indirect economic effects for residents and community businesses. Best available

data suggests that approximately 32 percent of Frederick County lies in forested areas.[31] As indicated earlier, in recent years, Frederick County has experienced an increase in population in the urban and rural areas. The Fire Zones map prepared by the Maryland Department of Natural Resources divides the county into five distinct zones that identify the fire risk for that area. The risk is based on factors such as fuel type, slope, potential for ignition (human), and land value. Zone 5 is considered the area with the highest risk and Zone 1, the lowest risk. There are no Zone 1 designations in the county. Significant area lies in Zone 2, including Frederick City, Walkersville, and the western part of the county; Zone 3 includes Burkittsville, Middletown, Libertytown, Woodsboro, Emmitsburg, Mt. Airy, Rosemont, Brunswick and unincorporated areas in the southeast part of the County; Zone 4 includes the Myersville area and the western part of the county; and a small part of the northwestern portion of Frederick County comprises Zone 5. The Zone 5 area carries the highest fire risk posing concern for future development. While much of the forested area of the county is in local, state, or federal parks, there are numerous privately owned in-holdings that increase the number of interfaces of residences and forested areas.

Future Trends

If more development is planned in the more rural or agricultural lands, the occurrence of human-caused fires and the number of people and property at risk due to wildfires and urban-interface fires will likely increase. Particular attention should be paid while planning for development in Zones 4 and 5.

Mitigation Measures

As people move to the more rural and forested areas, the increased development creates danger for both forests and the population there. Mitigation options for wildland fires need to address not only the management of fuels, but also the potential for a growing population in wildfire threat areas. These measures may also define the necessary interface between private property needs and natural resource needs, public education, fire breaks, and maintenance of fire roads. Hazardous fuels reduction, defensible space, and ignition-resistant construction materials and techniques are other options.

Loss Estimation

Based on data from the Maryland Department of Natural Resources (DNR) – Forest Service, Frederick County experienced a total of 331 fires between 1994 and 2003, resulting in a total of 382 acres burned and a total cost of approximately $70,000 (Table 3.13). This cost does not include the value of the land, only the costs incurred while fighting the fires. Information after 2003 was not available.

Table 3.13 Wildland Fire Incidents in Frederick County

Year	No. Fires	Acres Burned	Cost
2003	4	2.9	$354
2002	31	26.4	$18,363
2001	49	51.8	$6,767
2000	48	21.6	$6,950
1999	80	76	$3,880
1998	43	34	$14,135
1997	16	17.7	$2,118
1996	12	18.1	$1,364
1995	30	45	$11,111
1994	18	88.9	$4,551
TOTAL	331	382.4	$69,593

These figures include fires that burned on privately owned and/or county or state-owned property. The statistics represent only those wildland fires to which the Maryland DNR Forest Service responded. The DNR State Forest Service responds to 5 percent of the fires in the county (the larger fires).

In assessing physical vulnerability, the most important factor is the extent to which structures get damaged when they are exposed to fire and heat. Current standard loss estimation tables do not exist for wildfires. The local fire department and structural engineers should help estimate structure and content damage from wildfires.

Most wildfire-related deaths occur as a result of fire suppression activities. However, if roads are damaged or there is insufficient warning, other injuries and deaths could occur. Since death or injury statistics curves for wildfire are not available, they are estimated based on past wildfire events.

More information about specific properties in or near wooded areas and also total damage values would support determination of the relative vulnerability, as would an assessment of the vegetation types in determining specific risk factors. This information should be further researched.

Tropical Storm/ Hurricane

Historic occurrences of tropical storms/hurricanes indicate that Frederick County is at risk of experiencing future events that may severely impact the county. Typically, the damages caused by tropical storms/ hurricanes are due to the storm's extreme winds and rainfall. As of 2009, HAZUS-MH MR 3 did not have the capability to model loss estimates from tropical storms/ hurricanes; and combining the models of wind and flood were also not a capability. However, because the county is at risk of future occurrences, loss estimations should be accounted for. Please refer to the extreme wind and flooding sections of this chapter to estimate the total losses from a tropical storm/ hurricane.

Development Trends Analysis

Based on the 1998 County Comprehensive Plan, Frederick County comprised a total of 425,472 acres. Of this, agricultural and rural uses comprised 64.3 percent; woodlands comprised approximately 15.4 percent; and open space and parkland 5.3 percent of the total area. The remaining 15 percent consisted of residential (10.3 percent), institutional (2.5 percent), and commercial and industrial (2.2 percent) land uses. The predominant land use was agriculture. The two regions of the county that contained the highest percentage of agricultural use were the Brunswick and Walkersville Regions, where 80 percent of the land area was devoted to agriculture. The Frederick Region, which is dominated by the City of Frederick, had the lowest percentage of agricultural land use at 47 percent.

As development increases, the risk and exposure to hazards increase. In order to mitigate the effects of hazards, future land use planning has to consider the approximate locations and impacts of various hazard events by siting development in low-risk areas of the community.

The county recognizes the impacts that haphazard development could have on the natural environment or significant historic resources and views this as a priority. Growth is conducted in a manner that protects the county's sensitive resources. These resources include: streams and their buffers, SFHAs, habitats of threatened and endangered species, steep slopes, the Monocacy Scenic River, areas of prime agricultural soils outside of community growth areas, groundwater resources (specifically well-head protection areas), wetlands, limestone conglomerate/carbonate rock areas, and historic and archaeological resources.

Capability Analysis

Frederick County has a number of resources that it can access to implement hazard mitigation initiatives. These resources include both private and public assets at the local, state, and federal levels.

A detailed Hazard Mitigation Capabilities Assessment Questionnaire was prepared and distributed to each county jurisdiction for response. The questionnaire was designed to assess the community's ability to reduce future losses from hazards like floods, winter storms, etc. through its various policies and programs. The intent of the capability assessment was to provide an inventory of existing policies, programs, practices, and operational responsibilities that have or may have a major role in supporting the community's mitigation program. The results of the questionnaire are integral to the development of a mitigation strategy, the backbone of the local hazard mitigation plan 2009 revision. The questions presented in the questionnaire covered several different agencies within the jurisdictions, particularly the county. These agencies or positions included the Division of Planning, Division of Public Works, Floodplain Management, and Engineering. Table 3.14 summarizes the capabilities of the local county and municipalities that will facilitate implementation of the mitigation strategy.

Two important capabilities are the floodplain management ordinance and building code administration and enforcement. Through the administration of floodplain ordinances, each local government can ensure that all new construction or substantial improvements to existing structures located in the SFHA are built with first-floor elevations above the BFE.

Building codes are important in mitigation; codes regionally developed consider the hazards present within a region of the country. Consequently, structures that are built to applicable codes are inherently resistant to localized strong winds, floods, and earthquakes.

Each municipality has a separate floodplain management ordinance and storm water management ordinance, and building codes are administered by the county, with the exceptions of the Town of Burkittsville and the Village of Rosemont, which currently do not participate in the NFIP, but are currently in the process of joining. Each municipality either has a standalone storm water regulation (City of Frederick) or has adopted the county's storm water ordinance. The Soil Conservation District approves erosion and sediment control plans for land disturbing activities. The county provides inspection and enforcement functions except in the City of Frederick, which provides city-wide inspection and enforcement. The municipalities use the services of the Frederick County Division of Permits and Inspection for building inspections. The county has an inventory of historic structures, public and private parks, and open space for unincorporated areas of the county and municipalities.

Table 3.14 Mitigation Capability Analysis Compilation

	Brunswick	Rosemont	Thurmont	Walkers-ville	Frederick City	Middle-town	Myers-ville	Mt. Airy	Burkittsville **Historic Village*	Emmits-burg	Frederick County
Comprehensive Plan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- with Hazard Mitigation	No	No	No	No	No	No	No	No	No	No	No
Subdivision Regulations	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zoning Ordinance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CRS Rating	No	No	No	No	No	No	No	No	No	No	No
Stormwater Program	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Building Code	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Building Official	No	No	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes
- Inspections		No	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes
Local Emergency Operations Plan	Yes	No	No	No	Yes	Yes	No	Yes	No	No	Yes
Warning-sirens	Yes	No	No	No	No	No	Yes	No	Church Bells	Yes	No
- NOAA W. Radio	No	No	No	No	No	No	No	No	No	No	Yes
Structural Projects	No	No	Yes	No	Yes	No	No	Yes	No	No	Yes
Property Protection	No	No	Yes	No	Yes	No	No	Yes	No	Yes	Yes
Critical Facilities Protection	No	No	Yes	Yes	No	No	No	Yes	No	No	Yes
Natural/Cultural Resources Inventory	No	No	No	No	No	No	No	Yes	Yes	No	Yes
Erosion Control	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Sediment Control	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Public Information Program	No	No	No	No	Yes	No	No	No	Yes	No	Yes

Table 3.14 Mitigation Capability Analysis Compilation Continued

	Brunswick	Rosemont	Thurmont	Walkers-ville	Frederick City	Middle-town	Myers-ville	Mt. Airy	Burkittsville *Historic Village	Emmits-burg	Frederick County
Floodplain Management Ordinance	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- Administrator	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Joined NFIP	01/07/1977	N/A	09/28/1979	09/30/1980	06/15/0978	10/23/1981	12/15/1978	N/A	N/A	09/17/1980	06/01/0978
Current Effective FIRM Date	09/19/2007	09/19/2007	09/19/2007	09/19/2007	09/19/2007	09/19/2007	09/19/2007	09/19/2007	09/19/2007	09/19/2007	09/19/2007
Restrictive Ordinances	Set back, limit fill	N/A	Set back, limit fill	Set back, limit fill	Set back	setback, limit fill, zoning does not allow structures in floodplain	Set back, limit fill	N/A	N/A	Set back, limit fill	setback, limit fill, historic flooding, flooding soils, variance to build in floodplain
Freeboard Requirements	One Foot	N/A	One Foot	One Foot	One Foot	One Foot	One Foot	N/A	N/A	One Foot	One Foot
NFIP Manager	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes

Violation Procedures:
All jurisdictions except: Rosemont, Mt. Airy, and Burkittsville have violation procedures written into the penalty section of their floodplain ordinance.

Plan Assessment

A review of enabling statutes, ordinances, planning documents and building codes was conducted. Some aspects of the municipal regulations strongly supported mitigation capabilities. There are opportunities to enhance the county's mitigation efforts if specific sections are strengthened or revised. The municipalities' zoning ordinances, subdivision regulations and adequate public facilities ordinances should all address safety issues. Below are specific sections of each plan that may be modified to better address mitigation in future revisions. Specific recommendations are italicized.

Though many of the plans mentioned below are somewhat dated, they are the most current plans as of January 2009.

1998 Thurmont Master Plan

Page 13 – Discusses the vision for Thurmont and addresses issues such as small town character, mix of housing types, opportunities for employment, and traditional neighborhood design principals. *It fails to address development in hazardous areas.*

Page 15 – Open space – discusses that open space is relegated to leftover spaces around the periphery of the development's floodplain or around storm water management ponds, which do not provide a functional open space for the residents. *Open space, when possible should be a focal point of developments. Floodplain areas should be designated open spaces and development should be discouraged.*

Page 21 – Environment – Sensitive Areas While most of the land adjoining the creek is developed, there may still be opportunities to provide protective measures. *This should be made a priority.*

Page 23 – *The northern part of Rouzer Run and western portion of High Run do not have the SFHA delineated on FEMA maps.*

Page 27 – "…to concentrate growth into appropriate areas…" – *This statement is too broad and needs to be better defined.*

Page 37 – Discusses problem streets – square corner in downtown, intersection of Frederick Road and Water Street, etc. *The issue of moving people quickly through these areas in times of an emergency/evacuation needs to be addressed.*

Page 50 – Community Facilities - Policy – discourage development that may have adverse impacts on groundwater. *This statement could be further strengthened to include specific hazards.*

1996 Comprehensive Plan for the Town of Burkittsville

Page 4 – Goal: Protect Sensitive Areas within Burkittsville
Objectives: Protect the annual (100-year) floodplain along Burkitts Run; protect the town's groundwater resources. *Both of these are appropriate objectives as they discourage development in these areas.*

Page 5 – Objective – To facilitate adequate and potable water for all Burkittsville households. *This is an appropriate objective, but could be expanded to address groundwater contamination.*

Page 11 – The United States Department of Agriculture Natural Resources Conservation Service (NRCS) considers the Middletown Valley and Burkittsville as prime farmland. These areas are unsuitable for intensive development because bedrock is close to the surface limiting on-site sewage disposal drain fields.

Page 16 – A 100-year flood could occur even several times a year.

Page 36 – The town lacks public water and sewerage services and relies fully on well and septic. During the occurrence of a sinkhole, the wells are contaminated within hours. *This issue is of great concern and should be elaborated on to address contamination.*

Page 40 – Plan Implementation - Update the town zoning map and ordinance to be consistent with the comprehensive plan, and review Burkittsville's subdivision regulations to ensure that they are consistent with goals and policies contained in the comprehensive plan. *This should be expanded to include: consistent with goals and policies in the comprehensive plan and the county's hazard mitigation plan.*

1998 Brunswick Region Plan (constitutes Rosemont's Comprehensive Plan)

Page 80 - Rosemont is designated as a rural community and no new public facilities are planned and only limited development is allowed. While Rosemont does have water service, none of the rural communities are designated for additional water and or sewer service.

This plan does not include discussion on safety issues.

1992 - New Market Master Plan

Page 6 – Physical Environment – Recommendation - The town shall adopt and maintain standards for development on and/or near wetlands and floodplains so as to protect these critical resources. *This recommendation could be expanded to include other hazard areas.*

Page 15 - Discusses clustering. *This is a good concept and could be elaborated to address discouraging development in high hazard areas.*

Page 17 - Discusses preservation efforts, encouraging and assisting in preservation and rehabilitation of existing housing. *This should be done, keeping in mind structural solutions that can withstand high winds, tornadoes, etc*.

Page 26 - States that no development shall be allowed within a 100-year floodplain, historic or annual, and there shall be a 25-foot building setback in areas adjacent to these floodplains. *This is a good policy and is the only place where development related to a hazard is mentioned.*

Page 61 – Community Facilities – the entire individual water supply system for New Market currently comes from private wells. They will be connected to public water via a water line extension soon, by agreement with the county.

Page 97 - Discusses allowing for a variety of safe, adequate housing opportunities. The plan provides for limited expansion of the number and types of homes that can be constructed and stresses the importance of preserving the rural historic character of the area. *This discussion should be expanded to discourage development in high hazard areas.*

1999 – Myersville Comprehensive Plan

Page 2 – Policy – Steep slopes and floodplains shall be protected through review of existing regulations and establishment of minimum standards. *This should be expanded in terms of actual numbers.*

Page 3 - Discusses preserving the natural beauty of the hillsides and retaining steeply sloped areas and floodplain areas as natural open space and encouraging cluster development to leave unbuildable areas open. *This is a strong policy that discourages development in high hazard areas and should be enforced.*

1998 Emmitsburg Comprehensive Plan

Page 6 – Land Use - C. Natural features such as floodplains will be located on the periphery of the community. Floodplains cannot be moved or shifted. *How will this be done? This should focus more on how the community will locate its development out of the floodplain.*

Page 6A – Goals and Policies – *There is no mention of prohibiting development in high hazard areas.*

Page 7 Transportation B – Flat Run Creek will not be crossed by any town street or extension because of problems with drainage, erosion, cost of bridges, etc. *This should be expanded to mention prohibiting development in Flat Run Creek.*

Page 9 – Action Areas

a. Proposed community park extending to Tom's Creek
b. Page 10 – Continuity of future linear park along the Flat Run Creek corridor.

These are good recommendations for open space along the flood-prone areas.

Page 12 – Emmitsburg Conservation and Development Guidance Standards (1974) Methods of control discuss natural resource areas – preserved through zoning, special regulations, and easements. Floodplain, marsh, slope areas to be undeveloped through special regulations, easements, zoning. *These are appropriate recommendations that protect high hazard areas from development, and it should be ensured that controls are in place to implement them.*

Page 41 – Land use element – *The plan does not include policies to address safety or hazards in the community.*

Page 51 – Problem Areas - In time of flood emergency, Creamery Road has provided the only available access to and from US 15 for residents and emergency managers when Seton Avenue (North and South) and East Main Street were closed to vehicular traffic. It is in the best interest of the town to retain access to US 15 from Creamery Road in order to provide another travelway to and from the town during flooding events. *This is a good recommendation as it provides an alternate route.*

Page 113 – Floodplain – This section discusses Emmitsburg's adoption of the Maryland Model Floodplain Ordinance in December 1991. A minimum 100-foot setback should be maintained from the edge of the bank to any watercourse floodplain delineated, on the Floodway Map or FIRM. *This is the only statement in the plan that references a hazard.*

Middletown Comprehensive Plan – 2003

Page 3-2 - Floodplain and Wetlands - Middletown adopted the Maryland Model Floodplain Ordinance on 13, April 1992. Middletown updated its floodplain ordinance in July 2007.

Page 3-4 - #3: The town adopted a county wellhead protection policy. *This policy is a positive step in the protection of water resources.*

Page 3-4 - #5 – Additional regulations should be enacted in town which are floodplain soils, to protect them. *This is a good recommendation for preservation of open lands.*

Page 4-8 – There is no mention of limiting development in high hazard areas. Land Use Objectives and Policies - #7. The town shall direct development away from all stream valleys, steep slopes, and natural areas. #8: The town shall work to provide a buffer around its water resources.

Comprehensive Plan – Woodsboro 2008

In April 2008, the Woodsboro Comprehensive Plan was updated to include the following development elements.

Page 4-1 – Sensitive Areas Protection – The state's Planning Act of 1992 established a requirement for comprehensive plans to include a Sensitive Areas Element. Now referenced in Section 1.00(j) of Article 66B, the sensitive areas element should contain a jurisdiction's goals, policies, and standards for protecting areas from the adverse effects of development. Sensitive areas that should be protected include:

- Streams, wetlands and their buffers
- 100-year floodplains
- Habitats of threatened and endangered species
- Steep slopes
- Agricultural and forest lands intended for resource protection or conservation

Page 4-11 – Environmental Resource Goals – Goal 2: Continue to protect ecologically sensitive areas and wellhead protection areas. Objective 1: Permanently preserve the town's well fields and recharge areas from contamination and over-withdrawal.

