Montgomery County Hazard Mitigation Plan 2013

MONTGOMERY COUNTY OFFICE OF EMERGENCY MANAGEMENT AND HOMELAND SECURITY

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GAITHERSBURG, MARYLAND, 20878
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July 30, 2013

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This Plan was developed in cooperation with:

Montgomery County

CITIES OF:

Gaithersburg	*Rockville*	*Takoma Park*

TOWNS OF:

Barnesville	*Brookesville*	*Chevy Chase*	*Chevy Chase View*
Chevy Chase Village	*Garrett Park*	*Glen Echo*	*Kensington*
Laytonsville	*Poolesville*	*Somerset*	*Washington Grove*

VILLAGES OF:

Chevy Chase, Section 3	*Chevy Chase, Section 5*	*Martin's Additions*	*North Chevy Chase*

TABLE OF CONTENTS

CERTIFICATION OF ANNUAL MEETINGS

EXECUTIVE SUMMARY

CHAPTER 1: PLANNING PROCESS 2

BACKGROUND 2
PURPOSE 3
SCOPE 4
AUTHORITY 4
OVERVIEW OF HAZARD MITIGATION PLANNING 5
LOCAL METHODOLOGY AND UPDATE SUMMARY 5
THE PLANNING TEAM 7
PLANNING MEETINGS AND DOCUMENTATION 8
PUBLIC AND STAKEHOLDER PARTICIPATION 10
MULTI-JURISIDICTIONAL PLANNING AND PARTICIPATION 16
EXISTING PLANNING MECHANISMS 17
COMMUNITY PROFILE AND LAND USE/DEVELOPMENT TRENDS 20

CHAPTER 2: HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA) 26

INTRODUCTION AND UPDATE SUMMARY 26
THUNDERSTORMS 32
WINTER STORMS 41
EXTREME HEAT 48
FIRE 55
FLOODING 62
HURRICANE / TROPICAL STORM 84
WATER SHORTAGE 96
TORNADO 108
EARTHQUAKE 116
LAND SUBSIDENCE 125
HAZARDOUS MATERIALS 129
DAM FAILURE 136

CHAPTER 3: LOCAL NATURAL AND TECHNOLOGICAL HAZARD MITIGATION GOALS AND OBJECTIVES OVERALL COMMUNITY MITIGATION GOALS, POLICIES, AND VALUES 145

INTRODUCTION 145
GOALS AND OBJECTIVES UPDATE SUMMARY 149
2013 MONTGOMERY COUNTY MITIGATION GOALS AND OBJECTIVES 152
COMMUNITY VALUES, HISTORIC AND SPECIAL CONSIDERATIONS 154
THUNDERSTORMS MITIGATION STRATEGY 155
WINTER STORMS MITIGATION STRATEGY 159

EXTREME HEAT MITIGATION STRATEGY 162
FIRE MITIGATION STRATEGY 164
FLOOD MITIGATION STRATEGY 166
HURRICANE / TROPICAL STORM MITIGATION STRATEGY 173
WATER SHORTAGE MITIGATION STRATEGY 176
TORNADO MITIGATION STRATEGY 181
EARTHQUAKE MITIGATION STRATEGY 184
LAND SUBSIDENCE MITIGATION STRATEGY 186
HAZARDOUS MATERIALS MITIGATION STRATEGY 188
DAM FAILURE MITIGATION STRATEGY 190
ALL HAZARDS MITIGATION STRATEGY 193

CHAPTER 4: PLAN EXECUTION AND MAINTENANCE 195

IMPLEMENTATION ACTION PLAN 195
EVALUATION, MONITORING, UPDATING 195
PLAN UPDATE AND MAINTENANCE 197

APPENDIX A: COUNTY AND MUNICIPAL RESOLUTIONS

APPENDIX B: PLANNING MEETINGS

APPENDIX C: LOCAL MITIGATION PLAN REVIEW CROSSWALK

APPENDIX D: RISK ASSESSMENT SUPPORTING DATA

APPENDIX E: CAPABILITY ASSESSMENTS

CERTIFICATION OF ANNUAL REVIEW MEETINGS

The Montgomery County Mitigation Planning Committee has reviewed this Multi-Jurisdictional Hazard Mitigation Plan. See Chapter 4 of this Plan for further details regarding the following table. The Director of the Montgomery County Office of Emergency Management and Homeland Security hereby certifies this review.

YEAR	DATE	PUBLIC OUTREACH ADDRESSED	SIGNATURE
2014			
2015			
2016			
2017			
2018			

EXECUTIVE SUMMARY

Montgomery County and all municipalities within is borders have been and will continue to be committed to a long-term strategy for reducing the risks of hazards.

INTENT

The intention of this Plan update is to serve as a blueprint for coordinating and implementing hazard mitigation policies, programs, and projects. It provides a list of mitigation goals, objectives, and related actions that may assist Montgomery County in reducing risk and preventing loss from future natural and technological hazard events. The impacts of hazards can be lessened and sometimes avoided altogether if appropriate actions are taken before hazardous events occur. By avoiding unnecessary exposure to known hazard risks, communities will save lives and property and minimize the social, economic, and environmental disruptions that commonly follow hazard events. Montgomery County and its municipalities agree that hazard mitigation makes sense. Through the identification of vulnerable areas and the implementation of measures aimed at minimizing exposure, the negative impacts of both natural and technological hazards may be reduced for Montgomery County.

Some portions of Montgomery County were developed long before natural hazards were fully understood. Therefore, some sections of our community are vulnerable to flooding, tornadoes and high wind, severe storms and lightning, wildfire, and other hazards. Working through the cycle of hazard mitigation can help ensure that vulnerabilities will not increase. Encouraging acquisition, relocation, or retrofitting of existing vulnerable structures, along with the protection of valuable natural resources, can minimize damages and help make sure that our community is built back better and stronger than before.

Communities face significant challenges during post-disaster redevelopment in balancing the driving need for rapid recovery with implementing long-term hazard mitigation. The necessity to meet basic needs and resettle displaced populations immediately following a disaster often overshadows the more abstract, longer-term sustainability considerations. Once full-scale reconstruction is initiated, it is difficult to modify projects in progress to meet sustainability objectives. This trend highlights the need for pre-disaster mitigation planning that incorporates principles of sustainable development within the context of reconstruction, so that communities can more easily rebuild in a manner that will make them less vulnerable to future hazard events while improving the quality of life.

It is imperative that local decision makers become and stay involved in this planning process to provide new ideas and insight for future updates to the Hazard Mitigation Plan for Montgomery County. Now that a mitigation strategy has been developed (2007) and updated (2013), it will remain a challenge and a goal for Montgomery County to provide necessary updates as mitigation techniques are implemented. It will remain imperative that all local agencies, units of government, non-profit organizations, businesses and industries, and private citizens continue their involvement and dedication to hazard mitigation.

It is our long-term goal that the Hazard Mitigation Plan and the strategies identified will be fully integrated into daily decisions and routines of government and business.

This section of the Plan describes the mitigation planning process undertaken by Montgomery County and participating municipalities in the preparation of this Hazard Mitigation Plan update. This section consists of the following subsections:

- BACKGROUND
- PURPOSE
- SCOPE
- AUTHORITY
- OVERVIEW OF HAZARD MITIGATION PLANNING
- LOCAL METHODOLOGY AND UPDATE PROCESS
- THE PLANNING TEAM
- PLANNING MEETINGS AND DOCUMENTATION
- PUBLIC AND STAKEHOLDER PARTICIPATION
- MULTI-JURISIDICTIONAL PLANNING AND PARTICIPATION
- EXISTING PLANNING MECHANISMS
- COMMUNITY PROFILE
- JURISDICTIONAL PROFILES
- LAND USE AND DEVELOPMENT TRENDS

After completion of the Hazard Identification and Risk Assessment, the Planning Team developed the Mitigation Strategy for Montgomery County and its participating jurisdictions. The Strategy will serve as a guide for future hazard mitigation policy and project development and administration, and includes a list of proposed actions intended to reduce the impact of natural hazards upon the County. For each mitigation goal and objective, the responsible department, anticipated cost, potential funding sources, and timeframe have been provided.

BACKGROUND

Emergency Management is the discipline of identifying, managing, avoiding, and responding to risks. It is a discipline that involves preparing for a disaster before it occurs, supporting those affected by the disaster, as well as rebuilding after the natural or man-made disaster event. Emergency Management is an ever changing process by which all individuals, groups, and communities attempt to manage hazards in an effort to avoid or reduce the impact of disasters. One method to attempt to prevent hazards from developing into disasters all together is Hazard Mitigation Planning. Hazard Mitigation Planning is a process to identify policies, capabilities, activities, and tools necessary to implement successful and sustainable mitigation actions.

Why undertake mitigation planning? Mitigation planning offers many benefits, including:

- Saving lives and property;
- Reducing risk to first responders;

- Saving money;
- Quick and effective recovery following disasters;
- Reducing future vulnerability through wise development and post-disaster recovery and reconstruction;
- Enhancing coordination within and across participating jurisdictions;
- Expediting the receipt of pre-disaster and post-disaster grant funding; and demonstrating a firm commitment to improving community health and safety.

Typically, mitigation planning is described as having the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster loss. A core assumption of hazard mitigation is that pre-disaster investments will significantly reduce the demand for post-disaster assistance by lessening the need for emergency response, repair, recovery and reconstruction. Furthermore, mitigation practices will enable local residents, businesses and industries to re-establish themselves in the wake of a disaster, getting the community economy back on track sooner and with less interruption.

The benefits of mitigation planning go beyond reducing hazard vulnerability. Measures such as the acquisition or regulation of land in known hazard areas can help achieve additional community goals, such as preserving open space, improving water quality, maintaining environmental health and enhancing recreational opportunities. Thus, it is vitally important that any local mitigation planning process be integrated with other concurrent local planning efforts, and any proposed mitigation strategies must take into account other existing community goals or initiatives that will help complement or hinder their future implementation. The Montgomery County Office of Emergency Management and Homeland Security (OEMHS) and its municipalities have embraced this approach, identifying multiple opportunities to link the Plan with pre-existing programs, policies, plans and initiatives.

During the last two decades, the approach to the emergency management cycle has evolved considerably. A renewed emphasis has been placed on planning for disasters before they occur as a complement to effective response and recovery. As a result, hazard mitigation has gained increasing prominence as a critical part of emergency management. By mitigating hazards through sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards, risks can be proactively combated in a systematic manner, rather than being reacted to once they occur.

This 2013 Plan update is the result of continuing work by the citizens of the County to update a pre-disaster multi-hazard mitigation plan that will not only continue to guide the County towards greater disaster resistance, but will also respect the character and needs of the community.

PURPOSE

Montgomery County completed its previous hazard mitigation plan in January 2007 (approved February 2, 2007) which provided momentum for making homes, businesses, and communities as safe as possible against the impacts of floods, tornadoes, winter weather, and other natural hazards. The previous Plan assessed the effectiveness of prior and current programs and activities in the community and identified shortfalls; mitigation measures were further developed to help reduce Montgomery County's exposure to these natural hazards.

Montgomery County has remained dedicated in continuing the work started in 2006 by updating this Plan in 2013 in order to:

- Protect life and property by reducing the potential for future damages and economic losses that result from natural hazards;
- Qualify for additional grant funding, in both the pre-disaster and post-disaster environment;
- Provide quick recovery and redevelopment following future disasters;
- Integrate existing flood mitigation documents;
- Demonstrate a firm local commitment to hazard mitigation principles; and
- Comply with state and federal legislative requirements tied to local hazard mitigation planning

SCOPE

This Plan update has been prepared to meet requirements set forth by the Federal Emergency Management Agency (FEMA) and the Maryland Emergency Management Agency (MEMA) in order for Montgomery County to be eligible for funding and technical assistance from state and federal hazard mitigation programs. It will continue to be updated and maintained to continually address those natural hazards determined to be of high and moderate risk as defined by the updated results of the local hazard, risk, and vulnerability summary. Other natural hazards will continue to be evaluated during future updates to the Plan in order to determine if they warrant additional attention, including the development of specific mitigation measures intended to reduce their impact. This Plan will be updated and FEMA approved within its five-year expiration date.

This Hazard Mitigation Plan has been adopted by Montgomery County in accordance with the authority granted to counties by the State of Maryland.

This Plan was updated in accordance with current state and federal rules and regulations governing local hazard mitigation plans. The Plan shall be monitored and updated on a routine basis to maintain compliance with the following legislation and guidance:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. § 5121 et seq., Section 322 (42 U.S.C. § 5165), Mitigation Planning, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) and by FEMA's Interim Final Rule published in the Federal Register on February 26, 2002, at 44 CFR Part 201
- Maryland Emergency Management Agency (MEMA), established in the Maryland Code. The Emergency Management Policy was updated in 1991 through Executive Order 01.01.1991.02 State of Maryland Emergency Management Policy.

The following Federal Emergency Management Agency (FEMA) guides and reference documents were used to prepare this document:

- FEMA. 386-1: Getting Started. September 2002.

- FEMA. 386-2: Understanding Your Risks: Identifying Hazards and Estimating Losses. August 2001.
- FEMA. 386-3: Developing the Mitigation Plan. April 2003.
- FEMA. 386-4: Bringing the Plan to Life. August 2003.
- FEMA. 386-5: Using Benefit-Cost Review in Mitigation Planning. May 2007.
- FEMA. 386-6: Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning. May 2005.
- FEMA. 386-7: Integrating Manmade Hazards into Mitigation Planning. September 2003.
- FEMA. 386-8: Multi-Municipality Mitigation Planning. August 2006.
  FEMA. 386-9: Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects. August 2008.
- FEMA. Local Multi-Hazard Mitigation Planning Guidance. July 1, 2008.

OVERVIEW OF HAZARD MITIGATION PLANNING

Local hazard mitigation planning is the process of organizing community resources, identifying and assessing hazard risks, and determining how to best minimize or manage those risks. This process results in a hazard mitigation plan that identifies specific mitigation actions, each designed to achieve both short term planning objectives and a long-term community vision. To ensure the functionality of each mitigation action, responsibility is assigned to a specific individual, department or agency along with a schedule for its implementation. Plan maintenance procedures are established to implement, as well as evaluate and enhance the Plan as necessary. Developing clear plan maintenance procedures ensures that Montgomery County's Hazard Mitigation Plan remains a current, dynamic and effective planning document over time.

LOCAL METHODOLOGY AND UPDATE PROCESS

This updated Plan contains a narrative description of the process followed to prepare it. All municipalities were notified in November 2011 of the requirement concerning the Mitigation Planning Committee MPC and process. Subsequent meetings were held to ensure that all information is correct, and that all agencies, organizations and the public's input were included as presented. In all, the plan update process was conducted over the course of eight months, from November 2011 to July 2012. Throughout the planning update process, the Montgomery County MPC reviewed and analyzed each section of the plan. In preparing the updated Plan, documentation indicates that the committee utilized a multi-jurisdictional planning process consistent with the one recommended by FEMA (Publication Series 386).

The previous Montgomery County Multi-Hazard Mitigation Plan was adopted on February 6, 2007. In 2006, the Montgomery County MPC started preparing the Plan to fulfill the requirements of DMA 2000. Development of the plan was a concerted effort on the part of Montgomery County and its municipalities. The Montgomery County OEMHS Director invited directors and staff from public agencies, private businesses and organizations, and community representatives to participate in this recent planning committee. The 2007 Montgomery County Multi-Hazard Mitigation Plan and the current State of Maryland Hazard Mitigation Plan were reviewed for incorporation into the 2013 Montgomery County Hazard Mitigation Plan.

The 2007 Plan addressed ten natural hazards and two technological hazards. Most of those hazards were assessed by previous occurrences, vulnerability and exposure to County and municipal assets, and potential loss estimates (if applicable). In addition, the 2007 Plan defined those hazards that were considered to have the highest probability of occurrence. An update to the 2007 Plan was initiated in November 2011 with funding support from MEMA and the FEMA. Training Outreach and Michael Baker Jr., Inc. provided planning support and guidance to Montgomery County throughout the update process.

The planning process used for the 2013 Plan update was based on Section 322 of the Disaster Mitigation Act of 2000 and supporting guidance developed by FEMA. The planning process followed these steps:

- Conduct kickoff meeting and reestablish the Mitigation Planning Committee/Team
- Conduct a 5-year Plan review
- Review and update the local hazard, risk, and vulnerability summary
- Determine capability for the county and each municipality
- Update the mitigation strategy
- Update the Plan maintenance procedures
- Complete a draft plan for review by Montgomery County
- Advertise opportunity for comment on final draft
- Provide final draft to MEMA for review
- Provide final draft to FEMA for review
- Present Plan to municipalities for adoption
- Present Plan to Montgomery County for adoption

Each of the planning steps described above resulted in key products and outcomes that collectively make up the Hazard Mitigation Plan. These work elements are further discussed below for introductory purposes.

The *Community Profile*, located later in this chapter, describes the general makeup of Montgomery County and its municipalities, including prevalent geographic, demographic, and economic characteristics. This baseline information provides a snapshot of the Countywide planning area and thereby assists participating officials in recognizing those social, environmental, and economic factors that ultimately play a role in determining community vulnerability to natural hazards.

The *Hazard Identification and Risk Assessment* (*HIRA*), found in Chapter 2, is presented as three different elements: *Hazard Identification/Profile*, *Hazard Analysis* and a *Vulnerability Assessment*. Together, these elements serve to identify, analyze, and assess Montgomery County's overall risk to natural hazards. The HIRA builds on available historical data from previous occurrences, establishes hazard-by-hazard profiles, and culminates in a hazard risk priority or ranking based on conclusions about the frequency of occurrence, potential impact, spatial extent, warning time, and duration of each hazard. FEMA's Hazus-MH loss estimation methodology was also used in evaluating known flood risks according to their relative long-term cost, measured in expected damages. The HIRA is designed to assist communities in seeking the most appropriate mitigation actions to pursue and implement by focusing their efforts on those hazards of greatest concern and those structures or planning areas facing the greatest risk(s).

The *Community Profile and HIRA* collectively serve as a basis for updating goals for this Plan update, each contributing to the development, adoption, and implementation of a meaningful *Mitigation Strategy* update that is based on accurate background information.

The *Mitigation Strategy*, located in Chapter 3, consists of broad goal statements as well as specific mitigation actions for each jurisdiction participating in the planning process. This updated strategy provides the foundation for *Mitigation Action Plans* that link jurisdictionally specific mitigation actions to locally assigned implementation mechanisms and target completion dates. Together, these sections are designed to make the Plan more strategic and functional through the identification of both long-term goals and near-term actions that will guide day-to-day decision-making and project implementation.

In addition to the identification and prioritization of possible mitigation projects, emphasis is placed on the use of program and policy alternatives to help make Montgomery County and participating municipalities less vulnerable to the damaging forces of nature while improving the economic, social, and environmental health of the community. The concept of multi-objective planning is emphasized throughout this Plan update, identifying ways to link hazard mitigation policies and programs with complimentary community goals that may be related to housing, economic development, community revitalization, recreational opportunities, transportation improvements, environmental quality, land development, and public health and safety. This Hazard Mitigation Plan update should be seen as a proactive document that represents a concerted effort to make Montgomery County and participating jurisdictions more livable communities.

The *Plan Maintenance Procedures*, found in Chapter 4, includes the measures Montgomery County and participating jurisdictions will take to ensure the Plan's continuous long-term implementation. The procedures also include the manner in which the Plan will be regularly monitored, reported upon, evaluated and updated to remain a current and meaningful planning document.

The MPC reviewed the current plan, identified new information that needed to be included in the Plan update and incorporated it as required by state and federal guidelines. The planning committee was also tasked with collecting all accurate data from plan participants and provided outreach to the public and business stakeholders to ensure that everyone's information is included in this Plan update.

THE PLANNING TEAM

A well-rounded community-based planning team contributed heavily to the development of this Plan update. Montgomery County engaged past MPC members, local government officials, stakeholders, and the general public in local meetings and planning workshops to discuss and complete tasks associated with preparing the Plan update.

The participants listed in Table 1-1 represent the members of the MPC who were responsible for participating in the updating of this Plan.

Table 1-1: 2012 Core Mitigation Planning Committee Members

NAME	JURISDICTION , AGENCY
Chris Voss	Montgomery County OEMHS
Chuck Crisostomo	Montgomery County OEMHS
Lisa Connor	Montgomery County (CHHS)
Mehrab Karim	Montgomery County (CHHS)
Luke Fedders	Barnesville
Michael Acierno	Brookeville
Todd Hoffman	Chevy Chase
Janas S. Coe	Chevy Chase View
Michael Younes	Chevy Chase Village
Andy Harney	Chevy Chase Village Section 3
John Higgins	Chevy Chase Village Section 5
Skip Lanham	Gaithersburg
Ted Pratt	Garrett Park
Nicole Fraser	Glen Echo
Sanford Daily	Kensington
Charlene Dillingham	Laytonsville
Jean Sperling	Martin's Additions
Wade Wesley	MNCPPC
Robert Weesner	The Village of North Chevy Chase
Pete Pedersen	PEPCO
Wade Yost	Poolesville
Heather Gewandter	Rockville
Richard Charrovich	Somerset
Ed Coursey	Takoma Park
Mary Challstrom	Washington Grove
Laura Johnson	Training Outreach
Necolle Maccherone	Michael Baker Jr., Inc.
Carver Struve	Michael Baker Jr., Inc.

PLANNING MEETINGS AND DOCUMENTATION

The preparation of the Plan update required a series of meetings and workshops intended to facilitate discussion and initiate data collection efforts with local community officials. More importantly, the meetings and workshops prompted continuous input and feedback from local officials throughout the update process.

Below is a summary of the key meetings and workshops conducted by the Montgomery County Mitigation Planning Committee:

INTERNAL SCOPING MEETING WITH COUNTY PERSONNEL AND MUNICIPALITIES

On November 4, 2011 the Montgomery County OEMHS held a meeting of key County personnel to share information on the pending plan update. Topics covered included introduction and purpose of the Hazard Mitigation Plan Update, discussion of the mitigation process, review of the State of Maryland's Vulnerability Analysis, and potential mitigation projects.

On November 7, 2011 the Montgomery County Office of Emergency Management and Homeland Security (OEMHS) held a meeting and invited all the municipalities with the county to attend. The purpose of the meeting was to introduce the project and stress the importance of municipal involvement. Topics covered included introduction and purpose of the Hazard Mitigation Plan Update, discussion of the mitigation process, review of the State of Maryland's Vulnerability Analysis, and potential mitigation projects.

INTERNAL KICK OFF MEETING

Between the November 2011 meetings and February 2012 Montgomery County secured a private firm to assist in the update of the plan. On February 16, 2012 the County and the contractor met for an internal project kick meeting. During this meeting a five year plan review was conducted. Also discussed was data requested from the county, the details of standing up the project website, an overview of the hazard identification and risk assessment process, and project logistics.

KICKOFF MEETING AND FIVE YEAR PLAN REVIEW MEETING

This meeting was held and advertised as an open/public forum on March 2, 2012 during which the mitigation planning update project was introduced to county officials, representatives of participating jurisdictions, stakeholders, and the general public. The intent of this meeting was to educate local officials, stakeholders, and the general public on the mitigation planning process, being sponsored by Montgomery County, as well as to explain the DMA 2000 multi-jurisdictional planning requirements and the individual roles being required of selected planning committee members. The meeting also served to continue data collection efforts for the HIRA summary associated with the Plan update.

The meeting began with introductions and a detailed presentation on the mitigation planning process. Specific data collection needs were thoroughly explained, including the need for accurate GIS data as well as any unique local hazard risk data available for specific areas of concern. During the presentation, the project team from Training Outreach/Michael Baker Jr., Inc. reached a consensus on those natural and technological hazards that should be addressed in the HIRA, and subsequently those that participating jurisdictions would possibly focus their mitigation efforts throughout the next five years of the Plan's cycle.

An assessment was then conducted for ranking the top hazards affecting Montgomery County. The findings and details on each hazard can be found in Chapter 2: HIRA of this Plan. Following the presentation on the planning process the project team explained the need to assess existing county and jurisdictional capabilities. By determining existing capabilities we have information on the ability to implement hazard mitigation activities. A survey inventorying existing planning and regulatory tools and an analyzing the capacity to carry them out were provided to each attendee to complete and return to the team. This assessment process helped identify existing gaps, conflicts, and/or weaknesses that may need to be addressed through future mitigation planning goals and actions. It will also highlight the measures in place or already being performed that should continue to be supported and enhanced through future mitigation efforts. Any questions and concerns raised by the committee were addressed.

RISK ASSESSMENT REVIEW PLANNING COMMITTEE MEETING

The next meeting was conducted on April 4, 2012. The Mitigation Planning Committee reviewed current goals and objectives and evaluated whether they had been completed or whether they should be deferred into the 2012 Plan, deleted, or changed. An in-depth evaluation of the current mitigation actions was also conducted by the Mitigation Planning Committee to review, whether since 2007, actions have been completed, were incomplete and needed to be deferred to the 2012 Plan, changed, or deleted from the Plan altogether. A summary of the evaluation can be found in Chapter 3 of this Plan. The results of these evaluations are summarized in Chapter 3 of this Plan. The committee also reviewed the preliminary results of the HIRA and provided comments.

MITIGATION SOLUTIONS WORKSHOP

The next Mitigation Planning Committee meeting was held on May 3, 2012. Several handouts were distributed for workshop participants to use in identifying specific mitigation actions for incorporation into their own respective Mitigation Action Plans. This included Mitigation Action Templates (forms for proposing specific actions), along with a variety of planning tools and reference documents for considering and evaluating possible mitigation action alternatives. Workshop participants were instructed to complete these templates. The meeting also provided an opportunity for the County and participating municipalities to add new mitigation actions.

PUBLIC AND STAKEHOLDER PARTICIPATION

PUBLIC PARTICIPATION

An important component of Montgomery County's community-based mitigation planning process involves public, stakeholder, and jurisdiction participation. Individual citizen involvement provides the Mitigation Planning Committee with a greater understanding of local concerns and ensures a higher degree of mitigation success by developing community "buy-in" from those directly affected by the planning decisions of public officials.

Public input was sought using by advertising open public meetings in the community newspaper both during the development and draft stage of the planning process. The updated Plan was also available for review and comment at the Montgomery County Office of Homeland Security and Emergency Management and on the project website prior to adoption.

Further, the county-level public meetings were advertised throughout two stages of the planning process; during the kickoff presentation (development stage of the planning process) and following the completion of the draft Plan (draft stage of the planning process). The first meeting was advertised as a Montgomery County press release and as a newspaper advertisement posted in *The Gazette* prior to the meeting held on March 2, 2012 as shown in Figure 1-1. The intent of the meeting was to inform citizens about the importance of hazard mitigation, describe the mitigation planning process, and conduct a five year Plan review. The public was also invited to participate on the Mitigation Planning Team.

COMMUNITY VALUES, HISTORIC AND SPECIAL CONSIDERATIONS

Historic resources include landmark buildings, historic structures and sites, commercial and residential districts, historic rural resources, archaeological and cultural sites, and the historic environment in which they exist. Historic Resources serve as visual reminders of a community's past, providing a link to its cultural heritage and a better understanding of the people and events that shaped the patterns of its development. Preservation of these important resources makes it possible for them to continue to play an integral, vital role in the community.

A border county in a border state, Montgomery County has an architectural heritage with a dual nature. It is metropolitan and rural, northern and southern. Early European settlers were tobacco planters from the Chesapeake and wheat farmers from Pennsylvania. During the Civil War, residents were divided in their loyalties, with those in the western county with Virginia family ties sympathizing with the South, while Sandy Spring Quakers and northern-born residents aligned with the North.

Currently the County has 698 properties listed on the National Register of Historic Places.

Depending on the number of historic resources within a community, it can be unrealistic to assume that all of the necessary mitigation activities can be done at once to protect these resources. The work must be done in a manner that retains the character-defining features of a historic property, and can be costly. Therefore, it makes sense to set priorities in terms of which resources and mitigation projects should be the point of focus. Montgomery County recognizes that the preservation and maintenance of archaeological sites and historic structures contribute to the cultural heritage of the county and are in the long-term best interest of the county.

Figure 1-1: Public Meeting Notice as Published in the Gazette on February 29, 2012

TheGazette

Serving Maryland Communities since 1959

9030 Comprint Court, Gaithersburg, MD 20877 301-846-2108 2/29/12

This is to certify that the annexed advertisement of PUBLIC MEETING: OFFICE OF EMERGENCY MANAGEMENT was published in the Montgomery Gazette newspapers, a weekly newspaper published in Montgomery County, Maryland. The Ad appeared once a week for one week, before 2/30/12.

Copy of Ad Attached

Ad Order Number 1817900

Publication Date(s)

2/29/12

Mitigation Plan Public Meeting

The Montgomery County Office of Emergency Management and Homeland Security (OEMHS) invites residents to attend a planning meeting on Friday, March 2 to review and update the Montgomery County Hazard Mitigation Plan, which must be updated and approved by the Federal Emergency Management Agency every five years. The purpose of the update is to ensure that the mitigation plan reflects relevant information, enhanced analysis and revised community priorities. The current plan was approved by the Federal Emergency Management Agency (FEMA) in 2007.

The meeting will be held from 9:30 a.m. to12:30 p.m. in the first floor auditorium of the Stella B. Werner Council Office Building (COB), 100 Maryland Avenue, Rockville, MD. Paid visitor parking is available at the first level of the COB garage at the corner of Monroe and E. Jefferson streets.

Sign language interpreter services will be provided only upon request with at least 72 hours notice prior to the event. If these or other services, aids or information needed to participate in this activity, call OEMHS at 240-777-2300 or e-mail mchomelandsecurity@montgomerycountymd.gov.

1817900

Gazette Legal Advertising Department

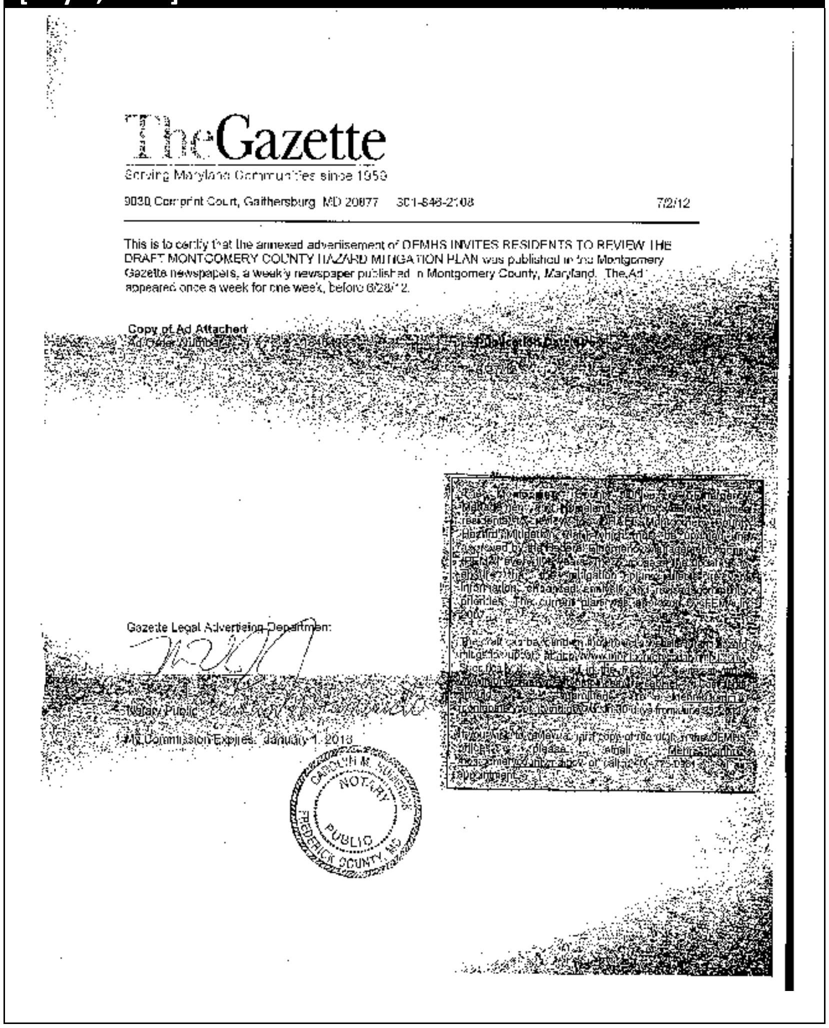
Notary Public Carolyn M Humerick

My Commission Expires: January 1, 2013

CAROLYN M. HUMERICK NOTARY PUBLIC FREDERICK COUNTY, MD

Public input on the draft plan was sought by advertising another public notice in *The Gazette* on [DATE] as shown below in Figure 1-2.

Figure 1-2: Public Meeting Notice as Published in the Gazette on [July 2, 2012]



The Gazette
Serving Maryland Communities since 1959
9030 Comprint Court, Gaithersburg MD 20877 301-848-2108 7/2/12

This is to certify that the annexed advertisement of OEMHS INVITES RESIDENTS TO REVIEW THE DRAFT MONTGOMERY COUNTY HAZARD MITIGATION PLAN was published in the Montgomery Gazette newspapers, a weekly newspaper published in Montgomery County, Maryland. The Ad appeared once a week for one week, before 6/28/12.

Copy of Ad Attached

Gazette Legal Advertising Department:

Notary Public

My Commission Expires: January 1, 2016

In addition to the public notice, upon completion of the final draft Plan, the document was posted on the Montgomery County project website for general public review and comment. The Plan was also made available for review at OEMHS. This provided citizens with several opportunities to review the content of each of the Plan's sections, to ask questions and suggest possible final revisions.

STAKEHOLDER PARTICIPATION

A range of stakeholders, including agencies, businesses, academia, nonprofits, and other interested parties were invited and encouraged to participate in the development of the Plan update. Stakeholder involvement was encouraged through Montgomery County's invitations to agencies and individuals to participate in Mitigation Planning Committee meetings and the Mitigation Solutions Workshop. The invitation and attendance of these stakeholders are documented in Table 1-2.