Page 8-18 – Storm water Management – Currently, developers are subject to storm water management laws that require sediment fencing, construction of storm water management ponds, and other best management practices. In 2007, the Maryland legislature passed HB 786, which will update these requirements ensuring that developers control runoff and implement environmentally sensitive design practices.

The Woodsboro Planning and Zoning Commission reviews subdivision plans within the town's jurisdiction and makes recommendations related to slope, vegetation, and impervious surface. Limited controls are in the subdivision regulations. At present, the Frederick County Division of Permitting and Development Review reviews subdivision improvement plans for the town and applies the current state and/or federal storm water guidelines.

Zoning Ordinance – Town of Woodsboro

Page 1 - Section 1.0 C. To regulate and determine the use and intensity of land. *This sentence should be expanded to include "with respect to natural hazards."*

Page 9 – Section 2.04 - *The site plan requirements list should be expanded to include information such as proximity to the floodplain, presence of sinkholes, etc.*

2007 Brunswick Master Plan

The following is a list of applicable goals and objectives for the 2007 plan:

Goal 1) Foster the growth of Brunswick as a regional center for residential, commercial, and employment development.

Objectives:

- Allow for a variety of housing types to be constructed in the city to accommodate the needs of a variety of household types. *This should be revised to limit the construction of certain manufactured homes.*
- Identify and reserve the most suitable land for future employment and industrial activities. *This should be expanded to include "land outside of high hazard areas."*
- Cooperate with Frederick County, Maryland, and other jurisdictions in the development of long-range plans and planning regulations. *This statement should include mitigation planning efforts.*

Goal 2) Protect Brunswick's Natural, Historic, and Scenic Resources.

Objectives:

- Protect steep slope, floodplain and wetland areas, and stream valleys from being cleared and developed.
- Encourage the planting of trees, particularly in stream valley and steep slope areas to prevent erosion and protect water quality.
- Protect the Potomac River as a water supply source and as a scenic and recreation resource.
- Minimize the negative impact of development on the city's natural, historic, and scenic resources.

2004 City of Frederick Comprehensive Plan

The following is a list of applicable goals and objectives for the 2004 plan:

Protect streams and their buffers.

1. During the update of the city's development regulations, establish setbacks from the Monocacy River and its tributaries, as recommended by the Monocacy Scenic River Commission.
2. Establish the baseline condition of the local streams and consider a plan to improve stream health. The plan should include measures such as the planting of native vegetation, providing stream buffers, and establishing a riparian buffer zone.
3. Consider the protection of historic resources along stream banks, especially archaeological sites, by designating buffer zones that encompass these resources.

Work to maintain and improve water quality.

1. Consider using bio-retention ponds within the city of Frederick. A pond located along Carroll Creek at Highland Street could help break down bacteria and absorb excess nutrients from the downtown, and prevent them from entering the Monocacy River.
2. Require the preservation of stream valley corridors as a method of maintaining water quality.

Strive to reduce impervious cover and promote best practices of storm water management.

1. Allow the use of permeable surfaces for driveways and parking areas in residential and commercial developments.
2. Encourage a greater use of rainwater and gray water to reduce demand for city water.
3. Use storm water runoff in large developments to water landscaping.
4. Promote enhancement of wetlands in conjunction with preservation efforts.
5. Create a storm water management (SWM) master plan that encourages best management practices that minimize and treat storm water at its source, including grass swales, rain gardens, and green building techniques. Promote the use of regional and joint SWM facilities in the City of Frederick.
6. During the update of the city's development regulations, investigate opportunities to encourage innovative techniques for storm water management.

*Promote erosion and sediment control***.**

1. Evaluate and upgrade the city's standards regarding erosion and sediment control.
2. Develop standards to implement best management practices along streams to encourage natural buffer areas and reduce the need for grass cutting near streams.
3. Evaluate city streams for evidence of erosion and develop appropriate restoration efforts.

Preserve steep slopes.

1. Encourage development to fit into the natural landscape. Discourage cut-and-fill practices requiring excessive excavation and retention.
2. Require developments to submit a slope analysis to clearly depict where steep slopes will be disturbed. Adopt standards for appropriate remediation techniques.
3. Plant steep slopes with trees and plant materials to reduce soil erosion and flooding.

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CHAPTER 4 – GOALS AND OBJECTIVES

Introduction

This chapter presents a series of goals and objectives to help Frederick County and its municipalities identify and select mitigation actions to address its vulnerabilities, as discussed in Chapter 3. The selected mitigation actions will help the county avoid, prevent, or otherwise reduce damages from hazards.

While the Hazard Identification and Vulnerability Assessment chapters identified potential hazards and the areas and facilities in the county vulnerable to them, this chapter will identify broad ideas to address these vulnerabilities and reduce the risk from natural hazards. Chapter 5 will lay out a specific mitigation strategy by specifying mitigation action items, prioritizing these actions, identifying the responsible department for completion, completion of the action, and identifying potential funding sources.

Mitigation Goals and Objectives

In the HMPC and public meetings conducted on January 12, 2009, citizens and local government representatives discussed the findings of the vulnerability assessment and its implications for mitigation strategies. Committee members were then provided an opportunity to update the plan's goals, objectives, and strategies. The HMPC developed a list of goals that addressed various hazards based on the risk assessment. These goals represent Frederick County's vision for reducing damages due to natural hazards.

After the HMPC developed mitigation goals for the communities, the committee identified specific mitigation objectives to support accomplishment of the goals (see definitions below). Each of the objectives was then developed into specific actions, which are discussed in Chapter 6 of the plan.

Definitions:

- *"Goals" are general guidelines that explain what you want to achieve. They are usually broad long-term policy statements, representing global visions.*

- *"Objectives" define strategies or implementation steps to attain the identified goals. Unlike goals, they are specific and measurable.*

PUBLIC AWARENESS

GOAL 1: Promote public understanding, support, and involvement in hazard mitigation activities.

Objective 1

Use countywide public information and education programs to advise citizens on how to protect themselves and their property from natural hazard events.

PLANS AND ORDINANCES

GOAL 2: Reduce exposure to natural hazards through local planning and ordinances.

Objective 1

Review and recommend revisions to the County Comprehensive Plan, sub-area plans, municipal plans, and existing ordinances (zoning, subdivision, and floodplain) as appropriate.

BUILDING CONSTRUCTION

GOAL 3: Reduce exposure of structures, infrastructure, and contents to hazards.

Objective 1

Create an awareness of building to safe standards.

KARST/SINKHOLES

GOAL 4: Reduce Frederick County's vulnerability to sinkholes.

Objective 1

Continue to educate Frederick County residents on karst.

Objective 2

Amend the county's wellhead protection ordinance to include strategies that address Karst terrain/sinkholes.

Objective 3

Ensure selected storm water management techniques are appropriate for use in areas with karst terrain.

FLOODS

GOAL 5: Investigate structural solutions to flooding problems.

Objective 1

Investigate the feasibility of enhancing and/or improving drainage of flood-prone lands.

GOAL 6: Develop measures to protect all buildings (commercial, residential, institutional, and industrial) that are in the floodplain.

Objective 1

Continue to ensure that the current building codes, floodplain ordinances, and/or standards are kept current, follow FEMA guidelines, and are properly enforced.

Objective 2

Develop flood mitigation strategies for flood-prone properties.

Objective 3
Strengthen building codes and zoning standards, where needed.

WILDFIRES

GOAL 7: Reduce the risk of wildland and urban interface wildfires in the county.
Objective 1
Continue to promote the concept of defensible spaces to county residents.

EVACUATION

GOAL 8: Ensure safe and efficient evacuation routes within, to, and from Frederick County.
Objective 1
Coordinate with local, state, and regional partners to provide safe and efficient evacuation routes.

SHELTERS

GOAL 9: Provide adequate multi-hazard shelters.
Objective 1
Maintain a list of designated shelters in various communities throughout the county to house residents during an emergency.

COMMUNICATION

GOAL 10: Improve severe weather notification within the county.
Objective 1
Improve access within the county to severe weather and emergency notifications.

COMMUNITY-SPECIFIC NEEDS

GOAL 11: Identify community-specific needs to reduce risks to various hazards.
Objective 1
The Frederick County Department of Emergency Preparedness will continue to work with all municipalities in the county to identify needs, abilities, and resources to implement appropriate mitigation efforts.

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CHAPTER 5 – MITIGATION PROJECTS

Introduction

The goals, objectives, and projects outlined in this plan are all a part of Frederick County's mitigation strategy. After the goals and objectives were refined, the 2004 mitigation projects were updated and evaluated to reflect their current status. Projects from the 2004 plan that the HMPC wishes to carry forward in the 2009 update are shown with a *Status* and *Comment* section and are highlighted blue; completed or inactive mitigation projects from the 2004 plan can be found in Appendix B with a description of individual status. New 2009 projects do not have a *Status* and *Comment* section and are highlighted green.

A priority level was assigned to each project based on the potential for the projects to be completed given the existing and potential funding; this prioritization method was selected because the HMPC believed that it would foster a realistic expectation of what could be accomplished in the next five years. A priority level of High indicates that these projects are currently in progress within the county and have designated funds for completion. A priority level of Medium indicates that the county is likely to receive funding for these particular projects, and if funding is received, the projects will be completed. Lastly, a priority level of Low indicates that these projects will be complete only if outside funding becomes available.

2004 Project Accomplishments

Frederick County

- As each regional plan was updated, the Hazard Mitigation Plan information was included.
- The county adopted a wellhead protection ordinance in May of 2007 (ordinance no. 07-16-456).
- The county identified and prioritized a list of critical facilities that would require generators during times of an emergency.
- The county has developed and published emergency preparedness informational CDs and brochures and dispersed them to the public school system. The comprehensive CD offers general preparedness information on natural and manmade hazards to business leaders and families. It contains guidance on developing an emergency plan and educates citizens on what to do before, during and after an emergency.

  The CD was a multi-agency project which also features preparedness messages from local public safety officials. Frederick County Public Schools endorsed the project and facilitated the delivery of the CDs to families of students in grades 2 and 3, or approximately 11,000 families. CDs were also delivered to all private schools for the same grade level students. CDs were provided at multiple public safety events, fairs and open houses.

  The project was funded through corporate donations, grant and county funds.

City of Frederick

- Developed a wellhead protection ordinance (all wellheads are in the SFHA).

Town of Brunswick

- Provided generators at the Brunswick Water Treatment Plant, Wastewater Treatment Plant, Police Department building, and the Fire Department building.

Town of Burkittsville

- Revised existing ordinances as appropriate. Sections that were improved focused on the Mitigation Capability Analysis section of this Plan.

Town of Mt. Airy

- Prepared and implemented an emergency response plan.

Village of Rosemont

- Developed a brochure on maintaining septic systems and measures that could be taken during times they are out of power.
- Revised existing ordinances as appropriate. Sections that were improved focused on the Mitigation Capability Analysis section of this Plan.

Mitigation Projects by Category

PUBLIC AWARENESS

Project 1
Description of project: Fund the purchase and delivery of all hazards public outreach materials, i.e., website, brochures, advertisements, public service announcements, etc., that instruct citizens and businesses on what to do before, during, and after an emergency to prepare, mitigate, respond, and recover.
Applicable Goal: Goal 1: Promote public understanding, support, and involvement in hazard mitigation activities.
Objective: Use countywide public information and education programs to advise citizens on how to protect themselves and their property from natural hazard events.
Responsible Organizations: Department of Emergency Preparedness.
Estimated Costs: Staff time.
Possible Funding Sources: HMGP.
Timeline for Implementation: On-going.
Priority: High

Project 2
Description of Project: Provide mitigation information in all branches of the county library system and the book mobile. Interested property owners can read or check out handbooks or other publications that cover their particular situation. The public library will also archive FEMA publications that address various flood and other hazard related topics. In addition to the community library, the county will provide publications for public use and distribution at Fredrick County buildings and municipalities. The following information and manuals could be obtained from FEMA on various topics including flooding, risk management, etc., and used for reference purposes: 1. FEMA 426 - Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings 2. FEMA 428- Primer to Design Safe School Projects in Case of Terrorist Attacks 3. http://www.fema.gov/about/faq1.shtm - information on ordering publications and frequently asked questions 4. http://www.fema.gov/nwz97/97050.shtm - This link contains information on publications for people with disabilities, Hispanic population, etc. 5. Repairing Your Flooded Home.
Applicable Goal: Goal 1: Promote public understanding, support, and involvement in hazard mitigation activities.
Objective: Develop a countywide public information and education program to advise citizens on how to protect themselves and their property from natural hazard events.
Responsible Organizations: Department of Emergency Preparedness, Frederick County Public Library System.
Estimated Costs: No cost incurred.
Possible Funding Sources: No funding required.
Timeline for Implementation: Annually.
Status Since 2004: In progress *Comments:* FEMA documents addressing flooding have been added to the Frederick County Public Library as a result of the prerequisites for the CRS.
Priority: High

Project 3
Description of Project: Develop and broadcast public service announcements (PSAs) on the immediate steps to be taken after a storm, to be disseminated immediately after the hazard occurs on Cable Channel 99 and WFMD, WFRE, and KEY 103.1 radio stations.
Applicable Goal: Goal 1: Promote public understanding, support, and involvement in hazard mitigation activities.
Objective: Develop a countywide public information and education program to advise citizens on how to protect themselves and their property from natural hazard events.
Responsible Organizations: Department of Emergency Preparedness, local TV station, radio stations.
Estimated Costs: Cost of information placement may vary by station.
Possible Funding Sources: General fund; pro-bono donation by broadcasters
Timeline for Implementation: On-going
Status Since 2004: As needed *Comments:* Staffing constraints limited the development of the PSAs
Priority: High

Project 4
Description of Project: Outreach projects are the first step in informing property owners about property protection measures and in encouraging and assisting them in designing and implementing a project. The Department of Emergency Preparedness will develop and run a public information campaign with displays, lectures, and other projects. The local libraries will be used as venues for these events. As such, public outreach projects will include information on property protection measures. Research has shown that targeted local information programs are more effective than national advertising or publicity campaigns. Therefore, outreach projects will be locally designed and tailored to meet local conditions. Because the west side of Frederick City contains an apartment complex that is predominantly Hispanic and other parts of the city also have pockets of Hispanic populations, informational materials will be prepared in English and Spanish. Educate citizens by teaching disaster preparedness at various locations throughout the county. Conduct road shows in schools and other various organizations and identify schools, fire halls, churches, and other non-profit organizations such as the Rotary Club, Kiwanis Club, etc., throughout the county that could be used as meeting areas and where presentations on awareness, prevention, preparedness, response, and recovery could be conducted. A PowerPoint presentation will be prepared that will be made available to these organizations on a regular basis. Also, booklets such as *Are You Ready* by FEMA will be distributed at these presentations with the ultimate objective of providing information to children who will take it to their families. The Department of Emergency Preparedness will conduct a road show in the local schools and use the prepared presentation to educate students.
Applicable Goal: Goal 1: Promote public understanding, support, and involvement in hazard mitigation activities.
Objective: Develop a countywide public information and education program to advise citizens on how to protect themselves and their property from natural hazard events.
Responsible Organizations: Department of Emergency Preparedness, Frederick County Schools, service clubs, volunteer fire departments – municipalities.
Estimated Costs: Regular employee pay.
Possible Funding Sources: No funding required.
Timeline for Implementation: Yearly.
Status Since 2004: On-going *Comments:* Plan 9 was developed in Spanish text and delivered through many different venues. Through our partnership with the American Red Cross, other outreach materials are available in multiple languages.
Priority: High

PLANS AND ORDINANCES

Project 5
Description of project: Ensure natural hazards are included in the Comprehensive Plan.
Applicable Goal: Goal 2: Reduce exposure to natural hazards through local planning and ordinances.
Objective: Review and recommend changes to the County Comprehensive Plan, sub-area plans, municipal plans, and existing ordinances (zoning, subdivision, and floodplain) as appropriate.

Responsible Organizations: Department of Emergency Preparedness, Planning Division.
Estimated Costs: None.
Possible Funding Sources: None.
Timeline for Implementation: two years
Priority: Medium

Project 6
Description of Project: The Frederick County Emergency Operations Plan is currently under revision. Ensure integration of the Hazard Mitigation Plan with the Emergency Plan.
Applicable Goal: Goal 2: Reduce exposure to natural hazards through local planning and ordinances.
Objective: Review and recommend changes to the county comprehensive plan, sub-area plans, municipal plans, and existing ordinances (zoning, subdivision, and floodplain) as appropriate.
Responsible Organizations: Department of Emergency Preparedness, Fire Department, county Sheriff's Office.
Estimated Costs: Staff salaries. .
Possible Funding Sources: No funding required.
Timeline for Implementation: 2-5 years.
Status Since 2004: In progress *Comments:* The Department of Emergency Preparedness is currently updating the Frederick County Emergency Operations Plan and functional annexes. The 2004 Hazard Mitigation Plan was a valuable resource in the plan's development. The Base Plan incorporates mitigation language.
Priority: High

Project 7 – Brunswick Specific
Description of Project: Revise existing ordinances as appropriate for Brunswick. Sections that should be improved and areas where attention should be focused have been elaborated in the Mitigation Capability Analysis section at the end of Chapter 3 of this Plan. Consider incorporating these changes during the next plan or ordinance amendment.
Applicable Goal: Goal 2: Reduce exposure to natural hazards through local planning and ordinances.
Objective: Review and recommend changes to the County Comprehensive Plan, sub-area plans and municipal plans, existing ordinances (zoning, subdivision, and floodplain) as appropriate.
Responsible Organizations: Individual municipalities, Department of Planning, Department of Engineering.
Estimated Costs: Regular employee pay.
Possible Funding Sources: No funding required.
Timeline for Implementation: 6-10 years.
Status Since 2004: In Progress *Comments*: Will continue to revise, update, and adopt all applicable codes and ordinances to mitigate hazards to the City of Brunswick.
Priority: High

Project 8 – Thurmont Specific
Description of Project: Revise existing ordinances as appropriate for Thurmont. Sections that should be improved and areas where attention should be focused have been elaborated in the Mitigation Capability Analysis section at the end of Chapter 3 of this Plan. Consider incorporating these changes during the next plan or ordinance amendment.