Table 1-2: Stakeholder Involvement in the Planning Process

STAKEHOLDER NAME	ORGANIZATION	ATTENDED MEETING(S)
Randy Paugh	Montgomery County Department of Transportation	•
Carl Mauney	Montgomery County Fire and Rescue Service	•
Steve Maloney	Montgomery College	•
Skip Lanham	Gaithersburg	•
Ed Coursey	Takoma Park	•
Keith Levchenko	Montgomery County Council Staff	•
Ligia Moss	Montgomery County Department of Transportation	•
John Reginaldi	Maryland Emergency Management Agency	•
William Kaarid	Montgomery County RD	•
Catherine Chatfield	American Red Cross	•
Leslie Hamm	Montgomery County	•
Kay Aaby	Montgomery County Department of Health and Human Services	•
Tom Toman	Montgomery County	•
Jean Sperling	Martin's Additions	•
David Humpton	Montgomery Village Foundation	•
Mary Challstrom	Washington Grove	•
Heather Gewandter	Rockville	•
Wade Yost	Poolesville	•
Karen Thon	Montgomery County B-CC RSC	•
Michael Younes	Chevy Chase Village	•
Janas S. Coe	Town of Chevy Chase View	•
Richard Charrovich	Town of Somerset	•
Bill Carroll	Maryland Emergency Management Agency	•
Becky McKinney	Fairfax County Office of Emergency Management	•
Michael Goldfarb	Montgomery County	•
Clark Beil	Montgomery County	•
Adrienne Oleck	Private citizen	•
Earl Stoddard	Montgomery County EMHS	•
Granville Campbell	Montgomery County Permitting Services	•
Mark James	Maryland Emergency Management Agency	•
Wanda Wesley-Major	Maryland National Capital Park	•
Pete Pedersen	Potomac Electric Power Company (Pepco)	•
Arnold Remsammy	Montgomery County Parks	•
Steve Martin	Montgomery County Department of Environmental Protection	•

Table 1-2: Stakeholder Involvement in the Planning Process		
STAKEHOLDER NAME	ORGANIZATION	ATTENDED MEETING(S)
Anthony Alexiou	Montgomery County	•
Dan Sadler	Montgomery County DTS-GIS	•
Apollo Teng	Montgomery County DTS-GIS	•
Matt Hochstein	Hagerty Consulting	•
Katie Freeman	Hagerty Consulting	•
John Higgins	Section 5 Chevy Chase	•
Sanford Daily	Town of Kensington	•
Clark Beil	Montgomery County Department of Health and Human Services	•
Jeremy Criss	Montgomery County Agricultural Services	•
Keith Compton	Montgomery County Department of Transportation	•
Kevin Grubbs	Montgomery County OEMHS	•
Phil Raum	Montgomery County Police	•
Mike Fitzgerald	Montgomery County Emergency Planner	•
Ted Pratt	Town of Garrett Park	•
Bill Kelly	Montgomery County Public Health	•
Steven Werts	Town of Washington Grove	•
Bill Robertson	Town of Washington Grove	•
Tom Stanton	Gaithersburg Police Department	•
Tim Marsh	Rockville City Police	•
Leo Galanko	Montgomery County DPS	•
Steve Suprata	Montgomery County Department of Transportation	•
Frances Higgins	Section 5 of the Village of Chevy Chase	•

MULTI-JURISDICTIONAL PLANNING AND PARTICIPATION

The 2013 Montgomery County Hazard Mitigation Plan is multi-jurisdictional and includes the participation of County officials and the following municipalities:

- Gaithersburg
- Rockville
- Takoma Park
- Barnesville
- Brookesville
- Chevy Chase
- Chevy Chase View
- Chevy Chase Village
- Garrett Park
- Glen Echo
- Kensington
- Laytonsville
- Poolesville
- Somerset
- Washington Grove
- Chevy Chase, Section 3
- Chevy Chase, Section 5
- Martin's Additions
- North Chevy Chase

To satisfy multi-jurisdictional participation requirements, each jurisdiction was required to perform the following tasks:

(1) Designate a representative to serve on the Montgomery County Mitigation Planning Committee;
(2) Participate in Plan update meetings and workshops;
(3) Provide best available data as required for the update to the local hazard, risk, and vulnerability summary section of the Plan;
(4) Determine capability and provide copies of any mitigation or hazard-related documents for review and incorporation into the Plan;
(5) Support the updating of the current Countywide mitigation strategy, including the update, evaluation , design and adoption of general goal statements for all jurisdictions to pursue;
(6) Review and provide timely comments on all draft components of the Plan update;
(7) Adopt the 2013 Montgomery County Mitigation Plan, including the local mitigation action plan specific to their jurisdiction.

Through the completion of these tasks, all municipalities participated with Montgomery County in updating this Plan. Further, through the preparation of their own local mitigation action plans, the municipalities were responsible for addressing their most significant hazard concerns. This component of the Plan provides the opportunity for the jurisdiction to monitor and update their specific action plan implementation responsibilities without necessarily having to meet with the Countywide Mitigation Planning Committee. Table 1-3 below is used to track each jurisdiction participation in the Plan development and implementation.

Table 1-3: 2006 and 2012 Multi-Jurisdictional Participation

JURISDICTION	2006 PARTICIPATION	2012 PARTICIPATION	2012 ADOPTION DATE
Barnesville	•	•	[INSERT DATE]
Brookeville	•	•	[INSERT DATE]
Chevy Chase	•	•	[INSERT DATE]
Chevy Chase View	•	•	[INSERT DATE]
Chevy Chase Village	•	•	[INSERT DATE]
Chevy Chase Village Section 3	•	•	[INSERT DATE]
Chevy Chase Village Section 5	•	•	[INSERT DATE]
Gaithersburg	•	•	[INSERT DATE]
Garrett Park	•	•	[INSERT DATE]
Glen Echo	•	•	[INSERT DATE]
Kensington	•	•	[INSERT DATE]
Laytonsville	•	•	[INSERT DATE]
Martin's Additions	•	•	[INSERT DATE]
North Chevy Chase	•	•	[INSERT DATE]
Poolesville	•	•	[INSERT DATE]
Rockville	•	•	[INSERT DATE]
Somerset	•	•	[INSERT DATE]
Takoma Park	•	•	[INSERT DATE]
Washington Grove	•	•	[INSERT DATE]

All jurisdictions participated in the Plan update, as well as reviewed and provided timely comments on all draft components of the Plan.

EXISTING PLANNING MECHANISMS

There are numerous existing regulatory and planning mechanisms in place at the state, County, and municipal levels of government which support hazard mitigation planning efforts. These tools include the State of Maryland Hazard Mitigation Plan, local floodplain management ordinances, the Montgomery County Emergency Operation Plans, and local ordinances. These mechanisms were discussed at planning meetings and the Montgomery County Mitigation Planning Committee reviewed all available technical information provided within these planning mechanisms and have incorporated them into this Plan update. This plan will also serve as a source document and be incorporated into local plans as they are updated or developed. These planning mechanisms enhance the County's mitigation strategy and are therefore incorporated into several of the mitigation actions identified in this Plan. For example, floodplain ordinances serve to guide development away from hazardous areas while storm-water management plans, as required in the planning and zoning codes for many communities, reduce the effects of erosion due to increased runoff.

Jurisdiction specific planning mechanisms are described below:

Chevy Chase Village

The Chevy Chase Village is a self-governing municipality located in Montgomery County. As such, the Village has the authority to regulate certain activities within its boundaries. The ordinances controlling building within the incorporated boundaries of the Village appear in Chapter 8 of the Municipal Code. County laws also apply in the Village for fire, electrical and plumbing codes, private water systems, air quality, erosion, housing, solid waste, and unsafe buildings; see list of ordinances on website (www.chevychasevillagemd.gov). Chevy Chase Village is a dual permitting zone requiring both a Village and County permit for new construction, additions, fences, or walls. A Village permit is not required for interior remodeling; however, the County may require a permit. A portion of the Village is also designated historic by the Historic Preservation Commission of Montgomery County and is subject to its permitting requirements.

City of Rockville

The Mayor and City Council of Rockville adopted a Comprehensive Master Plan for the City on November 12, 2002. It is currently under revision. An updated plan is scheduled for Planning Commission, Mayor, and Council approval in 2012-2013. The Master Plan articulates a broad vision for Rockville's future and directs all development activities. It also guides the City's capital improvement projects. By reference, this Plan acknowledges the City of Rockville Master Plan proposals, which relate to natural hazard mitigation strategies found in the City's Master Plan. Chapters 1-12 of the City's Master Plan include specific items on land use, urban growth, transportation, environment, recreation, parks and open spaces, community facilities, historic preservation, community appearance and design, housing, residential neighborhood planning areas, and economic development. More detailed information is available on the City of Rockville's website at www.rockvillemd.gov/government.

City of Gaithersburg

The Mayor and City Council of Gaithersburg adopted their City's 2009 Comprehensive Master Plan in phases throughout 2010 and 2011 covering Process and Overview, Water Resources, Transportation Element and Land Use Element. The Master Plan articulates a broad vision for Gaithersburg's future and directs all development activities. It also guides the City's capital improvement projects. The Comprehensive Master Plan describes general land use and zoning categories for public and private properties and makes recommendations for future use. The Plan also describes the extensive public input involved in the planning process. In accordance with Section 201.6(a)(4) of Federal Regulation, by reference, the County's Hazard Mitigation Plan acknowledges the City of Gaithersburg's Comprehensive Master Plan, which relates to natural hazard mitigation strategies. In the Master Plan regarding land use, language has been incorporated, where appropriate, for specific parcels to preserve stream valley buffers, floodplain areas, and wetlands. Specific language related to land use, urban growth, transportation, environment, recreation, parks and open spaces, historic preservation, housing, residential neighborhood planning areas, and economic development are included in the Master Plan. More detailed information is available on the City's website at www.gaithersburgmd.gov.

City of Takoma Park
The Mayor and City Council of Takoma Park jointly issued the City Master Plan with the Maryland National Capital Park and Planning Commission. The Master Plan articulates a broad vision for Takoma Park and its Central Business District with Silver Spring. It highlights Takoma Park's future development activities. It also guides the City's capital improvement projects. The Master Plan includes the City's future Land Use Plan, which makes recommendations for future use. Additional information is available from the City's website at www.takomaparkmd.gov. The City of Takoma Park Master Plan identifies stormwater management as a major environmental concern in the Central Business District. Urban renewal areas are covered by the Adopted Urban Renewal Plan.

Town of Barnesville
The Town of Barnesville has its own zoning authority but it relies upon County government to regulate building codes. At this time the Town has not adopted a master plan separate from the County's Master Plan.

Town of Brookeville
The Town of Brookeville has its own zoning authority, but it relies upon County government to regulate building codes. The Town of Brookeville has adopted its own Comprehensive Plan, as amended. The Town of Brookeville's Comprehensive Plan states that it is committed to maintaining the historical character of the community. They will continue to administer the requirement that all telephone lines for new construction must be installed underground by permit. They will also continue to administer the requirement for addressing historic preservation, flood plains, wetlands, and storm water management on the building permit.

Town of Chevy Chase
The Town of Chevy Chase is a self-governing municipality located in Montgomery County. As such, the Town has the authority to regulate certain activities within its boundaries. The ordinances controlling building within the incorporated boundaries of the Town appear in Chapter 4 of the Municipal Code. County laws also apply in the town for fire, electrical and plumbing codes, private water systems, air quality, erosion, housing, solid waste, and unsafe buildings; see list of ordinances on website (www.townofchevychase.org). The Town of Chevy Chase is a dual permitting zone requiring both Town and County permit for new construction, additions, fences, or walls. A Town permit is not required for interior remodeling; however, the County may require a permit.

Town of Laytonsville
The Town of Laytonsville was incorporated in 1892 and is located in the northern portion of the County. In 1989, the Mayor and Council approved a Comprehensive Plan that specified an effective road system for the future and defined a Historic District in the residential and commercial zones. The Town of Laytonsville has its own zoning, building, and subdivision authority.

Town of Poolesville
In 2005, the Town of Poolesville drafted a Master Plan with a vision, goal, and objectives. The plan was updated in 2011. Important features of the 2011 Plan, based on various sources, are to ensure that the characteristics that make Poolesville unique are preserved and strengthened in future years, and that efforts to encourage and sustain economic growth within the Town are greatly expanded. Such efforts must complement Poolesville's unique placement in and adjacent to the County's Agricultural Reserve.

Town of Somerset
The Town of Somerset has permitting authority for buildings and modifies the County Code Chapter 8. The Town will be integrating its natural hazard mitigation planning efforts by reference to the County's Multi-Hazard Mitigation Plan. By reference, this Plan acknowledges the Town of Somerset Long Range Planning Report developed with public hearings for those proposals which relate to natural hazard mitigation strategies found in the report. Recommendations in the Long Range Planning Report include specific items on land use, urban growth, transportation, environment, recreation, parks and open spaces, community facilities, historic preservation, community appearance and design, and economic development. More information is available at www.townofsomerset.com.

Washington Grove
The Town of Washington Grove has authority to adopt its own zoning and building ordinances. Washington Grove adopted a Master Plan in 1995. The plan was updated and revised in 2009. By reference, this Plan acknowledges the Master Plan of the Town of Washington Grove. Recognizing that most of the Town's privately owned parcels are already developed, the goals and objectives of the 2009 plan were to:

- *Preserve the integrity of the Town and its way of life by providing guidance for protection of the original pattern and character of the community;*
- *Enhance the Town's destiny by preserving historic resources through thoughtful adaptation of housing stock and conservation of the natural landscape;*
- *Protect and improve the economic value of both the privately owned property and the property and resources held in common;*
- *Create an awareness of Washington Grove in adjacent jurisdictions and support planning requirements throughout the State*

COMMUNITY PROFILE AND LAND USE AND DEVELOPMENT TRENDS

Various factors and circumstances of Montgomery County's profile demonstrate the challenges and complexities for implementing mitigation measures. These factors were accounted for throughout the hazard identification, risk analysis, and vulnerability analysis process.

Since Montgomery County is a partner to the National Capital Region, and is the location for several important federal agencies, the consequences and impacts of a hazardous event have the potential for crippling operations not only to the county, but throughout the region and the nation. As such, it is important that all community profile factors are analyzed and factored in throughout the mitigation process as well as in aligning mitigation measures to local jurisdictions.

This chapter will provide a summary of the county's geography and physical environment, demographics, housing characteristics, relationship between its municipalities, and its relationship to other jurisdictions.

Geography and Physical Environment

Montgomery County Maryland is a part of the Washington-Baltimore Metropolitan Area and covers 507 square miles. The total area is 97.7 percent land and 2.3 percent water. Montgomery County lies in the Piedmont Plateau Province of the United States.

Climate

Since the County lies midway between the mild climate of the South and the more severe climate of the North, the County experiences a continental type of climate and has four distinct seasons. According to the Maryland State Office of Climatology, Montgomery County experiences its coldest temperatures in the month of January and its warmest temperatures in July. The area has an average annual rainfall of 41.72 inches and an average annual snowfall of 19.89 inches[1]. The County received its largest daily rainfall amount of 7.9 inches on June 22, 1972, when Hurricane Agnes hit the area. The County received a record snowfall of more than 40 inches during back-to-back storms on February 5 and 6, 2010 and on February 9 and 10, 2010.

Topography

The County's topography is composed of small rolling hills. The elevation of the County ranges from 52 feet above sea level near the Washington D.C. line to 850 feet above sea level in the northern part of the County near the town of Damascus.

[1] http://www.usa.com/montgomery-county-md-weather.htm (updated in 2010)

Open Space

As seen in Figure 1-3, one-third of the County is open space, including farmland and approximately 35,000 acres of parkland and green space. Five large regional parks complement more than 416 different parks, including one state park, two national parks, and numerous local and neighborhood parks featuring a combined 636 acres of lakes[2]. The County has a land-use policy, that promotes open spaces and agricultural preservation in coordination with controlled growth in designated "wedges and corridors." This promotes planning for more efficient water, sewer, and public facilities.

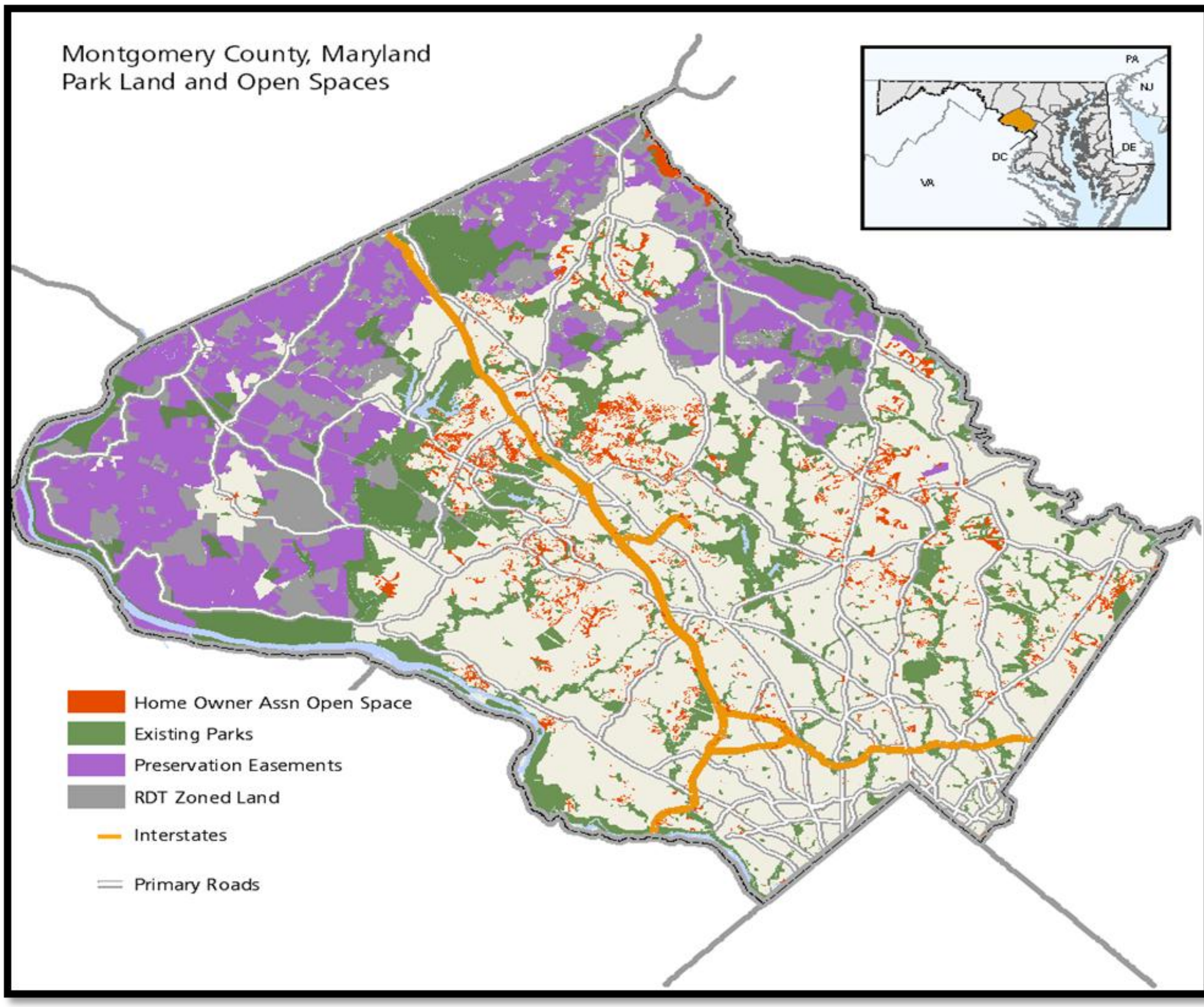


Figure 1-3

Map identifies open space by type in Montgomery County

[2] http://www.conservationmontgomery.org/whats_at_stake.html

Demographics

Montgomery County's population of 971,777 (2010 U.S. Census Bureau) makes it the state's most populous jurisdiction. As of 2009, there were 365,792 housing units with a population density of 1,961.1 persons per square mile. The average age of a Montgomery County resident is 38.0 years. The age distribution is 24.5% under 18; 75.2% over 18; and 12.3% who are 65 years of age or older. Table 1-4 shows how the county's population is distributed by jurisdiction.

Table 1-4: Population of Montgomery County Municipalities

MUNICIPALITY	POPULATION	% OF COUNTY POP
Gaithersburg	59,933	6.12%
Rockville	61,206	6.3%
Takoma Park	16,715	1.72%
Barnesville	172	.02%
Brookeville	134	.01%
Chevy Chase	2,824	.29%
Chevy Chase Village	1,953	.2%
Chevy Chase, Section 3	760	.08%
Chevy Chase, Section 5	658	.07%
Chevy Chase View	920	.09%
Garrett Park	992	.1%
Glen Echo	225	.02%
Kensington	2,213	.23%
Laytonsville	353	.04%
Martin's Additions	933	.1%
North Chevy Chase	519	.05%
Poolesville	4,883	.5%
Somerset	1,126	.13%
Washington Grove	555	.06%

Montgomery County is the State's most affluent county according to 2010 statistics with the median income per household at $93,774 at that time. Its population is highly educated with most County residents having received some college education and over half of the population possessing a bachelor's degree or higher.

Population Growth

Montgomery County's population continues to increase with its close proximity to Washington D.C. and Baltimore City. The 2010 population of 971,777 is an 11.3% increase from 2000 (or 98,436 residents). Figure 1-4 displays the population change from 2000-2010 obtained from the most recent Census data within specific regions of Montgomery County.

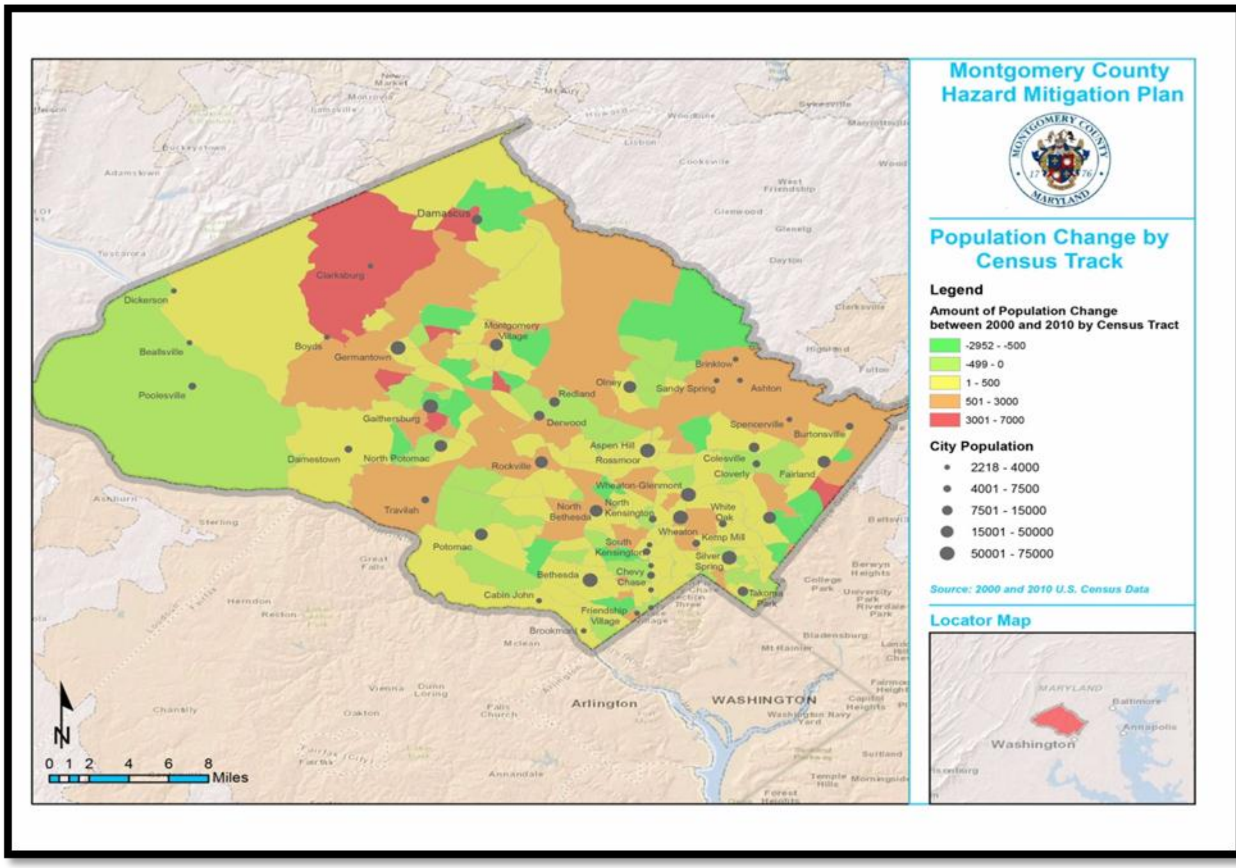


Figure 1-4

Table 1-5 shows the population distribution in Maryland and how Montgomery County's increase in this percentage continues to rise through the decades.

Table 1-5: Historic Population Change (shown as percentage of total state population)					
1960	1970	1980	1990	2000	2010
11%	13.3%	13.7%	15.8%	16.5%	16.8%

Over the previous decade, many long-term demographic shifts toward suburban and exurban growth have continued to impact land uses in Montgomery County. Previously, natural hazards in sparsely populated areas did not pose as significant a risk to the community. However, as populations increase, the potential for greater loss of life and property damage from natural hazards also increases. For this reason, FEMA requires that state and local plans evaluate land use and development trends so that mitigation options can be considered in future land use decisions. In addition, highly dense population areas are factored into the risk analysis process for prioritizing current mitigation strategies.

Relationship Between County and Municipalities

For more than 200 years, Montgomery County has a strong history of local community. This reflects the origins of the county as a series of rural communities surrounding the national capital. The municipalities, towns, and neighborhoods consistently work together to better themselves and each contributes to making Montgomery County a great place to live, work, and play.

Every community in Montgomery County is distinctive, although many share similar characteristics. Bethesda, Silver Spring, Kensington and Wheaton offer the advantages that come with urban settings. Olney, Poolesville, and Laytonsville offer small town appeal in a rural setting. Brookeville, Barnesville, and Washington Grove have significant properties designated in the historic district. Rockville, as the seat of the County, has an attractive residential historic district that merges well into the growing business district. Similarly, Gaithersburg has both an attractive residential historic district and museums in the commercial district.

Land Use Planning Authority

Seven municipalities have their own zoning authority: Barnesville, Brookeville, Gaithersburg, Laytonsville, Poolesville, Rockville, and Washington Grove. The cities of Gaithersburg and Rockville have permitting authority for building permits where the County Code, Chapter 8, does not apply.

Meanwhile, the following municipalities issue building permits: Takoma Park, Chevy Chase Village; Chevy Chase, Village of, Section 3; Chevy Chase, Village of, Section 5; Village of Martins Addition; North Chevy Chase; and the Towns of Glen Echo, Garrett Park, Kensington, Somerset, Chevy Chase, and Chevy Chase View.

Incorporated Municipalities Hazard Mitigation Goals

In accordance with Section 201.6(a) (4) of the federal regulation governing hazard mitigation plan standards, local jurisdictions with land use authority must be included in the multi-jurisdiction plan. Language from referenced planning documents from municipalities was found in the websites listed in pages 18-20 (Existing Planning Mechanisms). These planning documents are referred to and are incorporated by reference, rather than including these lengthy documents into this Plan.

This section of the Plan describes the Local Hazard Identification & Risk Assessment summary undertaken by Montgomery County and participating municipalities in the preparation of this Hazard Mitigation Plan Update. This section consists of the following subsections:

INTRODUCTION AND UPDATE SUMMARY
THUNDERSTORMS
WINTER STORM
EXTREME HEAT
FIRE
FLOODING
HURRICANE/TROPICAL STORM
WATER SHORTAGE/DROUGHT
TORNADO
EARTHQUAKE
LAND SUBSIDENCE/KARST
HAZARDOUS MATERIALS
DAM FAILURE

INTRODUCTION AND UPDATE SUMMARY

A key step in preventing disaster losses in Montgomery County is developing a comprehensive understanding of the hazards that pose risks to its communities. Table 2-1 below defines the standard FEMA terms used throughout this plan.

Table 2-1: Plan Terms & Definitions	
Hazard:	Event or physical conditions that have the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, other types of harm or loss
Risk:	Product of a hazard’s likelihood of occurrence and its consequences to society
Vulnerability:	Degree of susceptibility and resilience of the community and environment to hazards

Source: Federal Emergency Management Agency, 2001.

The Local Hazard Identification and Risk Assessment (HIRA) summary is a process or application of a methodology for evaluating risk as defined by probability and frequency of occurrence of a hazard event, exposure to people and property to the hazard, and consequences of that exposure. Different methodologies exist for assessing the risk of hazard events, ranging from qualitative to quantitative.

Montgomery County and its communities are vulnerable to a wide range of natural and technological hazards that threaten life and property. The hazards identified by the Montgomery County Mitigation Planning Committee for inclusion in this HIRA summary are those determined to be of actual potential threat to Montgomery County and its municipalities and are consistent with the hazards identified by the State of Maryland and the Federal Emergency Management Agency for this part of the State and this region of the country. The hazards for this 2013 Plan update include:

NATURAL HAZARDS

THUNDERSTORMS
WINTER STORM
EXTREME HEAT
FIRE
FLOODING
HURRICANE/TROPICAL STORM
WATER SHORTAGE/DROUGHT
TORNADO
EARTHQUAKE
LAND SUBSIDENCE/KARST

TECHNOLOGICAL HAZARDS

HAZARDOUS MATERIALS
DAM FAILURE

Some of these hazards can be interrelated (for example, thunderstorms can produce high wind/tornado activity and can cause flooding), and thus discussion of these hazards may overlap where necessary throughout the HIRA.

Of the thirteen (13) hazards profiled in the State of Maryland's 2011 Hazard Mitigation Plan, eleven (11) are addressed in this Plan. Table 2-2 illustrates how these hazards were addressed.

Table 2-2: State/Local Plan Hazards Matrix

STATE OF MARYLAND HAZARD MITIGATION PLAN 2011	INCLUDED IN MONTGOMERY COUNTY MITIGATION PLAN 2013	RATIONALE FOR EXCLUSION
FLOOD	✓	
COASTAL HAZARDS	✓	
HIGH WINDS		ID and profile for this is covered under thunderstorm and tornado
THUNDERSTORM	✓	
TORNADO	✓	
WINTER STORM	✓	
WILDFIRE	✓	
LANDSLIDE	✓	
LAND SUBSIDENCE/KARST	✓	
DROUGHT	✓	
EARTHQUAKE	✓	
DAM AND LEVEE FAILURE	✓	
MINING HAZARDS		Not a significant hazard identified by the planning team

Table 2-3 documents the review by the Montgomery County Mitigation Planning Committee as it relates to those hazards that were to be re-evaluated and/or identified, analyzed, and addressed through the updating of the Countywide HIRA summary. Hazards were either *on going*, *deleted*, *changed*, or *new* hazards were identified.

Table 2-3: Evaluation of Hazards for Inclusion in 2012 HIRA Summary

2007 HAZARD	STATUS	NOTES	2012 HAZARD
Blizzard/Ice Storms	Ongoing/Changed	Now called Winter Storm	Winter Storm
Drought	Ongoing /Changed	Now called Water Shortage to include Drought	Water Shortage
Dam Failure	Ongoing	No change	Dam Failure
Flooding/Flash Flooding	Ongoing /Changed	Now called Flooding to include flash flooding	Flooding
Tornado	Ongoing	No change	Tornado
Thunderstorm	Ongoing /Changed	Now a separate profile from Tornado in 2012	Thunderstorm
Hurricane	Ongoing /Changed	Now called Hurricane/Tropical Storm	Hurricane/Tropical Storm
Earthquake	Ongoing	No change	Earthquake
Hazardous Materials	Ongoing	No change	Hazardous Materials
Soil Movement	Ongoing /Changed	Now called Land Subsidence/Karst	Land Subsidence/Karst
Brush Fires	Ongoing /Changed	Now called Fire	Fire
Conflagrations	Ongoing /Changed	Included in Fire	n/a
Extreme Heat	Ongoing	No change	Extreme Heat
Extreme Cold	Ongoing /Changed	Now included within Winter Storm	n/a

The “Thunderstorm” hazard was separated for the 2013 Plan update due to the nature of the hazard being ranked as high risk. In the previous plan, “Thunderstorm” was profiled under the “Tornado” hazard.

Once the hazards were identified and evaluated for inclusion into the 2013 Plan update, the Mitigation Planning Committee then ranked these based on a Risk Factor (RF) approach. To further focus on the list of identified hazards for this Plan, Table 2-4 presents a list of all federal disaster and emergency declarations that have occurred in Montgomery County since 1962, according to the Federal Emergency Management Agency. This list presents the foundation for identifying what hazards pose the greatest risk within Montgomery County.

Table 2-4: Presidential Disaster and Emergency Declarations in Montgomery County

DECLARATION #	DATE	EVENT DETAILS
FEMA-EM-3335	8/27/2011	Hurricane Irene
FEMA-DR-1910	5/6/2010	Winter Storm
FEMA-DR-1875	2/19/2010	Winter Storm
FEMA-DR-1652	7/2/2006	Flooding/Tornadoes
FEMA-EM-3251	9/13/2005	Hurricane Katrina
FEMA-DR-1492	9/13/2003	Hurricane Isabel
FEMA-EM-3179	3/14/2003	Snow Storm

Table 2-4: Presidential Disaster and Emergency Declarations in Montgomery County

DECLARATION #	DATE	EVENT DETAILS
FEMA-DR-1324	4/10/2000	Winter Storm
FEMA-DR-1081	1/11/1996	Blizzard
FEMA-EM-3100	3/16/1993	Winter Storm
FEMA-DR-839	8/28/1989	Severe Storms/High Wind
FEMA-DR-524	1/26/1977	Ice conditions
FEMA-DR-489	10/4/1975	Flooding
FEMA-DR-341	6/23/1972	Tropical Storm Agnes
FEMA-DR-309	8/17/1971	Flooding
FEMA-DR-127	3/9/1962	Severe Storms, High Tides, Flooding

Hazards were ranked in order to provide structure and prioritize the mitigation goals and actions discussed in this plan. Ranking was both quantitative and qualitative. First, the quantitative analysis considered all the GIS and Hazus data available. Then, a qualitative approach, the Risk Factor (RF) approach, was used to provide additional insights on the specific risks associated with each hazard. This process can also be a valuable cross-check or validation of the quantitative analysis performed.

The RF approach combines historical data, local knowledge, and consensus opinions to produce numerical values that allow identified hazards to be ranked against one another. During the planning process, the Montgomery County Mitigation Planning Committee compared the results of the hazard profile against their local knowledge to generate a set of ranking criteria. These criteria were used to evaluate hazards and identify the highest risk hazard.

RF values are obtained by assigning varying degrees of risk to five categories for each hazard: *probability, impact, spatial extent, warning time*, and *duration*. Each degree of risk is assigned a value ranging from 1 to 4 and a weighing factor for each category was agreed upon by the Mitigation Planning Committee. Based upon any unique concerns for the planning area, the Mitigation Planning Committee may also adjust the RF weighting scheme. To calculate the RF value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the example equation below:

RF Value = [(Probability x .30) + (Impact x .30) +
(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]

(See Table 2-5 on the next page.)

Table 2-5: Risk Factor Criteria

RISK ASSESSMENT CATEGORY	LEVEL	DEGREE OF RISK LEVEL	INDEX	WEIGHT
PROBABILITY **What is the likelihood of a hazard event occurring in a given year?**	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY	**1**	**30%**
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	**2**	
	LIKELY	BETWEEN 10 &100% ANNUAL PROBABILITY	**3**	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY	**4**	
IMPACT ***In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?***	**MINOR**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION OF QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	**1**	**30%**
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	**2**	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.	**3**	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	**4**	
SPATIAL EXTENT ***How large of an area could be impacted by a hazard event? Are impacts localized or regional?***	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED	**1**	**20%**
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	**2**	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	**3**	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	**4**	
WARNING TIME ***Is there usually some lead time associated with the hazard event? Have warning measures been implemented?***	**MORE THAN 24 HRS**	SELF DEFINED	**1**	**10%**
	12 TO 24 HRS	SELF DEFINED	**2**	
	6 TO 12 HRS	SELF DEFINED	**3**	
	LESS THAN 6 HRS	SELF DEFINED	**4**	
DURATION ***How long does the hazard event usually last?***	**LESS THAN 6 HRS**	SELF DEFINED	**1**	**10%**
	LESS THAN 24 HRS	SELF DEFINED	**2**	
	LESS THAN 1 WEEK	SELF DEFINED	**3**	
	MORE THAN 1 WEEK	SELF DEFINED	**4**	

According to the default weighting scheme applied, the highest possible RF value is 4.0. The methodology illustrated above lists categories that are used to calculate the variables for the RF value.