Applicable Goal: Goal 2: Reduce exposure to natural hazards through local planning and ordinances.
Objective: Review and recommend changes to the County Comprehensive Plan, sub-area plans, and municipal plans, existing ordinances (zoning, subdivision, and floodplain) as appropriate.
Responsible Organizations: Individual municipalities, Department of Planning, Department of Engineering.
Estimated Costs: Regular employee pay.
Possible Funding Sources: No funding required.
Timeline for Implementation: 3-5 years.
Status Since 2004: In progress *Comments*: Master Plan update nearing completion. Document to contain clearer policy guidance regarding natural hazard mitigation.
Priority: Medium

BUILDING CONSTRUCTION

Project 9
Description of Project: Develop and distribute public outreach materials addressing building to safe standards.
Applicable Goal: Goal 3: Reduce exposure of structures, infrastructure, and contents to hazards.
Objective: Create an awareness of building to safe standards.
Responsible Organizations: Department of Emergency Preparedness, Permitting, and Development Review.
Estimated Costs: $2,000 per year.
Possible Funding Sources: HMGP.
Timeline for Implementation: 6 months from secured funding.
Priority: Low

Project 10 – Brunswick Specific
Description of project: To ensure that wind damage is minimal to city-owned facilities; continue tree-trimming program and tree maintenance in City of Brunswick.
Applicable Goal: Goal 3: Reduce exposure of structures, infrastructure, and contents to hazards.
Objective: Create an awareness of building to safe standards.
Responsible Organizations: City of Brunswick Department of Public Works
Estimated Costs: $3,000 per year
Possible Funding Sources: General Fund or HMGP
Timeline for Implementation: 1 year
Priority: Medium

Project 11
Description of Project: Mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include, but are not limited to: • Acquisition of hazard prone properties • Elevation of flood-prone structures • Minor structural flood control projects • Relocation of structures from hazard-prone areas • Retrofitting of existing buildings and facilities • Retrofitting of existing buildings and facilities for shelters • Infrastructure protection measures • Storm water management improvements • Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) • Targeted hazard education
Applicable Goal: Goal 3: Reduce exposure of structures, infrastructure, and contents to hazards.
Objective: Create an awareness of building to safe standards.
Responsible Organizations: Department of Emergency Preparedness
Estimated Costs: Project and structure-dependant.
Possible Funding Sources: FEMA HMGP funding through a presidential declared disaster; non-disaster FEMA grant funding such as PDM, Repetitive Flood Claims Program, Severe Repetitive Loss Program, Flood Mitigation Assistance Program.
Timeline for Implementation: On-going
Priority: High

Project 12
Description of Project: Conduct inspections of critical facilities to assess each facility's ability to sustain severe weather incidents and determine potential structural damages. Determine retrofitting or structural enhancements/replacements that may be needed as a result of the assessment.
Applicable Goal: Goal 3: Reduce exposure of structures, infrastructure, and contents to hazards.
Objective: Create an awareness of building to safe standards.
Responsible Organizations: Department of Emergency Preparedness
Estimated Costs: Engineering consulting fees
Possible Funding Sources: To be determined
Timeline for Implementation: 6-10 years
Priority: Medium

Project 13
Description of Project: Encourage safety in temporary classrooms in schools. Many portable classrooms have been built with an aluminum roof, thin trailer aluminum exterior, small windows, a residential grade door, doorframe and lockset, wood underlayment, studs and walls, and minimum lighting and ventilation. Non-combustible classrooms should be considered in Frederick County Public Schools. These consist of doublewide classrooms built on a rigid steel frame, with lightweight concrete floors with fiberglass reinforcement offering the feel of site-built construction. The new non-combustible structure sits on the ground and eliminates the need for the costly steps, decks, and ramps. This not only minimizes installation costs, but also eliminates a potential mold problem. Refer to http://www.mbinet.org/web/magazine/studyin5_01.html for

additional details on non-combustible classrooms.
Applicable Goal: Goal 3: Reduce exposure of structures, infrastructure, and contents to hazards.
Objective: Create an awareness of building to safe standards.
Responsible Organizations: Department of Emergency Preparedness, Frederick County Public Schools (FCPS).
Estimated Costs: To be determined.
Possible Funding Sources: HMGP.
Timeline for Implementation: 6-10 Years.
Status Since 2004: In progress *Comments:* The FCPS explored alternative, non-combustible portable classrooms, but determined that due to budget constraints and construction type and weight of alternative portables that a change would not be feasible at this time. FCPS has revised its Crisis Plan for Schools and is presently conducting emergency scenario-based table-top exercises at each school site. A hazard assessment has been completed for each school as well.
Priority: Low

KARST/SINKHOLES

Project 14
Description of project: Fund the purchase and delivery of public outreach materials, i.e., website, brochures, advertisements, public service announcements, etc., that educate citizens and businesses on karsts, how they are formed, and how to identify early indicators and mitigate or respond to karsts.
Applicable Goal: Goal 4: Reduce Frederick County's vulnerability to sinkholes.
Objective: Continue to educate Frederick County residents on karsts.
Responsible Organizations: Department of Emergency Preparedness.
*Estimated Costs: $*3,000 per year.
Possible Funding Sources: HMGP.
Timeline for Implementation: 6 months from receipt of secured funding.
Priority: Low

Project 15
Description of Project: Make available the karst topography brochure for sinkholes titled *A Users Guide to Karst and Sinkholes in Western Maryland* that has been developed by the Western Maryland Resource Conservation and Development Council.
Applicable Goal: Goal 4*:* Reduce Frederick County's vulnerability to sinkholes.
Objective: Continue to educate Frederick County residents on karsts.
Responsible Organizations: Department of Emergency Preparedness.
Estimated Costs: Regular employee pay for content and layout preparation, approximately $2 each for printing a tri-fold brochure.
Possible Funding Sources: No funding required.
Timeline for Implementation: 1 year.
Status Since 2004: In progress *Comments:* A Department of Emergency Preparedness Sinkhole Fact Sheet was developed and made available to the public. Upon request, additional guidance and information is provided to the public on specific concerns.
Priority: High

FLOODS

Project 16
Description of project: Ensure that all county-owned bridges and culverts are maintained on a yearly basis.
Applicable Goal: Goal 5: Investigate structural solutions to flooding problems.
Objective: Investigate the feasibility of enhancing and/or improving drainage of flood-prone lands.
Responsible Organizations: Division of Public Works and Department of Highways and Transportation.
*Estimated Costs: $*550,000 per year.
Possible Funding Sources: Division of Public Works annual budget.
Timeline for Implementation: On-going
Priority: High

Project 17
Description of Project: Install a series of rainfall and stream gauges to be placed in strategic locations within Frederick County and its municipalities. The gauges will allow enhanced, electronic, National Weather Service monitoring of the conditions, which may prompt hazardous flash-flooding incidents in Frederick County. In addition, early warning and educational signage and barricades will be purchased for the identified high traffic volume roadways with historically documented high water hazards.
Applicable Goal: Goal 5: Investigate structural solutions to flooding problems.
Objective: Investigate the feasibility of enhancing and/or improving drainage of flood-prone lands.
Responsible Organizations: Department of Emergency Preparedness
Estimated Costs: $100,000.
Possible Funding Sources: FEMA HMGP funding through a presidential declared disaster; non-disaster FEMA grant funding such as PDM, Repetitive Flood Claims Program, Severe Repetitive Loss Program, Flood Mitigation Assistance Program.

Timeline for Implementation: On-going
Priority: Medium

Project 18
Description of Project: To maintain county-owned storm water management facilities
Applicable Goal: Goal 5: Investigate structural solutions to flooding problems.
Objective: Investigate the feasibility of enhancing and/or improving drainage of flood-prone lands.
Responsible Organizations: Division of Parks and Recreation.
Estimated Costs: $50,000/ year for preventative maintenance and the occasional rehabilitation project.
Possible Funding Sources: General fund.
Timeline for Implementation: As funding is provided.
Priority: High

Project 19
Description of Project: Consider the benefits of enrolling Frederick County in the CRS. The NFIP CRS program was established to encourage communities to do more than the minimum when it comes to administering their individual floodplain management programs. All activities that the county undertakes that they wish to be considered above the minimum are documented and submitted for verification. Points are awarded for the various activities. For each set of 500 points earned, flood insurance premiums are lowered by 5 percent inside the SFHA (for homes outside of the SFHA, discounts vary based on CRS ratings). Once the CRS application is completed, it should be reviewed by the Insurance Services Organization (the contractor that administers the CRS program for FEMA) for accuracy and completeness.
Applicable Goal: Goal 6: Develop measures to protect all buildings (commercial, residential, and industrial) that are in the floodplain.
Objective: Continue to ensure that the current building codes, floodplain ordinances, and/or standards are kept current, follow FEMA guidelines, and are properly enforced.
Responsible Organizations: Department of Emergency Preparedness, Division of Planning.
Estimated Costs: Regular employee pay.
Possible Funding Sources: No funding required.
Timeline for Implementation: 6-10 years.
Status Since 2004: Complete/ In progress *Comments:* Frederick County began researching the CRS prerequisites and identifying and evaluating in place CRS creditable activities in 2008. The county anticipates submitting its application to join the CRS in the fall of 2009.
Priority: High

Project 20
Description of Project: Develop structural corrective action plans (paving/elevation programs) for Frederick County's pre-identified frequently flooded roadways.
Applicable Goal: Goal 5: Investigate structural solutions to flooding problems.
Objective: Investigate the feasibility of enhancing and/or improving drainage of flood-prone lands.

Responsible Organizations: Department of Emergency Preparedness, DPW, Maryland Department of Highways.
*Estimated Costs: $*500,000 per year.
Possible Funding Sources: HMGP/PDM.
Timeline for Implementation: 5 years
Priority: Low

Project 21
Description of Project: Identify structures in the SFHA and develop a resource guide to educate homeowners on protective measures, including insurance and governmental support opportunities.
Applicable Goal: Goal 6: Develop measures to protect all buildings (commercial, residential, and industrial) that are in the floodplain.
Objective: Develop mitigation strategies for flood-prone properties.
Responsible Organizations: Department of Emergency Preparedness, Planning Division.
*Estimated Costs: $*3,000 per year.
Possible Funding Sources: HMGP.
Timeline for Implementation: 1 year.
Priority: Low

Project 22
Description of Project: Although no changes to the county floodplain ordinances are required at this time, the State of Maryland recommends that the following changes to the State Model Ordinance be considered to strengthen those ordinances based on lessons learned from Hurricane Isabel. The recommended changes are outlined below. Municipalities should be encouraged to adopt the State Model or should determine how to best fit these changes into their ordinance. An increase in the freeboard requirement can be implemented by modifying the Flood Protection Elevation definition. Currently, the standard in the unincorporated areas of the county is 1 foot of freeboard; changing it to 2 or 3 feet will implement a higher level of protection. Also, it is recommended that "repetitive loss" be added to the development regulated by the county ordinances. This will allow extension of the Increased Cost of Compliance (ICC) coverage in flood insurance policies, which pays up to $30,000 in additional coverage to bring repetitive loss as well as substantially damaged properties into compliance with the floodplain ordinance. The community must be willing to treat repetitive loss properties the same as new and substantially improved structures to qualify. If this is adopted, they must require that repetitive loss properties meet all code requirements as new structures, but they will be making ICC payments available to these structures.
Applicable Goal: Goal 6: Develop measures to protect all buildings (commercial, residential, and industrial) that are in the floodplain.
Objective: Continue to ensure that the current building codes, floodplain ordinances, and/or standards are kept current, follow FEMA guidelines and are properly enforced.
Responsible Organizations: Department of Emergency Preparedness, municipalities.
Estimated Costs: Regular employee pay.
Possible Funding Sources: No funding required.
Timeline for Implementation: 6-10 years.
Status Since 2004: On-going *Comments:* In lieu of adopting the higher freeboard requirements, Frederick County has adopted more restrictive provisions. The county's ordinances allow no new structures or substantial improvements in the FEMA floodplain without approval from the Board of Appeals. Adoption of provisions to recognize and regulate repetitive loss properties located outside of the FEMA-designated floodplain in the same manner as properties mapped within the FEMA floodplain remains under consideration.
Priority: High

Project 23
Description of Project: Flooding on low-lying areas such as Route 550 at Israel Creek and Route 355 at Bennett's Creek are major areas of concern. These low-lying areas have shallow flooding that typically occurs following snowmelt or high volume rainfalls that often cause a significant amount of damage. Assess these areas to determine the best mitigation solution, such as improving the storm drain system, elevating the roadway, etc.

Applicable Goal: Goal 5*:* Investigate structural solutions to flooding problems.
Objective: Investigate the feasibility of enhancing and/or improving drainage of flood-prone lands.
Responsible Organizations: Department of Emergency Preparedness, Division of Public Works, Maryland State Highway Administration.
Estimated Costs: To be determined.
Possible Funding Sources: Flood Mitigation Assistance, HMGP.
Timeline for Implementation: 6-10 years.
Status Since 2004: In progress *Comments:* The Division of Public Works has identified frequently flooded roadways and developed a priority roads list guiding response during a weather-related incident. Signs and barricades have also been positioned.
Priority: High

Project 24
Description of Project: Once the parcel layer is complete, develop a structure layer on GIS that shows the actual structures (not only properties) in the SFHA for the county and the City of Frederick. This should be done in conjunction with the parcel layer.
Applicable Goal: Goal 6: Develop measures to protect all buildings (commercial, residential, and industrial) that are in the floodplain.
Objective: Develop flood mitigation strategies for flood-prone properties.
Responsible Organizations: Division of Planning, Department of Emergency Preparedness.
Estimated Costs: Regular employee pay.
Possible Funding Sources: No funding required.
Timeline for Implementation: 2-5 years.
Status Since 2004: In progress *Comments:* A structure layer that shows the actual structures (not only properties) in the SFHA for the county and the City of Frederick is available. The county GIS parcel layer has been completed and is current as of 2007. Building footprint data is complete and current as of 2005. The county Enterprise GIS Department is in process of obtaining point address data that would more accurately depict the addresses of the affected buildings. The point address data layer is in the process of being complete.
Priority: High

Project 25
Description of Project: Ensure that high-risk, pre-FIRM residential structures do not get repeatedly flooded by using retrofitting techniques to reduce the flood risk to the properties by developing a "flood inventory" of all repetitive loss structures. The Maryland Department of the Environment will provide the names and addresses of repetitively flooded properties (those having two or more claims of $1,000 or more within any 10-year period of time). However, FEMA has records only of those properties having flood insurance. The county will, therefore, need to rely upon their own records to determine repetitively flooded properties that do not carry flood insurance. Consider procuring the services of a consulting engineer/surveyor to determine and inventory the following on these repetitive loss structures: first floor elevation, basement elevation, lowest opening, lowest adjacent ground grade, type of construction, use, and condition. Continue to maintain acquisition plans or mitigation strategies for repetitively flooded properties. In residences that lose their basements due to elevating the home above the floodplain, include the construction of a "safe room" in the retrofitted structure on the first floor.
Applicable Goal: Goal 6: Develop measures to protect all buildings (commercial, residential, and industrial) that are in the floodplain.
Objective: Develop flood mitigation strategies for flood-prone properties.
Responsible Organizations: Division of Planning, Department of Emergency Preparedness.
Estimated Costs: Regular employee pay.
Possible Funding Sources: No funding required.
Timeline for Implementation: 1 year.
Status Since 2004: In progress *Comments:* Four homes were recently acquired and demolished as a result of the FEMA Repetitive Flood Claims project and county funds. The parcels were returned to open space.
Priority: Low

WILDFIRES

Project 26
Description of Project: Fund the purchase and delivery of public outreach materials, i.e., website, brochures, advertisements, public service announcements, etc., that educate citizens on the concept of defensible spaces.
Applicable Goal: Goal 7: Reduce the risk to wildland and urban interface wildfires in the county.
Objective: Continue to promote the concept of defensible spaces to county residents.
Responsible Organizations: Department of Emergency Preparedness, Division of Permitting and Development Review, and Division of Fire and Rescue.
Estimated Costs: $2,000 - $3,000 per year.
Possible Funding Sources: HMGP.
Timeline for Implementation: 2 years after funding secured.
Priority: Low

EVACUATION

Project 27
Description of Project: Develop a GIS data layer of priority roadways, which may be used to evacuate citizens, and ensure that the Evacuation Annex is kept current.
Applicable Goal: Goal 8: Ensure safe and efficient evacuation routes within, to, and from Frederick County.
Objective: Coordinate with local, state, and regional partners to provide safe and efficient evacuation routes.
Responsible Organizations: Department of Emergency Preparedness, Planning Division, Sheriff's Office, Division of Public Works.
Estimated Costs: None.
Possible Funding Sources: None.
Timeline for Implementation: On-going
Priority: High

Project 28
Description of Project: Recommendations from all countywide or regional evacuation plans that have been developed for adjacent areas should be integrated into Frederick County's Evacuation Plan to ascertain smooth transition, traffic flow, etc. A number of studies have been conducted with respect to evacuation. The following studies should be taken into account while developing these evacuation routes. The Baltimore Council of Governments and the Washington, DC, Council of Governments have completed evacuation and sheltering plans for the region. The Maryland State Highway Administration has a plan on roads in and around Frederick County that may get blocked during an emergency. All major highways such as MD 15, I-70, I-270, and MD 340 and the Frederick County Fairgrounds are areas that would require particular attention.
Applicable Goal: Goal 8: Ensure safe and efficient evacuation routes to and from Frederick County.
Objective: Coordinate with Local, State and regional partners to provide safe and efficient evacuation routes.
Responsible Organizations: Department of Emergency Preparedness, Department of Highways and Transportation, Sheriff's Office.
Estimated Costs: $ 50,000.
Possible Funding Sources: DHS.
Timeline for Implementation: 2-5 years.
Status Since 2004: In progress *Comments:* Metropolitan Washington Council of Governments evacuation plans have not been fully developed, and the state and local evacuation plans are in progress.
Priority: Medium

Project 29
Description of Project: Update Frederick County's evacuation plan to include issues such as staging areas, feeding plans for displaced persons, bathrooms, signs, temporary housing, decontamination, etc. An integral part of this plan will be introducing the concept of evacuation in stages. As part of this plan, destination points, such as schools, should be identified for shelters. The following points should be considered in developing the evacuation plan: experts in emergency planning, transportation planning, and traffic engineering should be involved in developing the plan; canned messages should be developed for use with the public and the

media; consideration of closed circuit televisions for the county and the State Highway Administration to help aid traffic flow during evacuations.
Applicable Goal: Goal 8: Ensure safe and efficient evacuation routes to and from Frederick County.
Objective: Coordinate with local, state, and regional partners to provide safe and efficient evacuation routes.
Responsible Organizations: Department of Emergency Preparedness, Department of Highways and Transportation, Sheriff's Office.
Estimated Costs: $30,000.
Possible Funding Sources: DHS.
Timeline for Implementation: 2-5 years.
Status Since 2004: In progress *Comments:* As the state's evacuation plan becomes solidified, Frederick County will review and take local action as appropriate.
Priority: Medium