RANKING RESULTS

Table 2-6: Risk Factor Results for Montgomery County and Participating Jurisdictions

#	NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING
1	Thunderstorm	1.2	0.6	0.8	0.3	0.3	**3.2**
2	Winter Storm	0.9	0.9	0.8	0.2	0.3	**3.1**
3	Extreme Heat	0.9	0.9	0.8	0.1	0.3	**3.0**
4	Flooding	0.9	0.6	0.4	0.3	0.2	**2.4**
5	Hurricane/Tropical Storm	0.9	0.3	0.8	0.1	0.3	**2.4**
6	Fire	0.9	0.6	0.4	0.3	0.2	**2.4**
7	Water Shortage	0.6	0.3	0.8	0.2	0.3	**2.2**
8	Tornado	0.6	0.3	0.4	0.4	0.2	**1.9**
9	Earthquake	0.3	0.3	0.6	0.4	0.2	**1.8**
10	Land Subsidence/Karst	0.3	0.3	0.2	0.4	0.1	**1.3**
#	**TECHNOLOGICAL HAZARDS**	**PROBABILITY**	**IMPACT**	**SPATIAL EXTENT**	**WARNING TIME**	**DURATION**	**RF RATING**
1	Hazardous Materials	0.9	0.9	0.4	0.4	0.2	**2.8**
2	Dam Failure	0.6	0.9	0.4	0.3	0.3	**2.5**

Based on the RF analysis, the natural hazard with the highest risk potential is “Thunderstorm”, which has a value of 3.2. This is primarily due to the probability of the hazard occurring and the spatial extent of the potential widespread damage within the affected areas of the County. “Winter Storm” and “Extreme Heat” were qualitatively calculated as second in risk potential, with values of 3.1 and 3.0.

The technological or human-made hazard with the highest risk potential was found to be “Hazardous Materials”, with a value of 2.8. This is primarily due to a lack of warning time and a high level of impact and the vast spatial extent that could be impacted. Major roadways and infrastructure could also be impacted.

The conclusions drawn from the qualitative and quantitative assessments, combined with final determinations from the Montgomery County Mitigation Planning Committee, were fitted into three categories for a final summary of hazard risk for Montgomery County based on High, Moderate or Low risk designations.

Table 2-7 Conclusions on Hazard Risk for Montgomery County and Participating Jurisdictions

HIGH RISK (3.0 or higher)	**Thunderstorm, Winter Storm, Extreme Heat**
MODERATE RISK (2.0 – 2.9)	**Flooding, Hurricane/Tropical Storm, Fire, Water Shortage, Hazardous Materials, Dam Failure**
LOW RISK (0.1 – 1.9)	**Tornado, Earthquake, Land Subsidence/Karst**

THUNDERSTORM

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING
THUNDERSTORM	1.2	0.6	0.8	0.3	0.3	**3.2**
HIGH RISK HAZARD (3.0 – 4.0)						

[SEVERE THUNDERSTORMS AND RELATED SUB-HAZARDS]

HAZARD IDENTIFICATION

Extreme weather conditions can exist during any season throughout Maryland. Thunderstorms, associated with strong winds, heavy precipitation, and lightning strikes can all be hazardous under the right conditions and locations. Strong winds and tornadoes can take down trees, damage structures, tip high profile vehicles, and create high velocity flying debris. Large hail can damage crops, dent vehicles, break windows, and injure or kill livestock, pets, and people. Coastal storms, which include hurricanes, tropical storms, and nor'easters, are among the most devastating naturally occurring hazards in the United States and its territories. Past events reveal the magnitude of damage that is possible. In 2005, Hurricane Katrina resulted in the highest total damage of any natural disaster in U.S. history, an estimated $90 billion, eclipsing many times the damage wrought by Hurricane Andrew in 1992.

Thunderstorms affect relatively small areas when compared with hurricanes and winter storms. Despite their small size, all thunderstorms are dangerous. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Of the estimated 100,000 thunderstorms that occur each year in the United States, about 10 percent are classified as severe. The National Weather Service considers a thunderstorm severe if it produces hail at least 3/4 inch in diameter, winds of 58 MPH or stronger, or a tornado. Every thunderstorm needs three basic components: (1) moisture to form clouds and rain (2) unstable air which is warm air that rises rapidly and (3) lift, which is a cold or warm front capable of lifting air to help form thunderstorms.

Lightning, although not considered severe by the National Weather Service definition, can accompany heavy rain during thunderstorms. Lightning develops when ice particles in a cloud move around, colliding with other particles. These collisions cause a separation of electrical charges. Positively charged ice particles rise to the top of the cloud and negatively charged ones fall to the middle and lower sections of the cloud. The negative charges at the base of the cloud attract positive charges at the surface of the Earth. Invisible to the human eye, the negatively charged area of the cloud sends a charge called a stepped leader toward the ground. Once it gets close enough, a channel develops between the cloud and the ground. Lightning is the electrical transfer through this channel. The channel rapidly heats to 50,000 degrees Fahrenheit and contains approximately 100 million electrical volts. The rapid expansion of the heated air causes thunder.

Hail develops when a super cooled droplet collects a layer of ice and continues to grow, sustained by the updraft. Once the hail stone cannot be held up any longer by the updraft, it falls to the ground. Nationally, hailstorms cause nearly $1 billion in property and crop damage annually, as peak activity coincides with peak agricultural seasons. Severe hailstorms also cause considerable damage to buildings and automobiles, but rarely result in loss of life. Table 2-8 below describes the reference sizes used for hail formation.

Table 2-8: Size Reference Chart for Hail

COMMON OBJECT	SIZE IN DIAMETER
Pea	0.25 Inch
Penny or Dime	0.75 Inch
Quarter	1.00 Inch
Half Dollar	1.25 Inch
Golf Ball	1.75 Inch
Tennis Ball	2.50 Inch
Baseball	2.75 Inch
Grapefruit	4.00 Inch

HAZARD PROFILE

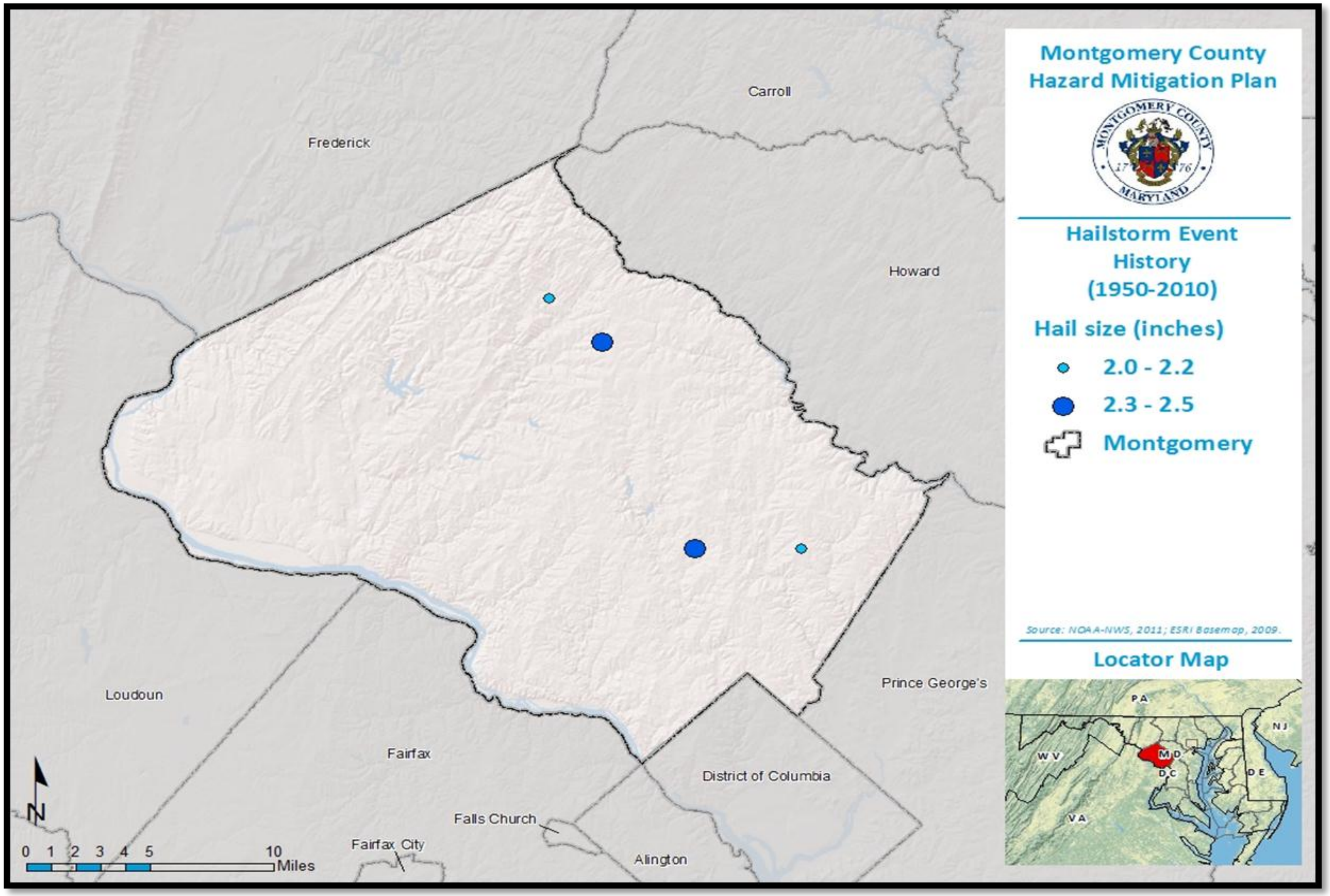
Dangerous and damaging aspects of a severe storm are tornadoes, hail, lightning strikes, flash flooding, and winds associated with straight-line winds, downbursts and micro-bursts. Reported severe weather events over the past 57 years provide an acceptable framework for determining the magnitude of such storms that can be expected and planned for accordingly. FEMA places this region in Zone II (155 MPH) for structural wind design (Federal Emergency Management Agency, 2008).

[HAIL]

Large hail can damage structures, break windows, dent vehicles, ruin crops, and kill or injure people and livestock. Based on past occurrences, hail sizes greater than 2 inches in diameter are possible and should be accounted for in future planning activities. Non-tornadic, thunderstorm and non-thunderstorm winds over 100 mph should also be considered in future planning initiatives. These types of winds can remove roofs, move mobile homes, topple trees, take down utility lines, and destroy poorly-built or weak structures.

Figure 2-1 on the next page shows the geographic extent and size of hail that has occurred in Montgomery County since 1950.

Figure 2-1


Montgomery County
Hazard Mitigation Plan
Hailstorm Event History (1950-2010)
Hail size (inches)
2.0 - 2.2
2.3 - 2.5
Montgomery
Source: NOAA-NWS, 2011; ESRI Basemap, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
Carroll
Frederick
Howard
Loudoun
Prince George's
Fairfax
District of Columbia
Falls Church
Fairfax City
Arlington
0 1 2 3 4 5 10 Miles
N

There have been 34 recorded hail events associated with thunderstorms that have either directly or indirectly impacted Montgomery County and its municipalities since 1950.

Table 2-9: Hail Events in Montgomery County Since 1960						
LOCATION	DATE	TYPE	MAGNITUDE	DEATH	INJURY	PROPERTY & CROP DAMAGE
Countywide	1950-2012	Hail	0.1”-2.5”	1	0	$1,194,191
			TOTALS:	**0**	**0**	**$1,194,191**

Reported hail events over the past 62 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. The probability of the County and its municipality experiencing a hail event associated with damages or injury can be difficult to quantify, but based on historical record of 34 hail events since 1950 that have either caused damages to buildings and infrastructure or resulted in an injury or death, it can reasonably be assumed that this type of event has occurred once every 1.8 years from 1950 through 2012.

[(Current Year) 2012] subtracted by [(Historical Year) 1950] = 62 Years on Record

[(Years on Record) 62] divided by [(Number of Historical Events) 34] = 1.82

Furthermore, the historic frequency calculates that there is a 55% chance of this type of event occurring each year.

[THUNDERSTORM WIND]

There have been 147 recorded severe wind events associated with thunderstorms that have either directly or indirectly impacted Montgomery County since 1950. One particular storm occurred on May 25th, 1994. Four homes caught

Table 2-10: High Wind Events Associated with Thunderstorms in Montgomery County since 1956							
LOCATION	DATE	TYPE	MAGNITUDE	DEATH	INJURY	PROPERTY DAMAGE	CROP DAMAGE
Countywide	1950-2012	Wind	kts	0	12	$16,330,792	$0

A complete list of the 147 recorded events can be found in Appendix D

One particular storm occurred on May 25th, 1994. Four homes caught fire after a lightning strike in the Potomac-Rockville area of Montgomery County. About $600,000 in damage resulted.

Reported thunderstorm winds over the past 62 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. The probability of the County and its municipality experiencing thunderstorm winds associated with damages or injury can be difficult to quantify, but based on historical record of 147 thunderstorm wind events since 1950 that have either caused damages to buildings and infrastructure or resulted in an injury or death, it can reasonably be assumed that this type of event has occurred once every .42 years from 1950 through 2013.

(Current Year) 2012] subtracted by [(Historical Year) 1950] =62 Years on Record

[(Years on Record) 62] divided by [(Number of Historical Events) 147] = .42

Furthermore, the historic frequency calculates that there is a 100% chance of this type of event occurring each year.

[LIGHTNING]

Except in cases where significant forest or range fires are ignited, lightning generally does not result in disasters. For the period of 1993 to 2011, NOAA reported four injuries, and one fatality along with several damage reports in Montgomery County (as shown in Table 2-11). The greatest impact due to a lightning strike in Montgomery County occurred on July 25, 2010 according to the National Weather Service. A lightning strike in Rockville killed a man while he was attending a celebration outdoors. An article from Maryland's Gazette explained that he was riding a bicycle to a community picnic when the lightning struck. During the same storm, a lightning strike also may have caused the death of another man jetskiing near the Chesapeake Bay Bridge.

A house caught on fire due to a lightning strike in Bethesda in June 2008 according to Maryland's Gazette. Several fires started throughout the county during the same storm in Germanton, Damascus, Colesville, and Laytonsville. The cause of at least one of the fires may have been lightning striking the gas meter of a home.

Another severe storm occurred more recently on August 15, 2011. Two houses were struck by lightning in the County, causing some damage. That evening over 10,000 residents were without power according to the Washington Post.

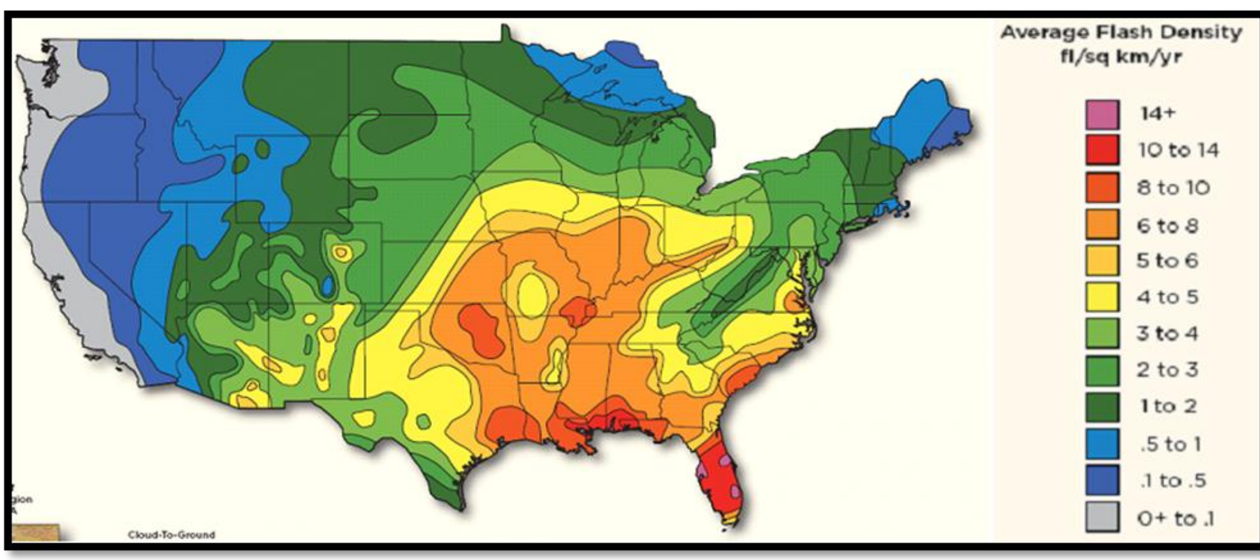
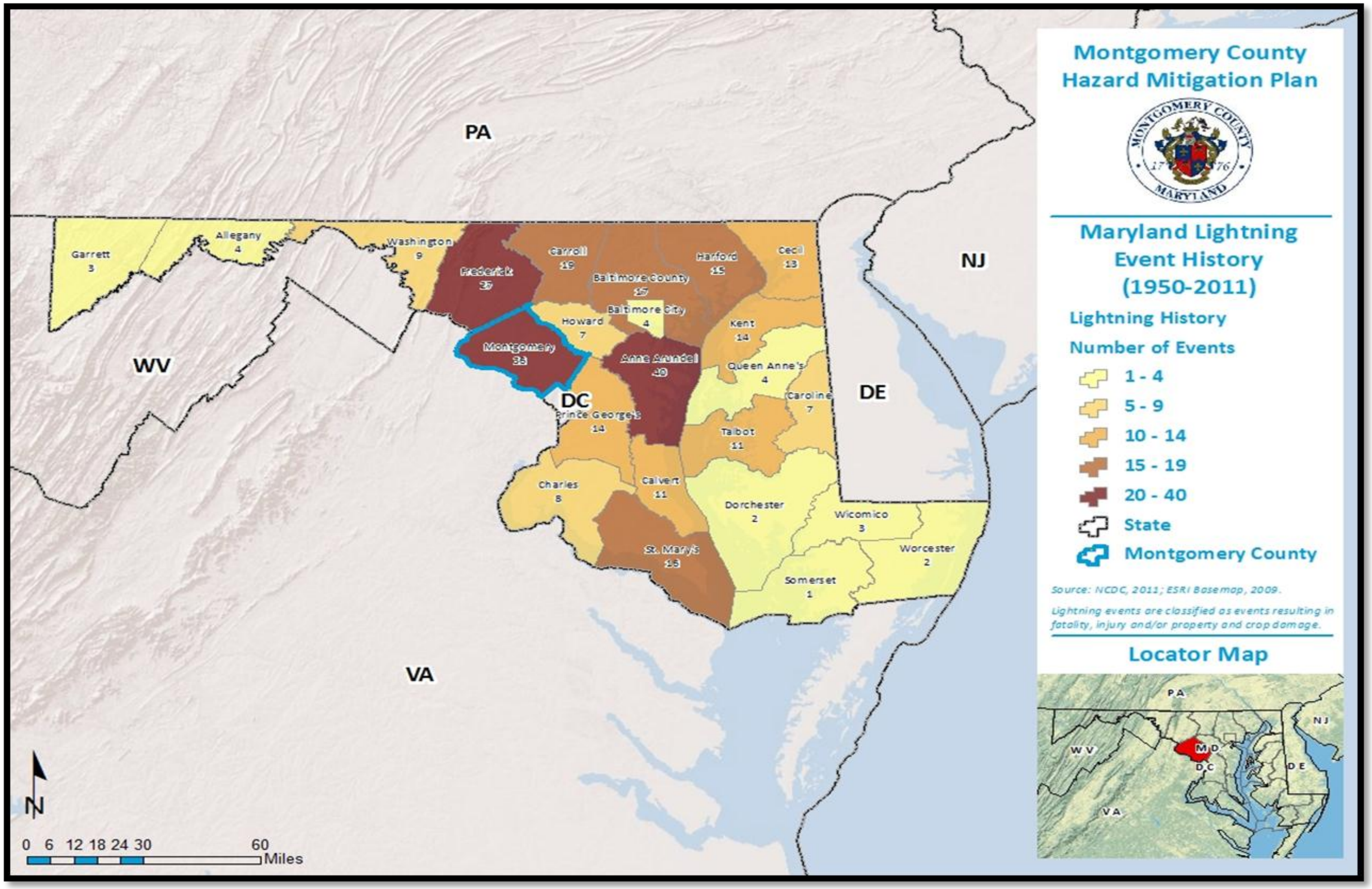


Figure 2-2; Source: www.lightningsafety.noaa.gov (NOAA)

Table 2-11: Lightning Strikes in Montgomery County Since 1993

JURISDICTION AFFECTED	DATE OF EVENTS	# OF FATALITIES	# OF INJURIES	RECORDED PROPERTY DAMAGES
Countywide	11/28/1993	0	0	50,000
Countywide	5/24/1994	0	0	1,000,000
Countywide	6/10/1996	0	0	2,000
Countywide	6/26/1997	0	0	30,000
Countywide	8/17/1997	0	0	265,000
Countywide	7/21/1998	0	1	0
Countywide	4/9/1999	0	0	1,000
Countywide	6/14/1999	0	1	0
Countywide	8/14/1999	0	0	2,500
Countywide	8/27/2000	0	0	95,000
Countywide	6/20/2001	0	0	2,000,000
Countywide	6/22/2001	0	0	120,000
Countywide	7/1/2001	0	0	80,000
Countywide	8/22/2001	0	0	120,000
Countywide	4/21/2002	0	0	250,000
Countywide	7/23/2002	0	0	45,000
Countywide	8/26/2003	0	0	100,000
Countywide	5/17/2004	0	0	400,000
Countywide	5/17/2004	0	0	75,000
Countywide	5/17/2004	0	0	25,000
Countywide	5/18/2004	0	0	75,000
Countywide	5/18/2004	0	0	15,000
Countywide	5/25/2004	0	0	1,300,000
Countywide	6/6/2005	0	0	475,000
Countywide	6/1/2006	0	0	500,000
Countywide	6/4/2008	0	0	10,000
Countywide	6/4/2008	0	0	3,000
Countywide	7/27/2008	0	0	105,000
Countywide	7/27/2008	0	1	0
Countywide	7/23/2009	0	1	0
Countywide	7/25/2010	1	0	0
	TOTAL	**1**	**4**	**$7,143,500**

Figure 2-3


PA
NJ
WV
DE
DC
VA
Garrett 3
Allegany 4
Washington 9
Frederick 27
Carroll 19
Baltimore County 17
Harford 15
Cecil 13
Baltimore City 4
Howard 7
Kent 14
Montgomery 31
Anne Arundel 40
Queen Anne's 4
Caroline 7
Prince George's 14
Talbot 11
Charles 8
Calvert 11
Dorchester 2
Wicomico 3
Worcester 2
St. Mary's 16
Somerset 1
Montgomery County Hazard Mitigation Plan
Maryland Lightning Event History (1950-2011)
Lightning History
Number of Events
1 - 4
5 - 9
10 - 14
15 - 19
20 - 40
State
Montgomery County
Source: NCDC, 2011; ESRI Basemap, 2009.
Lightning events are classified as events resulting in fatality, injury and/or property and crop damage.
Locator Map
N
0 6 12 18 24 30 60 Miles

Reported lightning strikes over the past 19 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. The probability of the County and its municipalities experiencing a lightning strike associated with damages or injury can be difficult to quantify, but based on historical record of 31 lightning strikes since 1993 that have either caused damages to buildings and infrastructure or resulted in an injury or death, it can reasonably be assumed that this type of event has occurred once every 0.61 years from 1993 through 2012.

[(Current Year) 2012] subtracted by [(Historical Year) 1993] = 19 Years on Record

[(Years on Record) 19] divided by [(Number of Historical Events) 31] = 0.61

Furthermore, the historic frequency calculates that there is a 100% chance of this type of event occurring each year.

INVENTORY ASSETS EXPOSED TO THUNDERSTORMS

All assets located in Montgomery County can be considered at risk from severe storms. This includes all of the County's population and all buildings and infrastructure within the County. Damages primarily occur as a result of high winds, lightning strikes, hail, and flooding. Most structures, including the county's critical facilities, should be able to provide adequate protection from hail but the structures could suffer broken windows and dented exteriors. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out.

POTENTIAL LOSSES

A timely forecast may not be able to mitigate the property loss, but could reduce the casualties and associated injury. It appears possible to forecast these extreme events with some skill, but further research needs to be done to test the existing hypothesis about the interaction between the convective storm and its environment that produces the extensive swath of high winds. Thunderstorms will remain a highly likely occurrence for Montgomery County. Lightning, hail and tornadoes may also be experienced in the area due to such storms.

LAND USE & DEVELOPMENT TRENDS

All future structures built in Montgomery County will likely be exposed to severe thunderstorm damage. Since the previous statement is assumed to be uniform countywide, the location of development does not increase or reduce the risk necessarily. Montgomery County and its jurisdictions need to adhere to building codes, and therefore, new development can be built to current standards to account for heavy snow loads. Additionally, as homes go up in more remote parts of the county, accessing those rural residents may become impossible should sheltering or emergency services be needed in an extreme event.

MULTI-JURISDICTIONAL DIFFERENCES

Each municipality in the County has an equal susceptibility to severe weather as profiled in this section. Predictability again causes a great problem when discussing the probability of damage from high wind events. There is really no way to pinpoint exactly where, when, and to what extent a thunderstorm or other severe weather event will cause damage. However, we know that thunderstorm events, with high wind and dangerous lightning, are highly possible in the county. These storms are prominent in the early spring and continue through late fall. If located in a densely populated area of the county, it is easy to estimate damages in the millions of dollars from these events.

In the case of lightning strikes, population and building density has a correlation with hazard vulnerability and loss. In particular, the urban and suburban areas have higher population and structure density as well as taller buildings that can act as lightning rods; therefore, they naturally have experienced greater vulnerability and loss during past lightning events. The environmental impacts most often associated with lightning strikes include damage or death to trees and ignition of wildfires. Jurisdictions that are heavily forested and that have, in the past, experienced wildfires that start because of a lightning strike are also vulnerable to losses due to lightning. Additionally older homes that are in deteriorating condition and those mobile homes composed aluminum-clad are also more susceptible to severe storms that generate high winds.

SEVERE WEATHER HIRA SUMMARY

Montgomery County is subject to severe thunderstorms which have the potential to cause flash flooding, tornadoes, downbursts, and debris. The severe storms profile is primarily concerned with past and future damages from high winds, lightning, heavy precipitation, and subsequent flooding.

Mitigation of building damage has been most successful where strict building codes for high-wind influence areas and designated special flood hazard areas have been adopted and enforced by local governments, and complied with by builders. Proven techniques are available to reduce lightning damage by grounding techniques for buildings.

Post-disaster mitigation efforts include buyout programs, relocations, structural elevations, improved open-space preservation, and land use planning within high-risk areas. Due to the significant risk from severe storms, Montgomery County will remain proactive in its mitigation efforts to help build sustainability throughout the County.

WINTER STORM

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING
WINTER STORM	0.9	0.9	0.8	0.2	0.3	**3.1**
HIGH RISK HAZARD (3.0 – 4.0)						

HAZARD IDENTIFICATION

Winter storms (including severe winter weather and extreme cold) have significantly impacted Montgomery County in the past. Winter storms are regional events that can cause hazardous driving conditions, communications and electrical power failure, community isolation and can adversely affect business continuity. This type of severe weather may include one or more of the following winter factors:

Blizzards, as defined by the National Weather Service, are a combination of sustained winds or frequent gusts of 35 mph or greater and visibilities of less than a quarter mile from falling or blowing snow for 3 hours or more. A blizzard, by definition, does not indicate heavy amounts of snow, although they can happen together. The falling or blowing snow usually creates large drifts from the strong winds. The reduced visibilities make travel, even on foot, particularly treacherous. The strong winds may also support dangerous wind chills. Ground blizzards can develop when strong winds lift snow off the ground and severely reduce visibilities.

Heavy snow, in large quantities, may fall during winter storms. Six inches or more in 12 hours or eight inches or more in 24 hours constitutes conditions that may significantly hamper travel or create hazardous conditions. The National Weather Service issues warnings for such events. Smaller amounts can also make travel hazardous, but in most cases, only results in minor inconveniences. Heavy wet snow before the leaves fall from the trees in the fall or after the trees have leafed out in the spring may cause problems with broken tree branches and power outages.

Ice storms develop when a layer of warm (above freezing), moist air aloft coincides with a shallow cold (below freezing) pool of air at the surface. As snow falls into the warm layer of air, it melts to rain, and then freezes on contact when hitting the frozen ground or cold objects at the surface, creating a smooth layer of ice. This phenomenon is called freezing rain. Similarly, sleet occurs when the rain in the warm layer subsequently freezes into pellets while falling through a cold layer of air at or near the Earth's surface. The US National Weather Service defines an ice storm as a storm which results in the accumulation of at least .25 inch of ice on exposed surfaces. Extended periods of freezing rain can lead to accumulations of ice on roadways, walkways, power lines, trees, and buildings. Almost any accumulation can make driving and walking hazardous. Ice accumulations can lead to downed trees, utility poles and communication towers. Ice can disrupt communications and power while utility companies repair significant damage. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians. Bridges can overpasses are particularly dangerous because they freeze before other surfaces.

Extreme Cold, in extended periods, could occur throughout the winter months in Montgomery County. Heating systems compensate for the cold outside. Most people limit their time outside during extreme cold conditions, but common complaints usually include pipes freezing and cars refusing to start. When cold temperatures and wind combine, dangerous wind chills can develop.

Wind chill is how cold it "feels" and is based on the rate of heat loss on exposed skin from wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature, and eventually, internal body temperature. Therefore, the wind makes it feel much colder than the actual temperature. For example, if the temperature is 0°F and the wind is blowing at 15 mph, the wind chill is -19°F. At this wind chill, exposed skin can freeze in 30 minutes. Wind chill does not affect inanimate objects. (National Weather Service)

Maryland's greatest winter storms are the nor'easters. For nor'easters to occur in Maryland, an arctic air mass would 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; therefore, it funnels south down the valleys and along the Coastal Plain. Winds around the nor'easter's center can become intense. The strong northeast winds that rack the East 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 come and go 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 while dragging more sand away from the beaches.

HAZARD PROFILE

Winter Storms have an extensive history in Montgomery County; of the 16 Disaster Declarations in Montgomery County, seven have been winter storm disasters. The National Weather Service reports that average annual snowfall in Montgomery County is expected to range from 20 inches in the southern half of the county to 30 inches its northernmost reaches.

Winter storms have been a recent threat to Montgomery County. In February 2010, back-to-back blizzards dropped more than 40 inches of snow on the County, leaving more than 80,000 households and businesses without power. Hundreds of trees and tree limbs fell, exacerbating the utility outages and preventing swift response time. Other significant winter storms occurred in January 1996, when a blizzard crippled all of Maryland west of the Chesapeake Bay, and January 1999, when a major ice storm caused ice accumulations of 0.25 to 1 inch and resulted in 30 Montgomery County school buses slipping off the road, among other roadway accidents.

According to SHELDUS, there have been a total of 71 winter weather events from 1960-2012. These events are summarized in Table 2-12 below, and the full dataset can be found in Appendix D.

Table 2-12: Severe Winter Storms from 1960-2012

NATURAL HAZARD	# OF EVENTS	# OF INJURIES	# OF FATALITIES	RECORDED PROPERTY DAMAGES	RECORDED CROP DAMAGES
Winter Storm/Heavy Snow/Ice	71	69.15	8.07	$3,634,043	$812
Please note that injuries and fatalities are reported with decimal places when damages were reported for multiple counties; the total amount of loss is divided by the number of counties included in each event to estimate local loss.					

Due to the nature of winter storms, it is extremely difficult to predict, but through identifying various indicators of weather systems, and tracking these indicators, it provides us with a crucial means of monitoring severe winter weather. Understanding the historical frequency, duration, and spatial extent of severe winter weather assists in determining the likelihood and potential severity of future occurrences. The characteristics of past severe winter events provide benchmarks for projecting similar conditions into the future. The probability of Montgomery County and its municipalities experiencing a severe winter storm event can be difficult to quantify, but based on historical record of 71 events since 1960, it can reasonably be assumed that this type of event has occurred once every .73 years from 1960 through 2012.

[(Current Year) 2012] subtracted by [(Historical Year) 1960] = 52 Years on Record

[(Years on Record) 52] divided by [(Number of Historical Events) 71] = .73

Furthermore, the historic frequency calculates that there is a 100% chance of this type of event occurring each year.

[EXTREME COLD]

Extreme Cold can also be a hazard in any given year. Threats such as hypothermia and frostbite can lead to loss of fingers and toes or cause permanent kidney, pancreas and liver injury and even death. While the average minimum temperature in Montgomery County ranges from 21-26 ^{o} F (Figure 2-4), above the extreme cold threat levels, major winter storms can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall and cold temperatures that induce cold-related injuries. Fifty percent of cold-related injuries happen to people over sixty years of age. More than seventy-five percent happen to males, and almost twenty percent occur within the home.

The dangers associated with extreme cold include frostbite and hypothermia. Frostbite is damage to body tissue caused by that tissue being frozen. Frostbite causes a loss of feeling in extremities, such as fingers, toes, ear lobes, or the tip of the nose. Hypothermia, or low body temperature can lead to uncontrollable shivering, memory loss, disorientation, slurred speech, drowsiness, and apparent exhaustion. Table 2-13 describes the cold temperature threat levels.