SHELTERS

Project 30
Description of Project: Review shelter site and keep partnership agreements current. Identify additional locations that could be equipped and identified as shelters based on the needs and the population centers in the county. Work with the Red Cross to conduct an assessment of existing shelters in the county to determine their condition and adequacy with respect to beds, etc. Develop a database of shelters and their locations and determine which ones would need to be retrofitted, particularly with respect to schools. This should be based on various factors such as wind load certification, etc. The Red Cross and Frederick County's Emergency Management Department should share information about local shelters at least on an annual basis. Information should include the location of each shelter, its capacity, its back up power availability, and any other relevant information.
Applicable Goal: Goal 9: Provide adequate multi-hazard shelters.
Objective: Maintain a list of designated shelters in various communities and ensure there are an adequate number of shelters throughout the county to house residents during an emergency.
Responsible Organizations: Department of Emergency Preparedness, American Red Cross.
Estimated Costs: Regular employee pay, professional consulting fees for architect/engineer.
Possible Funding Sources: None.
Status Since 2004: On-going *Comments*: Frederick County Emergency Management and the Frederick County Red Cross work in partnership to identify appropriate shelter sites. Working through the County Sheltering Committee, best practices have been identified. The Red Cross no longer identifies, or maintains, separate agreements with sites, but works in conjunction with Emergency Management to identify the most appropriate shelter sites. Discussion among committee members identifies the most appropriate sites based on population centers, access to evacuation routes, facility structure, and planning by Animal Control for animal shelters. Buildings are evaluated by size, current/potential usage, and generator power. Working together, and with the committee, sites for storage of shelter equipment and shelter trailers are identified. All agencies collaborate together to identify new sites in appropriate locations throughout the county. Currently, a database of shelters is not maintained locally, beyond the

list maintained by the Frederick County Red Cross, which does not include school information. The Frederick County Red Cross through the FEMA/Red Cross partnership enters their shelters into the National Shelter System. Difficulty has been encountered in entering shelters into MD WebEOC.
Priority: High

COMMUNICATION

Project 31
Description of Project: Evaluate and enhance Frederick County's local warning system notifications through multiple mechanisms. The Division of Emergency Management should consider introducing a Reverse 9-1-1 system that would enhance their quality of service. Reverse 9-1-1 is an interactive community notification system that enables a recorded telephone message to be sent out to selected areas, blocks, or neighborhoods in the event of an emergency. The system is a quick and efficient way of contacting and notifying residents of a potentially serious problem near their homes or businesses. It allows the police department to quickly send out time-critical messages rather than going door-to-door. Messages can be sent to a select jurisdiction or the entire county and includes a convenient TTY/TDD feature capable of sending information to the hearing impaired. The system is sophisticated enough to indicate whether a call was received or whether a message was left on an answering machine. It also can be programmed to keep trying until a call has been successfully received. Develop a countywide audible alert system. Evaluative alternatives such as sirens, e-911, etc. Identify major developments, municipalities, and other populated centers for the installation of these early warning devices. Develop a booklet to educate the public on meanings of warnings, and appropriate actions to take before, during, and after a disaster or emergency.
Applicable Goal: Goal 10: Expedite/improve severe weather notification within the community.
Objective: Improve access within the county to severe weather and emergency notifications.
Responsible Organizations: Department of Emergency Preparedness, Emergency Communications.
Estimated Costs: As funding becomes available.
Possible Funding Sources: HMGP, DHS's Emergency Services Performance Grant (EMPG).
Timeline for Implementation: 2- 5 years.
Status Since 2004: In progress *Comments:* Multiple mechanisms of communicating emergency information are being developed in Frederick County. The Dialogic or Reverse 911 system is operable. The TTY system is available to hearing-impaired individuals. The Division of Emergency Management has been working cooperatively with municipal leaders, public safety partners, and Communications Electronics, Inc., to actively pursue efforts to expand the Early Warning System (EWS) program in Frederick County. Currently, Frederick County utilizes two broad types of siren warning systems, which include siren tone activation and voice and tone activation. Tone activation occurs in 30 fire stations, with siren activation in 23. Voice and tone siren communication systems are fully operational in the Town of Emmitsburg,

at the National Fire Academy, at Mount Saint Mary's College, and in the Town of Myersville, with limited functionality in the City of Brunswick and Ft. Detrick. To further enhance Frederick County's mass notification system, a voice and tone siren system has been proposed for the Town of Middletown. A countywide proposal has been developed pending funding. In addition, an emergency alert indicator (flashing red button on the homepage) has been added to the county's website. The Department of Emergency Preparedness is evaluating text messaging systems.
Priority: High

COMMUNITY-SPECIFIC NEEDS

Project 32
Description of Project: Develop a clear, concise, and consistent community-specific threat-based public preparedness message that can be delivered within each municipality using their previously established media sources and public outreach mechanisms.
Applicable Goal: Goal 11: Identify community-specific needs to reduce risks to various hazards.
Objective: The Department of Emergency Preparedness will continue to work with all the municipalities in the county to identify needs, abilities, and resources to implement appropriate mitigation efforts.
Responsible Organizations: Department of Emergency Preparedness, municipal leaders.
*Estimated Costs: $*3,000 per year*.*
Possible Funding Sources: HMGP.
Timeline for Implementation: 2-3 years.
Priority: Medium

City of Frederick

Project 33
Description of Project: Complete the Carroll Creek Levee. The completion of the project will protect an additional 48 properties.
Applicable Goal: Reduce exposure to natural hazards through local planning and ordinances.
Objective: Review and recommend revisions to the County Comprehensive Plan, sub-area plans, and municipal plans, existing ordinances (zoning, subdivision, and floodplain) as appropriate.
Responsible Organizations: City of Frederick – Planning, Engineering, Public Works, Maryland Department of the Environment, Maryland Historical Trust, Federal agencies
Estimated Costs: $40 per linear foot for 2-foot levee; $75 per linear foot for 4-foot levee; $125 per linear foot for 6-foot levee
Possible Funding Sources: HMGP, FMA
Timeline for Implementation: 6-10 years
Status Since 2004: In progress *Comments:* Completion of levee will now be included as part of the Monocacy Boulevard Central section design. Gashouse Pike (as it leaves town as East Church Street) will be reconstructed to be raised above the BFE and act as the levee across the length of the Nikodemus Property. Nikodemus Property is responsible per their annexation resolution to fund or construct the improvements.

Priority: High

Project 34
Description of Project: Retrofit drainage where major roads frequently flood: • West Patrick Street opposite West Frederick Middle School (MD Route 144-major arterial road). • Gas House Pike near confluence of Carroll Creek and Monocacy River (construction of new Monocacy Boulevard might relieve burden). This has been planned but not built. • Waverly Drive (Frederick Towne Mall, major city mall subject to flooding by Rock Creek).
Applicable Goal: Reduce exposure to natural hazards through local planning and ordinances.
Objective: Review and recommend revisions to the County Comprehensive Plan, sub-area plans, and municipal plans, existing ordinances (zoning, subdivision, and floodplain) as appropriate.
Responsible Organizations: City of Frederick – Public Works, Engineering, Planning
Estimated Costs: City engineer to do preliminary analysis to determine costs at each location
Possible Funding Sources: HMGP, FMA
Timeline for Implementation: 6-10 years
Status Since 2004: In progress *Comments:* Flooding along Gashouse Pike will be relieved as part of Monocacy Blvd. Central Section construction. Waverly Drive will be realigned and pulled out of SFHA as part of Waverly View subdivision construction. Updated FEMA study adopted in 2007 pulled portions of the Frederick Towne Mall property out of the floodplain. There are no plans to address flooding at MD144 in front of West Frederick Middle at this time.
Priority: High

Project 35
Description of Project: Develop a GIS map of all city sinkholes. Require that sinkhole topography be included in all site plans in affected areas.
Applicable Goal: Reduce exposure to natural hazards through local planning and ordinances.
Objective: Review and recommend revisions to the County Comprehensive Plan, sub-area plans, and municipal plans, existing ordinances (zoning, subdivision, and floodplain) as appropriate.
Responsible Organizations: City of Frederick – Engineering, Planning
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 1 year
Status Since 2004: In progress
Priority: Medium

Project 36
Description of Project: Middletown, Walkersville, and the City of Frederick should get together and urge the county to adopt a sinkhole ordinance.
Applicable Goal: Reduce exposure to natural hazards through local planning and ordinances.
Objective: Review and recommend revisions to the County Comprehensive Plan, sub-area plans, and municipal plans, existing ordinances (zoning, subdivision, and floodplain) as appropriate.
Responsible Organizations: Town of Middletown, Town of Walkersville, City of Frederick – Engineering, Public Works, Legal, Mayor's Office
Estimated Costs: Regular employee pay

Possible Funding Sources: No funding required
Timeline for Implementation: 6-10 years
Status Since 2004: In progress
Priority: Medium

Project 37
Description of Project: Establish a regular maintenance inspection and preventive program for sinkholes on/near city streets.
Applicable Goal: Reduce exposure to natural hazards through local planning and ordinances.
Objective: Review and recommend revisions to the County Comprehensive Plan, sub-area plans, and municipal plans, existing ordinances (zoning, subdivision, and floodplain) as appropriate.
Responsible Organizations: City of Frederick – Streets and Grounds
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 1 year
Status Since 2004: In progress
Priority Number: Medium

Town of Mt. Airy

Project 38
Description of Project: Install/replace emergency backup generators at all critical facilities.
Applicable Goal: Goal 11: Identify community-specific needs to reduce risks to various hazards.
Objective: The Department of Emergency Preparedness will continue to work with all the municipalities in the county to identify needs, abilities, and resources to implement appropriate mitigation efforts.
Responsible Organizations: Town of Mt. Airy Communications & Technology Committee, Department of Water and Sewer.
Estimated Costs: Varies based on size, horse power, etc.
Possible Funding Sources: HMGP, Department of Homeland Security (DHS) grant.
Timeline for Implementation: 2-5 years.
Status Since 2004: In progress. *Comments*: The town has installed back-up generators for five water stations and is still going to acquire the last back-up generator. They are also seeking emergency operations funding from Carroll County for back-up generators for the Town Hall, Town Maintenance Building, and Town waste water treatment plant.
Priority: Medium

Project 39
Description of Project: Install a SCADA system to monitor all critical public works facilities. This is a type of computer monitoring system for water and wastewater system operations. From a desk top and/or laptop computer, all pumps, flows, chemical feeds, power usage, security door contacts, fire detectors, etc., could be monitored.
Applicable Goal: Goal 11: Identify community-specific needs to reduce risks to various hazards.

Objective: The Department of Emergency Preparedness will continue to work with all the municipalities in the county to identify needs, abilities, and resources to implement appropriate mitigation efforts.
Responsible Organizations: Town of Mt. Airy Communications & Technology Committee, Division of Public Works, Department of Water and Sewer.
Estimated Costs: Unknown
Possible Funding Sources: DHS Emergency Services Performance Grant (EMPG).
Timeline for Implementation: 1 year.
Status Since 2004: In progress. *Comments*: Project is approximately 50-percent complete at this time. Project has been upgraded from a telephone line notification system to wireless capability.
Priority: Low

Town of Brunswick

Project 40
Description of Project: Consider providing battery-operated radios, flashlights, etc., to residents, free-of-charge.
Applicable Goal: Goal 11: Identify community-specific needs to reduce risks to various hazards.
Objective: The Department of Emergency Preparedness will continue to work with all the municipalities in the county to identify needs, abilities, and resources to implement appropriate mitigation efforts.
Responsible Organizations: Town of Brunswick, Department of Emergency Preparedness.
Estimated Costs: Regular employee pay.
Possible Funding Sources: General fund.
Timeline for Implementation: None.
Status Since 2004: Inactive *Comments:* Funding not available
Priority: Low

Project 41
Description of Project: Provide generators at the Fire Department Building.
Applicable Goal: Goal 11: Identify community-specific needs to reduce risks to various hazards.
Objective: The Department of Emergency Preparedness will continue to work with all the municipalities in the county to identify needs, abilities, and resources to implement appropriate mitigation efforts.
Responsible Organizations: Town of Brunswick, Department of Emergency Preparedness.
Estimated Costs: Varies based on size, horse power, etc.
Possible Funding Sources: DHS EMPG.
Timeline for Implementation: 2-5 years.
Status Since 2004: In Progress *Comments:* Fire Dept. new generator part of county Critical Infrastructure Program
Priority: High

Town of Middletown

Project 42
Description of project: To construct an Emergency Alert System Tower in the Town of Middletown.
Applicable Goal: Goal 10: Improve severe weather notification within the community.
Objective: Improve access within the county to severe weather and emergency notifications.
Responsible Organizations: Town of Middletown, County of Frederick
Estimated Costs: TBD
Possible Funding Sources: HMGP, PDM.
Timeline for Implementation: 2 years
Priority: Medium

Town of Thurmont

Project 43
Description of Project: Obtain generators of various sizes for wastewater treatment and for water treatment facilities.
Applicable Goal: Goal 11: Identify community-specific needs to reduce risks to various hazards.
Objective: The Department of Emergency Preparedness will continue to work with all the municipalities in the county to identify needs, abilities, and resources to implement appropriate mitigation efforts.
Responsible Organizations: Town of Thurmont, Department of Emergency Preparedness.
Estimated Costs: Varies based on size, horse power, etc.
Possible Funding Sources: Department of Homeland Security's Emergency Services.
Timeline for Implementation: 1 year.
Status Since 2004: In progress *Comments:* Back-up generators installed at water treatment facility, police station, and town offices. Not complete at waste water treatment plant.
Priority: High

Project 44
Description of Project: Coordinate with local fire and rescue services to develop a community emergency response plan.
Applicable Goal: Goal 11: Identify community-specific needs to reduce risks to various hazards.
Objective: The Department of Emergency Preparedness will continue to work with all the municipalities in the county to identify needs, abilities, and resources to implement appropriate mitigation efforts.
Responsible Organizations: Town of Thurmont, Department of Emergency Preparedness.
Estimated Costs: Regular employee pay.
Possible Funding Sources: None.
Timeline for Implementation: 2-5 years.
Status Since 2004: In progress *Comments:* Need to initiate formal planning process.
Priority: Medium

Project 45
Description of Project: Seek funding to mitigate flooding concerns at the Town Hall/Police Station via relocation, elevation, or levee construction.
Applicable Goal: Goal 11: Identify community-specific needs to reduce risks to various hazards.
Objective: The Department of Emergency Preparedness will continue to work with all the municipalities in the county to identify needs, abilities, and resources to implement appropriate mitigation efforts.
Responsible Organizations: Town of Thurmont, Department of Emergency Preparedness.
Estimated Costs: Varies by type of mitigation measure.
Possible Funding Sources: FMA, HMGP, PDM.
Timeline for Implementation: 2-5 years.
Status Since 2004: In progress *Comments:* Police Station has been relocated to a new facility out of the floodplain. Town continues to consider options regarding ultimate location of municipal office and meeting facilities.
Priority: Low

Town of Walkersville

Project 46
Description of project: To construct an emergency water line from the county in case the town water supply becomes polluted from runoff, flooding, etc.
Applicable Goal: Goal 11: Identify community-specific needs to reduce risks to various hazards.
Objective: The Department of Emergency Preparedness will continue to work with all the municipalities in the county to identify needs, abilities, and resources to implement appropriate mitigation efforts.
Responsible Organizations: Department of Public Works
Estimated Costs: TBD
Possible Funding Sources: HMGP, PDM.
Timeline for Implementation: 2 years
Priority: Medium

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CHAPTER 6 – ACTION PLAN

Introduction

This document is intended to serve as Frederick County's road map for evaluating hazards, identifying resources and capabilities, selecting appropriate actions, and developing and implementing mitigation measures to eliminate or reduce future damage from those hazards in order to protect the health, safety, and welfare of the residents in the community.

This chapter contains the list of mitigation actions (Action Plan), which outlines the steps necessary to implement the mitigation strategies. The Action Plan also identifies procedures for keeping this plan current and updated at least once every 5 years, as prescribed by the DMA2K.

Monitoring, Evaluating, and Updating the Plan

Plan maintenance requires an ongoing effort to monitor and evaluate the implementation of the plan, and to update the plan as progress, roadblocks, or changing circumstances are recognized. The Department of Emergency Preparedness will be responsible for monitoring and updating the plan and the HMPC will play an advisory role available for oversight. The team should accomplish the following:

- The Department of Emergency Preparedness will review the plan yearly, specifically the mitigation action plan and Responsible Organization designation in each project;
- If extra funding becomes available, the Department of Emergency Preparedness will re-visit the inactive 2004 mitigation strategies for reinstatement.
- If needed, the Department of Emergency Preparedness will request a meeting with the HMPC and the public to do a formal review of the plan;
- A 5-year written update to be submitted to the state and FEMA Region III, unless a disaster or other circumstances (e.g., change in regulations) leads to a different time frame.

The timing of the yearly reviews should coincide with either the anniversary of the approval date of this plan or another date chosen by the committee. Re-prioritization of projects may be needed as high priority mitigation actions are completed.

As described above, the Department of Emergency Preparedness and primary responsible organizations for each project listed in Chapter 5 will be responsible for evaluating progress in implementing mitigation projects. The Department of Emergency Preparedness, during its annual review, also may identify corrective actions for projects. In addition, the Department of Emergency Preparedness should review its organizational composition annually and adjust membership, if needed.

The Department of Emergency Preparedness will determine at its annual meeting if a formal update of the plan is required. At a minimum, the plan will be updated every five years. Factors to consider when determining if an update is necessary include:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions;
- Increased vulnerability as a result of new development;
- New state/federal laws, policies, or programs;
- Changes in resource availability; and/or

- Applicability of goals/objectives/strategies.