Figure 2-4

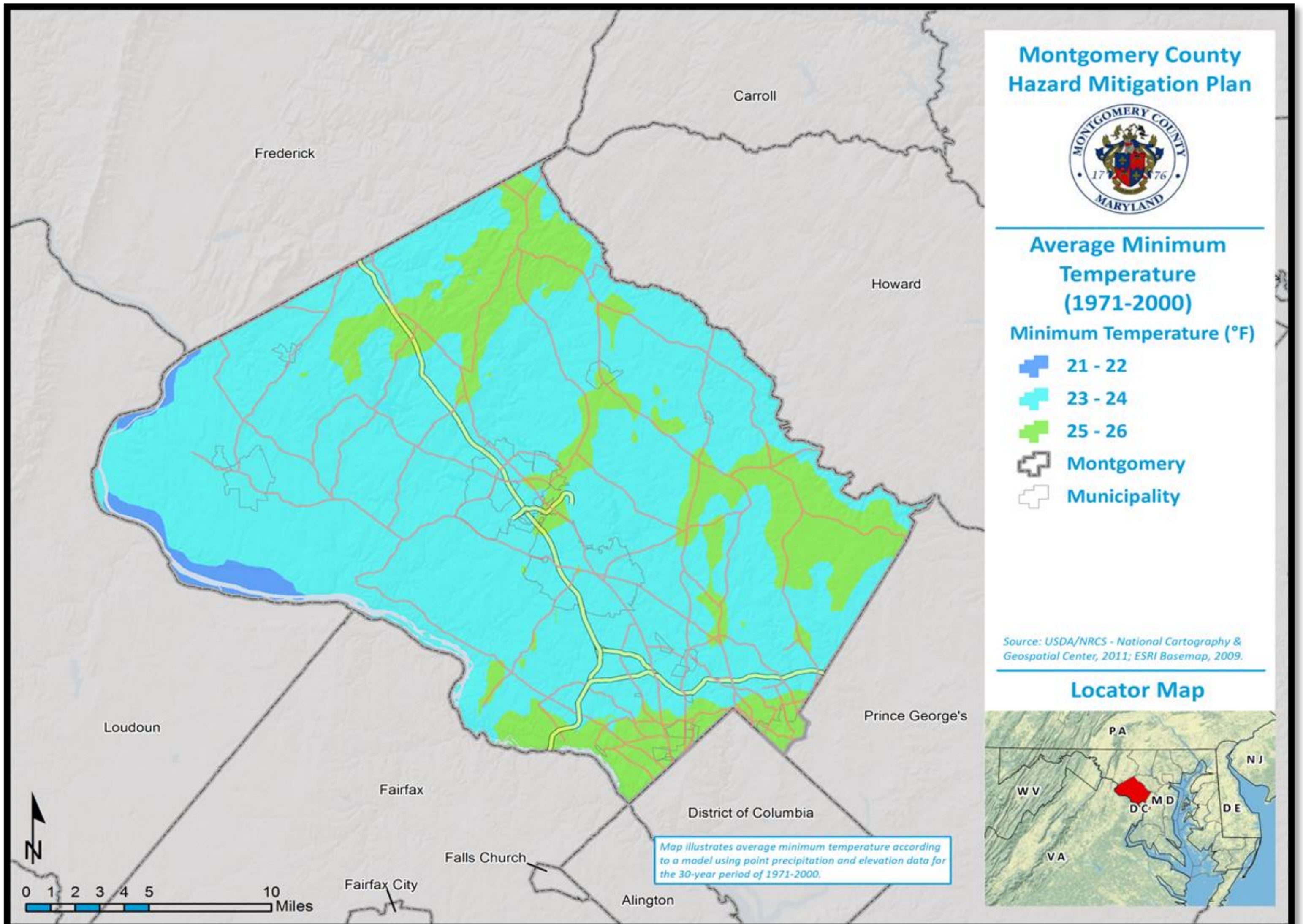

Montgomery County
Hazard Mitigation Plan
Average Minimum Temperature (1971-2000)
Minimum Temperature (°F)
21 - 22
23 - 24
25 - 26
Montgomery
Municipality
Source: USDA/NRCS - National Cartography & Geospatial Center, 2011; ESRI Basemap, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
Carroll
Frederick
Howard
Prince George's
Loudoun
Fairfax
District of Columbia
Falls Church
Fairfax City
Alington
Map illustrates average minimum temperature according to a model using point precipitation and elevation data for the 30-year period of 1971-2000.
N
0 1 2 3 4 5 10 Miles

Table 2-13: Cold Temperatures and Associated Threat Level	
EXTREME COLD THREAT LEVEL	**DESCRIPTION**
Extreme	**"An Extreme Threat to Life and Property from Excessive Cold."** It is likely that wind chill values will drop to -35° F or below for 3 hours or more. Or, lowest air temperature less than or equal to -20° F.
High	**"A High Threat to Life and Property from Excessive Cold."** It is likely that wind chill values will drop to -28° F to -35 ° F for 3 hours or more. Or, lowest air temperature -15° to -20° F.
Moderate	**"A Moderate Threat to Life and Property from Excessive Cold."** It is likely that wind chill values will drop to -20° F to -28 ° F or below for 3 hours or more. Or, lowest air temperature -10° to -15° F.
Low	**"A Low Threat to Life and Property from Excessive Cold."** It is likely that wind chill values will drop to -15° F to -20 ° F or below for 3 hours or more. Or, lowest air temperature -5° to -10° F.
Very Low	**"A Very Low Threat to Life and Property from Excessive Cold."** It is likely that that wind chill values will drop to -10° F to -15 ° F or below for 3 hours or more. Or, lowest air temperature zero to -5° F.
Non-Threatening	**"No Discernible Threat to Life and Property from Excessive Cold."** Cold season weather conditions are non-threatening.

According to SHELDUS, Montgomery County has experienced eight extreme cold events. These events are listed in Table 2-14 below.

Table 2-14: Severe Winter Storms Since 1960 as reported to SHELDUS					
EVENT TYPE	**DATE**	**# OF INJURIES**	**# OF FATALITIES**	**RECORDED PROPERTY DAMAGES**	**RECORDED CROP DAMAGES**
Low Temperatures	1/8/1970	0	0	$1,041.67	$0
Wind, Cold	1/28/1977	0	0	$20	$0
Rapid Temperature/ Pressure Change	3/21/1978	0	0	$500	$0
Cold	1/9/1982	0.68	0	$200	$0
Cold	1/16/1982	0.46	0	$0	$0
Extreme Cold	12/24/1983	0.4	0.16	$20,000	$0
Extreme Cold	1/19/1994	0	0	$20,833.33	$208,333.33
Unseasonably Cold	3/11/1998	0	0	$0	$1,346.15
	TOTAL	1.54	0.16	$42,595	$209,679.48
Please note that injuries and fatalities are reported with decimal places when damages were reported for multiple counties; the total amount of loss is divided by the number of counties included in each event to estimate local loss.					

Reported extreme cold temperatures over the past 52 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. The probability of the County and its municipalities experiencing an extreme cold event can be difficult to quantify, but based on historical record of 8 winter storm events since 1960, it can reasonably be assumed that this type of event has occurred every 6.5 years from 1960 through 2012.

[(Current Year) 2012] subtracted by [(Historical Year) 1960] = 52 Years on Record

[(Years on Record) 52] divided by [(Number of Historical Events) 8] = 6.50

Furthermore, the historic frequency indicates that there is a 15% chance of this type of event occurring each year.

INVENTORY ASSETS EXPOSED TO HAZARD

All assets in Montgomery County can be considered at risk from winter storms. This includes 100% of the population, buildings, and infrastructure located within the county. However, elderly populations are relatively more vulnerable to the impacts of winter storms. Damages due to winter storms primarily occur as a result of cold temperatures, heavy snow or ice, and sometimes high winds. Because winter storms occur regularly in Montgomery County, these storms are considered hazards only when they result in damage to structures or cause disruption to traffic, communication, power, and utilities.

A winter storm can adversely affect roadways, utilities, business activities, and can cause loss of life, frostbite and freezing conditions. They can result in the closing of secondary roads, particularly in more rural locations, loss of utility services and depletion of oil heating supplies. Most structures, including the county's critical facilities, should be able to provide adequate protection, but structures could suffer damage from snow load on rooftops and large deposits of ice. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out. Older structures that have not been well maintained are more at risk to damage due to winter storms.

The use of auxiliary heat and electricity supplies such as wood burning stoves, kerosene heaters and gasoline power generators reduces the vulnerability of humans to extreme cold temperatures commonly associated with winter storms. People residing in structures lacking adequate equipment to protect against cold temperatures or significant snow and ice are more vulnerable to winter storm events. Even for communities that are prepared to respond to winter storms, severe events involving snow accumulations that exceed six or more inches in a twelve hour period can cause a large number of traffic accidents, strand motorists due to snow drifts, interrupt power supply and communications, and cause the failure of inadequately designed and/or maintained roof systems.

Environmental impacts of winter storms often include damage to shrubbery and trees due to heavy snow loading, ice build-up, and/or high winds which can break limbs or even bring down large trees.

POTENTIAL LOSSES

Based on the information available, all communities in Montgomery County are essentially equally vulnerable to the direct impacts of winter storms, so exact losses are difficult to calculate. Potential loss estimates based on past events indicate that the average property damage caused by a winter storm is approximately $47,000, while crop damages average $5,000. Injuries are generally more common than fatalities; in the fifty years of data on record, there have been 71 injuries and 8 fatalities.

LAND USE & DEVELOPMENT TRENDS

All future structures built in Montgomery County will likely be exposed to winter storm damage. Since the previous statement is assumed to be uniform countywide, the location of development does not increase or reduce the risk necessarily. Montgomery County and its jurisdictions need to adhere to building codes, and therefore, new development can be built to current standards to account for heavy snow loads. Additionally, as homes go up in more remote parts of the county where ingress and egress routes are limited, accessing rural residents may become impossible should sheltering or emergency services be needed in an extreme event.

MULTI-JURISDICTIONAL DIFFERENCES

Because of the regional nature of winter storms, all of Montgomery County is equally likely to experience winter storms and extreme cold events, but their magnitude will generally increase the farther north and west the jurisdiction is in the County. A number of factors also correlate with increased jurisdictional risk, including higher proportions of elderly residents, higher building densities, and higher proportions of aging building stock.

EXTREME COLD HIRA SUMMARY

Montgomery County is subject to severe winter storms which have the potential to be hazard as a result of cold temperatures, heavy snow or ice and sometimes strong winds. Severe winter storm hazards can cause a range of damage to structures that will depend on the magnitude and duration of storm events. Losses may be as small as lost productivity and wages when workers are unable to travel or as large as sustained roof damage or building collapse. The severe winter storms profile is primarily concerned with past and future damages from cold temperatures, heavy snow or ice and sometimes strong winds.

EXTREME HEAT

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING
EXTREME HEAT	0.9	0.9	0.8	0.1	0.3	**3.0**
HIGH RISK HAZARD (3.0 – 4.0)						

HAZARD IDENTIFICATION

Extreme Heat is the number one weather-related killer in the United States, resulting in hundreds of fatalities each year. On average, excessive heat claims more lives each year than floods, lightning, tornadoes and hurricanes combined. While there is no universal definition for extreme heat, NOAA does release the following watch, warning, and advisory products when extremely high temperatures are likely or expected:

- **Excessive Heat Outlook**, issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead time to prepare for the event, such as public utilities, emergency management and public health officials.
- **Excessive Heat Watches,** are issued when the conditions are favorable for an excessive heat event in the next 12 to 48 hours. A Watch is used when the risk of a heat wave has increased, but its occurrence and timing is still uncertain. A watch provides enough lead time so those who need to prepare can do so, such as cities that have excessive heat mitigation plans.
- **Excessive Heat Warnings/Advisories,** are issued when an excessive heat event is expected within the next 36 hours. These products are issued when an excessive heat event is occurring, is imminent, or has a very high probability of occurring. The warning is used for conditions posing a threat to life or property. An advisory is for less serious conditions that cause significant discomfort or inconvenience and, if caution is not taken, could lead to a threat to life and/or property.

In the Mid-Atlantic, summers tend to combine both high temperature and high humidity. Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When the body heats too quickly to cool itself safely, or when too much fluid is lost through dehydration or sweating, the body temperature rises, and heat-related illnesses may develop.

The major human risk associated with extreme heat is heatstroke, heat exhaustion, heat syncope, and heat cramps.

- **Heatstroke**, considered a medical emergency, is often fatal. It occurs when perspiration and the vasomotor, hemodynamic, and adaptive behavior responses to heat stress are insufficient to prevent a substantial rise in core body temperature.

- **Heat Exhaustion** is much less severe than heatstroke. Victims may complain of dizziness, weakness, or fatigue. Body temperature may be normal or slightly or moderately elevated.
- **Heat Syncope.** Usually refers to sudden loss of consciousness.
- **Heat Cramps** occur when people unaccustomed to heat exercise outdoors. The cramps are thought to be due to mild fluid and electrolyte imbalances.

Extreme temperatures can result in elevated utility costs to consumers and also can cause human risks. Extremely high temperatures cause heat stress which can be divided into four categories. Each category is defined by apparent temperature which is associated with a heat index value that captures the combined effects of dry air temperature and relative humidity on humans and animals. Major human risks for these temperatures include heat cramps, heat syncope, heat exhaustion, heatstroke, and death. Note that while the temperatures in “0” serve as a guide for various danger categories, the impacts of high temperatures will vary from person to person based on individual age, health, and other factors.

Figure 2-5 on the following page shows the average maximum temperatures for Maryland and Montgomery County.

Figure 2-6 on page 51 shows the average maximum temperature for Montgomery County only.

Figure2-5

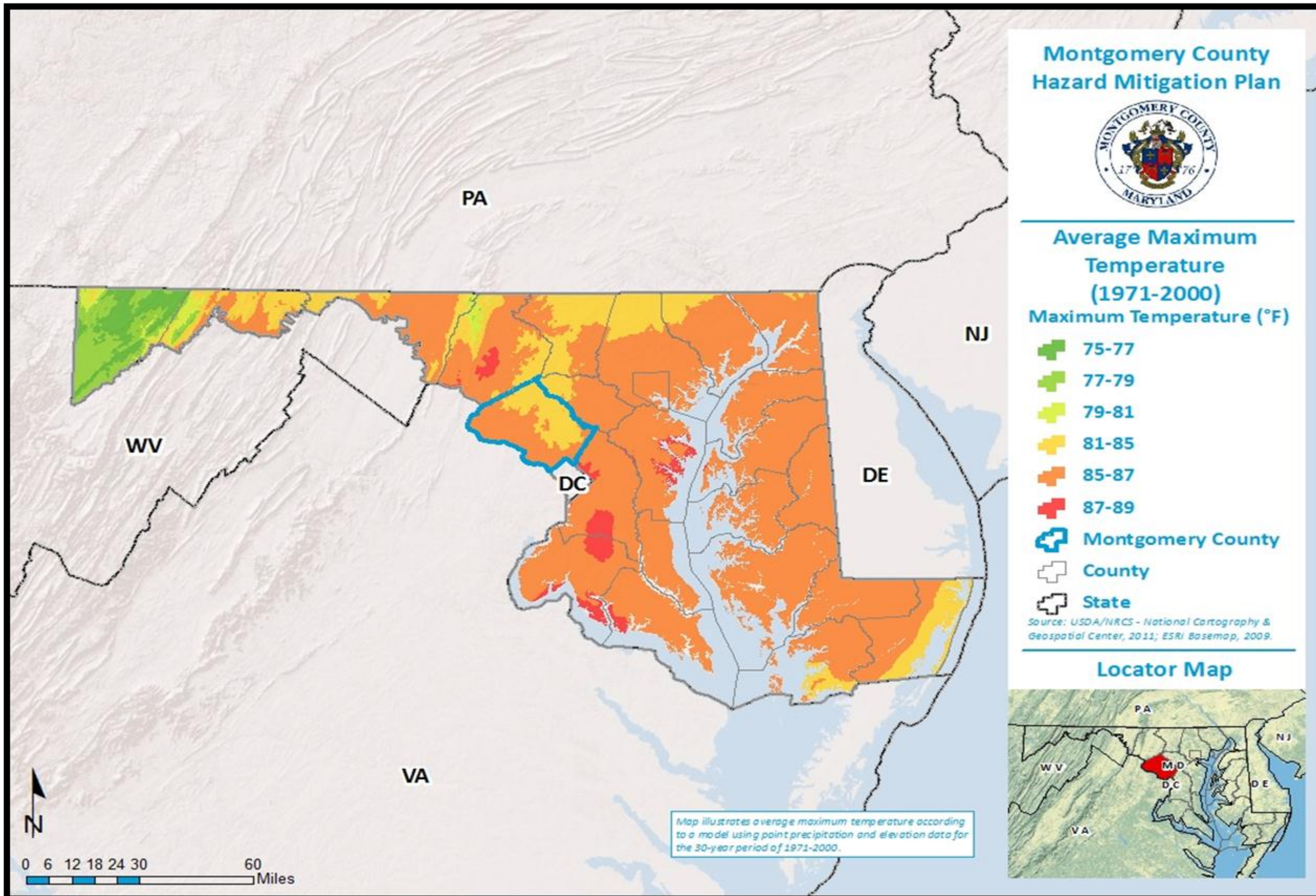
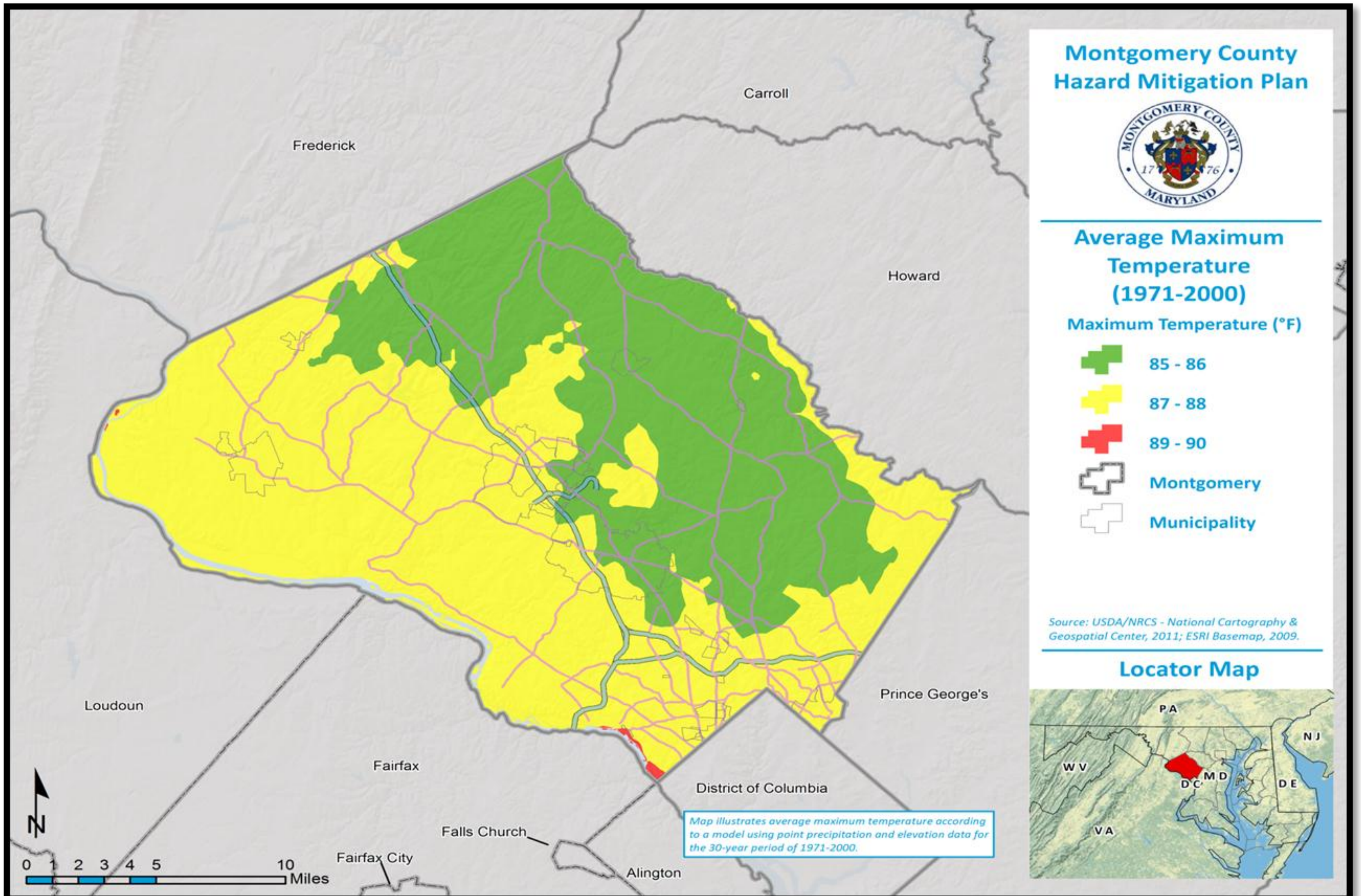

Montgomery County
Hazard Mitigation Plan
Average Maximum
Temperature
(1971-2000)
Maximum Temperature (°F)
75-77
77-79
79-81
81-85
85-87
87-89
Montgomery County
County
State
Source: USDA/NRCS - National Cartography & Geospatial Center, 2011; ESRI Basemap, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
PA
NJ
WV
DC
DE
VA
Map illustrates average maximum temperature according to a model using point precipitation and elevation data for the 30-year period of 1971-2000.
N
0 6 12 18 24 30 60
Miles

Figure 2-6


Montgomery County
Hazard Mitigation Plan
Average Maximum Temperature (1971-2000)
Maximum Temperature (°F)
85 - 86
87 - 88
89 - 90
Montgomery
Municipality
Source: USDA/NRCS - National Cartography & Geospatial Center, 2011; ESRI Basemap, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
Carroll
Frederick
Howard
Loudoun
Prince George's
Fairfax
District of Columbia
Falls Church
Fairfax City
Alington
Map illustrates average maximum temperature according to a model using point precipitation and elevation data for the 30-year period of 1971-2000.
0 1 2 3 4 5 10 Miles
N

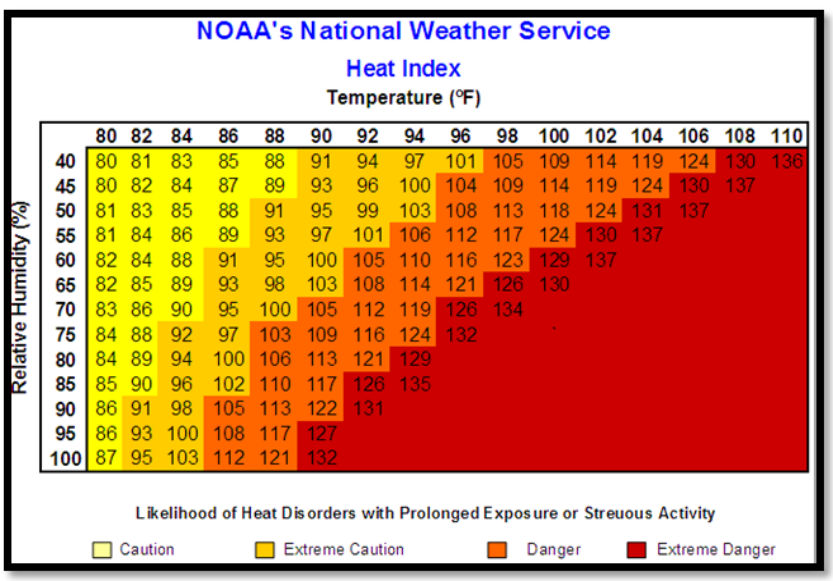
HAZARD PROFILE

Temperature advisories, watches and warnings are issued by the National Weather Service relating the above impacts to the range of temperatures typically experienced in Maryland. Exact thresholds vary across the State including Montgomery County, but in general *Heat Advisories* are issued when the heat index will be equal to or greater than 100°F, but less than 105°F, *Excessive Heat Warning*s are issued when heat indices will attain or exceed 105°F, and *Excessive Heat Watches*, are issued when there is a possibility that excessive heat warning criteria may be experienced within twelve to forty-eight hours (NOAA NWS, 2010).

Table 2-15: Four Categories of Heat Stress (FEMA, 1997).

DANGER CATEGORY	HEAT DISORDERS	APPARENT TEMPERATURE (°F)
I (Caution)	Fatigue possible with prolonged exposure and physical activity.	80 to 90
II (Extreme Caution)	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and physical activity.	90 to 105
III (Danger)	Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible with prolonged exposure and physical activity.	105 to 130
IV (Extreme Danger)	Heatstroke or sunstroke imminent.	>130

Figure 2-7: NOAA's National Weather Service Heat Index



Extreme heat can be associated with severe weather associated with summer storms. For temperature extremes, Montgomery County has experienced only 13 events according to SHELDUS since 1983. A summary is provided in Table 2-16 on the next page.

Table 2-16: Temperature Extremes Since 2005				
NATURAL HAZARD	# OF EVENTS	# OF INJURIES	# OF FATALITIES	RECORDED PROPERTY & CROP DAMAGES
Extreme Heat	13	N/A	13	N/A

Reported high heat events over the past 7 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. The probability of the County and its municipalities experiencing a high heat event can be difficult to quantify, but based on historical record of 13 heat events since 2005, it can reasonably be assumed that this type of event has occurred once every 1.32 years from 1983 through 2012.

[(Current Year) 2012] subtracted by [(Historical Year) 2005] = 7 Years on Record

[(Years on Record) 7] divided by [(Number of Historical Events) 13] = 0.54

Furthermore, the historic frequency calculates that there is a 100% chance of this type of event occurring each year.

The summer of 1999 was characterized by both extreme heat and by drought. According to NCDC, the number of days the temperature was at or above 90 was significantly greater than previous years. From July 4th through the 7th of that year, many residents reported injury and at least one reported fatality occurred in Montgomery County. Excessive heat caused the most damage in Montgomery County on July 17, 1987 with about $2,200 in both crop and property damages according to SHELDUS. In nearby Ellicott City in Howard County, a nearly 1 year old child was left in a car parked in a driveway and died of heat stroke. The most recent heat related death in Montgomery County occurred on June 24th, 2010. According to the Baltimore Sun, the victim had no major health concerns and was not a senior citizen.

INVENTORY ASSETS EXPOSED TO HAZARD

Vulnerability for extreme heat was classified as areas having a maximum average temperature over 85 degrees, according to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) study. This range falls within the upper limits of FEMA's heat stress index, Caution Category 1. Extreme heat does not generally impact buildings; instead, they primarily impact people. Nonetheless, facilities need to be maintained to ensure that they operate in appropriate conditions for people.

POTENTIAL LOSSES

It is evident from past events that extreme heat is dangerous and can cause human related illnesses and death. As temperature goes up so do the number of people hospitalized for heat related illnesses. Therefore it is important to understand how many people are exposed to such conditions, and how many buildings exist, where potential problems could arise should power be lost. Additionally, extreme heat can cause damage to buildings or contents by overheating HVAC or air conditioning systems, contributing to jurisdictional losses. It is unlikely that an entire building would be impacted in an extreme heat event, though.

LAND USE & DEVELOPMENT TRENDS

The elderly just like small children are more susceptible to temperature extremes. Additionally buildings of significant age may be more susceptible to temperature extremes. It is important to identify building stock and special needs populations so that those who have to respond to an emergency will be better prepared.

The Maryland Department of Health and Mental Hygiene developed a Heat Emergency Plan for the state of Maryland in 2011 laying out specific actions and preparation that can help mitigate the impacts of extreme heat. During the summer of 2011, cooling centers were established to provide residents of Rockville refuge from the heat. That same year, sites were set up across the county to distribute fans to residents without sufficient cooling in their homes and who were exposed to extreme heat.

MULTI-JURISDICTIONAL DIFFERENCES

During the summertime the Northern portion of the County has temperatures of 85-86 °F whereas the Southern portion of the County has average temperatures of 87-88 °F. A small part in the Southern portion of the County has average temperatures closer to 89-90°F.

Temperature extremes generally do not impact buildings; instead they primarily impact people. The Center for Disease Control and Prevention (CDC) sites those at greatest risk for temperature (hot and cold)-related illness include infants and children up to four years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. Based on the 2010 Census, Maryland District 7 (the southernmost district in Montgomery County) currently has 23% of its population under the age of 18 and 18% of its population over the age of 65. Montgomery County as a whole currently has 24% of its population under the age of 18 and 12% of its population over the age of 65.

HIRA SUMMARY

Montgomery County is subject to temperature extremes. The affect temperature extremes will have on the County will vary due to population density, age of population, and the age of structures. Nonetheless, facilities need to be maintained to ensure that they operate in appropriate conditions for people. Temporary periods of extreme hot temperatures typically do not have significant environmental impact. However, prolonged periods of hot temperatures may be associated with drought conditions and can damage or destroy vegetation, dry up rivers and streams, and reduce water quality. Those that are most prone to temperature extremes are jurisdictions with the highest populations, buildings, and building costs.

FIRE

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING
FIRE	0.9	0.6	0.4	0.3	0.2	**2.4**
MODERATE RISK HAZARD (2.0 – 2.9)						

HAZARD IDENTIFICATION

Wildfire is an unplanned ignition of vegetation including unauthorized human-caused fires, in a wilderness area. Other names such as brush fire, bushfire, forest fire, grass fire, and vegetation fire, may be used to describe the same phenomenon depending on the type of vegetation being burned. A wildfire differs from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to change direction unexpectedly, and its ability to jump gaps such as roads, rivers and fire breaks.

During a very intense wildfire or “conflagration” a significant movement of air and combustion occurs. Conflagrations occur mostly in a building fire however, in forests or other wilderness areas they are known as a “firestorm”. A firestorm is a conflagration which attains such intensity that it creates and sustains its own wind system which further fuels the fire. Firestorms are most commonly created during some of the largest of bushfires, forest fires, and wildfires.

HAZARD PROFILE

Wildfire hazard is a significant and recurrent threat in Montgomery County and has the potential to harm people, destroy buildings and cause damage to vital infrastructure. Wildfire season in Montgomery County commences in early spring through late fall every year during the hotter, dryer months. Topography, weather, and vegetation provide the ingredients for destructive wildfires that can spread rapidly throughout the county.

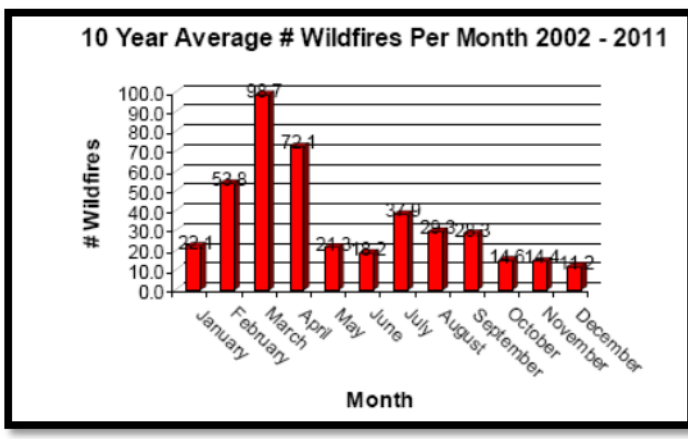


Figure 2-8: Average for Wildfires per Month in the State of Maryland (Source: MD DNR Forest Service 2011)

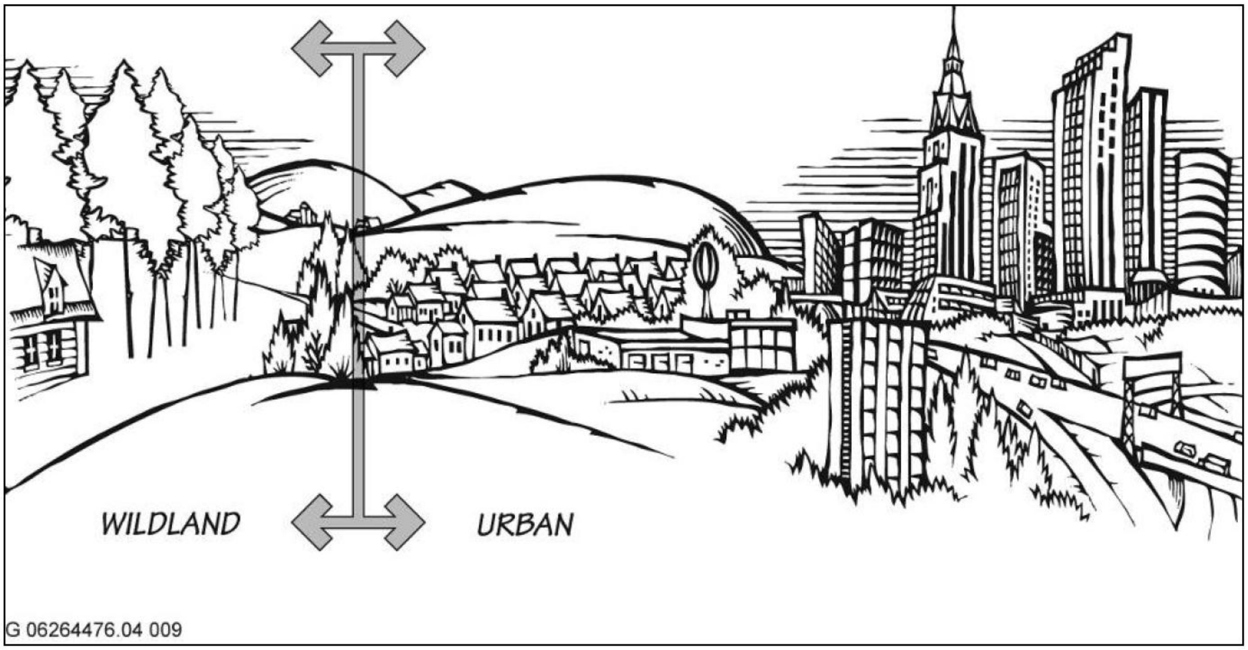


Figure 2-9: Wildland Urban Interface

In Montgomery County, development activities within wildfire hazard areas have exacerbated the problem by placing more development into more rural and vegetated area. In recent years, more and more people have built houses in or near the forest. Over 650 wildfires burn over 3,500 acres every year in Maryland alone. Since humans cause 98% of these fires, a zone has been created where homes intermingle with wildland fuels and the risk of wildland fire ignitions is increased. This zone is called the Wildland-Urban Interface (WUI). The WUI is an area where homes and lives are at high risk of the dangers associated with wildfires. In these areas development has pushed an increasing number of people and buildings at risk as illustrated in Figure 2-9.

The MD DNR Forest Service is mandated by Natural Resources statute §5-701 with the responsibility and mission of forest fire protection on all forest lands within Maryland. Over a ten year period (2001-2011), the Forest Service responded to an average of 421 wildfires a year burning a total of 8,310 acres throughout the state. As indicated Figure 10, the number one cause of wildfire in the State of Maryland over the ten year period has been human caused, with Debris Burning (29%) as number one wildfire cause, followed by Arson (24%).

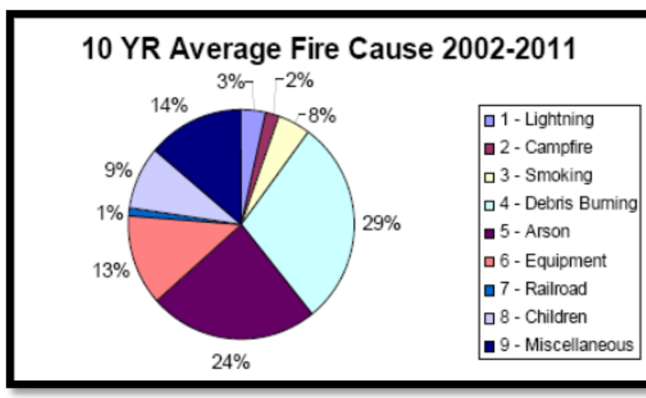


Figure 2-10: Year Average Fire Cause (Source: MD DNR Forest Service 2011)

In Montgomery County, wildfire has been a continuous threat for rural areas with large fuel loads. In the county, a total of 23 wildfires have ignited across the most of the county from 2005-2010. As indicated is the Table 2-17 the majority of fires (32%) are caused by arson. There have been no death or injuries related to fire over the five year reporting period.