A major event, such as a presidentially declared disaster, may trigger a need to review the plan. If such an event affects Frederick County, the Department of Emergency Preparedness will coordinate to determine how best to review and update the plan. Major changes to the plan will be submitted to the state and to FEMA Region III.

Public Involvement

Public notice of the annual review will be given and public participation will be invited. At a minimum, notification will be through web postings and press releases to local media outlets, primarily newspapers. In addition, an annual event will be held to publicize progress on implementing the mitigation plan. This event could be timed to coincide with the anniversary of a significant event or annual awareness event (e.g., Hurricane Preparedness Week). The county will also post a link to the mitigation plan on the Department of Emergency Preparedness's website. It is recommended that the county's website serve as a means of communication by providing information about mitigation initiatives and updates to the projects and the plan itself.

Appendix A: 2004 Hazard Historic Overview and Vulnerability Analysis

The information contained in Appendix A is data from the 2004 Frederick County Mitigation Plan. The information shown has not been changed or updated.

Extreme Wind Events

- High winds occurred on March 14, 1993 as the "Blizzard of 1993" moved through the region. Wind gusts over 60 mph created snow drifts to 10 feet. Nearly $500,000 in property damage occurred.

- On November 11, 1995, a strong cold front ripped through the region creating wind gusts to hurricane force which is 74 mph. Property damage in the county mounted to $70,000.

- A severe wind event occurred on April 23, 1996 resulting in over 30,000 Baltimore Gas and Electric customers without power. Damages were reported over $100,000.

- Strong winds in excess of 30 mph knocked down a healthy tree just south of Mt. Airy which just missed a nearby home. A deteriorating and aging silo was also knocked down. Damages were $15,000.

- A strong coastal storm rolled through the state on February 4, 1998 resulting in sustained winds of 35 mph and gusts in excess of 50 mph. Dozens of trees fell across the county and nearly 15,000 people were without power at the height of the storm. A tractor trailer was flipped over by the wind on Interstate 70 near the Myersville exit. Damages were near $350,000 from the storm.

- One person was injured on February 24, 1998 when a wall fell in an unfinished townhome during a severe windstorm. Property damage was $70,000.

- On February 11, 2000, strong cold fronts passed through the region with winds in excess of 55 mph. Trees were reportedly down on area roadways in Emmitsburg, New Market and Middletown. Over 1000 people were without power in the county and property damage was $22,000.

- A vigorous cold front crossed the county on December 12, 2000 resulting in large tree limbs being knocked down onto U.S. Route 15 near Point of Rocks. A wind gust to 44 mph was reported at Frederick Airport. Property damages were $35,000.

- A severe wind event occurred on February 1, 2002 with a wind gust to 54 mph at Frederick Airport. There were trees and power lines reported down across the county along with scattered power outages.

- Strong downslope winds from the Appalachian Mountains gusted over 50 mph on January 9, 2003. Tree limbs were downed near Brunswick and wires were downed in Walkersville and Mount Pleasant.

- High winds occurred on November 13, 2003 as a strong cold front plowed through the region. A truck was blown over on U.S. Route 15. Over 150,000 homes and businesses were without power at the height of the storm in Maryland.

Thunderstorms

- On February 4, 1998, a powerful nor'easter, carrying copious amounts of moisture from the Gulf of Mexico and Caribbean region, dumped between 2 and 4 inches of rain across much of Maryland between the foothills and the Chesapeake Bay. Several counties in Maryland, including Frederick County, were affected. Minor sewage backups were reported farther north in Frederick County. A tractor-trailer flipped over along Interstate 70 in western Frederick County near the Myersville exit (State Route 17). The total property damage incurred across the State totaled $145,000 and crop damage was $200,000.

- On July 19, 1996, a supercell that was producing weak to moderate tornadoes across southern Washington and Frederick Counties had an associated rear-flank downburst that struck immediately west of the tornado track. Numerous trees were uprooted or snapped over a wide area from just west of Rosemont to the banks of the Potomac River. Wind speeds maximized along the shoreline, likely a result of a channeling effect through the mountain gap just east of Harpers Ferry, West Virginia. Power outages were substantial in these areas; 10,000 customers in Loudoun County, Virginia, and Frederick County, Maryland, were briefly without electricity. The total crop damage incurred was $50,000 and property damage was $25,000.

- On July 21, 1998, a small but potent line of severe thunderstorms raced from western Maryland through the Washington, DC, metropolitan region, producing wind gusts between 60 and 70 mph along the leading edge. The storm gained strength as it plowed southeast into Frederick and Montgomery Counties. In Frederick County, damage included felled scattered trees and power lines in the Middletown/Braddock Heights area. More substantial damage occurred in the south portion of the City of Frederick, where two roofs partially collapsed at a shopping center near the intersection of State Route 85 and Interstate 270. An unfastened trailer was flipped off cinder block supports and fell onto an automobile, pinning the car against a curb. Homes at a nearby neighborhood sustained minor damage, including one whose garage was partially destroyed. The total property damage was approximately $90,000.

Lightening

- On August 21, 1994, lightning struck and burned a historic barn in the City of Frederick at the School for the Deaf. The County incurred a total damage of $500,000.

- On July 28, 1999, a series of thunderstorms swept across north central Maryland, producing heavy downpours, frequent lightning, and damaging winds in excess of 55 miles per hour. The storms moved through Washington, Frederick, Carroll, and Howard Counties. In Frederick County, trees and power lines were downed onto Route 180 at the intersection of Mt. Zion Road, Main Street in New Market, Route 75 between Route 80 and Ed McClain Road, and Route 144. A concentrated area of tree damage also occurred between Monrovia and Bartholows Road. Monrovia was hit especially hard. One home lost part of its roof when several trees fell onto the structure. A car in the driveway was also damaged by a fallen tree. A nearby 150-year-old log home valued at $130,000 was hit by lightning and burned to the ground. The fire department reported delays reaching the structure because of roads

blocked by downed trees. In the City of Frederick, one house was damaged and 22 intersections were blocked by fallen trees. Approximately 150,000 customers in and around Frederick County lost power as a direct result of the storm. The total property damage was estimated at $130,000.

- On August 7, 2000, lightning-scattered thunderstorms moved across central Maryland during the afternoon and early evening. These storms produced winds in excess of 55 miles per hour, frequent lightning, and hail. In Frederick City, an apartment complex was hit by lightning. The total property damage during this lightning event (including Howard, Prince Georges, Montgomery Counties) was $750,000.

- In August 2002, several thunderstorms with high winds, large hail, and frequent lightning moved through western and central Maryland. In Frederick County, a 52-year-old man was killed by lightning while standing on the back porch of his Frederick home. It was not raining at the time he was struck. A 17-year-old swimming pool lifeguard at Fort Detrick was injured when lightning struck nearby. A 36-year-old Frederick County man was also injured by lightning in an unknown location. At least four homes across the County were damaged by lightning and 2000 bales of hay were set on fire near Emmitsburg. Wind damage was reported in Park Mills. Marble to quarter-sized hail fell just south of Frederick for nearly 10 minutes. No fatalities or casualties were reported and there was no damage to crop or property.

- On August 29, 2003, a home caught fire after being struck by lightning. An afternoon thunderstorm produced a lightning bolt that struck a home in Brunswick. The home on East A Street was heavily damaged from the resulting fire and two families were displaced. The damage was estimated at $50,000.

Tornadoes

- On July 31, 1978, a tornado was visible in Frederick County. The exact location was unknown. Property damage was estimated at $25,000. No fatalities or injuries were reported.

- On July 19, 1996, a supercell thunderstorm that produced the F2 tornado in Yarrowsburg (Washington Co) dropped a second tornado in Rosemont. The tornado first touched down in Rosemont, damaging numerous trees as it crossed State Route 17 and moved into Brunswick. A service station's roof was partially damaged by a fallen tree. Many of the homes in Brunswick were protected by the trees and the steep sloping terrain towards the Potomac. The total property damage was estimated at $80,000 and total crop damage was estimated at $50,000.

- On August 14, 1999, an area of thunderstorms moved across much of Maryland, producing damaging wind, frequent lightning, and brief heavy downpours. The thunderstorm complex intensified rapidly as it moved into Frederick County. The northwest side of the City of Frederick took the brunt of the storm. As the storm reached the Abbington Farms area, a tornado developed. The tornado was F1 strength with winds between 75 and 112 miles per hour and ranged from 50 to 200 yards wide as it traveled east for 3 miles. The twister did extensive damage to trees as it moved through the communities of Eastview, Walnut Springs, Shookstown, and Fort Detrick. Some trees fell onto cars and houses, and a few homes under construction were damaged. One home under construction in Walnut Ridge was torn to pieces by the tornado and the debris turned into airborne missiles that heavily

damaged two finished homes nearby. Two homes in the Eastview subdivision were condemned after trees fell onto the structures. A chimney was blown off a Willowdale Drive home. Yellow Springs Road had to be closed for several hours until power and telephone poles blocking the road could be cleared. A metal storage building on Rosemont Avenue was crumbled. Part of the roof of the Food Lion grocery store on Rosemont Avenue was torn off and thrown toward the gates of Fort Detrick. The store suffered water damage and the loss of frozen foods and perishables from the resulting power outage. Next, the storm moved across Fort Detrick, causing $260,000 in damage. The twister moved onto the main post where it uprooted trees, downed power lines, and blew off parts of buildings. The headquarters building and post chapel lost part of its roof. Nearly 30 cars along Rocky Springs Road and near post housing were damaged by downed trees and debris. In addition, the central portion of Frederick was hit by destructive straight line winds estimated between 60 and 70 miles per hour. Thirty Bradford pear trees were downed on Heather Ridge Drive. Sixteen city streets were closed by fallen trees. A 1-mile stretch of Route 40 west of the Golden Mile had to be closed for an hour to clear fallen trees. A glider valued at $11,000 was ripped from its mooring at the airport and totaled. The storm downed a total of 300 trees across Frederick, and resulted in outages for 8,000 power customers. High winds also downed trees in Brunswick, leaving 100 customers without power. The total damage to property was $800,000.

- On June 14, 2004, unconfirmed reports of funnel clouds and tornadoes were received by the National Weather Service Office in Sterling. Several areas across northern Maryland reported wind damage mainly due to downed trees and powerlines. Areas of damage included the region between Thurmont and Libertytown. The tornado was rated F1 with an estimated winds of 75 miles per hour. The initial tornado touchdown occurred one-1/2 mile north of Woodsboro along Route 194 near a cement plant. The tornado tracked southeast mostly across farmland and wooded areas, uprooting and toppling trees along its path.

Hail

- On July 16, 2000, scattered thunderstorms that produced winds in excess of 55 miles per hour, heavy rainfall, large hail, and frequent lightning moved across Maryland. In Frederick County, quarter-sized hail destroyed a cornfield in Thurmont and a car was hit by lightning but no one was injured.
- On June 22, 2001, severe storms contained very heavy rainfall, frequent lightning, and occasionally produced high winds and large hail. In Frederick County, nickel sized hail was reported on Route 40 west of Frederick. In Frederick, pea-sized hail fell and a wind gust of 50 miles per hour was estimated. Trees were downed by high winds in the Putman Road area 5 miles north-northwest of Frederick. Pea-sized hail was reported in Poolesville. A spotter in Braddock Heights reported 2 inches of rainfall in 20 minutes. At Point of Rocks, the railroad crossing on Route 28 was flooded. A three-story mansion was struck by lightning and the resulting fire caused $300,000 damage. Another lightning fire in Kemptown caused $20,000 damage. No casualties or fatalities were reported.

Winter Storm

- On March 26, 1997, a strong surface high pressure area over New England pushed a shallow layer of subfreezing air into the northern tier of Maryland, causing a severe winter storm. Carroll, Frederick, northern Baltimore, and Washington Counties were affected. Total property damage to these counties was estimated at $150,000.
- On January 14, 1999, a strong arctic cold front moved slowly southeast across the Mid-Atlantic region. This front brought a thick layer of sub-freezing air to the lowest levels of the atmosphere, but just off the surface warmer air moved in. This created ice accumulations of one-1/4 to one-1/2 inch north and west of a line from Montgomery County to Harford County, including Frederick County. The total damage to Maryland counties was estimated at 3.2 million. No fatalities or casualties were reported.
- On February 14, 2003, a complex storm system produced copious amounts of wintry precipitation across Maryland, west of the Chesapeake Bay. Nicknamed the President's Weekend Snowstorm of 2003, this storm will go down in history as the heaviest snowstorm in the Baltimore region since records began in 1870. A total of 28.2 inches of snow was recorded at Baltimore-Washington International Airport. This massive storm took a heavy toll on residents, structures, transportation systems, emergency responders, businesses, livestock, and travelers. A state of emergency was declared by the Governor of Maryland and people across the State were ordered to stay off the roads during the height of the storm between the morning of the 16th and the morning of the 17th. Roads were covered by deep snow and sleet and were nearly impassable. Main highways were partially cleared by the 18th but it took up to 5 days to reach some secondary and residential roads. In Frederick County, five sheds or barns caved-in. Portable classrooms at four county schools collapsed. A meeting hall and a tennis court bubble were crushed. A 42-year-old man died from a heart attack after shoveling snow in New Market. A 12-year-old boy died from carbon monoxide poisoning in a snowbound car in Mt. Airy. Property damage incurred by the Maryland counties was approximately $5.2 million. There were 2 fatalities and 10 injuries.
- On December 5, 2003, a winter storm produced 5 to 6 inches of snow across North and Central Maryland. A medical condition rendered a Frederick woman unconscious after she walked outside to check her mailbox and she eventually died of hypothermia. No property or crop damage was reported during this event.

Extreme Heat

- On August 22, 2002, high temperatures rose into the mid 90s and heat index values soared to near 105 degrees during the afternoon. Three people in Frederick County died as a result of the excessive heat. No damage to property or crop was reported.
- High pressure sitting off the Atlantic coastline pumped hot and humid air into the region between August 12 and 19, 2002. Temperatures soared well into the 90s during the afternoon each day and heat index values approached 100 degrees in Frederick County and neighboring areas. Four Marylanders died during the 8-day heat wave. No property or crop damage was reported.
- High pressure off the Atlantic Coast pumped hot and humid air into the Mid-Atlantic region. This caused high temperatures to reach between 92 and 100 degrees between August 1 and August 5, 2002 and heat indices soared between 98 and 110 degrees. In Frederick County, 11 people participating in an outdoor activity in Ijamsville were treated for heat illnesses. The heat was also blamed for buckling pavement on Interstate 70 near the Route

355 exit. Several regional power companies noted record energy consumption during this heat wave, the hottest in 5 years.

- A large area of high pressure sat off the Mid-Atlantic coast during the last week of July 2002. This caused a warm and moist south wind to blow into the region for several days, resulting in another heat wave in the Frederick County region. The hottest days were the 28th and 29th of July when temperatures rose into the 90s and heat index values reached 100 to 110 degrees. Power companies reported record electricity use on the 29th. Three fatalities were recorded in the Maryland area.
- High pressure remained stationary off the Delmarva coastline during the first week of July 2002. This resulted in a prolonged period of hot and humid weather across the Mid-Atlantic region. Between July 2nd and 4th, high temperatures rose into the lower to middle 90s and dew points reached into the lower 70s. This resulted in heat index values reaching 100 to 110 degrees during the afternoon. Twenty other people were treated at hospitals for heat illnesses countywide between July 2nd and 4th. Twenty-one fatalities were recorded in the Maryland area. There was no damage to crops or property.

Flooding

- On 14 June 1972, Hurricane Agnes began as a tropical disturbance off the coast of Mexico. By 19 June, Agnes became a hurricane and made initial landfall along the Florida panhandle and made her way up the Atlantic Coast. The most impressive aspect of the hurricane was the widespread nature of its floods, resulting in extremely rare floods on major rivers and streams. The flood recurrence frequency in many locations exceeded 100 years, most notably on the Susquehanna River downstream of Waverly, New York, and on the Potomac River, downstream, from Point of Rocks, Maryland. The Monocacy River in Frederick rose from a height of 30 to 35.9 feet after Agnes. Hurricane Agnes was the costliest natural disaster in the United States at that time. Damage was estimated at $3.1 billion and 117 deaths were reported. In Maryland, the damage was estimated at $110 million and 19 deaths were reported.

- On 19 January 1996, snowmelt combined with 1 to 3 inches of rain to produce heavy river flooding in Allegany, Montgomery, Washington, and Frederick Counties. The flooding was the worst in the region since 1985. Almost all dwellings in the town of Point of Rocks were damaged by the flood waters in some way. There were several water and sewage plant failures. Water line breaks occurred in La Vale and failures at Sharpsburg and Hagerstown forcing residents to boil water for 3 to 5 days (thousands of others were without water for 1 to 2 days). The plant in Brunswick was shut down for 1 to 3 days due to flood waters and high turbidity. Three counties, Washington, Allegany, and Frederick in central Maryland were declared under a Federal disaster declaration. Total property damage to the area was estimated at $ 60 million. No fatalities or injuries were reported.

- On 19 June 1996, the northern part of the County experienced a major flood. There was one fatality and approximately $5 million of property damage.

- On 6 September 1996, a flood was experienced throughout the County. No casualties or injuries were reported. Property damage and crop damage to the area was $75,000 and $10,000, respectively.

- On 1 August 2000, scattered thunderstorms produced very heavy rainfall, gusty winds, and frequent lightning. In Frederick County, the chimney of a two-story home in Jefferson was struck by lightning. A fire resulted that heavily damaged the structure. A heavy downpour sent Martin's Creek out of its banks in Brunswick. Rushing water from the creek inundated nearby buildings. A Brunswick City building made of cinder blocks had the rear and part of a side wall washed away. Cars, trucks, and other equipment stored inside were also damaged. Some culvert pipes were washed out and a foot bridge and a fence were washed away. A home across the street from the creek also reported flood damaged to appliances. Property damage to the County was approximately $100,000. No fatalities or injuries were reported.

- On 18 September 2003, Hurricane Isabel made landfall on the North Carolina Coast. The high wind gusts up to 70 mph came with bands of showers down to the surface causing streaks of damage that sometimes appeared as though a tornado had moved through instead of a strong narrow ribbon of wind. Wind damage to structures was limited but wind damage to trees in the area was extensive and widespread. Soil moisture was high from previous rains, making it easier for trees to uproot. Also, the trees were still in full canopy, which acted like a sail to catch the wind. Trees fell on electrical and utility wires, taking out power and phone lines. Trees fell on roads, cars, and homes. In Frederick County, a State trooper was injured when a tree fell on his car in the storm and another was injured when a tree fell on him. Two homes had some damage and there were 40 road closures from trees falling on them. Approximately 29,000 customers lost power in Frederick County due to this flooding event. The region incurred property damage of approximately $130,000. No fatalities were reported.

Drought

- July 1997 was a very dry month, containing one 7-day heat wave, exacerbated drought-like conditions across much of the fertile farmland of Maryland. The weather in July proved disastrous for much of the crop yields, including corn, hay, alfalfa, and soybeans. Agricultural states of emergency were declared in many areas west of the Chesapeake Bay. Hardest-hit counties included Carroll, Frederick, Howard, Montgomery, and Washington. Some of the more impressive damage estimates were as follows: in Frederick County nearly $9 million in corn, an approximate 90 percent loss; an additional $5.5 million in corn for silage and soybean, a 60 percent loss. The total crop damage to the 12-county region in Maryland was estimated at $43.7 million.

- November 1998 was the fifth month in a row that drought conditions were seen across Central and Northern Maryland. Only 1.13 inches of rain fell at the Baltimore/Washington International Airport in Anne Arundel County during the month of November, 2.07 inches below normal. Other monthly rainfall totals from affected counties included 0.6 inches in Washington, 0.7 in Howard, 0.9 in Frederick, 1.0 in Charles, 1.1 in Carroll and Anne Arundel, and 1.2 in Montgomery and Prince George's. Water levels and reserves were greatly affected by the persistent drought. The total crop damage incurred by 13 counties in Maryland including Frederick was approximately $20 million.

- From September 1998 through August 1999, precipitation was a staggering 12 to 16 inches below average. During August, 6.14 inches of rain fell at Baltimore/Washington International Airport, 2.22 inches above normal. Additional August rainfall totals included Allegany County at 2.5 inches, Washington County at 2.3 inches, Frederick County at 3.1 inches, Prince George's County at 5.3 inches, Carroll County at 4.7 inches, Anne Arundel at 6.6 inches,

Northern Baltimore County at 5.4 inches, Howard County at 4.3 inches, Montgomery County at 4.6 inches, Charles and Calvert Counties at 5.5 inches, and St. Mary's County at 5.8 inches. The lack of rainfall through the third week of August continued to affect water levels along the Potomac River and the Chesapeake Bay. Nineteen Maryland counties were declared Federal drought disaster areas. The worst agricultural drought in Maryland continued to devastate farmers. Approximately 55 percent of pasture land, 45 percent of corn, 39 percent of sorghum, 29 percent of tobacco, and 34 percent of soybeans across the State were reported in poor or very poor condition and 42 percent of topsoil and 84 percent of subsoil were reported as short or very short of moisture. Frederick County lost 90 percent of their corn and soybean crop, and $9 million in lost revenues. Crop damage for several Maryland Counties totaled to $30 million.

- During the summer of 2002, drought gripped the State of Maryland. The ground and reservoir water supply in Frederick County was low. By September 2002, the area was being strangled by the worst drought in more than 30 years. The first nine months of 2002 were dangerously dry, with 25 inches of rain recorded at Dulles International Airport during that time (average for that time period, is 32 inches).

Appendix B: 2004 Mitigation Projects

This Appendix contains an update on the status of projects from the 2004 mitigation plan. The list below contains only those projects whose 2009 status was indicated as *Complete* or *Inactive* by the Planning Committee members. 2004 projects that are *In Progress* are found in Chapter 5 of this plan.

PUBLIC AWARENESS

Goal 1
Promote public understanding, support, and involvement in hazard mitigation related activities
Objective 1
Develop a public information and education program for the county to advise citizens on how to protect themselves and their property from natural hazard events.

Project 1
Educate public/businesses that lie in the immediate area of critical facilities to report unusual operations with respect to natural hazards. Develop a check sheet that identifies a list of unusual or suspect activities and distribute this to residences and businesses that are in close proximity to one or more critical facilities. Include at least two or three names and contact numbers to immediately report these activities.
Responsible Organizations: Department of Emergency Preparedness
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 1 year
Status: Inactive *Comments: The Department of Emergency Preparedness has six full time employees currently on staff. The department has been spearheading efforts to accomplish and continue mitigation projects as noted in Chapter 5, and they have additionally been completing the county-wide Continuity of Operations Plan, County Emergency Operations Plan and functional annexes, the multi-year public outreach plan, and the multi-year exercise plan. Due to staffing constraints, this project is currently inactive.*

Project 2
Promote best practices in Frederick County by maintaining an on-going list of activities and learning from those communities that have successfully accomplished these activities, such as Mt. Airy's siren system. This list of best practices could be a component of the annual report to be drafted by the Planning Commission regarding progress on implementing this plan.
Responsible Organizations: Department of Emergency Preparedness
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 2-5 years
Status: Inactive *Comments: The Department of Emergency Preparedness has six full time employees currently on staff. The department has been spearheading efforts to accomplish and continue mitigation projects as noted in Chapter 5, and they have additionally been completing the county-wide Continuity of Operations Plan, County Emergency Operations Plan and functional annexes, the multi-year public outreach plan, and the multi-year exercise plan. Due to staffing constraints,*

this project is currently inactive.

PLANS AND ORDINANCES

Goal 2
Promote growth and development in a sustainable fashion
Objective 1
Revise County Comprehensive Plan, sub-area plans, and municipality plans, as appropriate.

Project 3
Integrate this Hazard Mitigation Plan into the county's eight regional plans and update as necessary.
Responsible Organizations: Division of Planning, Department of Emergency Preparedness
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 6-10 years
Status: Complete *Comments: When the Comprehensive Plan was reviewed and revised, the Hazard Mitigation Plan information was incorporated.*

Objective 2
Revise existing ordinances (zoning, subdivision, floodplain ordinance), as appropriate.

Project 4
The Towns of Walkersville, Myersville, and Middletown have adopted Well-head Protection Plans. The State of Maryland has completed a Source Protection Plan for the entire county, including areas in the karst terrain. Work with County Commissioners to expedite the review process – via the County Managers Office and encourage the County Attorney to review the ordinance so it may be adopted and implemented.
Responsible Organizations: Department of Emergency Preparedness, Division of Planning, municipalities
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 1 year
Status: Complete *Comments: The County has adopted a wellhead protection ordinance in May of 2007 (ordinance no. 07-16-456). It is available on the County's website on the webpage of the county attorney.*

Project 5
The Town of Mt. Airy has been considering adopting Carroll County's Floodplain Ordinance. Work with the local officials in Mt. Airy and encourage the Town to adopt this floodplain ordinance as soon as possible.
Responsible Organizations: Town of Mt. Airy, Carroll County Department of Planning
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 2-5 years
Status: Complete.

Comments: The Town of Mount Airy has adopted the Carroll County's floodplain Ordinance in the last couple of years. The County Planning Office reviews all in-town projects to make sure they comply with the adopted Ordinance. The Town adopted two ordinances in 2006 that relate to implementation of the floodplain regulations. They are Town Ordinances 2006-12 and 2006-14.

Project 6 – Mt Airy
Revise existing ordinances as appropriate for the towns and the county. Sections that should be improved and areas where attention should be focused have been elaborated in the Mitigation Capability Analysis section at the end of Chapter 3 of this Plan. Consider incorporating these changes during the next plan or ordinance amendment.
Responsible Organizations: Individual municipalities, Department of Planning, Department of Engineering
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 6-10 years
Status: Completed. *Comments: The Town of Mt Airy continuously adopts the new ordinances as adopted by Carroll County in relation to sediment control, storm water management, floodplain and environmentally sensitive areas.*

SHELTERS

Goal 4
Provide adequate shelters to handle multi-hazards such as floods, tornadoes, winter storms, etc.
Objective 2
Ensure critical facilities are equipped to handle hazard events.

Project 7
Identify and prioritize a list of critical facilities that would require generators during times of an emergency. Seek funding sources to help agencies purchase generators.
Responsible Organizations: Department of Emergency Preparedness, municipalities
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 2-5 years
Status: Complete *Comments: A survey was conducted with municipal leaders on their generator needs.*

BUILDING CONSTRUCTION

Goal 6
Reduce exposure of structures to hazards.
Objective 1
Create an awareness of building to safe standards.

Project 8
Identify large abandoned structures that are in a state of disrepair and consider demolition of these structures. A good example of this is the old water tank in Mt. Airy on North Main Street next to the elementary school, which is to be demolished shortly. Ensure that the integrity of historic properties is maintained.
Responsible Organizations: Department of Emergency Preparedness, Division of Planning, Fire Department
Estimated Costs: Varies by structure
Possible Funding Sources: HMGP, PDM
Timeline for Implementation: 2-5 years
Status: Inactive *Comments: The Department of Emergency Preparedness has six full time employees currently on staff. The department has been spearheading efforts to accomplish and continue mitigation projects as noted in Chapter 5, and they have additionally been completing the county-wide Continuity of Operations Plan, County Emergency Operations Plan and functional annexes, the multi-year public outreach plan, and the multi-year exercise plan. Due to staffing constraints, this project is currently inactive.*

Project 9
Conduct structural assessments and engineering inspections of critical facilities and determine any replacement requirements while assessing each facility's ability to sustain damage from both flood and wind events and recommend specific retrofitting measures for each building as appropriate to better protect them from flooding and high winds.
Responsible Organizations: Office of Risk Management
Estimated Costs: Engineering consulting fees
Possible Funding Sources: To be determined
Timeline for Implementation: 6-10 years
Status: Inactive *Comments: Staffing constraints have hindered the completion of this project*.

MOBILE HOMES

Goal 7
Ensure safety in mobile home parks.
Objective 1
Ensure there is adequate shelter space available for residents in mobile home parks to seek refuge during hazard events.

Project 10
Consider planning for a storm safe structure/shelter in or in close proximity to each mobile home park. Investigate the availability of shelter space at the following locations: Ruritan and Jefferson Fire Halls for the two trailer parks on MD 180 and large buildings at the MD 340/MD180 Interchange such as Prospect Hall, 7th Day Adventist Church, and the assisted living home; and the Shields Trailer Park on Route 355 as possible shelter locations. The extreme forces of a tornado require that a shelter envelope be designed to resist high wind pressures and the impact of windborne debris. The walls, roof, and doors to the shelter should be designed, at a minimum, to resist 250-mph (3-second gust) wind speeds and the impact of windborne debris (15-pound wood 2 x 4) traveling at 100 mph. The architect and the structural engineer should ensure that the connections between the shelter foundation and walls and between the walls and roof are adequate to resist the design loads specified by FEMA 361 Design and Construction Guidance for Community Shelters. FEMA 361 includes requirements for shelter size based on the number and type of expected shelter occupants. The shelter should include toilets, storage space, a mechanical room and circulation area in addition to the actual space that houses the occupants.
Responsible Organizations: Department of Emergency Preparedness, Division of Planning, Division of Engineering
Estimated Costs: Varies by shelter
Possible Funding Sources: HMGP
Timeline for Implementation: 6-10 years
Status: Inactive *Comments: A list of available shelters has been developed and maintained. Shelter partnerships have been developed with Frederick County Public Schools and at multiple sites through agreements with the American Red Cross – Frederick County Chapter.*

KARST/SINKHOLES

Goal 8
Reduce Frederick County's vulnerability to sinkholes.
Objective 1
Ensure development is regulated in karst areas.

Project 11
Establish building standards and regulations in areas where there is evidence of water-soluble bedrock (limestone, dolomite, marble, gypsum). While regulation is not meant to discourage development, it ensures that the proper steps are taken to minimize the potential for future problems. Regulation could include requiring special foundations for residential and commercial structures and requiring special design for utility and stormwater facilities. Establish stringent requirements and inspection by geologists, prior to any new construction.
Responsible Organizations: Department of Permits and Inspections, Department of Emergency Preparedness, Soil Conservation District
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 2-5 years
Status: Inactive *Comments: The Department of Emergency Preparedness has six full time employees currently on staff. The department has been spearheading efforts to accomplish and continue mitigation*

projects as noted in Chapter 5, and they have additionally been completing the county-wide Continuity of Operations Plan, County Emergency Operations Plan and functional annexes, the multi-year public outreach plan, and the multi-year exercise plan. Due to staffing constraints, this project is currently inactive.

Project 12
Establish specific development regulations and stormwater management plans in karst areas to minimize future problems.
Responsible Organizations: Department of Permits and Development Review
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 6-10 years
Status: Inactive *Comments: Staffing constraints have hindered the completion of this project*.

Project 13
Encourage homeowners and developers to pay particular attention to foundation issues and geotechnical engineering during construction by providing them informational material.
Responsible Organizations: Department of Permits and Inspections
Estimated Costs: Regular employee pay for content and layout preparation, approximately $2 each for printing a trifold brochure
Possible Funding Sources: To be determined
Timeline for Implementation: 2-5 years
Status: Inactive *Comments: Staffing constraints have hindered the completion of this project*.

Objective 3
Educate Frederick County residents on karst.

Project 14
Encourage residents to find out what is beneath the land surface prior to purchase of property. Information could be found in the library, at the county, or at State and Federal agencies on the geology of the area. The Soil Conservation District and /or NRCS at 92 Thomas Johnson Drive, Suite 230, Frederick MD 21702, phone 301-695-2803, serves as a local resource center for information. Other State and regional agencies include the Maryland Geological Survey (MGS) and the Western Maryland Resource Conservation & Development Council (RC&D).
Responsible Organizations: Division of Planning, Board of Realtors
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 1 year
Status: Inactive *Comments: Staffing constraints have hindered the completion of this project*.

FLOODS

Goal 9
Investigate structural solutions to flooding problems.

Objective 1
Investigate the feasibility of enhancing and/or improving drainage of flood-prone lands.

Project 15
A thorough inspection of each of the identified critical facilities in the 100-year floodplain should be conducted by a registered engineer or architect. The inspection will enable the engineer or architect to identify potential structural weaknesses and other factors that could affect its ability to withstand a major wind or flood event and adequately protect its contents. Alternatives such as elevation, relocation, floodproofing, and retrofitting should be considered to determine the best flood control measure. For each critical facility, a technical report should be completed to provide information on the first floor and base flood elevations. Mitigation measures and a detailed benefit cost analysis should be conducted for each facility. This type of inspection would cost approximately $2,000-$3,000. Upon completion of a thorough assessment, the County could complete an application for Federal mitigation funds to fund a retrofitting project. A project application form would need to be completed for the project and submitted to the State Hazard Mitigation Officer (at the Maryland Emergency Management Agency).
Responsible Organizations: Department of Emergency Preparedness, Department of Public Services, Division of Planning, municipalities
Estimated Costs: will vary by facility
Possible Funding Sources: USACE's Floodplain Services Program, Pre-disaster Mitigation Assistance Funds administered by MEMA, Flood Mitigation Assistance Program Technical Assistance Funds, Small Flood Control Projects, Watershed Protection and Flood Prevention Program, Watershed Surveys and Planning.
Timeline for Implementation: 6-10 years
Status: Inactive *Comments: When the 2007 FEMA FIRM were released, the County sent letters to homeowners in the 100-year floodplain offering guidance.*

WILDFIRES

Goal 11
Reduce the risk of wildfires in the more rural parts of the county.
Objective 1
Introduce and enforce the concept of defensible spaces.

Project 16
There are a number of logging roads throughout the county that serve as good fire breaks. These roads are overgrown and, as a result, not being used for the purposes they were intended. Identify these roads and maintain them on a regular basis so that they can be used as natural breaks.

Responsible Organizations: Department of Highways and Transportation, Department of Natural Resources
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 2-5 years
Status: Inactive *Comments: More research is needed. Coordination between Frederick County and Maryland Department of Natural Resources needs to be accomplished to identify which logging roads are meant to be maintained by the county, and by other parties.*

COMMUNITY-SPECIFIC NEEDS

Goal 12
Identify community-specific needs to reduce risks to various hazards.
Objective 1
Work with the Town of Mt. Airy, City of Frederick, Village of Rosemont, Town of Walkersville, Town of Burkittsville, Town of Brunswick, and Town of Thurmont to identify the needs, abilities, and resources to implement various local projects.

Town of Mt. Airy

Project 17
Prepare and implement an emergency response plan for the Town of Mt. Airy.
Responsible Organizations: Town of Mt. Airy Communications & Technology Committee, Department of Emergency Preparedness
Estimated Costs: Regular employee pay and/or consultant fees
Possible Funding Sources: Department of Homeland Security's Emergency Services Performance Grant (EMPG)
Timeline for Implementation: 2-5 years
Status: Complete. *Comments: Basic Emergency Operations Plan drafted and several annexes drafted and under review by Frederick and Carroll Counties.*

City of Frederick

Project 18
Protect the Independent Hose Company on Baughman's Lane by either raising the road or creating a levee. A 100-year flood could block access to the only firehouse west of downtown.
Responsible Organizations: City of Frederick - Planning, Engineering, Public Works
Estimated Costs: $40 per linear foot for 2' levee; $75 per linear foot for 4' levee; $125 per linear foot for 6' levee
Possible Funding Sources: HMGP, FMA
Timeline for Implementation: 6-10 years
Status: Inactive *Comments: The revised FEMA floodplain and associated study for this area were adopted in 2007. The City has reviewed the study and determined that the culverts under Rt. 15 set the floodplain elevation on the firehouse property. There are currently no plans to construct a levee or raise the road to pull the firehouse out of the floodplain.*

Project 19
Develop a wellhead protection ordinance (all wellheads are in the 100-year floodplain).
Responsible Organizations: City of Frederick – Public Works, Engineering, Water and Sewer, Legal
Estimated Costs: Regular employee pay and/or consultant fees
Possible Funding Sources: No funding required
Timeline for Implementation: 1 year
Status: Complete *Comments: Wellhead protection ordinance adopted as part of the Land Management Code (LMC).*

Village of Rosemont

Project 20
Develop a brochure for the Town of Rosemont, Town of Burkittsville, and all the rural areas in the county on how to maintain septic systems and measures that could be taken during times they are out of power. A large part of Rosemont relies on well and septic systems. Approximately 50 percent of Rosemont is on public wells. These systems, like most others, are subject to breakdown if not maintained properly. The Frederick County Health Department has published a brochure on septic systems. Routine maintenance procedures, repair centers, and internet sites on related information could be included as part in this brochure.
Responsible Organizations: Town of Rosemont, Town of Burkittsville, Health Department
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 1 year
Status: Complete

Project 21
Revise existing ordinances as appropriate for the towns and the county. Sections that should be improved and areas where attention should be focused have been elaborated in the Mitigation Capability Analysis section at the end of Chapter 3 of this Plan. Consider incorporating these changes during the next plan or ordinance amendment.
Responsible Organizations: Individual municipalities, Department of Planning, Department of Engineering
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 6-10 years
Status: Complete

Project 22
Develop measures to assist those who rely on well water, during the drought season and during electrical outages and ensure adequate water pressure in fire hydrants.
Responsible Organizations: Village of Rosemont
Estimated Costs: To be determined
Possible Funding Sources: To be determined
Timeline for Implementation: 2-5 years
Status: Inactive *Comments: Unable to acquire funding for completion.*

Project 23
Provide the Rosemont Community Building with a generator.
Responsible Organizations: Village of Rosemont
Estimated Costs: Varies based in size, horse power, etc.
Possible Funding Sources: Department of Homeland Security's Emergency Services Performance Grant (EMPG)
Timeline for Implementation: 1 year
Status: Inactive *Comments: Unable to acquire funding for completion.*

Town of Walkersville

Project 24
Purchase a generator for the Town Hall.
Responsible Organizations: Town of Walkersville
Estimated Costs: Varies based in size, horse power, etc.
Possible Funding Sources: Department of Homeland Security's Emergency Services Performance Grant (EMPG)
Timeline for Implementation: 1 year
Status: Inactive *Comments: Unable to acquire funding for completion.*

Project 25
Update the sinkhole ordinance to address sinkholes on private property.
Responsible Organizations: Town of Walkersville, Division of Permits and Inspections
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 2-5 years
Status: Inactive *Comments: Unable to acquire funding for completion.*

Project 26
Update procedures for mapping sinkholes to GIS.
Responsible Organizations: Town of Walkersville, Department of Emergency Preparedness
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 1 year
Status: Inactive *Comments: Lack of funding.*

Town of Burkittsville

Project 27
Develop a brochure for the Town of Rosemont, Town of Burkittsville, and all the rural areas in the county on how to maintain septic systems and measures that could be taken during times they are out of power. A large part of Rosemont relies on well and septic systems.