Table 2-17: Past Wildfire Occurrences

NO.	YEAR	FIRE NAME	CAUSE	ACRES BURNED
1078	2005	N/A	Debris Burning	4.0
1091	2005	N/A	Smoking	1.0
1687	2006	Needwood Golf Course	Arson	5.0
1689	2006	Lake Needwood Park	Arson	1.0
1793	2006	Snouffer School Road	Arson	3.5
1795	2006	Brown Church Road	Smoking	2.5
1833	2006	N/A	Smoking	0.5
1844	2006	N/A	Miscellaneous, Spontaneous combustion	0.2
1910	2006	N/A	Miscellaneous, Spontaneous Combustion	0.2
1917	2006	N/A	Arson	0.2
1975	2006	Needwood 3	Arson	0.3
1995	2006	N/A	Arson	0.4
2057	2006	N/A	Arson	0.1
2144	2006	N/A	Lightning	0.1
2395	2007	N/A	Railroad	6.0
2422	2007	N/A	Smoking	0.1
2520	2007	N/A	Children	0.1
3037	2008	Indian Spring	Smoking	5.2
3203	2008	N/A	Campfire	0.1
3564	2009	Peach Tree Road	Miscellaneous, Downed power line	8.7
3735	2009	Glendevon	Children	1.1
4062	2010	Barnes Road Fire	Equipment	7.0
	2011	Darnestown Fire	Undetermined	460.0

Throughout Maryland, communities are increasingly concerned about wildfire safety as increased development forested areas and subsequent fire control practices have affected the natural cycle of the ecosystem. As indicated in Figures 2-11 and 2-12, where there is human access to wild-land areas, such as the areas more populated near southern Montgomery County, the risk of fire increases due to a greater chance for human carelessness. Within the County, the area starting near the District of Colombia and extending west and northwest through the center of the county is most prone to wildfire due to its terrain and vegetation.

Figure 2-11

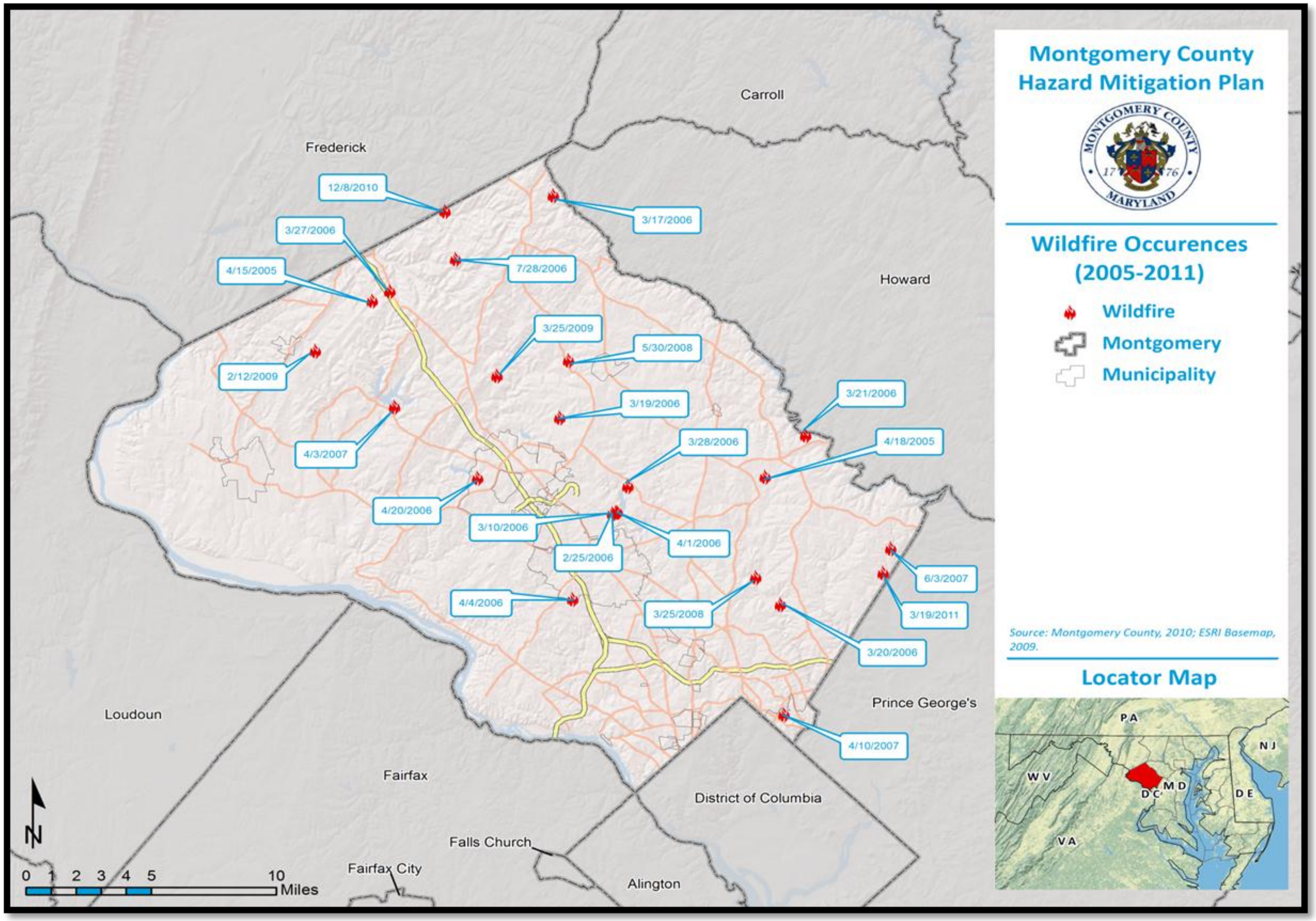
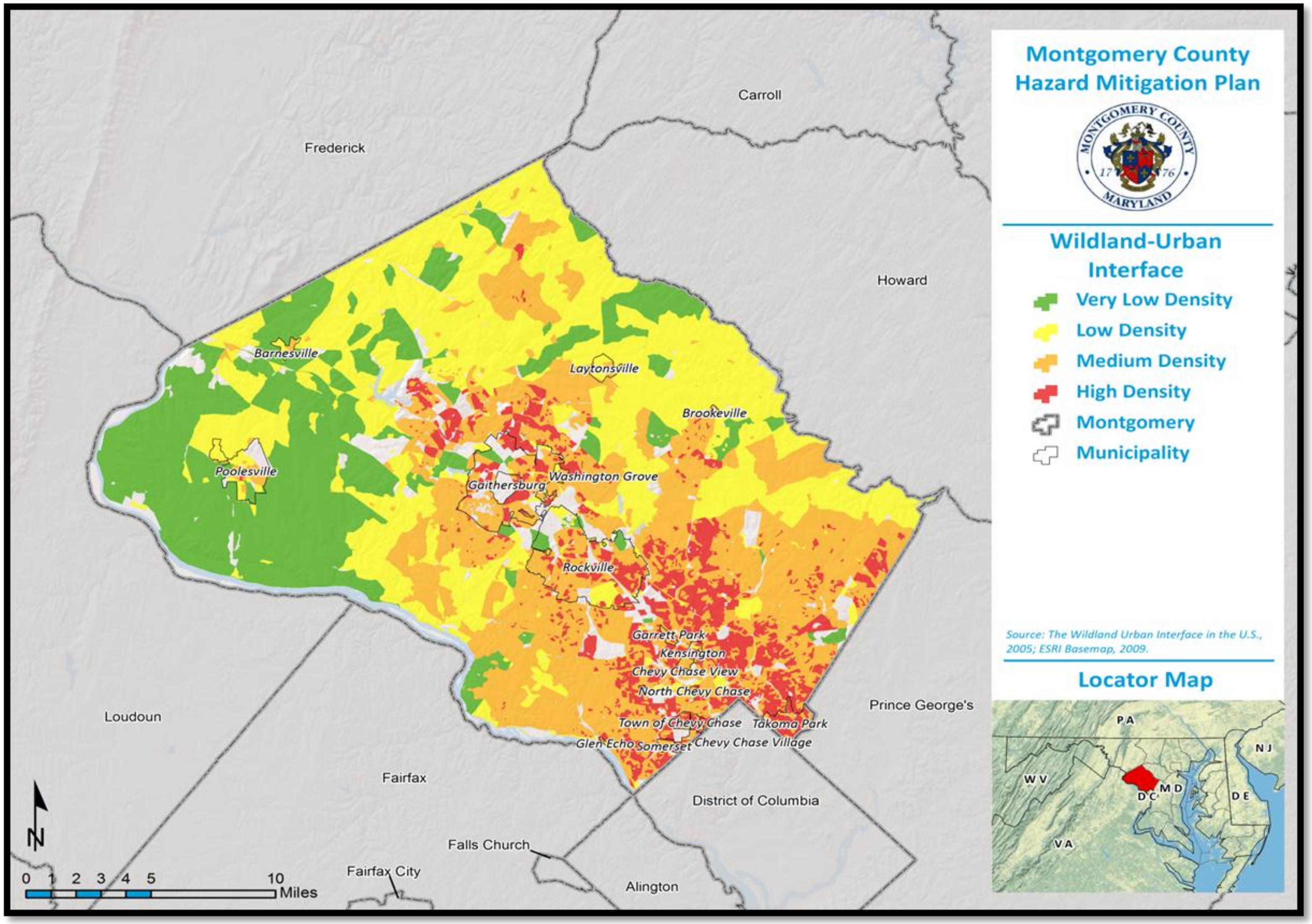

Montgomery County Hazard Mitigation Plan
Wildfire Occurences (2005-2011)
Wildfire
Montgomery
Municipality
Source: Montgomery County, 2010; ESRI Basemap, 2009.
Locator Map
Carroll
Frederick
Howard
Loudoun
Fairfax
Prince George's
District of Columbia
Falls Church
Fairfax City
Alington
12/8/2010
3/17/2006
3/27/2006
7/28/2006
4/15/2005
3/25/2009
5/30/2008
2/12/2009
3/19/2006
3/21/2006
4/3/2007
3/28/2006
4/18/2005
4/20/2006
3/10/2006
4/1/2006
2/25/2006
6/3/2007
4/4/2006
3/25/2008
3/19/2011
3/20/2006
4/10/2007
0 1 2 3 4 5 10 Miles

Figure 2-12


Montgomery County
Hazard Mitigation Plan
Wildland-Urban Interface
Very Low Density
Low Density
Medium Density
High Density
Montgomery
Municipality
Source: The Wildland Urban Interface in the U.S., 2005; ESRI Basemap, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
Carroll
Frederick
Howard
Barnesville
Laytonsville
Brookeville
Poolesville
Gaithersburg
Washington Grove
Rockville
Garrett Park
Kensington
Chevy Chase View
North Chevy Chase
Town of Chevy Chase
Takoma Park
Glen Echo
Somerset
Chevy Chase Village
Prince George's
Loudoun
Fairfax
District of Columbia
Falls Church
Fairfax City
Alington
0 1 2 3 4 5 10
Miles
N

INVENTORY ASSETS EXPOSED AND POTENTIAL LOSSES

Montgomery County has had 0 injuries in relation to forest fires from 1998-2010. Total damage for wildfires from 1998 to 2010 was $3,689. The 2011 State of Maryland Hazard Mitigation Plan indicated that there are approximately 76 critical facilities (State and County) within a high wildfire area for Montgomery County. The total content value that was assessed for those 76 critical facilities was $4,359,053. Information was pulled from the 2011 Maryland State Hazard Mitigation Plan as best available information.

Fires can extensively impact the economy of an affected area. Major direct costs associated with forest fires or wildfires include the salvage and removal of downed timber and debris and the restoration of the burned area. If burned-out woodlands and grasslands are not replanted quickly to prevent widespread soil erosion, then landslides, mudflows, and floods could result, compounding the damage. Generally, there are three major factors that sustain wildfires and predict a given area's potential to burn. These factors are fuel, topography, and weather.

- **Fuel** – Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Also to be considered as a fuel source are manmade structures, such as homes and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Fuel is the only factor that is under human control.
- **Topography** – An area's terrain and land slopes affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes.
- **Weather** – Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed wildfires, creating a situation where fuel will ignite more readily and burn more intensely. Thus, during periods of drought, the threat of wildfire increases. Wind is the most treacherous weather factor. The greater a wind, the faster a fire will spread and the more intense it will be.

Factors contributing to the wildfire risk in Montgomery County include

- Overstocked forests,
- lack of defensible space around structures;
- Excessive vegetation along roadsides and hanging over roads,
- fire engine access, and evacuation routes;
- Drought and overstocked forests;
- Increasing population density leading to more ignitions.

LAND USE AND DEVELOPMENT TRENDS

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 snow and/or a spring and summer with sparse rainfall. Forest fires and 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 properties are developed on wooded land and increased numbers of people use these areas.

MULTI-JURISDICTIONAL DIFFERENCES

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.

HIRA SUMMARY

Wildfires and brush fires in Maryland from 1988 to 2002 have forced school closings, disrupted telephone services by burning fiber optic cables, damaged railroads and other infrastructure, and adversely affected tourism, outdoor recreation, and hunting. The likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response. Weather conditions, particularly drought events, increase the likelihood of wildfires occurring. It is important to note that 98% of wildfires are human-caused. Nonetheless, the critical inference to draw from this statistic is the fact that the occurrence of future wildfire events will strongly depend on patterns of human activity. Events are more likely to occur in wildfire-prone areas experiencing new or additional development.

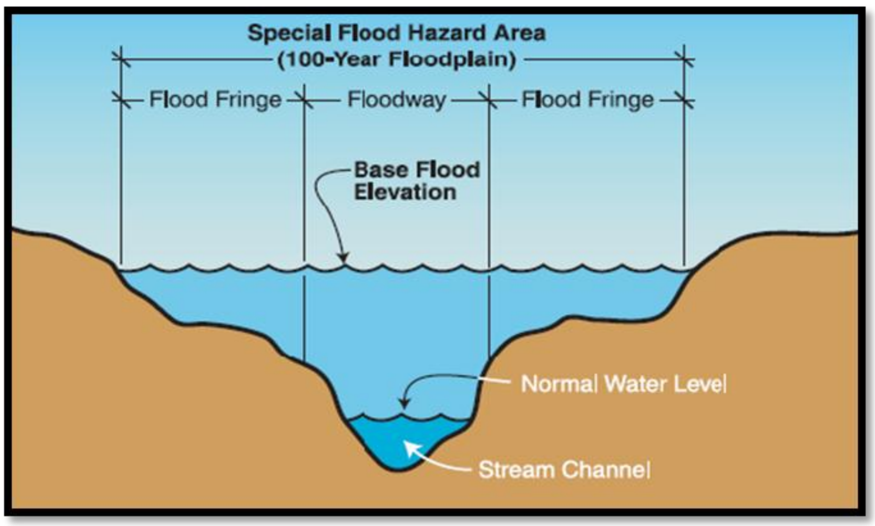
FLOODING

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING
FLOODING	0.9	0.6	0.4	0.3	0.2	**2.4**
MODERATE RISK HAZARD (2.0 – 2.9)						

HAZARD IDENTIFICATION

A flood is a natural event for rivers and streams and occurs when a normally dry area is inundated with water. Excess water from snowmelt or rainfall accumulates and overflows onto the stream banks and adjacent floodplains. As illustrated in figure 2-13 below, floodplains are lowlands, adjacent to rivers, streams and creeks that are subject to recurring floods. Flash floods, usually resulting from heavy rains or rapid snowmelt, can flood areas not typically subject to flooding, including urban areas. Extreme cold temperatures can cause streams and rivers to freeze, causing ice jams and creating flood conditions.

Figure 2-13: Floodplain Terminology



Floods are considered hazards when people and property are affected. Nationwide, hundreds of floods occur each year, making it one of the most common hazards in all 50 states and U.S. territories. In Maryland, flooding occurs commonly and can occur during any season of the year from a variety of sources. Most injuries and deaths from flooding happen when people are swept away by flood currents and most property damage results from inundation by sediment-filled water. Fast-moving water can wash buildings off their foundations and sweep vehicles downstream. Pipelines, bridges, and other infrastructure can be damaged when high water combines with flood debris. Basement flooding can cause extensive damage. Flooding can cause extensive damage to crop lands and bring about the loss of livestock. Several factors determine the severity of floods, including rainfall intensity and duration, topography and ground cover.

Riverine flooding originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Water from snowmelt, rainfall, freezing streams, ice flows, or a combination thereof, causes the river or stream to overflow its banks into adjacent floodplains. Winter flooding usually occurs when ice in the rivers creates dams or streams freeze from the bottom up during extreme cold spells. Spring flooding is usually the direct result of melting winter snow packs, heavy spring rains, or a combination of the two.

Flash floods can occur anywhere when a large volume of water flows or melts over a short time period, usually from slow moving thunderstorms or rapid snowmelt. Because of the localized nature of flash floods, clear definitions of hazard areas do not exist. These types of floods often occur rapidly with significant impacts. Rapidly moving water, only a few inches deep, can lift people off their feet, and only a depth of a foot or two, is needed to sweep cars away. Most flood deaths result from flash floods.

Urban flooding is the result of development and the ground's decreased ability to absorb excess water without adequate drainage systems in place. Typically, this type of flooding occurs when land uses change from fields or woodlands to roads and parking lots. Urbanization can increase runoff two to six times more than natural terrain. (National Oceanic and Atmospheric Administration, 1992) The flooding of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it.

Stream Bank Erosion is measured as the rate of the change in the position or horizontal displacement of a stream bank over a period of time. It is generally associated with riverine flooding and discharge, and may be exacerbated by human activities such as bank hardening and dredging.

Ice Jams are stationary accumulations of ice that restrict flow. Ice jams can cause considerable increases in upstream water levels, while at the same time, downstream water levels may drop. Types of ice jams include freeze up jams, breakup jams, or combinations of both. When an ice jam releases, the effects downstream can be similar to that of a flash flood or dam failure. Ice jam flooding generally occurs in the late winter or spring.

Montgomery County and its 19 political subdivisions, which consist of cities, towns, and villages, continue to work together to enforce the local floodplain management ordinance requirements set forth by the National Flood Insurance Program (NFIP). See Table 2-18, on the next page, which outlines the NFIP status for the 19 jurisdictions.

Table 2-18: FEMA Community Status in the NFIP				
CID	**COMMUNITY NAME**	**STATUS**	**INITIAL FIRM IDENTIFIED**	**CURRENT EFFECTIVE MAP DATE**
240049#	Montgomery County (Unincorporated)	Participating	7/02/79	9/29/06
240094#	Barnesville	Participating	8/10/79	9/29/06 (M)*
240166#	Brookeville	Participating	6/19/89	9/29/06
240122#	Chevy Chase – NSFHA, all Zone X	Participating	9/29/06	9/29/06
240132#	Chevy Chase View - NSFHA, all Zone X	Participating	9/29/06	NSFHA
240047#	Chevy Chase Village – NSFHA, all Zone X	Participating	9/29/06	9/29/06
240136#	Chevy Chase Village Section 3**	Sanctioned - 9/29/07	09/29/06	NSFHA
240137#	Chevy Chase Village Section 5	Participating	9/29/06	NSFHA
240128#	Friendship Heights ***	Non-Participating	9/29/06	9/29/06
540050#	Gaithersburg	Participating	12/01/82	9/29/06
240150#	Garrett Park	Participating	9/29/06	9/29/06
240142#	Glen Echo	Participating	9/29/06	9/29/06
240119#	Kensington – "All Zone C and X no SFHA"	Participating	9/29/06	9/29/06
240055#	Laytonsville	Sanctioned – 9/29/07	9/29/06	9/29/06
240113#	Martin's Addition	Participating	9/29/06	9/29/06
240129#	North Chevy Chase	Sanctioned – 9/29/07	9/29/06	9/29/06
240118#	Poolesville	Participating	10/15/82	9/29/06
240051#	Rockville	Participating	1/05/78	9/29/06
240134#	Somerset	Participating	9/29/06	9/29/06
240126#	Takoma Park	Participating	9/29/06	9/29/06
240135#	Washington Grove	Participating	9/29/06	9/29/06

HAZARD PROFILE

The severity of flooding in Montgomery County is determined by a number of local factors, including river basin topography , precipitation patterns, recent soil moisture conditions, and groundcover/vegetative state. Montgomery County and its municipalities have many streams and small tributaries that are highly susceptible to flooding. The County is bounded by the Potomac River along the southwest. There are 22 watersheds in the County and each of area is subject to flash flooding. The Tridelphia and T. Howard Duckett reservoirs on the Patuxent River bound Montgomery County to the north. The properties in and near the identified floodplains of Montgomery County are subject to flooding events on an almost annual basis. Floodplain management, flood control structures, hazard mitigation, and flood relief funds are strategies that have reduced Montgomery County's annual flood damages.

Large floods have occurred along the major streams in the basin during all seasons of the year. However, the most devastating floods have occurred between the months of March and June. The maximum flood of record occurred along the Potomac River in March 1936. Along small tributaries, flood stages can rise from normal flow to extreme flood peaks, with accompanying high velocities, in a relatively short period. Along the Potomac River, floods rise to their crest over a longer period and remain out of banks for a more extended length of time.

Considering the available records of all known floods in the basin, it is probable that the five (5) largest floods in Montgomery County occurred in 1936, 1937, 1942, 1972, and 1996. Historical Crests for the five largest floods of record for the Potomac River at Little Falls are shown below.

Table 2-19: Discharge Values for Largest Floods along the Potomac River at Little Falls, Montgomery County

DATE OF CREST	FEET	ESTIMATED PEAK DISCHARGE (CFS)
03/19/1936	28.10	n/a
10/17/1942	26.88	n/a
04/28/1937	23.30	n/a
06/24/1972	22.03	n/a
01/21/1996	19.29	n/a

Information on historical floods in Montgomery County along the main stem of the Potomac River and was obtained from stream gauging stations maintained by the USGS at several locations within the drainage basin.

Table 2-20: Flood Categories for Potomac River near Little Falls (USGS)

FLOOD CATEGORIES	FEET
MAJOR FLOOD STAGE	14'
MODERATE FLOOD STAGE	12'
FLOOD STAGE	10'
ACTION STAGE	5'

According to the National Climatic Data Center as well as the University of South Carolina's Hazards and Vulnerability Research Institute (SHELDUS), Montgomery County has been impacted by 74 flood events since 1964.

Table 2-21: Flood Events affecting Montgomery County

Location	Date	Type	Death	Injury	Property Damage	Agricultural Damage
Montgomery	1964-2012	Flood	0	0	$9.6 Million	$956,650

County						
		TOTAL:	**0**	**0**	**$9.6 Million**	**$956,650**

Reported flood events over the past 48 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. The probability of the County and its municipalities experiencing a flood event can be difficult to quantify, but based on historical record of 74 flood events since 1964, it can reasonably be assumed that this type of event has occurred once every 0.65 years from 1964 through 2012.

[(Current Year) 2012] subtracted by [(Historical Year) 1964] = 48 Years on Record

[(Years on Record) 48] divided by [(Number of Historical Events) 74] = 0.65

Furthermore, the historic frequency calculates that there is a 100% chance of this type of event occurring each year.

Figure 2-14

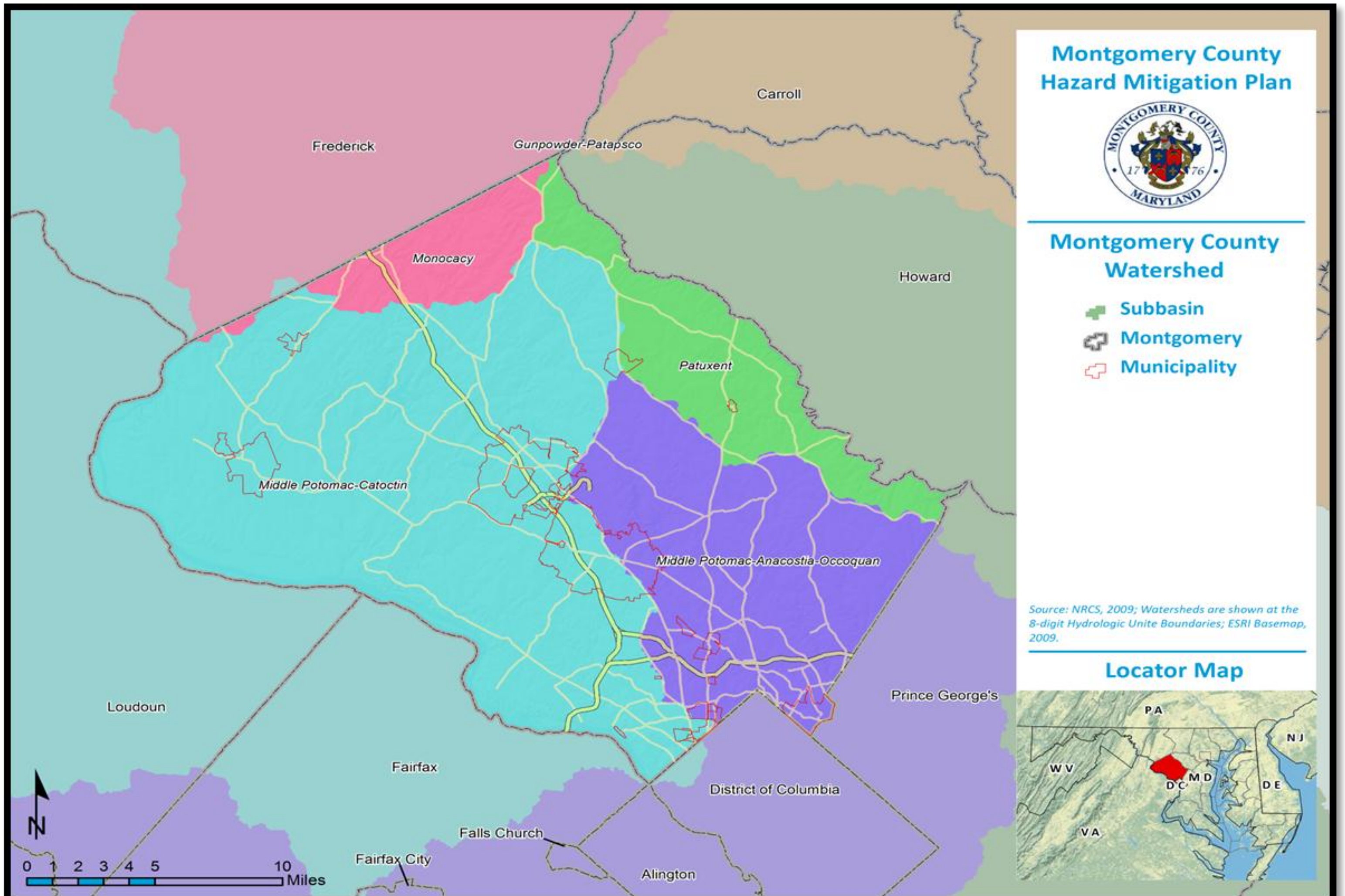

Montgomery County
Hazard Mitigation Plan
Montgomery County
Watershed
Subbasin
Montgomery
Municipality
Source: NRCS, 2009; Watersheds are shown at the 8-digit Hydrologic Unite Boundaries; ESRI Basemap, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
Carroll
Frederick
Gunpowder-Patapsco
Howard
Monocacy
Patuxent
Middle Potomac-Catoctin
Middle Potomac-Anacostia-Occoquan
Loudoun
Fairfax
Prince George's
District of Columbia
Falls Church
Fairfax City
Alington
N
0 1 2 3 4 5 10 Miles

Figure 2-15

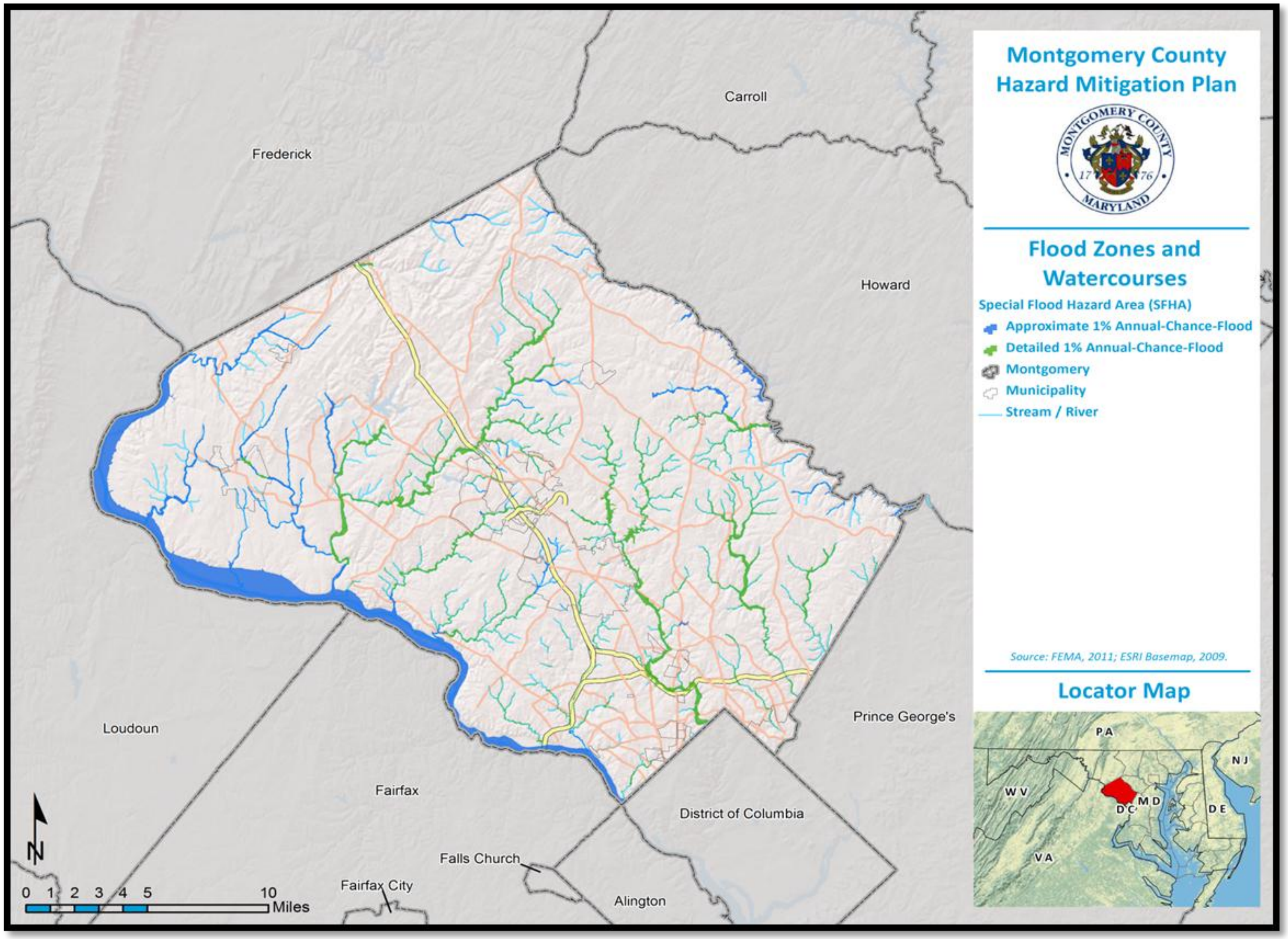
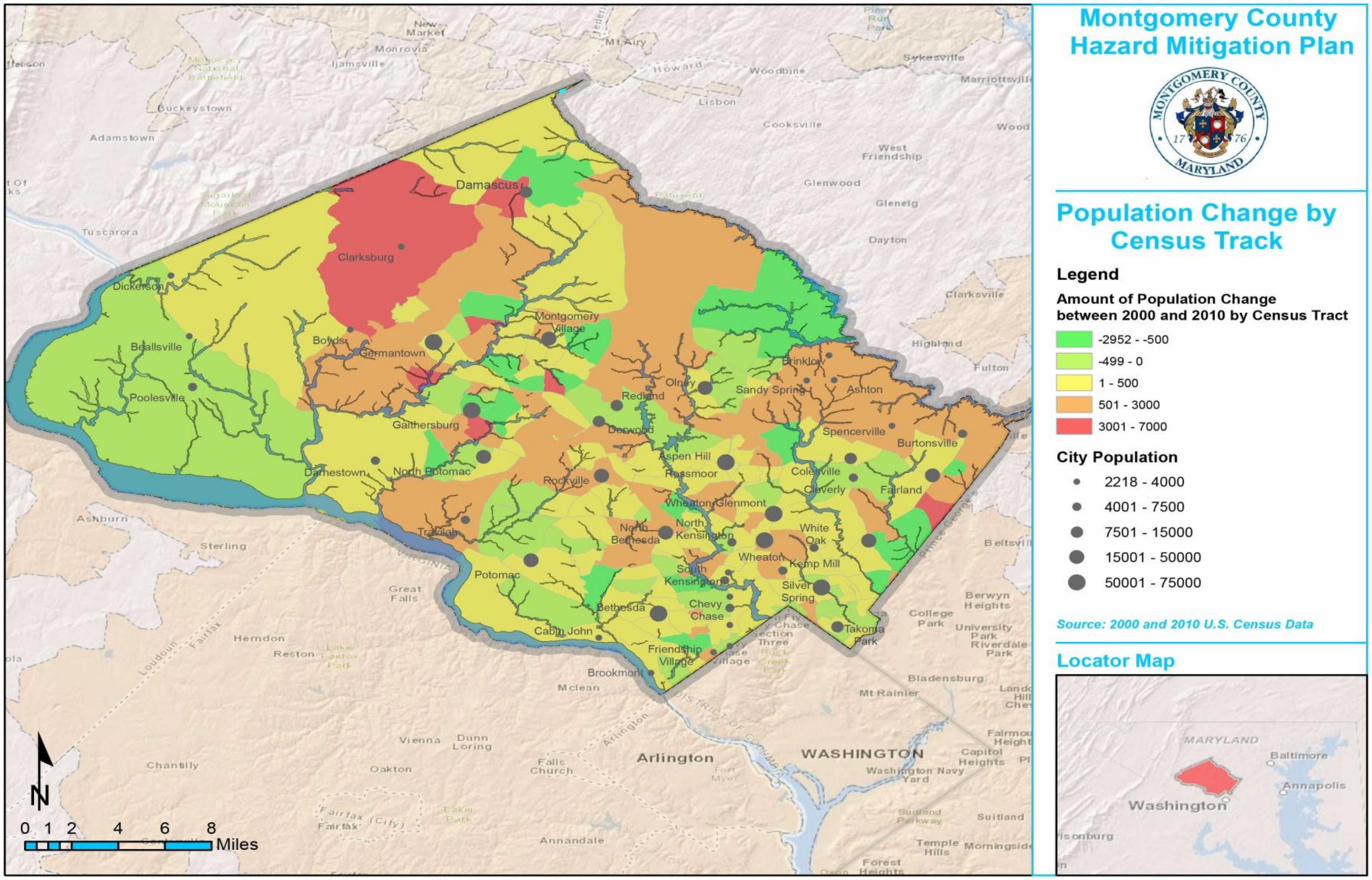

Montgomery County
Hazard Mitigation Plan
Flood Zones and Watercourses
Special Flood Hazard Area (SFHA)
Approximate 1% Annual-Chance-Flood
Detailed 1% Annual-Chance-Flood
Montgomery
Municipality
Stream / River
Source: FEMA, 2011; ESRI Basemap, 2009.
Locator Map
Carroll
Frederick
Howard
Prince George's
Loudoun
Fairfax
District of Columbia
Falls Church
Fairfax City
Alington
0 1 2 3 4 5 10 Miles
N

Figure 2-16 (100 Year Floodplain overlaid on the Census growth map)



INVENTORY ASSETS EXPOSED TO FLOODING (FOR THE WHOLE OF MONTGOMERY COUNTY)

The method used in determining the types and numbers of potential assets exposed to flooding was conducted using a loss estimation model called Hazus-MH. Hazus-MH is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Buildings Sciences (NIBS). For this Plan update, a 100-year flood scenario was modeled and the results are presented below.