Approximately 50 percent of Rosemont is on public wells. These systems, like most others, are subject to breakdown if not maintained properly. The Frederick County Health Department has published a brochure on septic systems. Routine maintenance procedures, repair centers, and internet sites on related information could be included as part in this brochure.
Responsible Organizations: Town of Rosemont, Town of Burkittsville, Health Department
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 1 year
Status: Inactive *Comments: Personnel and Time*

Project 28
Revise existing ordinances as appropriate for the towns and the county. Sections that should be improved and areas where attention should be focused have been elaborated in the Mitigation Capability Analysis section at the end of Chapter 3 of this Plan. Consider incorporating these changes during the next plan or ordinance amendment.
Responsible Organizations: Individual municipalities, Department of Planning, Department of Engineering
Estimated Costs: Regular employee pay
Possible Funding Sources: No funding required
Timeline for Implementation: 6-10 years
Status: Complete

Project 29
Develop an additional fire pond at east end of the Town.
Responsible Organizations: Town of Burkittsville
Estimated Costs: To be determined
Possible Funding Sources: HMGP
Timeline for Implementation: 6-10 years
Status: Inactive *Comments: Project deemed not feasible*

Town of Brunswick

Project 30
Provide generators at the Brunswick Water Treatment Plant, Police Department building and the Fire Department Building.
Responsible Organizations: Town of Brunswick, Department of Emergency Preparedness
Estimated Costs: Varies based on size, horse power, etc.
Possible Funding Sources: Department of Homeland Security's Emergency Services Performance Grant (EMPG)
Timeline for Implementation: 2-5 years
Status: Complete *Comments: WTP approved improvements include new generator. WWTP new generator installed. Police Dept. new generator installed.*

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Appendix C: Maps

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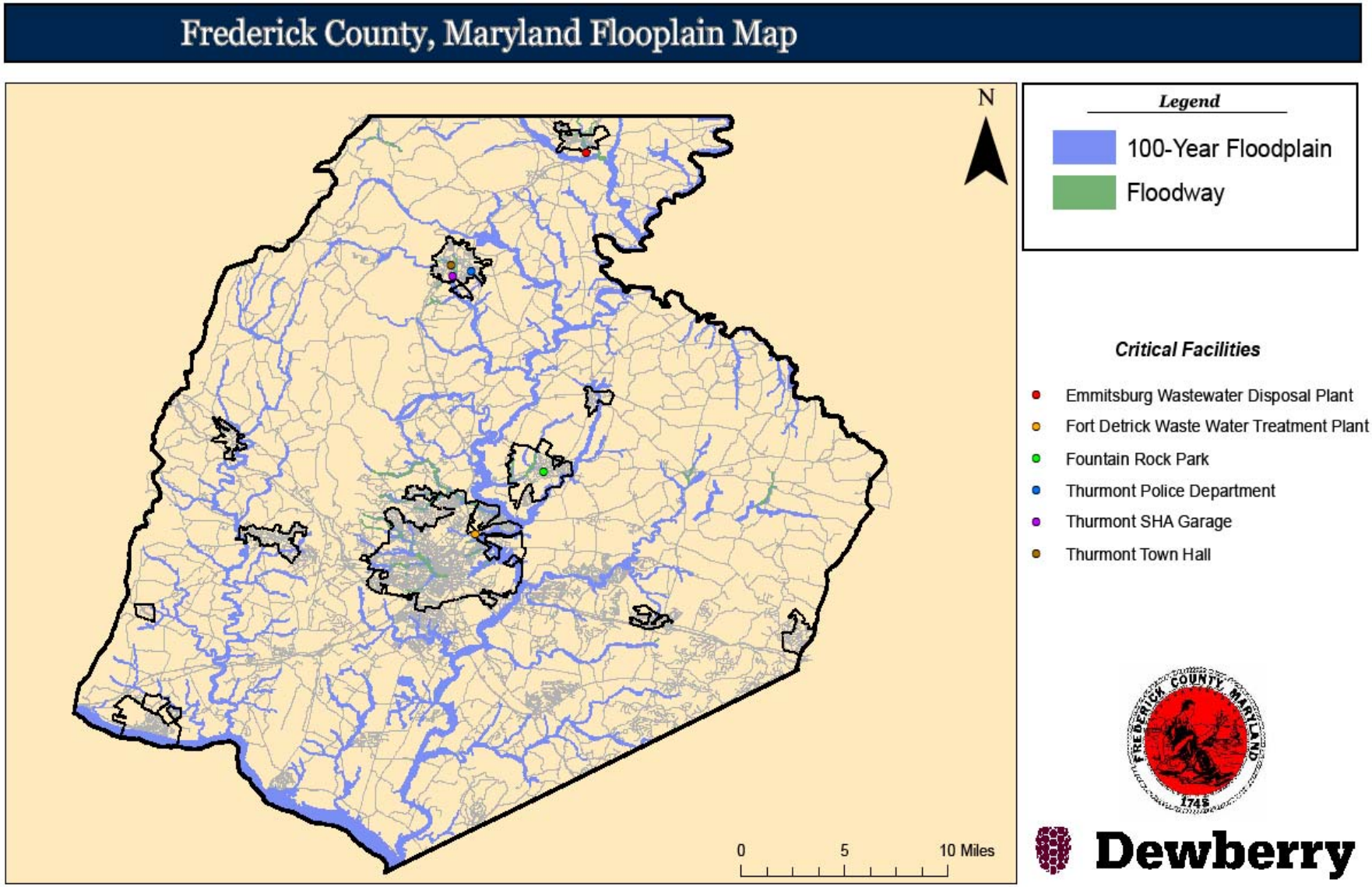
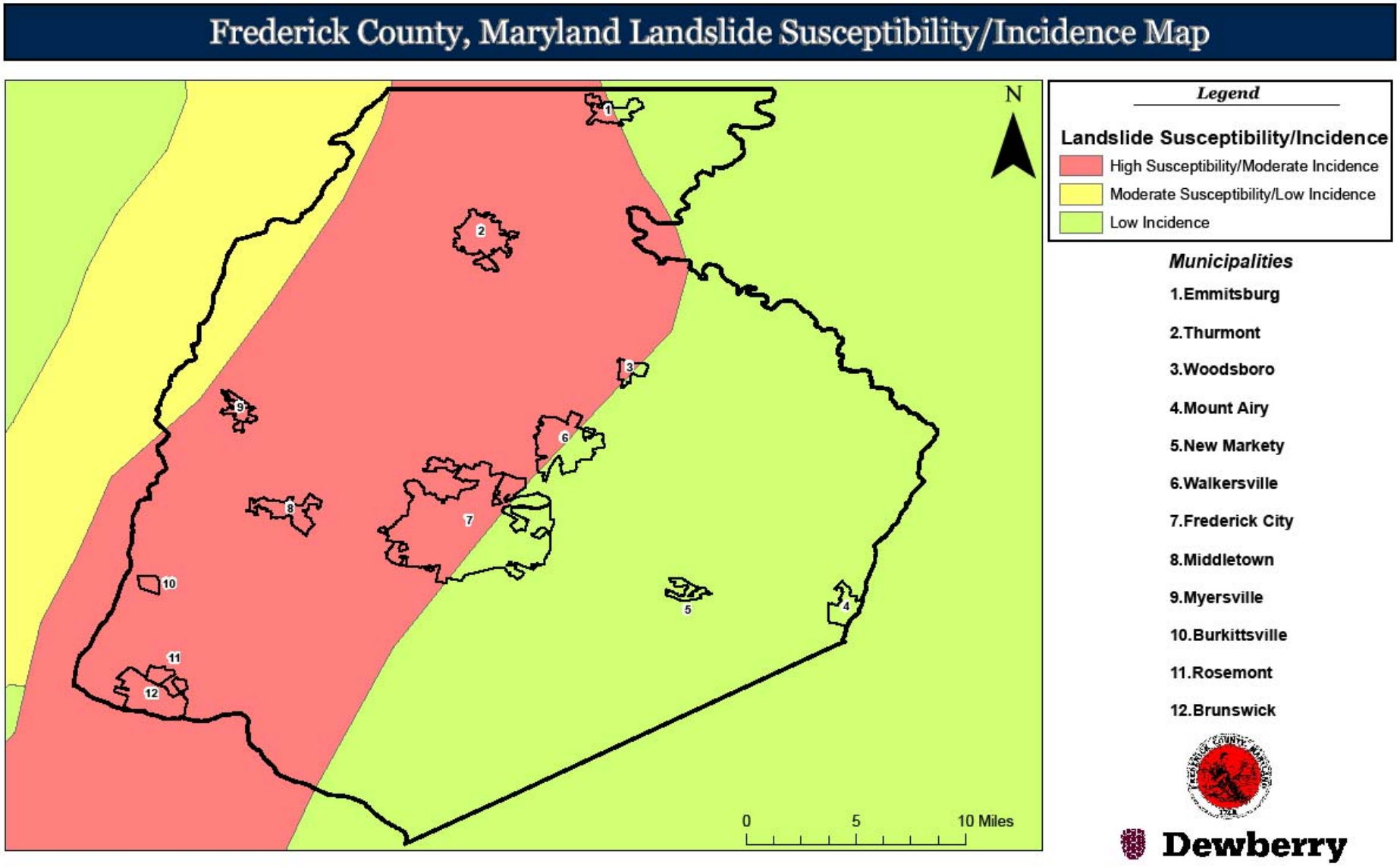
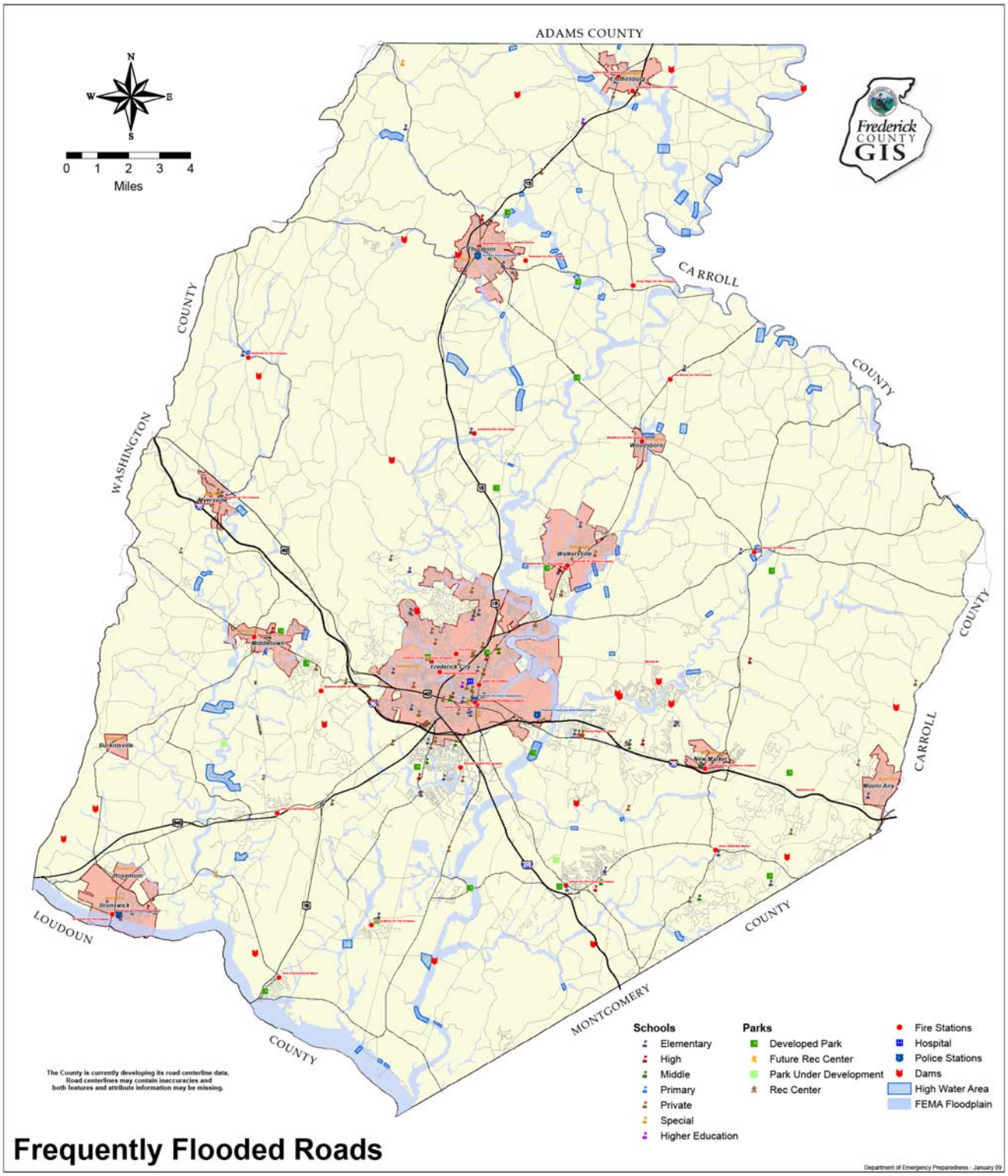
Map 1: Frederick County Floodplain



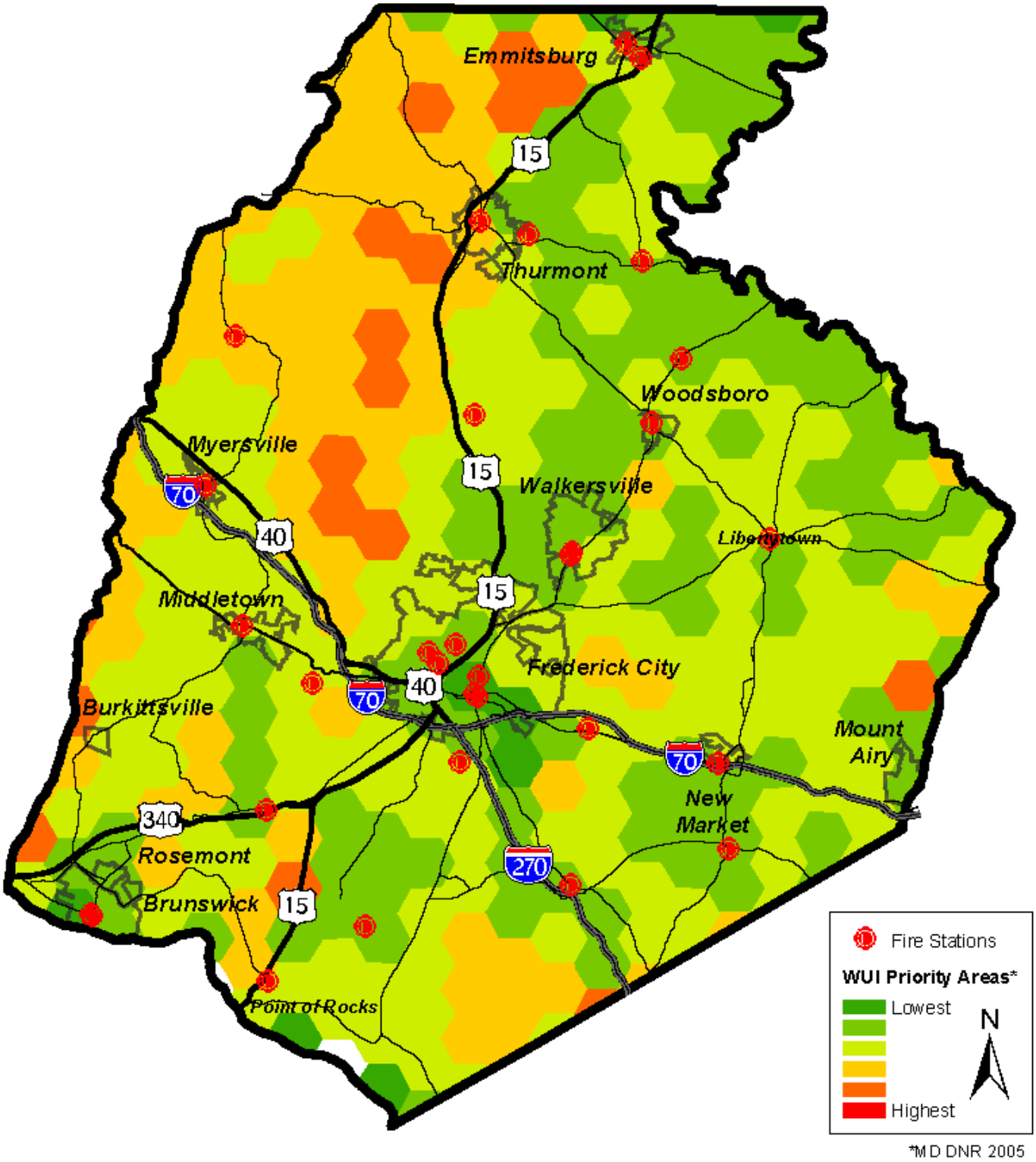
Map 2: Frederick County Landslide Susceptibility



Map 3: Frederick County Frequently Flooded Roads



Map 4: Frederick County Fire Hazard Potential



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Appendix D: Public Outreach Materials

Public Outreach Meeting, Notice of Public Meeting: January 12, 2009

800 PUBLIC NOTICES

NOTICE OF PUBLIC HEARING

RE: Rezoning Request #R-98-01(A)

The Board of County Commissioners ("Board") of Frederick County, Maryland, will conduct a public hearing on **Tuesday, January 6, 2009**, at 7:00 p.m. in the first floor hearing room of Winchester Hall, 12 East Church Street, Frederick, Maryland, to consider the rezoning application #R-98-01(A).