HAZUS-MH 100-YEAR FLOOD SCENARIO

Hazus estimates that approximately 1,797 buildings will be at least moderately damaged which is over 25% of the total number of buildings in the scenario. There are an estimated 140 buildings that will be completely destroyed. The tables below summarize the expected damage by general occupancy for the buildings and the expected building damage by building type in the study region.

Table 2-22: Expected Building Damage by Occupancy (Hazus Flood Scenario)

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00
Commercial	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	53	2.95	547	30.49	318	17.73	736	41.03	140	7.80
Total	0		55		547		318		737		140	

Table 2-23: Expected Building Damage by Building Type (Hazus Flood Scenario)

	1-10		11-20		21-30		31-40		41-50		Substantially	
Building Type	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	11	100.00
Masonry	0	0.00	16	3.31	151	31.26	77	15.94	206	42.65	33	6.83
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	37	2.86	395	30.53	241	18.62	525	40.57	96	7.42

The scenario reports that one critical facility in the study region will experience a moderate damage by a 100-year flood event. Critical facilities are essential to the health and welfare of the whole population and are especially important following hazard events. Hazus indicates that there are approximately 397 critical facilities that are flood-prone. Please note that Hazus refers to these buildings as “essential” and the County refers to these as “critical.” Also, what the County defines as critical may also differ from what Hazus refers to as essential facilities. Please refer to the map on the next page to see the location of County deemed critical facilities.

Table 2-24: Hazus Determined Critical Facilities that are Floodprone		
CRITICAL FACILITIES	# OF FLOODPRONE STRUCTURES	LOSS OF USE
FIRE	20	2*
POLICE	20	0
HOSPITALS	11	0
SCHOOLS	346	0
TOTAL STRUCTURES	**397**	**2**

*Includes the Gaithersburg Washington Grove Volunteer Fire Department and the fire protection facilities on the National Institute of standards and Technology Campus.

[DEBRIS GENERATION]

Hazus estimates the amount of debris that will be generated by the 100-year flood. The model breaks the debris into three general categories: a) Finishes (dry wall, insulation), b) Structural (wood, brick), and c) Foundations (concrete, slab, block, rebar). This distinction is made because of the different types of materials handling equipment required to handle the debris.

The model estimates that a total of 31,306 tons of debris will be generated due to the flood. Of the total amount, finishes comprises 48% of the total, structural comprises of 28% of the total, with the remainder being foundations. If the building tonnage is converted to an estimated number of truckloads, it will require 1,252 truckloads (@25 tons/truck) to remove the debris generated by the flood.

[DISPLACEMENT AND SHELTER REQUIREMENTS]

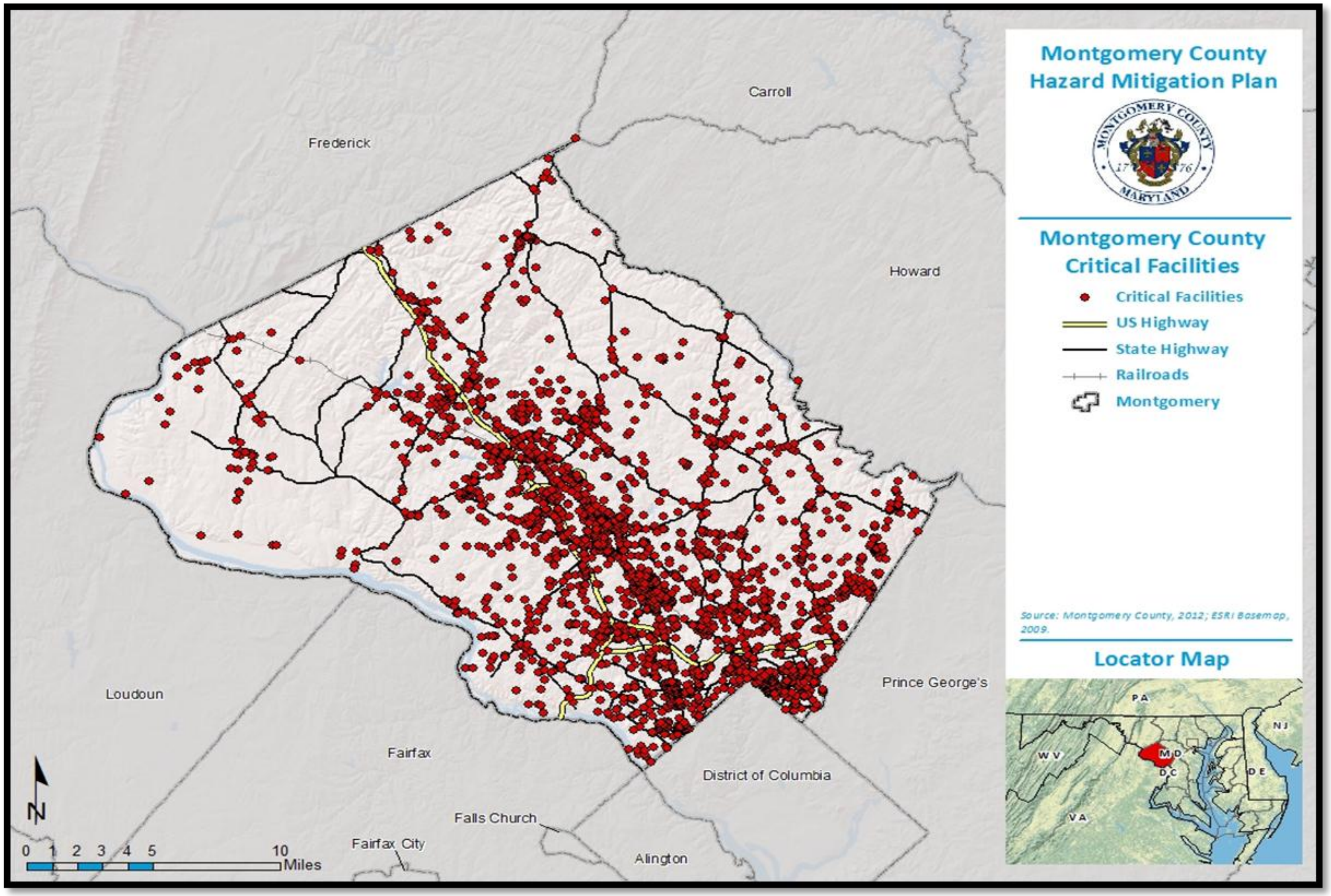
Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 2,555 households to be displaced due to the flood. Of these, 6,577 persons will seek temporary shelter in public shelters.

Critical facilities are essential to the health and welfare of the whole population and are especially important following hazard events. The following figure illustrates critical facilities located in the flood hazard areas followed by a table providing further data.

POTENTIAL LOSSES FROM FLOODING

Because not all datasets for the 2010 census have been published, census 2000 data indicates that Montgomery County has nearly 272,584 buildings with a total replacement value (excluding contents) of $73.5 billion (2006 dollars). Though the majority of this property is not in the floodplain, a significant amount is. All assets are considered at risk from flooding; however, losses may vary widely depending on the type and factors contributing to the flood. To examine the potential losses from a flood, Montgomery County modeled a 100-year flood in Montgomery County using FEMA's loss estimation tool: Hazus-MH.

Figure 2-16


Montgomery County
Hazard Mitigation Plan
Montgomery County
Critical Facilities
Critical Facilities
US Highway
State Highway
Railroads
Montgomery
Source: Montgomery County, 2012; ESRI Basemap, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
Carroll
Frederick
Howard
Prince George's
Loudoun
Fairfax
District of Columbia
Falls Church
Fairfax City
Arlington
N
0 1 2 3 4 5 10
Miles

HAZUS-MH 100-YEAR FLOOD SCENARIO

The total economic loss estimated for the flood is $454 million, which represents 6.38% of the total replacement value of the scenario buildings. The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with the inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were $453 million. $1.05 Million of the estimated losses were related to the business interruption of the region. The residential occupancies made up 78% of the total loss. The table below provides a summary of the losses associated with the building damage.

Table 2-25: Building-Related Economic Loss Estimates (Hazus Flood Scenario)

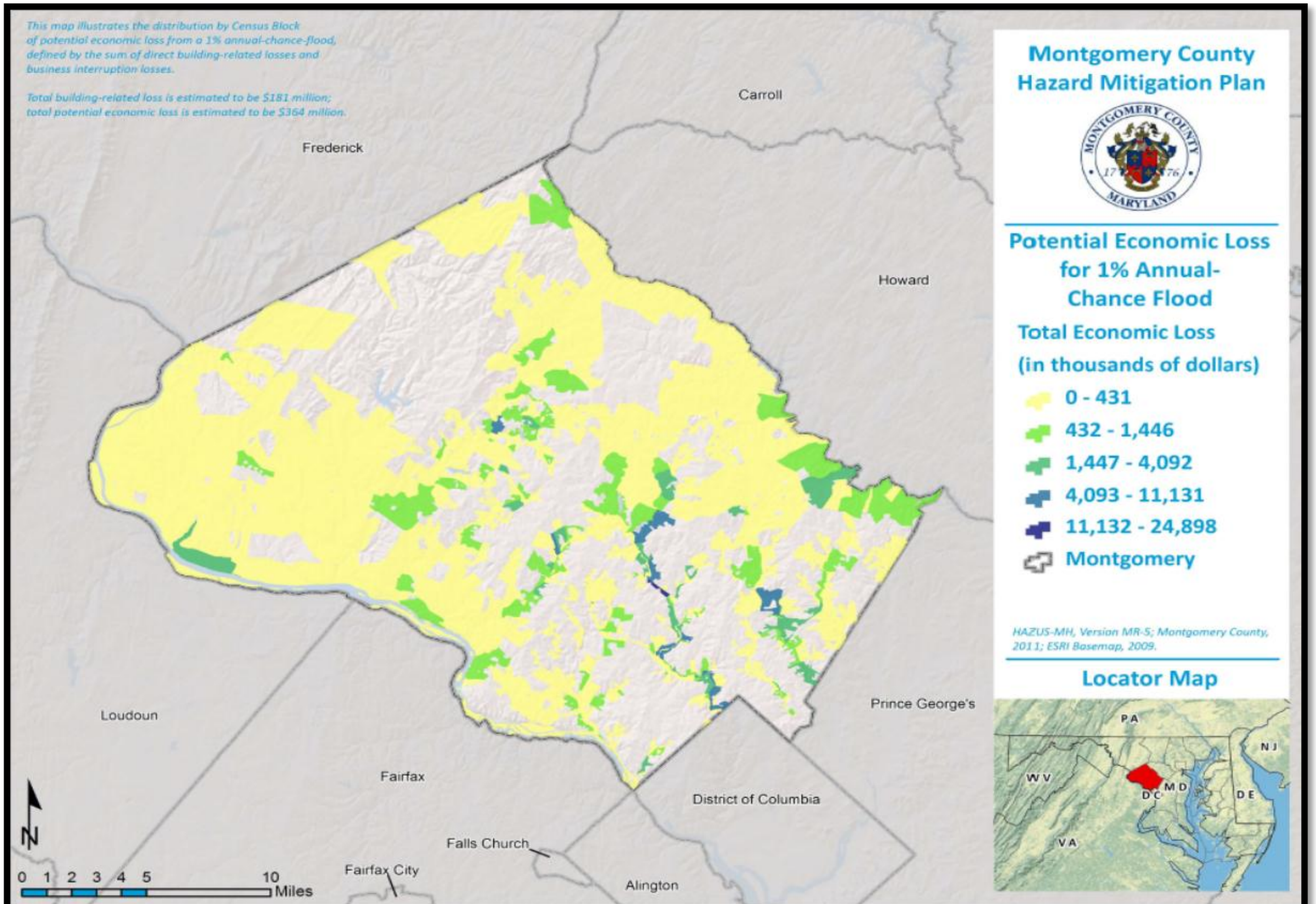
(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	221.88	20.77	3.60	3.51	249.76
	Content	135.57	45.65	6.36	14.18	201.76
	Inventory	0.00	0.74	1.04	0.46	2.24
	Subtotal	**357.45**	**67.15**	**11.00**	**18.16**	**453.76**
Business Interruption						
	Income	0.00	0.16	0.00	0.01	0.17
	Relocation	0.36	0.02	0.00	0.00	0.38
	Rental Income	0.07	0.01	0.00	0.00	0.08
	Wage	0.01	0.12	0.00	0.25	0.38
	Subtotal	**0.44**	**0.30**	**0.00**	**0.27**	**1.01**
ALL	**Total**	**357.89**	**67.46**	**11.00**	**18.42**	**454.77**

The map on the next page depicts where Hazus estimated most loss would occur throughout Montgomery County.

The number and value of structures within the 100 year floodplain is considerable, as shown by the Table 2-25 above. A flooding event could occur in a highly developed area such as Gaithersburg, Rockville, and Takoma Park and cause substantial infrastructure damage resulting in high dollar losses. While flooding could certainly affect many facilities in the county, including critical facilities, it is safe to say that few critical facilities in the county are directly located in floodplains. Many first responder agencies throughout the County are located in the floodplain. Additionally, many measures have been taken to lessen the probability of flooding in the municipal areas, which is where many of the county's critical facilities are located. Many residential structures may be affected by flooding outside of the municipalities. However, with the exception of repetitive loss properties these structures are not directly located in floodplains either.

Figure 2-17


This map illustrates the distribution by Census Block
of potential economic loss from a 1% annual-chance-flood,
defined by the sum of direct building-related losses and
business interruption losses.
Total building-related loss is estimated to be $181 million;
total potential economic loss is estimated to be $364 million.
Frederick
Carroll
Howard
Prince George's
Loudoun
Fairfax
District of Columbia
Falls Church
Fairfax City
Alington
N
0 1 2 3 4 5 10
Miles
Montgomery County
Hazard Mitigation Plan
MONTGOMERY COUNTY
MARYLAND
Potential Economic Loss
for 1% Annual-
Chance Flood
Total Economic Loss
(in thousands of dollars)
0 - 431
432 - 1,446
1,447 - 4,092
4,093 - 11,131
11,132 - 24,898
Montgomery
HAZUS-MH, Version MR-5; Montgomery County, 2011; ESRI Basemap, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA

Repetitive loss properties are those for which two or more losses of at least $1,000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978. Tables 2-26 and 2-27 detail the known repetitive loss properties in Montgomery County by location, number of losses, and structure type. As of 2013, there are 40 repetitive loss properties located in Montgomery County. All repetitive loss properties in Montgomery County are located in Unincorporated Areas. The map in Figure 2-18 shows the location of these repetitive loss properties.

Figure 2-18

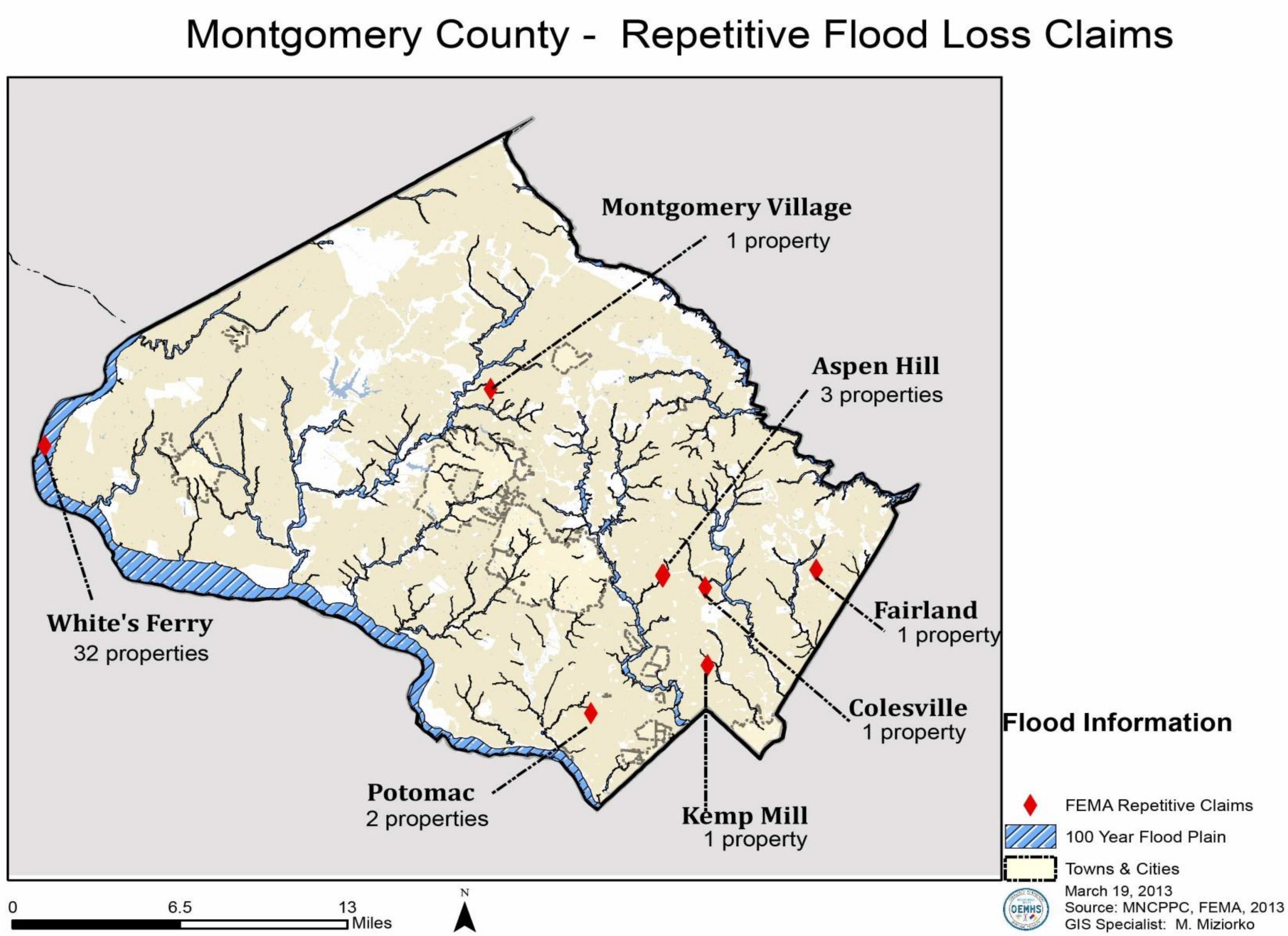

Montgomery County - Repetitive Flood Loss Claims
Montgomery Village
1 property
Aspen Hill
3 properties
White's Ferry
32 properties
Fairland
1 property
Colesville
1 property
Potomac
2 properties
Kemp Mill
1 property
Flood Information
FEMA Repetitive Claims
100 Year Flood Plain
Towns & Cities
March 19, 2013
Source: MNCPPC, FEMA, 2013
GIS Specialist: M. Miziorko
OEMHS
0
6.5
13
Miles
N

Table 2-26: Repetitive Flood Claim Properties in Montgomery County				
LOCATION	# PROPERTIES	CLAIMS	TYPE	NFIP INSURED
Montgomery County	31	63	Single Family	20
Montgomery County	6	19	Non-Residential	2
Montgomery County	4	10	Multi-Family (Condo)	3
TOTALS	**41**	**92**	**N/A**	**25**

Table 2-27: NFIP Policies Per Jurisdiction			
LOCATION	# POLICIES	# CLAIMS	Total Coverage
Brookeville, Town of	1	0	$350,000
Chevy Chase Section V, Village of	2	0	$378,000
Chevy Chase Section III, Village of	2	0	$490,000
Chevy Chase View, Town of	4	0	$756,000
Chevy Chase Village, Town of	8	0	$2,303,000
Chevy Chase, Town of	15	1	$3,762,000
Gaithersburg, City of	55	8	$14,304,200
Garrett Park, Town of	5	0	$1,428,000
Glen Echo, Town of	1	0	$350,000
Kensington, Town of	5	1	$1,442,000
Martin's Addition, Town of	2	0	$700,000
Montgomery County	2,136	417	$513,814,200
Poolesville, Town of	8	0	$2,345,000
Rockville, City of	151	18	$38,798,200
Somerset, Town of	11	1	$2,783,500
Takoma Park, City of	19	1	$3,017,000
Washington Grove, Town of	1	0	$28,000
TOTALS	**2,426**	**447**	**$587,049,100**

INVENTORY ASSETS EXPOSED TO FLOODING (FOR THE CITY OF ROCKVILLE)

The method used in determining the types and numbers of potential assets exposed to flooding was conducted using a loss estimation model called Hazus-MH. Hazus-MH is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Buildings Sciences (NIBS). For this Plan update, a 100-year flood scenario was modeled and the results are presented below.

HAZUS-MH 100-YEAR FLOOD SCENARIO

Hazus estimates that approximately 0 buildings will be at least moderately damaged which is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The tables below summarize the expected damage by general occupancy for the buildings and the expected building damage by building type in the study region.

Table 2-28: Expected Building Damage by Occupancy (Hazus Flood Scenario)

Occupancy	1-10 Count	1-10 (%)	11-20 Count	11-20 (%)	21-30 Count	21-30 (%)	31-40 Count	31-40 (%)	41-50 Count	41-50 (%)	Substantially Count	Substantially (%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

Table 2-29: Expected Building Damage by Building Type (Hazus Flood Scenario)

Building Type	1-10 Count	1-10 (%)	11-20 Count	11-20 (%)	21-30 Count	21-30 (%)	31-40 Count	31-40 (%)	41-50 Count	41-50 (%)	Substantially Count	Substantially (%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

The scenario reports that zero critical facilities in the study region will experience a moderate damage by a 100-year flood event. Critical facilities are essential to the health and welfare of the whole population and are especially important following hazard events. Hazus indicates that there are approximately 35 critical facilities that are floodprone. Please note that Hazus refers to these buildings as “essential” and the County refers to these as “critical.” Also, what the County defines as critical may also differ from what Hazus refers to as essential facilities.

Table 2-30: Hazus Determined Critical Facilities that are Floodprone (Rockville)

CRITICAL FACILITIES	# OF FLOODPRONE STRUCTURES	LOSS OF USE
FIRE	2	0
POLICE	6	0
HOSPITALS	0	0
SCHOOLS	27	0
TOTAL STRUCTURES	**35**	**0**

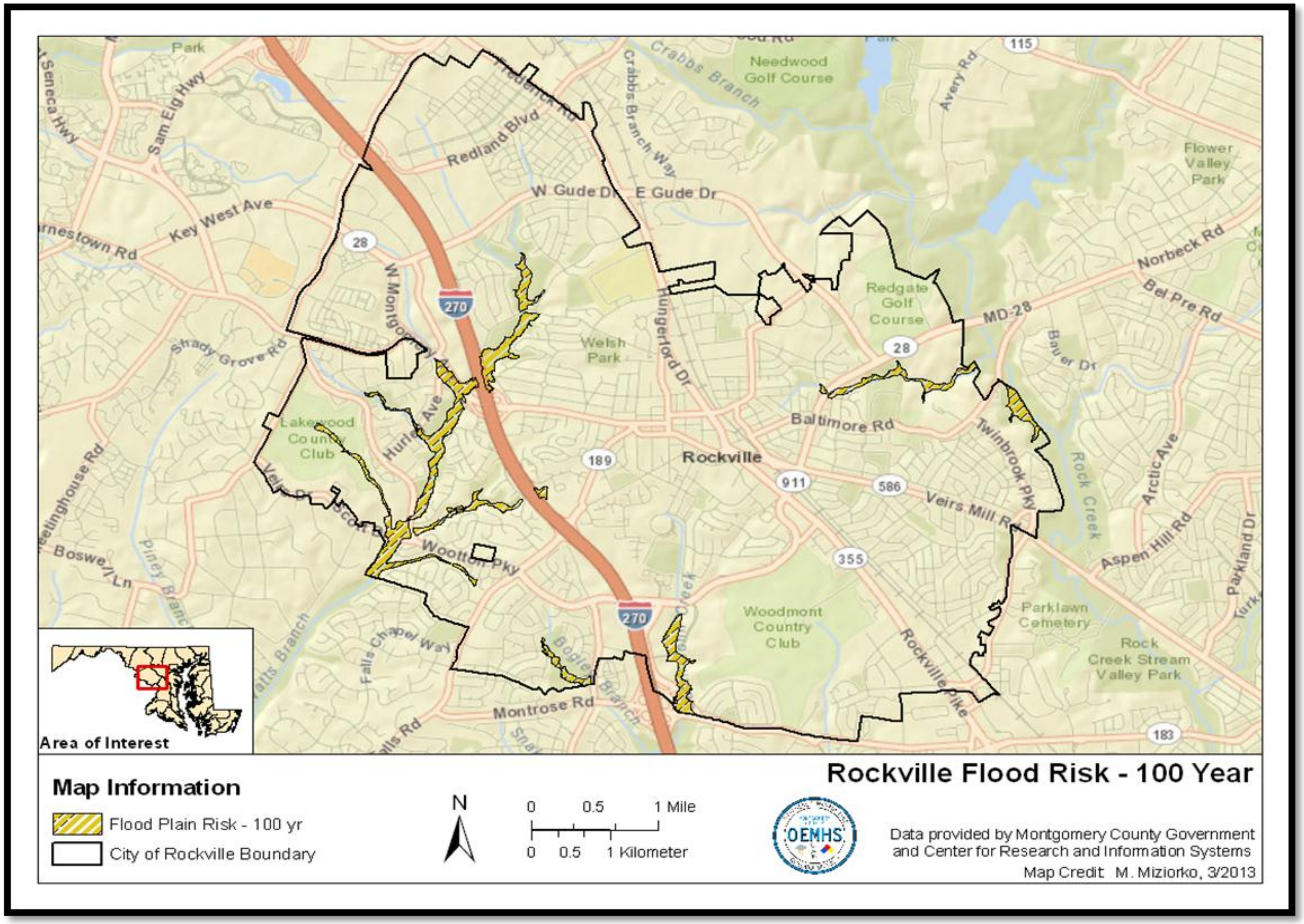
[DISPLACEMENT AND SHELTER REQUIREMENTS]

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the flood. Of these, 0 persons will seek temporary shelter in public shelters.

Critical facilities are essential to the health and welfare of the whole population and are especially important following hazard events. The following figure illustrates critical facilities located in the flood hazard areas followed by a table providing further data.

The map on the following page shows the City of Rockville with an overlaid 100-year floodplain.

Figure 2-19


Rockville Flood Risk - 100 Year
Map Information
Flood Plain Risk - 100 yr
City of Rockville Boundary
Area of Interest
N
0 0.5 1 Mile
0 0.5 1 Kilometer
OEMHS
Data provided by Montgomery County Government and Center for Research and Information Systems
Map Credit: M. Miziorko, 3/2013
Rockville
Needwood Golf Course
Redgate Golf Course
Welsh Park
Lakewood Country Club
Woodmont Country Club
Flower Valley Park
Parklawn Cemetery
Rock Creek Stream Valley Park
Redland Blvd
W Gude Dr
E Gude Dr
Key West Ave
Shady Grove Rd
Hungerford Dr
Baltimore Rd
Veirs Mill Rd
Twinbrook Pky
Norbeck Rd
Bel Pre Rd
MD-28
Montrose Rd
Wootton Pky
Falls Chapel Way
Aspen Hill Rd
Arctic Ave
Rockville Pike
Sam Eig Hwy
Crabbs Branch Way
Rock Creek

HAZUS-MH 100-YEAR FLOOD SCENARIO

The total economic loss estimated for the flood is $0.27 million, which represents 7.02% of the total replacement value of the scenario buildings. The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with the inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were $0.27 million. $0 Million of the estimated losses were related to the business interruption of the region. The residential occupancies made up 0% of the total loss. The table below provides a summary of the losses associated with the building damage.

Table 2-31: Building-Related Economic Loss Estimates (Hazus Flood Scenario)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.00	0.02	0.04	0.00	0.06
	Content	0.00	0.09	0.11	0.00	0.20
	Inventory	0.00	0.00	0.01	0.00	0.01
	Subtotal	**0.00**	**0.12**	**0.15**	**0.00**	**0.27**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.00**	**0.12**	**0.15**	**0.00**	**0.27**

INVENTORY ASSETS EXPOSED TO FLOODING (FOR UNINCORPORATED MONTGOMERY COUNTY – WHITE'S FERRY AREA)

The method used in determining the types and numbers of potential assets exposed to flooding was conducted using a loss estimation model called Hazus-MH. Hazus-MH is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Buildings Sciences (NIBS). For this Plan update, a 100-year flood scenario was modeled and the results are presented below.

HAZUS-MH 100-YEAR FLOOD SCENARIO

Hazus estimates that approximately 2 buildings will be at least moderately damaged which is over 50% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The tables below summarize the expected damage by general occupancy for the buildings and the expected building damage by building type in the study region.

Table 2-32: Expected Building Damage by Occupancy (Hazus Flood Scenario)

Occupancy	1-10 Count	(%)	11-20 Count	(%)	21-30 Count	(%)	31-40 Count	(%)	41-50 Count	(%)	Substantially Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	1	50.00	0	0.00	1	50.00	0	0.00
Total	**0**		**0**		**1**		**0**		**1**		**0**	

Table 2-33: Expected Building Damage by Building Type (Hazus Flood Scenario)

Building Type	1-10 Count	(%)	11-20 Count	(%)	21-30 Count	(%)	31-40 Count	(%)	41-50 Count	(%)	Substantially Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	0	0.00	1	50.00	0	0.00	1	50.00	0	0.00

The scenario reports that zero critical facilities in the study region will experience a moderate damage by a 100-year flood event. Critical facilities are essential to the health and welfare of the whole population and are especially important following hazard events. Hazus indicates that there are approximately 3 critical facilities that are floodprone. Please note that Hazus refers to these buildings as "essential" and the County refers to these as "critical." Also, what the County defines as critical may also differ from what Hazus refers to as essential facilities.

Table 2-34: Hazus Determined Critical Facilities that are Floodprone (Rockville)

CRITICAL FACILITIES	# OF FLOODPRONE STRUCTURES	LOSS OF USE
FIRE	0	0
POLICE	0	0
HOSPITALS	0	0
SCHOOLS	3	0
TOTAL STRUCTURES	**3**	**0**

[DISPLACEMENT AND SHELTER REQUIREMENTS]

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 28 households to be displaced due to the flood. Of these, 6 persons will seek temporary shelter in public shelters.

HAZUS-MH 100-YEAR FLOOD SCENARIO

The total economic loss estimated for the flood is $8.97 million, which represents 11.28% of the total replacement value of the scenario buildings. The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with the inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were $8.96 million. $0 Million of the estimated losses were related to the business interruption of the region. The residential occupancies made up 39.09% of the total loss. The table below provides a summary of the losses associated with the building damage.

Table 2-35: Building-Related Economic Loss Estimates (Hazus Flood Scenario)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	2.15	0.53	0.40	0.45	3.52
	Content	1.36	1.72	0.51	1.45	5.04
	Inventory	0.00	0.11	0.10	0.19	0.40
	Subtotal	**3.51**	**2.35**	**1.01**	**2.09**	**8.96**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.01**	**0.00**	**0.00**	**0.01**
ALL	**Total**	**3.51**	**2.36**	**1.01**	**2.09**	**8.97**

LAND USE & DEVELOPMENT TRENDS

Besides the localized flooding, there is also the great amount of property, both private and public that is at risk from flooding. As development grows within the county, there is added risk and probability for damage. It is essential that zoning and land use plans take into account not only the dollar amount of damage that buildings near waterways could incur, but also the added risk of flood debris and narrowing the floodplains by building close to the rivers.

MULTI-JURISDICTIONAL DIFFERENCES

As stated previously, a flooding event could occur in a built-up area such as Gaithersburg, Rockville, and Takoma Park and cause substantial structure damage resulting in high dollar losses. While flooding could certainly affect many facilities in the county, including critical facilities, it is safe to say that few critical facilities in the county are directly located in floodplains. The County as a whole should anticipate that there is an overall likelihood of being exposed to a flood annually.

FLOODING HIRA SUMMARY

Severe flooding has the potential to inflict significant damage in Montgomery County. Assessing flood damage requires the communities throughout the County to remain alert and notify local officials of potential flood prone areas near infrastructure such as roads, bridges, and buildings. While flooding remains a highly likely occurrence throughout the identified flood hazard areas of Montgomery County, smaller floods caused by heavy rains and inadequate drainage capacity will be more frequent, but not as costly as the large-scale floods which may occur at much less frequent intervals. While the potential for flood is always present, Montgomery County does have policies and regulations for development that should help lessen potential damage due to floods.

HURRICANE

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING
Hurricane	3(.9)	1 (.3)	4 (.8)	1 (.1)	3 (.3)	**2.4**
MODERATE RISK (2.0 – 2.9)						

HAZARD IDENTIFICATION

Coastal hazards take many forms ranging from storm systems like tropical storms, hurricanes and Nor'easters that can cause storm surge inundation, heavy precipitation that may lead to flash flooding, and exacerbation of shoreline erosion to longer term hazards such as sea level rise.

Tropical cyclones, a general term for tropical storms and hurricanes, are low pressure systems that usually form over the tropics. These storms are referred to as —cyclones due to their rotation. Tropical cyclones are among the most powerful and destructive meteorological systems on earth. Their destructive phenomena include very high winds, heavy rain, lightning, tornadoes, and storm surge. As tropical storms move inland, they can cause severe flooding, downed trees and power lines, and structural damage.

There are three categories of tropical cyclones:

1. Tropical Depression: maximum sustained surface wind speed is less than39 mph.
2. Tropical Storm: maximum sustained surface wind speed from 39-73 mph.
3. Hurricane: maximum sustained surface wind speed exceeds 73 mph.

Once a tropical cyclone no longer has tropical characteristics it is then classified as an extratropical system. Most Atlantic tropical cyclones begin as atmospheric —easterly waves that propagate off the coast of Africa and cross the tropical North Atlantic and Caribbean Sea. When a storm starts to move toward the north, it begins to leave the area where the easterly trade winds prevail, and enters the temperate latitudes where the westerly winds dominate. This produces the eastward curving pattern of most tropical storms that pass through the Mid-Atlantic region. When the westerly steering winds are strong, it is easier to predict where a hurricane will go. When the steering winds become weak, the storm follows an erratic path that makes forecasting very difficult.

Hurricanes are categorized according to the Saffir/Simpson scale with ratings determined by wind speed and central barometric pressure. Hurricane categories range from One through Five, with Category Five being the strongest (winds greater than 155 mph). A hurricane watch is issued when hurricane conditions could occur within the next 36 hours. A hurricane warning indicates that sustained winds of at least 74 mph are expected within 24 hours or less. The National Weather Service (NWS) National Hurricane Center defines June 1 through November 30 as the Atlantic hurricane season. September is typically the most active month for tropical cyclones in Maryland.

Tropical storms and hurricanes are accompanied by a storm surge, an abnormal local rise in sea level. The storm surge is caused by the difference in wind and barometric pressure between a tropical system and the environment outside the system. The end result is that water is pushed onto a coastline. The height of the surge is measured as the deviation from mean sea level and can reach over 25 feet in extreme circumstances. The most devastating storm surges occur just to the right of the eye of a land falling hurricane. For coastal areas, the storm surge is typically the most dangerous and damaging aspect of the storm.

Howling winds associated with nor'easters also have the potential to produce significant storm surge, similar to that of a Category One hurricane. In addition, these types of storms can also produce wind gusts to near hurricane force as well as flooding rain and crippling snowfall. The wintry impacts of Nor'easters are discussed in greater detail in Severe Winter Storms.

The Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model is used to evaluate the potential impact of storm surge. Emergency managers use data from SLOSH to identify at-risk populations and determine evacuation areas. Storm surges also affect tidal rivers and creeks, potentially increasing evacuation areas. The Saffir/Simpson scale was developed in 1971 by Herbert Saffir and Dr. Robert Simpson as a way to classify hurricanes. The scale rates the intensity of hurricanes based on wind speed and barometric pressure measurements. The scale gives an indication of the potential flooding and wind damages associated with each hurricane category. While major hurricanes comprise only 20% of all tropical cyclones making landfall, they account for over 70% of the damage in the United States.

Table 2-36: Saffir-Simpson Scale categories with associated wind speeds and damages (NHC, 2009)

STORM CATEGORY	WIND SPEED (mph)	DESCRIPTION OF DAMAGES
1	74-95	*MINIMAL*: Damage is limited primarily to shrubbery and trees, unanchored

Table 2-36: Saffir-Simpson Scale categories with associated wind speeds and damages (NHC, 2009)		
STORM CATEGORY	WIND SPEED (mph)	DESCRIPTION OF DAMAGES
		mobile homes and signs. No significant structural damage.
2	96-110	*MODERATE*: Some trees are toppled, some roof coverings are damaged and major damage occurs to mobile homes. Some roofing material, door and window damage.
3	111-130	*EXTENSIVE*: Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Large trees are toppled. Terrain may be flooded well inland.
4	131-155	*EXTREME*: Extensive damage to roofs, windows and doors; roof systems on small buildings completely fail. More extensive curtain wall failures. Terrain may be flooded well inland.
5	>155	*CATASTROPHIC*: Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Massive evacuation of residential areas may be required.

HAZARD PROFILE

All of Montgomery County could be affected by a hurricane or a tropical storm. Since they can disrupt power and inundate roads, tropical storms can cause havoc on the entire community. The county's proximity to the Potomac River indicates potential for flooding during heavy rains and high winds.

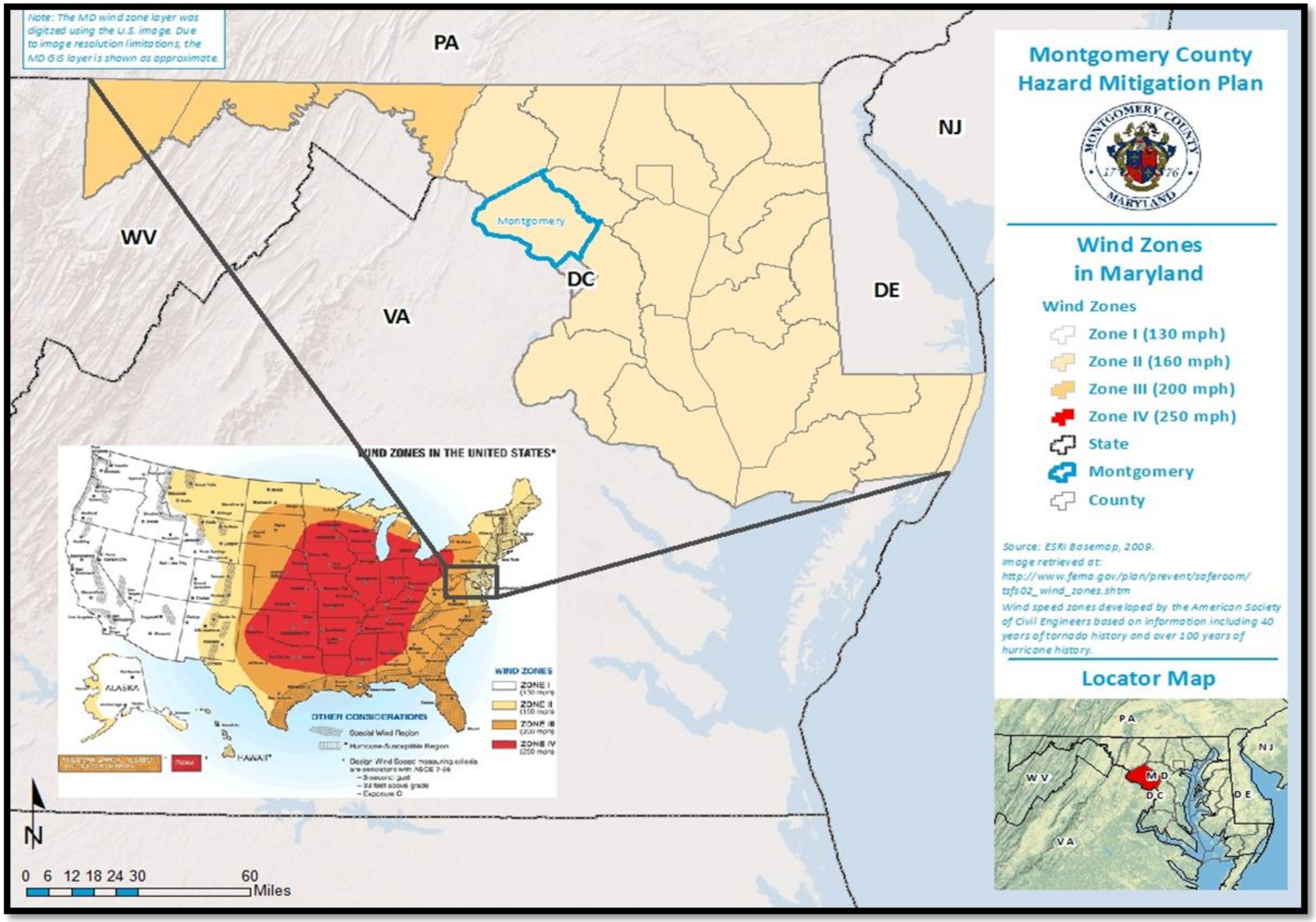
Figure 2-20 on page 88 depicts the wind zone for Montgomery County. The wind zones were established by the American Society of Civil Engineers based on information which includes 40 years of tornado history and over 100 years of hurricane history. Montgomery County falls into within Zone II. Shelters and critical facilities should be able to withstand a 3-second gust of up to 160 mph, regardless of whether the gust is the result of a tornado, coastal storm, or windstorm event.

In September 1979, Hurricane David reduced to a Tropical Storm and struck Montgomery County, resulting in property damage of over $2 million and crop damage of over $20,000 according to SHELDUS. Power outages, road closures, and damage to homes occurred across the county. On 16 September 1999, Hurricane Floyd hit Maryland and resulted in property damage worth approximately $200 million. Hurricane Floyd made landfall just east of Cape Fear, North Carolina, in the early morning hours of the 16th and moved north-northeast across extreme southeast Virginia to near Ocean City, Maryland. The Maryland Eastern Shore was declared a disaster area as damages totaled near $3.5 million. Tidal flooding was reported along the Chesapeake Bay.

On 18 September 2003, Montgomery County was struck by Hurricane Isabel. Initially Isabel was identified as a Category 2 hurricane that turned into a tropical storm by the time it struck Montgomery

County. Power outages impacted hospitals, nursing homes, and traffic signals. Downed trees, wires, and flooding led to numerous road closures.

Figure 2-20


Note: The MD wind zone layer was digitzed using the U.S. image. Due to image resolution limitations, the MD GIS layer is shown as approximate.
PA
NJ
WV
VA
DC
DE
Montgomery
Montgomery County
Hazard Mitigation Plan
Wind Zones
in Maryland
Wind Zones
Zone I (130 mph)
Zone II (160 mph)
Zone III (200 mph)
Zone IV (250 mph)
State
Montgomery
County
Source: ESRI Basemap, 2009.
image retrieved at:
http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm
Wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history.
Locator Map
WIND ZONES IN THE UNITED STATES*
WIND ZONES
ZONE I
ZONE II
ZONE III
ZONE IV
OTHER CONSIDERATIONS
ALASKA
HAWAII
N
0 6 12 18 24 30 60
Miles

SHELDUS only lists Tropical Storm David for Montgomery County; however the county may have been impacted by other hurricane and tropical storm events that have affected the State of Maryland. Figure 2-21 shows hurricane tracks and Figure 2-22 shows the tropical storms that have crossed Montgomery County. These additional events are listed below:

- **August 12 and 18, 1955: Hurricanes Connie and Diane**
  Hurricanes Connie and Diane both passed over Maryland as tropical storms within several days of each other, on Aug. 12 and 18, respectively. The rains from Connie set the stage for the devastating floods caused by Diane, which poured 10-20 inches of rain on the already-soaked region. Major flooding occurred in central Maryland, particularly along the Potomac River. Strong gales from Connie sunk the tour schooner Levin J. Marvel, about 20 miles south of its home port of Annapolis. Fourteen passengers drowned.
- **June 21-23, 1972: Hurricane Agnes**
  Hurricane Agnes moved through the Atlantic past Maryland as a tropical storm on June 21-23. Widespread and in some places record flooding wrought one of the state's most destructive natural disasters. In the tributaries on the north side of the Potomac River, from the Conococheague Creek at Fairview, Maryland down to Rock Creek at Washington, DC, floods in excess of the 100 year frequency level were observed. Many roads were closed, particularly in central Maryland, and thousands of evacuations occurred. Montgomery County along with several surrounding jurisdictions was declared a federal disaster area. The event proved to be an ecological calamity for the Chesapeake Bay. The damage in Maryland was in excess of $110 million (in 1972 dollars), and there were 19 deaths.
- **July 13, 1996: Hurricane Bertha**
  Hurricane Bertha moved across the Lower Maryland Eastern Shore on July 13th. The highest sustained wind speed recorded was 23 mph at Salisbury, with gusts up to 63 mph at Ocean City. One confirmed tornado was spawned by the hurricane near Madison in Dorchester County. Numerous trees and power lines were blown down and resulted in scattered property damage and power outages. Rainfall amounts generally ranged from to 5.0 inches and caused some street flooding. Property damages of $100,000 and crop damages of $15,000 occurred.
- **September 6, 1996: Tropical Storm Fran**
  Spiral bands associated with Hurricane Fran affected the Lower Maryland Eastern Shore during Friday, September 6th. The highest sustained wind speed recorded was 22 mph at Salisbury with gusts of 35 mph. A storm surge of 4 to 6 feet inundated portions of the communities of Taylors Island, Hoopers Island, and Madison in Dorchester County along the Chesapeake Bay. Many roads were flooded with some homes receiving water damage at the time of high tide. Dorchester, Wicomico, Somerset, and Worcester counties were affected, and property damages reached $1 million. Storm winds channeled water up the Chesapeake Bay and its main tributaries, which became a small-scale storm surge, causing $1.6 million in property damages and $5,000 in crop damages in central Maryland.

- **October 8, 1996: Tropical Storm Josephine**
  Remnants of Tropical Storm Josephine moved quickly up the East Coast during Tuesday, October 8th, affecting the Lower Maryland Eastern Shore. The storm produced 1.5 to 3.5 inches of rain resulting in flooding of several roads. The storm caused $100,000 in damages.
- **September 16, 1999: Hurricane Floyd**
  Hurricane Floyd moved north-northeast across extreme southeast Virginia and reached Maryland near Ocean City by evening on the 16th. Hurricane Floyd was a Category 1 hurricane as it crossed the Wakefield WFO county warning area. The storm surge caused tides two to three feet above normal throughout central Maryland. Tropical storm force wind gusts occurred in the northwest quadrant of the storm over portions of the Lower Maryland Eastern Shore. Property damages of over $1 million and crop damages of $575,000 occurred.
- **September 18, 2003: Hurricane Isabel**
  Hurricane Isabel had been downgraded to a tropical storm by the time it reached Maryland, but it still caused significant damage in the state. Isabel's eye tracked well west of the bay, but the storm's 40 to 50 mph sustained winds pushed a bulge of water northward up the bay and its tributaries producing a record storm surge. The Maryland western shore counties of the Chesapeake Bay and along the tidal tributaries of the Potomac, Patuxent, Patapsco and other smaller rivers experienced a storm surge that reached 5 to 9 feet above normal tides. Over 2000 people were evacuated from their homes. Many buildings were destroyed and the Lower Maryland East Shore suffered the worst power outages in history. The storm caused one fatality, 200 injuries, $530 million in property damages, and $190,000 in crop damages. Montgomery County was one of several jurisdictions with significant damages, road closures, and flooding.
- **September 1, 2006: Tropical Storm Ernesto**
  Moderate coastal flooding occurred due to the storm surge from the remnants of Tropical Storm Ernesto. The tide crest at Annapolis was 3.56 MLLW late Friday.
- **September 6, 2008: Tropical Storm Hanna**
  Tropical Storm Hanna brought heavy rain, strong winds and some tidal flooding to the Eastern Shore during the day and into the evening of the 6th. Maximum sustained winds reached 50 mph. Tree damage was sustained throughout much of the state, and many roads were closed due to trees down.
- **August 27, 2011: Hurricane Irene**
  Hurricane Irene, a Category One hurricane brought rain and heavy winds to Maryland. Sustained winds speed measured at nearly 85 mph. Tree damage, power outages, and road closures were sustained as were several deaths throughout Maryland and neighboring Virginia. Because of the recent occurrence of this event, damages and event details are still being assessed.
- **September 6, 2011: Tropical Storm Lee**
  Remnants from Tropical Storm Lee impacted over 400 residents in the state at an estimated cost of over $23 million in public assistance. This prompted the Governor to request a major disaster

declaration for seven counties. Though several areas within Montgomery County were affected by the storm, the declaration was not extended to include the county.

The figure on the following page shows the Hurricane Tracks for the State of Maryland that have Impacted Montgomery County.

Figure 2-21

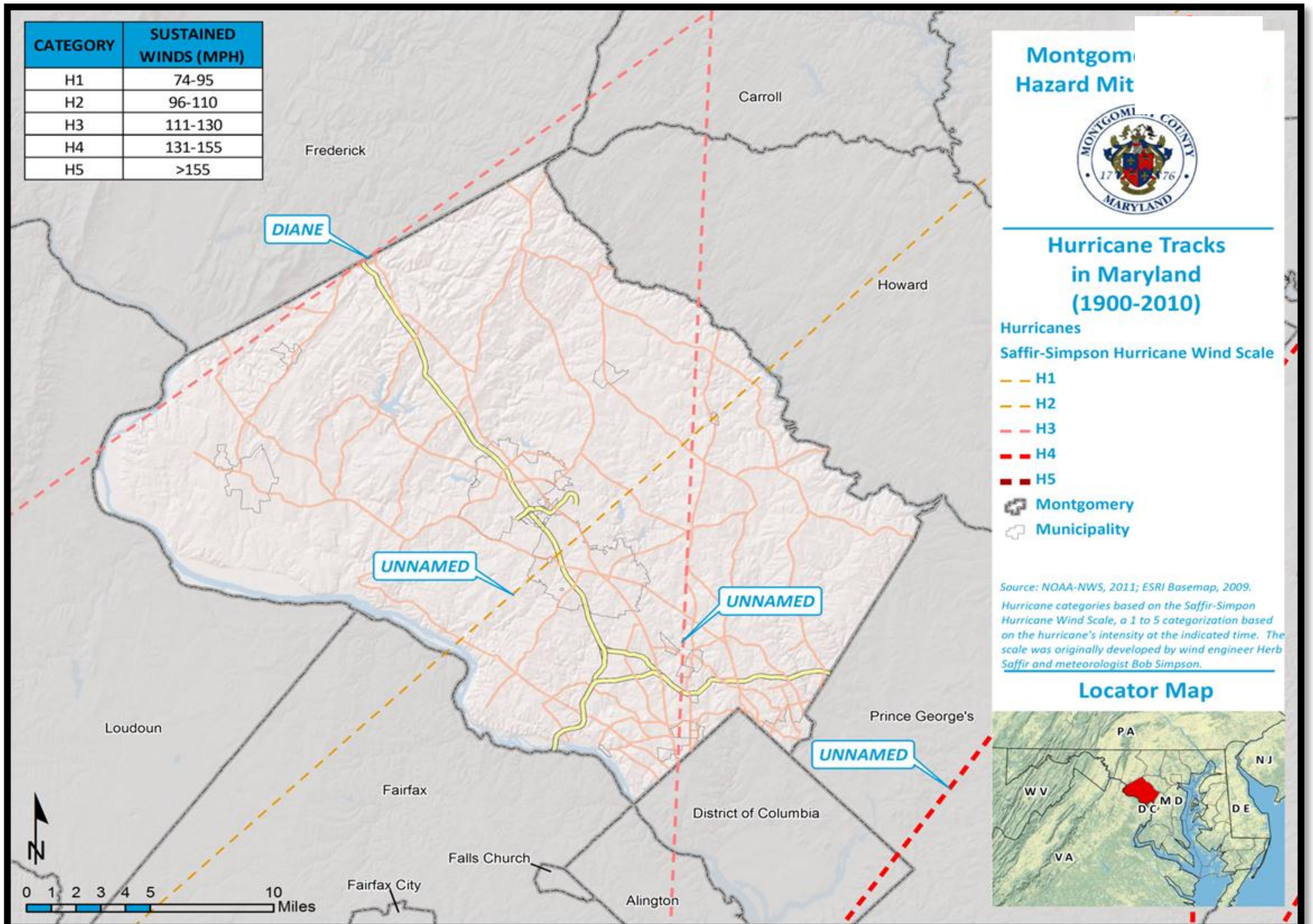
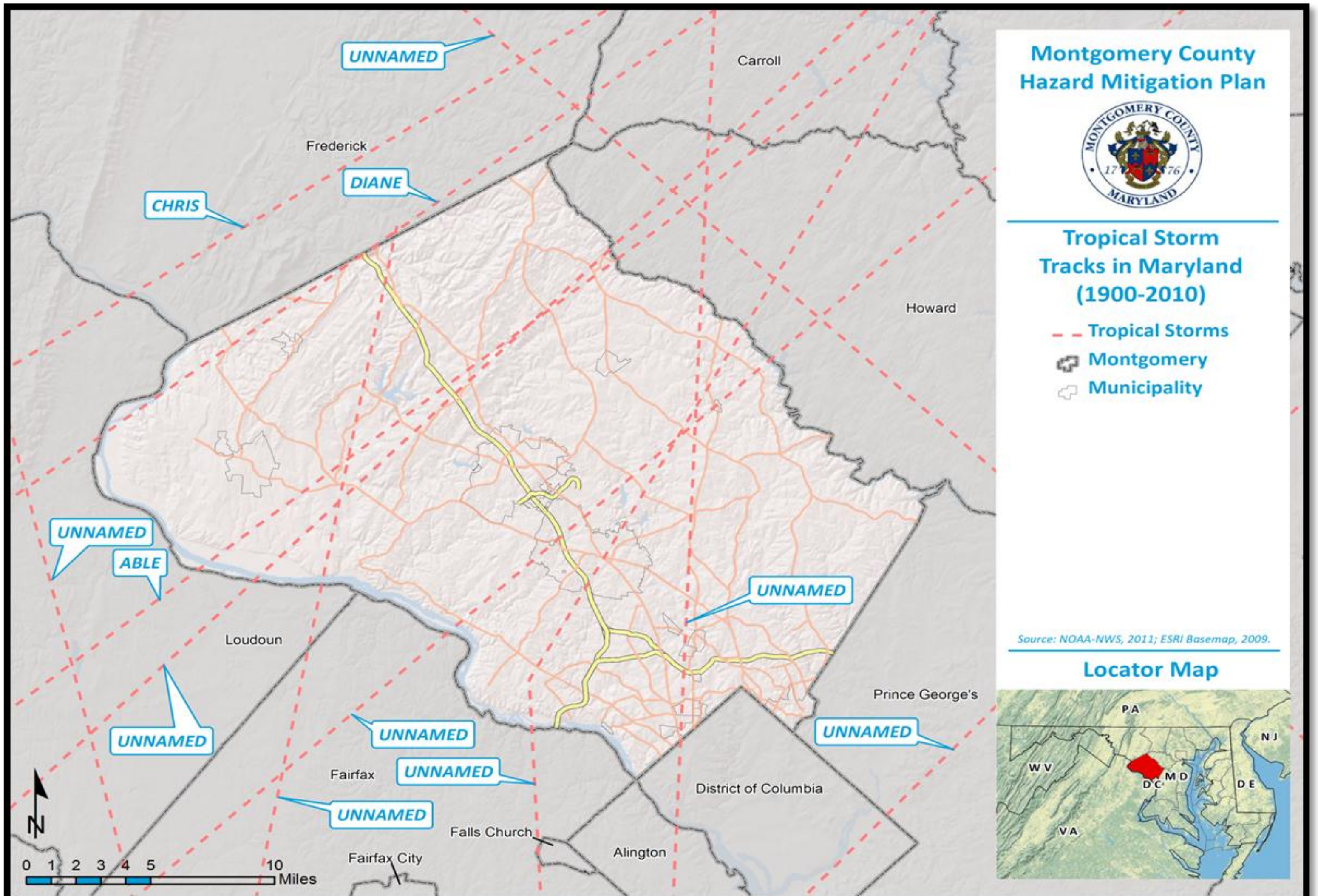

CATEGORY | SUSTAINED WINDS (MPH)
H1 74-95
H2 96-110
H3 111-130
H4 131-155
H5 >155
Montgom
Hazard Mit
Hurricane Tracks in Maryland (1900-2010)
Hurricanes
Saffir-Simpson Hurricane Wind Scale
H1
H2
H3
H4
H5
Montgomery
Municipality
Source: NOAA-NWS, 2011; ESRI Basemap, 2009.
Hurricane categories based on the Saffir-Simpon Hurricane Wind Scale, a 1 to 5 categorization based on the hurricane's intensity at the indicated time. The scale was originally developed by wind engineer Herb Saffir and meteorologist Bob Simpson.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
Carroll
Frederick
Howard
DIANE
UNNAMED
UNNAMED
UNNAMED
Prince George's
Loudoun
Fairfax
District of Columbia
Falls Church
Fairfax City
Alington
0 1 2 3 4 5 10 Miles
N

Figure 2-22


Montgomery County
Hazard Mitigation Plan
Tropical Storm
Tracks in Maryland
(1900-2010)
Tropical Storms
Montgomery
Municipality
Source: NOAA-NWS, 2011; ESRI Basemap, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
UNNAMED
CHRIS
DIANE
ABLE
Frederick
Carroll
Howard
Loudoun
Prince George's
Fairfax
Falls Church
Fairfax City
District of Columbia
Alington
N
0 1 2 3 4 5 10 Miles

INVENTORY ASSETS EXPOSED TO HAZARD

The 2011 Maryland State Hazard Mitigation plan indicated that Montgomery County has not had any injuries or deaths related to coastal storms. The State plan also does not list any property damage or crop damage associated with this hazard, although SHELDUS data did indicate damage from Tropical Storm David in 1979.

All assets located in Montgomery County can be considered at risk from tropical storms. This includes all of the County's population and all buildings and infrastructure within the County. Damages primarily occur as a result of high winds, heavy rains, and flooding.

POTENTIAL LOSSES

Also completed with updating the 2011 State Hazard Mitigation Plan was a Hazus-MH MR5 was also run for hurricane wind in order to determine potential losses due to winds associated with tropical storm and hurricanes. The total amount of annualized losses for Montgomery County is just over $2.2 million. The table below lists the occupancy type and expected loss based on the Hazus analysis.

Table 2-37: Annualized Loss Estimates by Occupancy in thousands of dollars.

Agricultural	Commercial	Educational	Government	Industria l	Religion-Non Profit	Residential	Total
4	181	8	10	24	16	1977	2220

The table below lists the building construction types and expected loss based on Hazus analysis.

Table 2-38: Hazus-MH MR5 Annualized Loss Estimates by Building Type in thousands of dollars.

Wood	Masonry	Concrete	Steel	Manufactured Homes	Total
1358	715	28	103	1	2205

Montgomery County is not within a high coastal hazard area, but is still at risk of impacts from coastal storms (Maryland State HMP, 2011).

Table 2-39: Annual probability of tropical storm and hurricane strength wind speeds for Montgomery County (FEMA, 2000)

WIND SPEED (mph)	CORRESPONDING SAFFIR-SIMPSON TROPICAL STORM/HURRICANE CATEGORIES	ANNUAL PROBABILITY OF OCCURRENCE (%)
39-74	Tropical Storms	91.59
74-95	Category 1 to 2 Hurricanes	8.32
96-110	Category 3 to 4 Hurricanes	0.0766
111-130	Category 4 to 5 Hurricanes	0.0086
131-155	Category 5 Hurricanes	0.00054
>155	Category 5 Hurricanes	0.00001

LAND USE & DEVELOPMENT TRENDS

The type and age of construction plays a role in vulnerability of facilities to coastal hazard winds. In general, concrete, brick and steel-framed structures tend to fare better than older, wood-framed structures or manufactured homes. Vulnerability to storm surge is determined by facility location in relation to storm surge inundation zones. Finally, not all critical facilities have redundant power sources and may not even be wired to accept a generator.

MULTI-JURISDICTIONAL DIFFERENCES

All of Montgomery County could be affected by a hurricane or a tropical storm. Since they can disrupt power and inundate roads, tropical storms can cause havoc on the entire community. The county's proximity to the Potomac River exposes it to significant potential for flooding.

HIRA SUMMARY

Tropical cyclones are among the most powerful and destructive meteorological systems on earth. Their destructive phenomena include very high winds, heavy rain, lightning, tornadoes, and storm surge. As tropical storms move inland, they can cause severe flooding, downed trees and power lines, and structural damage. It is important to ensure that all development is built to code to withstand impacts from flooding and severe wind associate with hurricanes and other tropical storms.

WATER SHORTAGE/DROUGHT

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING
WATER SHORTAGE/DROUGHT	0.6	0.3	0.8	0.2	0.3	**2.2**
MODERATE RISK HAZARD (2.0 – 2.9)						

HAZARD IDENTIFICATION

Drought is a normal part of virtually all climates, including areas with high and low average rainfall. It is caused by a deficiency of precipitation and can be aggravated by other factors such as high temperatures, high winds, and low relative humidity.

Droughts can be grouped as meteorological, hydrologic, agricultural, and socioeconomic. Representative definitions commonly used to describe the types of drought are summarized below.

Meteorological drought is defined solely on the degrees of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.

Hydrologic drought is related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.

Agricultural drought is defined principally in terms of soil moisture deficiencies relative to water demands of plant life, usually crops.

Socioeconomic drought associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of a weather related supply shortfall. The incidence of this type of drought can increase because of a change in the amount of rainfall, a change in societal demands for water (or vulnerability to water shortages), or both.

The Maryland Department of the Environment uses the U.S. Army Corp of Engineers' definition of drought, which states, "droughts are periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or stream flow." As a result, the State monitors precipitation levels, stream flows, groundwater levels, and reservoir storage to manage water supplies to meet the needs of humans, the environment, and wildlife.

The Standardized Precipitation Index (SPI) is a drought index based on the probability of an observed precipitation deficit occurring over a given prior time period. The assessment periods considered range from 1 to 36 months. The variable time scale allows the SPI to describe drought conditions important for a range of meteorological, agricultural, and hydrological applications. For example, soil moisture conditions respond to precipitation deficits occurring on a relatively short time scale, whereas groundwater, stream flow, and reservoir storage respond to precipitation deficits arising over many months.

The Palmer Drought Severity Index (PDSI) was developed by Wayne Palmer in the 1960s and uses temperature and rainfall information in a formula to determine dryness. It has become the semi-official drought index. The Palmer Index is most effective in determining long term drought—a matter of several months—and is not as good with short-term forecasts (a matter of weeks). It uses a 0 as normal, and drought is shown in terms of minus numbers; for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought.

Table 2-40: Drought Severity Classification

DROUGHT SEVERITY	RETURN PERIOD (YEARS)	DESCRIPTION OF POSSIBLE IMPACTS	DROUGHT MONITORING INDICES		
			Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Minor Drought	3 to 4	Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-0.5 to -0.7	D0	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme Drought	18 to 43	Major crop and pasture losses; extreme fire danger; widespread water shortages or restrictions	-1.6 to -1.9	D3	-4.0 to -4.9
Exceptional Drought	44 +	Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies	Less than -2	D4	-5.0 or less

Source: National Drought Mitigation Center

HAZARD PROFILE

There is no commonly accepted approach for assessing risk associated with droughts given the varying types and indices. Drought risk is based on a combination of the frequency, severity, and spatial extent (the physical nature of drought) and the degree to which a population or activity is vulnerable to the effects of drought. The degree of Montgomery County's vulnerability to drought depends on the environmental and social characteristics of the region and is measured by its ability to anticipate, cope with, resist, and recover from drought.

Because drought is usually considered a regional hazard, it is not enhanced or analyzed by County-level mapping. All jurisdictions are assumed to have the same risk level within Montgomery County.

Mapping of the current drought status is published by the National Integrated Drought Information System (NIDIS): U.S. Drought Portal which can be found online at: www.drought.gov.

The 2011 Maryland State Hazard Mitigation Plan identifies historical drought occurrences for the State. According to the National Climate Data Center's U.S. Storm Events Database, there were 14 drought events between August 7, 1995 and November 1, 2010. Crop damages from these events totaled $11,171,772, for an average damage assessment of $797,984 per event. Table 2-41 below provides information for some of the more significant drought events in Montgomery County.

Table 2-41: Hazus-MH MR5 Annualized Loss Estimates by Building Type in Thousands of Dollars.

EVENT	COMMENTS
1930-1932	Probably the most severe agricultural drought ever recorded in Maryland and the District of Colombia. Rainfall was about 40 percent less than average, and crop losses for 1930 alone were estimated at $40 million.
1953-1956	Affected almost all of Maryland and the District of Columbia. Drought recurrence intervals exceeded 25 years for those areas of Maryland west of Baltimore. For the remaining parts of Maryland and the District of Columbia, the drought had recurrence intervals of 10-25 years, except for the area north and east of Baltimore where recurrence intervals were less than 10 years.
1958-1971	This drought lasted the longest of any drought since 1930 and was the most severe in terms of annual departure from average stream flow. Rainfall was sufficient to prevent major agricultural losses. Stream flow in the Potomac declined to record lows, with withdrawals accounting for 80 percent of the available water flow.
1980-1983	Affected all but the westernmost part of Maryland. Recurrence interval of the drought was about 10 to 25 years throughout the affected area. The extent to which stream flow decreased during this drought is similar to that during the 1958-71 drought. No major agricultural drought developed, and water supplies were adequate for public supply use.
Fall 1984 - Summer 1988	This drought affected Maryland east and south of Frederick and Washington D.C. Many counties were declared disaster areas because of large agricultural losses. These losses for 1986-1988 were estimated at $302 million. Water supplies for municipalities did not become critically low, although water use was restricted in several areas during summers. Crop damages for Montgomery County amounted to over $2.0 million. No injuries, fatalities, or properties were lost or damaged.
August - September, 1995	Dry weather, combined with periods of excessive heat, caused substantial damage to several crops, and limited the production of healthy livestock, during a month-long period that extended through mid-September. Montgomery County crop damages amounted to $100. No injuries, fatalities, or properties were lost or damaged.
July 1, 1997	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 to be the death knell for much of the crop yield, including corn, hay, alfalfa, and soybeans.

Table 2-41: Hazus-MH MR5 Annualized Loss Estimates by Building Type in Thousands of Dollars.

EVENT	COMMENTS
	Agricultural states of emergency were declared in many areas west of the Chesapeake Bay. Hardest-hit counties included Carroll, Frederick, Howard, Montgomery, and Washington. Total crop damages were estimated at $43.7 million for the State; crop damages for Montgomery County amounted to $4.6 million. No injuries, fatalities, or properties were lost or damaged.
September 1998	Crop damages for Montgomery County amounted to over $1.4 million. No injuries, fatalities, or properties were lost or damaged.
November 1998	Crop damages for Montgomery County amounted to over $1.8 million. No injuries, fatalities, or properties were lost or damaged.
August 1999	High pressure was the dominant weather feature across Maryland through the 24th of August. Most rain producing storm systems steered north of the region through the period. This resulted in the continuation of the climatological, meteorological, and hydrological drought which plagued the area. By the third week of August the Palmer Drought Index, a measure of long term drought conditions, indicated Maryland was in an extreme drought. Washington County reported the lowest groundwater levels in history on the 4th. Nineteen Maryland counties were declared federal drought disaster areas on the 11th. The agricultural drought in Maryland continued to devastate farmers, who suffered crop damages of $30 million. An official drought declaration was declared by the Governor of Maryland. Montgomery County crop damage resulting from this drought event amounted to over $2.3 million. The County approved $1.0 million to distribute to 94 farmers covering 35,590 acres. No injuries, fatalities, or properties were lost or damaged.
September 2001 - September 2002	These months were the driest on record since record keeping began in 1871. Groundwater levels, reservoirs, and stream levels fell below record lows. Much of the state was under mandatory water-use restrictions, and wildfires were abundant. Precipitation amounts during this time were only about 57 percent of normal levels. An official drought declaration was declared by the Governor of Maryland.
August 22, 2007	The U.S. Department of Agriculture Secretary declared a drought disaster for the entire State of Maryland. County losses were projected to exceed $13 million. The County approved $1.5 million for distribution to impacted farmers.
November 2008	This was the fifth month in a row that drought conditions were seen across Central and Northern Maryland. Persistent high pressure over the Southeast U.S. forced most rain producing low pressure systems to steer north of the region. The 5 month rainfall total at BWI Airport was only 5.79 inches, compared to the normal of over 17 inches. The drought contributed to a six-fold increase in the amount of brush fires seen across Maryland this November. The agricultural community continued to be hard hit by the persistent drought. By November 20th, 80 percent of topsoil moisture across the state was rated short or very

Table 2-41: Hazus-MH MR5 Annualized Loss Estimates by Building Type in Thousands of Dollars.

EVENT	COMMENTS
	short. The persistent drought contributed $40 million in damage to the fall harvest.
June 2010 – August 2010	Drought/Excessive Hear Economic Injury Disaster (#12386) declared by US Small Business Administration in Maryland, including Montgomery County.

Source: 2011 Maryland State Hazard Mitigation Plan; Spatial Hazard Events and Losses Database for the United States (SHELDUS), Hazards & Vulnerability Research Institute, University of South Carolina, December 2008; US Small Business Administration Disaster Declarations (http://archive.sba.gov/disasternotices/md.html).

There is no commonly accepted return period or non-exceedance probability for defining the risk from drought (such as the 100-year or 1% annual chance of flood). The magnitude of drought is usually measured in time and the severity of the hydrologic deficit. There are several resources available to evaluate drought status and even project very near future expected conditions. The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) prescribes an interagency approach for drought monitoring, forecasting, and early warning (NIDIS, 2007). The NIDIS maintains the U.S. Drought Portal22, which is a centralized, web-based access point to several drought-related resources including the U.S. Drought Monitor (USDM) and the U.S. Seasonal Drought Outlook (USSDO). The USDM March 27, 2012, shown in Figure 2-21, depicts the current weekly status of drought in Maryland and is developed/ maintained by the National Drought Mitigation Center. Montgomery County is abnormally dry at the time of writing. The USSDO for March 15 through June 2012, shown in Figure 2-22, projects potential drought conditions developed by the National Weather Service's Climate Prediction Center.