The applicant, Urbana Corporate Center, LLC, is requesting to amend the conditions in the Phase I Plan of the 211.6 acre Urbana Office/Research Center MXD to re-orient and increase the amount of commercial uses in the proposed development. The site is located south of MD 80, west of MD 355, and east of I-270 at the Urbana interchange, in the Urbana Planning Region.

The application may be inspected and the staff report may be obtained at the Frederick County Planning Division, Second Floor - Winchester Hall, 12 East Church Street, Frederick, Maryland 21701 or by contacting Denis Superczynski at 301-600-1142.

The applicant is limited to a 30-minute presentation and five (5) minutes for rebuttal. Individuals will be given an opportunity to be heard at this meeting and comments will be limited to five (5) minutes per speaker.

Persons requiring special accommodations for this public hearing are requested to contact the County Manager's Office at 301-600 1100 (TTY: Use Maryland Relay) to make the necessary arrangements no later than five (5) business days prior to the hearing.

Frederick County Government does not discriminate on the basis of race, color, national origin, sex, religion, age, or disability in employment or the provision of services.

BY ORDER OF THE BOARD OF COUNTY COMMISSIONERS

Ronald A. Hart
County Manager

Dec. 20, 27, 2008

Find a **house**.
The Frederick News-Post
CLASSIFIEDS
Call 301-662-1162

800 PUBLIC NOTICES

NOTICE OF PUBLIC MEETING

The Frederick County Department of Emergency Preparedness is hosting a public meeting on Monday, January 12, 2009, at 12:00 p.m. until 1:00 p.m. in the C. Burr Artz Trust Conference Room at C. Burr Artz Public Library, 110 East Patrick Street, Frederick, Maryland.

The Department of Emergency Preparedness staff will discuss Frederick County's Hazard Mitigation Plan update and educate the public on the planning process. For more information about the meeting please contact 301-600-1746.

Individuals will be given an opportunity to be heard at this public meeting. Comments will be limited to five (5) minutes per speaker.

Persons requiring special accommodations for this public meeting are requested to contact the Department of Emergency Preparedness staff at 301-600-1746 (TTY: Use Maryland Relay) to make the necessary arrangements no later than three (3) business days prior to the meeting.

Frederick County Government does not discriminate on the basis of race, color, national origin, sex, religion, age, or disability in employment or the provision of services.

dec 27, 2008, Jan 3, 2009

PUBLIC HEARING
NEW MARKET, MD
RES 08-03 –
THE ORCHARD FIRST AMENDMENT TO THE DEVELOPMENT RIGHTS AND RESPONSIBILITIES AGREEMENT

Notice is hereby given that the New Market Town Council will conduct a public hearing on Wednesday, January 14, 2009, at the hour of 7:00 PM in the New Market Town Hall, 39 W. Main Street, New Market, MD for the purpose of hearing public comment on the proposed First Amendment to Development Rights and Responsibilities Agreement (DRRA)

The proposed amendment would extend the period of exemption from municipal impact fees from seven to ten years. The full text of the proposed amendment is available for review at Town Hall and on the Town website at http://www.townofnewmarket.org

BY ORDER OF THE MAYOR AND TOWN COUNCIL
Winslow F. Burhans, III
Mayor
Instructions

Your life. Your community. Your paper.

Public Outreach Meeting, Notice of Public Meeting: March 25, 2009

NOTICE OF PUBLIC MEETING

The Frederick County Department of Emergency Preparedness is hosting a public meeting on **Wednesday, March 25, 2009**, at 12:30 p.m. until 1:30 p.m. in the large conference room at the Municipal Office Annex, 140 West Patrick Street, Frederick, Maryland.

The Department of Emergency Preparedness staff will discuss Frederick County's Hazard Mitigation Plan update and educate the public on the planning process. For more information about the meeting please contact 301-600-1746.

Individuals will be given an opportunity to be heard at this public meeting. Comments will be limited to five (5) minutes per speaker.

Persons requiring special accommodations for this public meeting are requested to contact the Department of Emergency Preparedness staff at 301-600-1746 (TTY: Use Maryland Relay) to make the necessary arrangements no later than three (3) business days prior to the meeting.

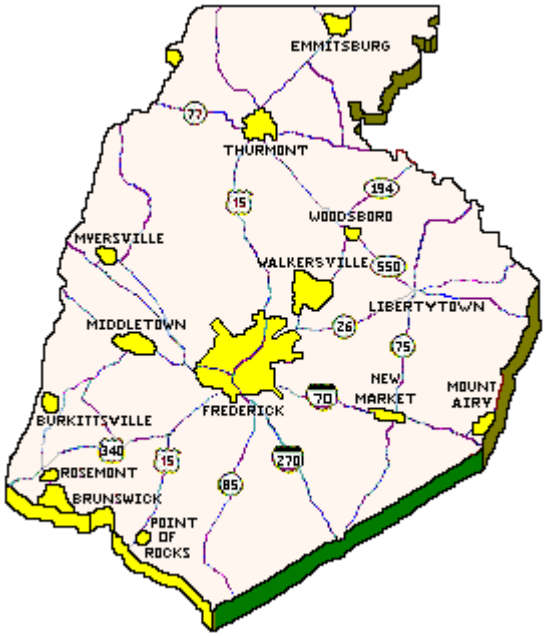
Frederick County Government does not discriminate on the basis of race, color, national origin, sex, religion, age, or disability in employment or the provision of services.

HOW CAN I GET INVOLVED?

The plan will be the citizens' and communities' plan. It will allow the various local governments to serve you better and more efficiently. We welcome all comments and suggestions as to specific hazards that affect you and how best we can eliminate, reduce or manage these effects to improve your quality of life.

If you would like to be a part of this exciting process, provide any information, or would like additional information about the Hazard Mitigation Plan, please contact Kathy Forrest, Department of Emergency Preparedness. She can be reached at (301) 600-6679, or via e-mail at kaforrest@fredco-md.net

Public Outreach Meeting Brochure



FREDERICK COUNTY HAZARD MITIGATION PLAN:

Making Frederick County a Safer Place

Brunswick
Burkittsville
Emmitsburg
Frederick
Middletown
Mt. Airy
Myersville
New Market
Rosemont
Thurmont
Walkersville
Woodsboro

HAZARD MITIGATION PLANNING

WHAT IS MITIGATION PLANNING?

Natural and manmade disasters occur in hundreds of communities in the United States every year and the impacts can be devastating. Natural hazards cause millions of dollars of damage and threaten the lives and safety of thousands of people. Unfortunately, because these hazards cannot be prevented, it is only a matter of time until a community is struck by disaster.

Communities, however, can take steps to prepare for such events before they occur, and take actions that could reduce the impacts of disaster. The process of taking action prior to an event to reduce or eliminate the risk of damage or loss of life due to natural disasters is called ***mitigation***, the benefits of which have been demonstrated in countless ways across the country.

WHAT CAN BE DONE?

A comprehensive way to identify what actions may be most effective in a community is to develop a community-wide mitigation plan. Using a grant received from the Maryland Emergency Management Agency and the Federal Emergency Management Agency, Frederick County is leading an effort to update their plan.

Natural Hazards Profiled in the Plan

Extreme Wind Events
Thunderstorms
Lightning
Tornadoes
Tropical Storms/ Hurricanes
Hailstorms
Severe Winter Storms
Extreme Summer Heat
Wildfires/ Urban Interface Fires
Floods
Drought
Earthquakes
Land Subsidence: Landslides
Land Subsidence: Sinkholes/ Karst Topography

Manmade Hazards Profiled in the Plan

Weapons of Mass Destruction
Agroterrorism
Pandemic Influenza
Conventional Bomb/Improvised Explosive Device
Hazardous Materials Release at a Facility
Mobile Hazardous Materials Release
Automobile Transportation Accidents
Railway Transportation Accidents
Air Transportation Accidents
Dam Failure
Bridge Failure
Utilities Failure
School and Workplace Violence

WHAT DOES THE UPDATED PLAN INCLUDE?

The Frederick County Hazard Mitigation Plan will be comprehensive in nature and will focus on natural and manmade hazards such as extreme wind events, flooding, and winter storms.

The mitigation plan is designed to accomplish the following objectives:

- Identify hazards that affect the County
- Assess the County's vulnerability and risk associated with the identified hazards
- Recommend a course of action to eliminate, reduce or manage the effects of the hazards on residents and the community

The course of action will include proactive measures to prevent loss of life and property before it occurs. Strategies also will be identified to bring things back to normal as quickly as possible if, or when, a disaster strikes Frederick County.

The course of action will include proactive measures to prevent loss of life and property before it occurs. Strategies also will be identified to bring things back to normal as quickly as possible if, or when, a disaster strikes Frederick County.

References

[1] FEMA. *FEMA's Mitigation Directorate Fact Sheet*. Spring/Summer 2008.
[2] Nese, Jon M. and Grenci, Lee M. Kendall/Hunt Third Edition A World of Weather. Penn State Meteorology
[3] American Red Cross. *Talking About Disaster: Guide for Standard Messages*.
[4] American Red Cross. *Talking About Disaster: Guide for Standard Messages*.
[5] Federal Emergency Management Agency. *Multi-Hazard Identification and Risk Assessment*.
[6] http://www.spc.noaa.gov/faq/tornado/ef-scale.html Accessed March 2009
[7] US Census of Agriculture, US Department of Agriculture, 2007
[8] http://landslides.usgs.gov/learning/nationalmap/ Accessed January 6, 2009
[9] Maryland Department of the Environment, Mining Program
[10] *Stratigraphy-Karst Relationships in the Frederick Valley of Maryland*
[11] http://www.washingtonpost.com/wp-dyn/content/article/2008/04/24/AR2008042401708.html Accessed 2004
[12] https://www.fredericknewspost.com/sections/news/display.htm?storyID=79942 Accessed 2004
[13] Center for Science in the Earth System, *et al*. *Preparing for Climate Change. A Regional Guidebook for Local, Regional and State Governments*. September 2007.
[14] *American Planning Association Policy Guide on Planning and Climate Change*. April 27, 2008.
[15] http://www.mdclimatechange.us/ Accessed November 18, 2008.
[16] http://www.mwcog.org/news/press/detail.asp?NEWS_ID=332 Accessed November 18, 2008.
[17] Center for Science in the Earth System (The Climate Impacts Group). *Preparing for Climate Change. A Guidebook for Local, Regional, and State Governments*. September 2007.
[18] Metropolitan Washington Council of Governments Climate Change Steering Committee. *National Capital Region's Climate Change Report*. Pg 27. November 12, 2008
[19] Metropolitan Washington Council of Governments Climate Change Steering Committee. *National Capital Region's Climate Change Report*. Pg 27. November 12, 2008
[20] Center for Science in the Earth System (The Climate Impacts Group). *Preparing for Climate Change. A Guidebook for Local, Regional, and State Governments*. September 2007.
[21] http://www.epa.gov/climatechange/effects/water/ Accessed November 25, 2008.
[22] Richard M. Adams and Dannele E. Peck. Effects of Climate Change on Water Resources. 2008
[23] http://www.usatoday.com/weather/climate/globalwarming/2008-08-07-heavy-precipitation_N.htm Accessed December 18, 2008
[24] Maryland Commission on Climate Change. *Comprehensive Assessment of Climate Change Impacts in Maryland*. July 2008
[25] Maryland Commission on Climate Change. *Comprehensive Assessment of Climate Change Impacts in Maryland*. July 2008
[26] Prof. Sudhakar YEDLA, Climate Change Mitigation Initiatives in Urban Transportation – Strategies to Promote Non-Motorized Modes in Indian Cities. May 2008.
[27] http://www.who.int/globalchange/climate/summary/en/index10.html. Accessed December 4, 2008.
[28] http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms Accessed January 23, 2009
[29] National Weather Service. Accessed December 2008
[30] http://www.mde.state.md.us/Water/Drought/responding/index.asp Accessed 2004
[31] http://www.dnr.state.md.us/forests/download/5yearFCAreview.pdf Accessed January 7, 2009

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STATE OF MARYLAND
MILITARY DEPARTMENT

MARTIN O'MALLEY
GOVERNOR

ANTHONY G. BROWN
LIEUTENANT GOVERNOR

JAMES A. ADKINS
BRIGADIER GENERAL
THE ADJUTANT GENERAL

RICHARD G. MUTH
DIRECTOR

MARYLAND EMERGENCY MANAGEMENT AGENCY
State Emergency Operations Center, Camp Fretterd Military Reservation
5401 Rue Saint Lo Drive, Reisterstown, MD 21136
(410) 517-3600 • Fax (410) 517-3610 • Toll Free 1 (877) 636-2872
TTY Users: 1 (800) 735-2258

August 21, 2009

Mr. Jon Janowitz
FEMA Region III
One Independence Mall, Sixth Floor
615 Chestnut Street
Philadelphia, PA 19106-4404

Attention: Therese Grubb

Dear Mr. Janowitz,

The Maryland Emergency Management Agency (MEMA) has reviewed the revised Frederick County 2009 Hazard Mitigation Plan Update and determined that the local mitigation plan requirement articulated in 44 CFR 201.6 have been satisfied. A copy of this document is enclosed. At this time FEMA review of the plan is requested. Please note that adoption of the Frederick County 2009 Hazard Mitigation Plan Update will occur subsequent to FEMA approval.

Thank you for your continued support of mitigation in Maryland. Please feel free to contact me at 410-517-3624 with any questions or concerns regarding the subject plan.

Sincerely,

J. Carver Struve
State Hazard Mitigation Officer

Enclosure

Cc: Seamus Mooney, Director
Department of Emergency Preparedness

Attachment A

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

FEMA

SEP 04 2009

Mr. Carver J. Struve
State Hazard Mitigation Officer
Maryland Emergency Management Agency
Camp Fretterd Military Reservation
5401 Rue Saint Lo Drive
Reisterstown, Maryland 21136

Dear Mr. Struve:

The Federal Emergency Management Agency (FEMA) has reviewed the Frederick County Maryland Hazard Mitigation Plan, based on the standards contained in 44 Code of Federal Regulations, Part 201, as authorized by the Disaster Mitigation Act of 2000 (DMA 2000. These criteria address the planning process, hazard identification and risk assessment, mitigation strategy and plan maintenance requirements.

The plan received a "satisfactory" rating for all required criteria. However, prior to formal approval, Frederick County and the jurisdictions in the county are required to provide FEMA an adoption resolution.

We commend you for your dedication demonstrated in supporting the Disaster Mitigation Act of 2000 (DMA 2000) and the State's commitment to reduce future disaster losses.

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

Sincerely,

for

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

cc: Seamus Mooney, Director, Frederick County Department of Emergency Preparedness

Attachment B

THE EFFECTIVE DATE OF THE RESOLUTION IS June 15, 2010

RESOLUTION NO. 10-16

Re: Adoption of Frederick County Hazard Mitigation Plan Update

PREAMBLE

WHEREAS, the Board of County Commissioners recognizes that no community is immune from the effects of large-scale emergencies and disasters; and

WHEREAS, the most efficient use of resources is the prevention of emergencies and disasters where possible and practical through effective regulation, policy, or practice; and

WHEREAS, the Board of County Commissioners seeks to minimize the impact on the lives of the County's citizens, the environment, and citizens' property of hazard events which cannot be prevented; and

WHEREAS, through effective hazard mitigation planning and projects, steps can be taken to reduce the impact of emergencies and disasters that cannot be prevented; and

WHEREAS, a committee consisting of designated representatives of all of Frederick County's municipalities, the Emergency Management Policy Advisory Committee, private preparedness partners and led by the Division of Emergency Management cooperatively developed an update to the local Hazard Mitigation Plan as required by the Disaster Mitigation Act of 2000 (44CFR Sec. 201.6) with guidance from the Federal Emergency Management Agency and Maryland Emergency Management Agency; and

WHEREAS, the adoption of this update ensures that Frederick County and its municipalities will remain eligible for hazard mitigation and disaster recovery grants from the state and federal governments; and

WHEREAS, a duly advertised public hearing was held on this update on June 1, 2010. The public had an opportunity to comment on this update at this public hearing.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF FREDERICK COUNTY, MARYLAND, that the 2010 Hazard Mitigation Plan Update, attached hereto, is approved and adopted.

AND BE IT FURTHER RESOLVED, that this plan and its goals will be implemented to the extent that resources allow;

AND BE IT FURTHER RESOLVED, that to ensure the relevance of the plan; its effective use to support planning efforts; and to ensure that the plan continues to evolve and and reflect and accurate picture of the hazards and mitigation opportunities facing the County, the hazards, goals and projects identified in this mitigation plan, or subsequently developed by the

planning partners, shall be considered in the development and revision of the County's Regional Plans and Comprehensive Plan.

The undersigned hereby certify that this resolution was approved and adopted on this 15th day of June, 2010.

ATTEST:

Ronald A. Hart, County Manager

BOARD OF COUNTY COMMISSIONERS
OF FREDERICK COUNTY, MARYLAND

Jan H. Gardner, President

MJC 6/16/10