A number of indices measure how much precipitation for a given period of time has deviated from historically established norms. The Palmer Drought Severity Index (PDSI) is widely used by the US Department of Agriculture to determine when to grant emergency drought assistance. The PDSI is a commonly used index that measures the severity of drought for agriculture and water resource management. It is calculated from observed temperature and precipitation values and estimates soil moisture. The PDSI is most effective in determining long-term drought (a matter of several months), but is not as good with short-term forecasts (a matter of weeks). It uses a 0 as normal, and drought is shown in terms of minus numbers; for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought. The average annual PDSI value for Montgomery County from 1895 to 2010 was -0.32, denotes near normal moisture conditions. However, as discussed in the Previous Occurrences, Montgomery County has been impacted by several drought events.

The 2011 Maryland State HMP provides annualized event figures for drought for the State's counties, based on drought events between 1995 and 2010. Montgomery County's annualized event figure was calculated to be 0.88, which correlates to the consistent occurrence of droughts every two to five years.

Future droughts can also be expected due to more frequent extreme heat events as a result of a warming climate. Long-term climate forecast models suggest that a warming planet will lead to changes in precipitation distribution and more frequent and severe drought in some parts of the country. In spite of projections of moderate increases in annual precipitation in Maryland, increases in temperatures in

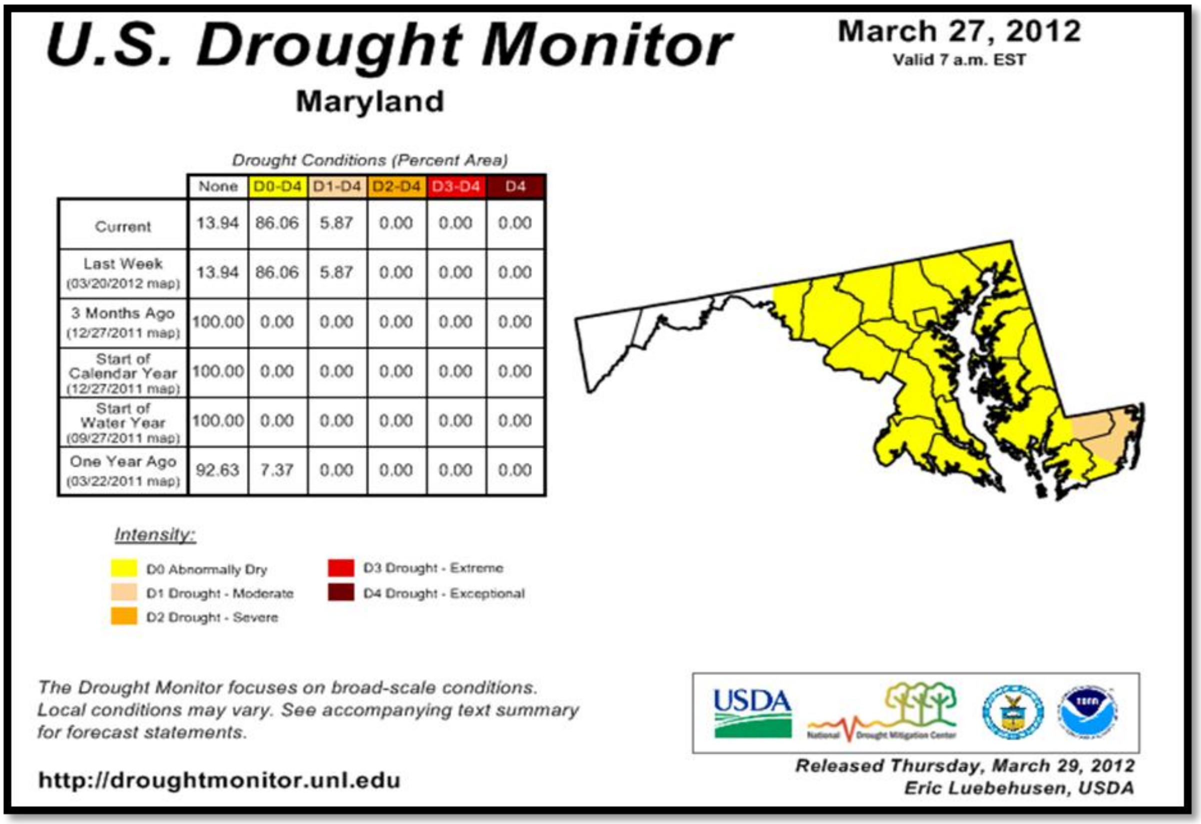


Figure 2-21

climate models lead to decreases in soil moisture throughout the year. The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report indicates that it is very likely that hot extremes and heat waves will become more frequent as the Earth warms. In Maryland, the number of days above 90F is projected to more than double under a lower greenhouse gas emissions scenario and roughly triple under a higher emissions scenario by the end of the century. Extended heat waves (temperatures above 90F for at least three consecutive days) are expected to be much more frequent and longer lasting, particularly under higher emissions scenarios. The 2008 Maryland Climate Action Plan predicts with moderate confidence the increasing likelihood of heat waves and temperature extremes.

Recent droughts in both developing and developed countries and the resulting economic and environmental impacts and personal hardships have underscored the vulnerability of all societies to this “natural” hazard. Droughts may cause a shortage of water for human and industrial consumption, hydroelectric power, recreation, and navigation. Water quality may also decline and the number and severity of wildfires may increase. Severe droughts may result in the loss of agricultural crops and forest products, undernourished wildlife and livestock, lower land values, and higher unemployment.

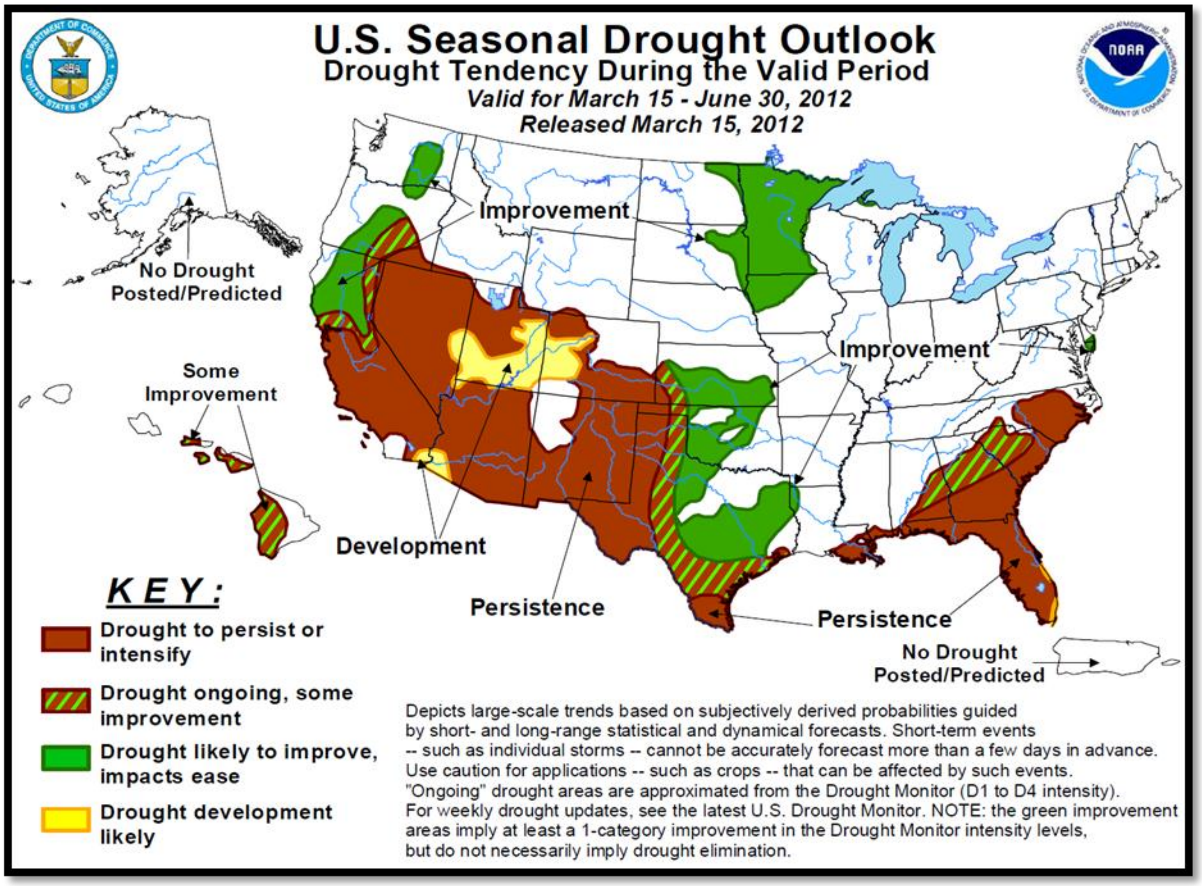


Figure 2-22: Source: http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html

Impacts are commonly referred to as direct or indirect. The most significant impacts associated with drought include agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline. These are just a few examples of direct impacts. The consequences of these impacts illustrate indirect impacts. For example, a reduction in crop, rangeland, and forest productivity may result in reduced income for farmers and agribusiness, increased prices for food and timber, unemployment, reduced tax revenues because of reduced expenditures, increased crime, foreclosures on bank loans to farmers and businesses, migration, and disaster relief programs. Direct or primary impacts are usually biophysical. Conceptually speaking, the more removed the impact from the cause, the more complex the link to the cause. In fact, the web of impacts becomes so diffuse that it is very difficult to come up with financial estimates of damages. The impacts of drought can be categorized as economic, environmental, or social.

Many economic impacts occur in agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to obvious losses in yields in both crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and diseases to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn places both human and wildlife populations, as well as buildings, infrastructure, and critical facilities, at higher levels of risk. However, drought conditions by itself are not anticipated to impact general building stock, critical facilities, and infrastructure.

Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected. Reduced income for farmers has a ripple effect. Retailers and others who provide goods and services to farmers face reduced business. This leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue for local, state, and federal government. Less discretionary income affects the recreation and tourism industries. Prices for food, energy, and other products increase as supplies are reduced. In some cases, local shortages of certain goods result in the need to import these goods from outside the stricken region. Reduced water supply impairs the navigability of rivers and results in increased transportation costs because products must be transported by rail or truck. Hydropower production may also be curtailed significantly.

Environmental losses are the result of damages to plant and animal species, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity of the landscape. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects.

INVENTORY ASSETS EXPOSED TO DROUGHT

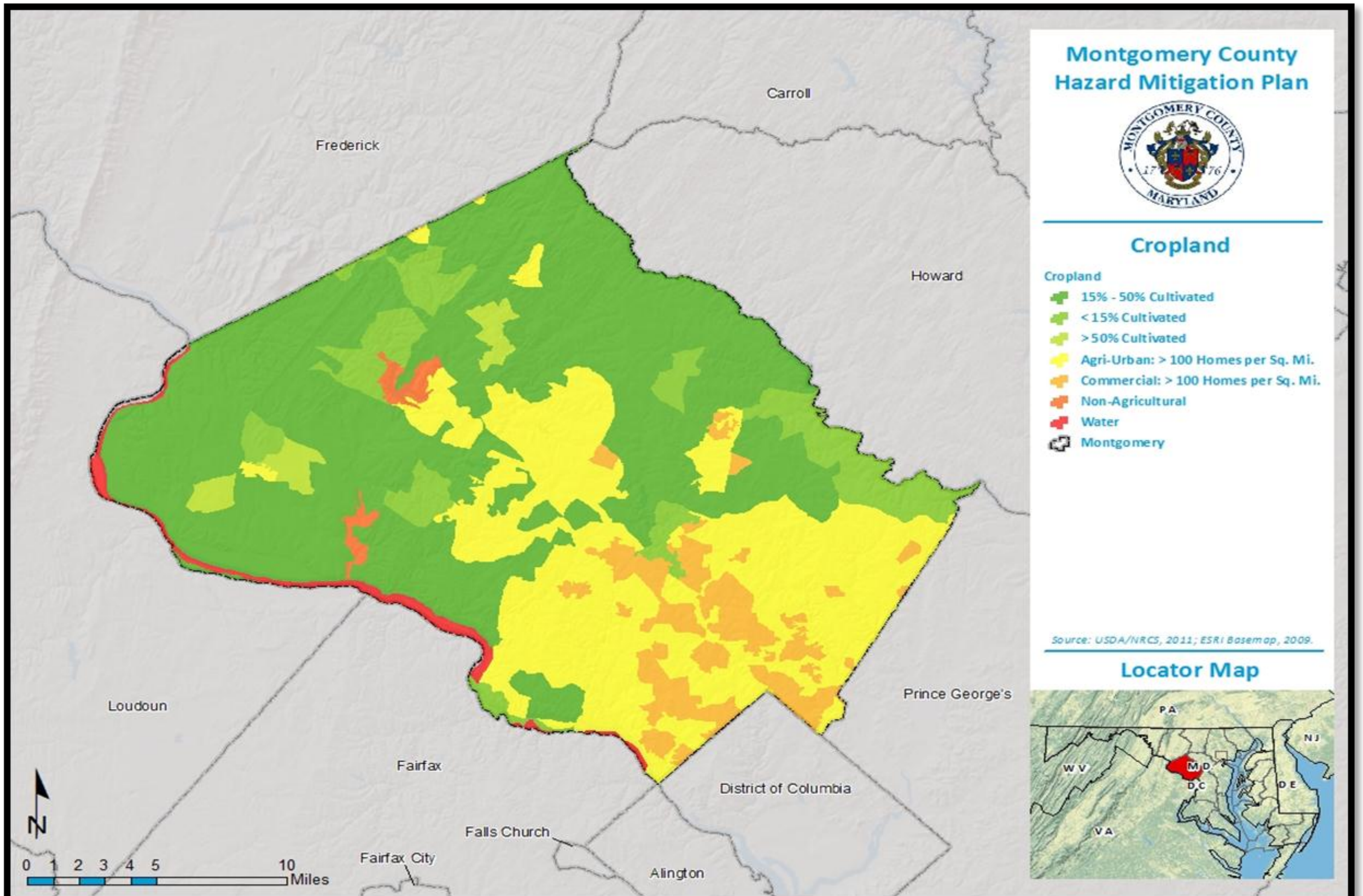
Drought typically does not have a direct impact on critical facilities or structures. However, possible losses/impacts to critical facilities include the loss of critical function due to low water supplies. Severe droughts can negatively affect drinking water supplies. Should a public water system be affected, the losses could total into the millions of dollars if outside water is shipped in. Private springs/wells could also dry up. The majority of drought related damages do not impact buildings or infrastructure. However, water supplies for critical facilities may be impacted during a severe drought. The 2011 Maryland State HMP identified critical facility exposure to drought, shown in Table 2-42. A loss of water to these buildings would render them inoperable.

Table 2-42: Hazus-MH MR5 Annualized Loss Estimates by Building Type in Thousands of Dollars.

FACILITY TYPE	EXPOSURE TO DROUGHT
Police Facilities	19
Fire Facilities	40
Health Facilities	49
Educational Facilities	367
TOTAL Number of All Types	6,992
Building Values of All Types	$2,073,052,250
Content Values of All Types	$691,017,417
TOTAL Values of All Types (Building and Content)	**$2,764,069,667**

Source: 2011 Maryland State HMP

Figure 2-25


Montgomery County
Hazard Mitigation Plan
Cropland
Cropland
15% - 50% Cultivated
< 15% Cultivated
> 50% Cultivated
Agri-Urban: > 100 Homes per Sq. Mi.
Commercial: > 100 Homes per Sq. Mi.
Non-Agricultural
Water
Montgomery
Source: USDA/NRCS, 2011; ESRI Basemap, 2009.
Locator Map
Carroll
Frederick
Howard
Prince George's
Loudoun
Fairfax
District of Columbia
Falls Church
Fairfax City
Alington
0 1 2 3 4 5 10 Miles
N

Direct costs such as increased pumping costs due to lowering of groundwater levels and costs to expand water infrastructure to compensate for reduced yields or to develop alternative water sources, are a significant factor but very difficult to estimate due to a lack of documentation. There are also the intangible costs associated with lost tourism revenues, and impacts to wildlife habitat and animals. Typically, these impacts are translated into the general economy in the form of higher food and agricultural goods prices and increase utility costs.

LAND USE & DEVELOPMENT TRENDS

Society's vulnerability to drought is affected by (among other things) population growth and shifts, urbanization, demographic characteristics, technology, water use trends, government policy, social behavior, and environmental awareness. These factors are continually changing, and society's vulnerability to drought may rise or fall in response to these changes. For example, increasing and shifting populations put increasing pressure on water and other natural resources—more people need more water.

According to the 2011 Statistical Abstract conducted by the U.S. Census Bureau, Maryland's current residential population is estimated at just over 5.5 million people. Considering the data available between 1980 and 2009, Maryland's residential population has grown an average of 10.6% every decade. Considering these factors and timeline (1980 – 2009), Maryland's residential population has consistently ranked 19th among the United States of America. The U.S. Census Bureau projects Maryland's population will increase by over 32% between 2000 and 2030. Considering these projections were developed for each of the 50 states, it is estimated that Maryland's residential population ranking will be 16th in by the year 2030.

Future development's greatest impact on the drought hazard would possibly be to ground water resources. New water and sewer systems or significant well and septic sites could use up more of the water available, particularly during periods of drought. Public water systems are monitored, but individual wells and septic systems are not as strictly regulated. Therefore, future development could have an impact on drought vulnerabilities.

MULTI-JURISDICTIONAL DIFFERENCES

Due to the nature of drought, all jurisdictions within Montgomery County are expected to be impacted equally due to drought conditions.

HIRA SUMMARY

Drought is extremely difficult to predict. However, identifying and tracking a number of established indicators for drought provides a crucial means of monitoring conditions that result in drought. As identified, Montgomery County has been affected severely by periods of drought, which seem to be occurring more frequently and last longer in recent years resulting in water shortages which will impact domestic, agricultural and fire response needs.

The Montgomery County Department of Environmental Protection, Metropolitan Washington Council of Governments, and the Washington Suburban Sanitary Commission have worked together to develop the Metropolitan Washington Water Supply and Drought Awareness Response Plan: Potomac River System, updated May 2001, to address potential drought conditions. Additionally, water conservation campaigns and literature have been developed to increase awareness. Several mitigation measures will be reviewed and considered by Montgomery County for incorporation into this Plan that will build upon these current efforts, including:

- Decreasing emphasis on the natural event (precipitation deficiencies)
- Increasing emphasis on water/natural hazard resource management
- Assessment programs
- Water supply augmentation and development of new supplies
- Public awareness and education programs
- Technical assistance on water conservation
- Reduction and water conservation programs
- Emergency response programs
- Drought contingency plans

Some of these actions can have long-term impacts; such as contingency plan development, and the development of water conservation and public awareness programs. As Montgomery County gains more experience assessing and responding to drought, future actions will undoubtedly become more timely, effective, and less reactive.

Possible losses to infrastructure include the loss of potable water, but a drought evolves slowly over time and the population typically has ample time to prepare for its effects. Should a drought affect the water available for public water systems or individual wells, the availability of clean drinking water could be compromised. This situation would require emergency actions and could possibly overwhelm the local government and financial resources.

TORNADO

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING
Tornadoes	0.6	0.3	0.4	0.4	0.2	**1.9**
LOW RISK (0.1-1.9)						

HAZARD IDENTIFICATION

A tornado is a violently rotating funnel-shaped column of air that extends from a thunderstorm cloud toward the ground. Tornadoes can touch the ground with winds of over 300 mph. While relatively short-lived, tornadoes are intensely focused and are one of nature's most violent storms. Tornadoes can occur at any point in the day or night, but are most frequent during the late afternoon into early evening, the warmest hours of the day, and most likely occur during the spring and early summer months of March through June.

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.
- **Downburst** - A strong downdraft, initiated by a thunderstorm, which induces an outburst of straight-line winds on or near the ground. They may last anywhere from a few minutes in 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.

Tornadoes usually form from one of three types of thunderstorms: 1) squall-lines; 2) multicells; and 3) supercells. Supercell thunderstorms are rotating storms containing what is known as a mesocyclone, or a rotating updraft (column of air) from which tornadoes sometimes form. Supercell thunderstorms have a greater potential than other thunderstorms for producing severe weather, including tornadoes. Tornadoes can range from just several yards to over two miles in width. Although tornadoes normally travel on the ground for short distances, tornado tracks of 200 miles or more have been reported. Tornadoes can destroy almost everything in their path; the damage is a result of high wind velocities, wind-blown debris, and the frequent appearance of lightning or large hail. The destruction caused by tornadoes depends on the intensity, size, and duration of the storm, but typically tornadoes inflict the most damage on structures with light construction such as mobile homes and trailers.

Previously, tornado damage was measured on the Fujita Scale, also called the F-Scale, named for Dr. Tetsuya Theodore Fujita. The operational Fujita scale ranges from an F0 to an F5. The strongest tornadoes observed to date have been F5 (winds between 261-318 mph). An Enhanced Fujita Scale (EF-Scale) was developed and implemented operationally by the National Weather Service (NWS) in 2007. The EF-Scale was developed to better align tornado wind speeds with associated damages; it classifies tornadoes into six intensity categories based upon the maximum wind occurring within the wind vortex.

The Enhanced Fujita Scale, also known as the “EF-Scale,” measures tornado strength and associated damages. The EF-Scale is an update to the earlier Fujita scale that was published in 1971. It classifies United States tornadoes into six intensity categories, as shown in table below, based upon the estimated maximum winds occurring within the wind vortex. The EF-Scale has become the definitive metric for estimating wind speeds within tornadoes based upon the damage done to buildings and structures since it was implemented through the National Weather Service in 2007.

Table 2-43: Enhanced Fujita Scale and Associated Damage

EF-SCALE NUMBER	WIND SPEED (MPH)	TYPE OF DAMAGE POSSIBLE
EFO	65-85	**Minor damage**: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	86-110	**Moderate damage**: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	**Considerable damage**: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	**Severe damage**: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	**Devastating damage**: Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200	**Extreme damage**: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (300 ft); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

The Storm Prediction Center has developed damage indicators to be used with the Enhanced Fujita Scale for different types of buildings but can be also be used to classify any high wind event. Some of the indicators for different building types are shown in tables below.

Table 2-44: Institutional Buildings	
DAMAGE DESCRIPTION	WIND SPEED RANGE (Expected in Parentheses)
Threshold of visible damage	59-88 MPH (72 MPH)
Loss of roof covering (<20%)	72-109 MPH (86 MPH)
Damage to penthouse roof & walls, loss of rooftop HVAC equipment	75-111 MPH (92 MPH)
Broken glass in windows or doors	78-115 MPH (95 MPH)
Uplift of lightweight roof deck & insulation, significant loss of roofing material (>20%)	95-136 MPH (114 MPH)
Façade components torn from structure	97-140 MPH (118 MPH)
Damage to curtain walls or other wall cladding	110-152 MPH (131 MPH)
Uplift of pre-cast concrete roof slabs	119-163 MPH (142 MPH)
Uplift of metal deck with concrete fill slab	118-170 MPH (146 MPH)
Collapse of some top building envelope	127-172 MPH (148 MPH)
Significant damage to building envelope	178-268 MPH (210 MPH)

Source: Storm Prediction Center, 2009

Table 2-45: Educational Institutions (Elementary Schools, High Schools)	
DAMAGE DESCRIPTION	WIND SPEED RANGE (Expected in Parentheses)
Threshold of visible damage	55-83 MPH (68 MPH)
Loss of roof covering (<20%)	66-99 MPH (79 MPH)
Broken windows	71-106 MPH (87 MPH)
Exterior door failures	83-121 MPH (101 MPH)
Uplift of metal roof decking; significant loss of roofing material (>20%); loss of rooftop HVAC	85-119 MPH (101 MPH)
Damage to or loss of wall cladding	92-127 MPH (108 MPH)
Collapse of tall masonry walls at gym, cafeteria, or auditorium	94-136 MPH (114 MPH)
Uplift or collapse of light steel roof structure	108-148 MPH (125 MPH)
Collapse of exterior walls in top floor	121-153 MPH (139 MPH)
Most interior walls of top floor collapsed	133-186 MPH (158 MPH)
Total destruction of a large section of building envelope	163-224 MPH (192 MPH)

Source: Storm Prediction Center, 2009

Table 2-46 Metal Building Systems	
DAMAGE DESCRIPTION	WIND SPEED RANGE (Expected in Parentheses)
Threshold of visible damage	54-83 MPH (67 MPH)
Inward or outward collapsed of overhead doors	75-108 MPH (89 MPH)
Metal roof or wall panels pulled from the building	78-120 MPH (95 MPH)
Column anchorage failed	96-135 MPH (117 MPH)
Buckling of roof purlins	95-138 MPH (118 MPH)
Failure of X-braces in the lateral load resisting system	118-158 MPH (138 MPH)
Progressive collapse of rigid frames	120-168 MPH (143 MPH)
Total destruction of building	132-178 MPH (155 MPH)

Source: Storm Prediction Center, 2009

Table 2-47: Electric Transmission Lines	
DAMAGE DESCRIPTION	WIND SPEED RANGE (Expected in Parentheses)
Threshold of visible damage	70-98 MPH (83 MPH)
Broken wood cross member	80-114 MPH (99 MPH)
Wood poles leaning	85-130 MPH (108 MPH)
Broken wood poles	98-142 MPH (118 MPH)

Strong winds can also occur outside of tornadoes, severe thunderstorms, and winter storms. These winds typically develop with strong pressure gradients and gusty frontal passages. The closer and stronger two systems (one high pressure, one low pressure) are, the stronger the pressure gradient, and therefore, the stronger the winds are.

Downburst winds, which can cause more widespread damage than a tornado, occur when air is carried into a storm's updraft, cools rapidly, and comes rushing to the ground. Cold air is denser than warm air, and therefore, wants to fall to the surface. On warm summer days, when the cold air can no longer be supported up by the storm's updraft, or an exceptional downdraft develops, the air crashes to the ground in the form of strong winds. These winds are forced horizontally when they reach the ground and can cause significant damage. These types of strong winds can also be referred to as straight-line winds. Downbursts with a diameter of less than 2.5 miles are called microbursts and those with a diameter of 2.5 miles or greater are called macrobursts. A derecho, or bow echo, is a series of downbursts associated with a line of thunderstorms. This type of phenomenon can extend for hundreds of miles and contain wind speeds in excess of 100 mph.

HAZARD PROFILE

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 structure. Table below indicates events that have occurred in Montgomery County since 1920; events occurring prior to 2007 have magnitudes assigned according to the old F-Scale while those after 2007 are reported in the EF-Scale. Montgomery County reported a total of 17 tornadoes to NOAA since 1950. One of the most damaging occurred on October 18, 1990. During this event, a number of tornadoes spawned from a supercell, and an F1 tornado struck Kensington. This storm had a damage path 1 mile long and 100 yards wide, causing an estimated $500,000 in damage and one injury. Trees were uprooted and many snapped, landing on cars and homes.

Table 2-48: Tornado History for Montgomery County, MD from 1950 – 2010.					
LOCATION	DATE	MAGNITUDE	DEATH	INJURY	PROPERTY DAMAGE
Montgomery County	05/02/1929	Unknown	4	4	$75,000

Table 2-48: Tornado History for Montgomery County, MD from 1950 – 2010.					
LOCATION	DATE	MAGNITUDE	DEATH	INJURY	PROPERTY DAMAGE
Montgomery County	8/31/1952	F1	0	0	$5,000-$50,000
Montgomery County	7/1/1959	F1	0	0	$500-$5000
Montgomery County, MD and Loudon County, VA	8/26/1967	F1	0	0	$5,000-$50,000
Montgomery County	9/5/1979	F2	0	0	$50,000-$500,000
Montgomery County	5/12/1974	F1	0	0	$500-$5000
Montgomery County	10/18/1990	F1	0	1	$500,000
Montgomery County	8/20/1991	F1	0	0	$5,000-$50,000
Montgomery County	9/27/1993	F1	0	0	$50-$500
Montgomery County	9/22/1995	F1	0	0	$5,000-$50,000
Montgomery County	7/19/1996	F1	0	0	-
Montgomery County, MD and Loudon County, VA	7/19/1996	F0	0	0	-
Montgomery County	6/21/2000	F1	0	0	$250,000
Montgomery County	5/27/2001	F1	0	0	$500,000
Montgomery County, MD and Loudon County, VA	11/5/2003	F0	0	0	$1,000
Montgomery County	11/5/2003	F1	0	0	$200,000
Montgomery County	11/5/2003	F1	0	0	$1,000,000
Montgomery County	9/17/2004	F1	0	0	$120,000
Montgomery County	6/4/2008	EF0	0	0	$2,000

A tornado path averages 4 miles in length, but may reach up to 300 miles. Widths average 300 to 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 or more than 15 to 20 minutes in a 10-mile area, but their short periods of existence do 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 also be affected by downbursts. Because of this, the path of a tornado can be very unpredictable, including veering right, left or even taking a U-turn.

Due to the nature of storms, it is extremely difficult to predict, but through identifying various indicators of weather systems, and tracking these indicators, it provides us with a crucial means of monitoring extreme weather. Understanding the historical frequency, duration, and spatial extent of high wind events assists in determining the likelihood and potential severity of future occurrences. The characteristics of past severe wind events provide benchmarks for projecting similar conditions into the future. The probability of Montgomery County and its municipalities experiencing a tornado can be difficult to quantify, but based on historical record of 17 events since 1950, it can reasonably be assumed that this type of event has occurred once every 3.5 years from 1950 through 2012.

[(Last Reporting Year) 2012] subtracted by [(Historical Year) 1950] = 62 Years on Record

[(Years on Record) 62] divided by [(Number of Historical Events) 17] = 3.65

Furthermore, the historic frequency calculates that there is a 27% chance of this type of event occurring each year. The figure on the next page shows where tornadoes have occurred in Montgomery County, MD.

POTENTIAL LOSSES FROM TORNADO EVENTS

Any given tornado can cause damage along its specific track, including causing losses to above-ground structures and infrastructure. These losses are typically covered by insurance, but there are indirect losses related to time, maintenance, and contents. Because it is so difficult to predict the path of a tornado, potential loss estimates must rely on historic events. Montgomery County has experienced between $2.6 and $7.3 million in cumulative tornado-related damages since 1950; individual events have ranged in damages from $50 to $500,000.

LAND USE & DEVELOPMENT TRENDS

All future structures built in Montgomery County will likely be exposed to high winds over their lifetime, regardless of the land use or development trends. However, Montgomery County's residential and commercial construction design parameters include provisions for structures to withstand 90 mph wind speeds. Additionally, accessory buildings and sheds constructed must be anchored to resist wind loads of 15 lbs. per square foot of lateral load. Implementation of these design standards may lessen the impact of tornado events for future construction across Montgomery County.

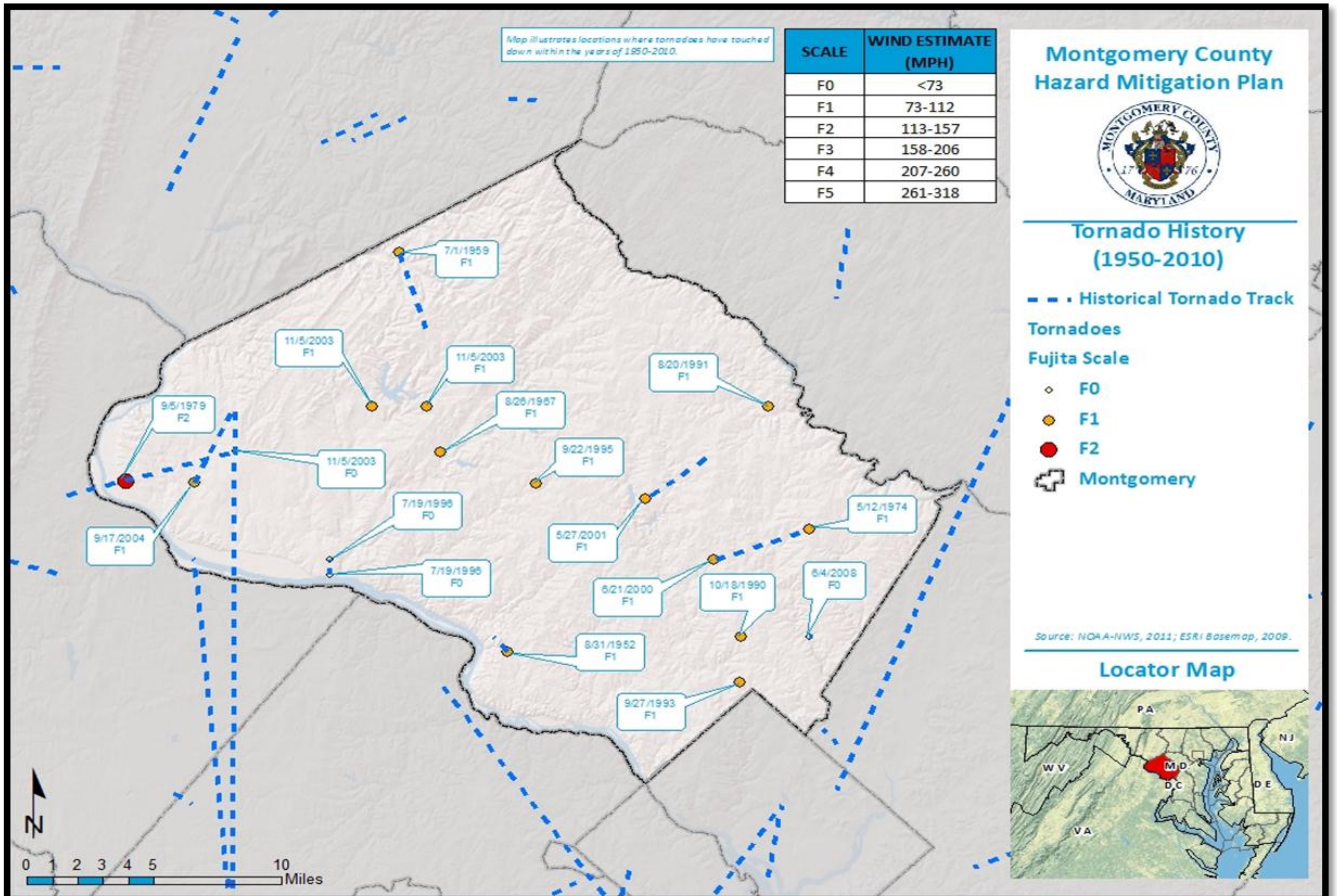
MULTI-JURISDICTIONAL DIFFERENCES

Due to the nature of high winds, all jurisdictions in Montgomery County are expected to be equally susceptible to tornadoes. However, damages may be higher in the denser areas following the I-270 and I-495 corridors in the communities of Gaithersburg, Rockville, Garrett Park, Kensington, Bethesda, Chevy Chase, Silver Spring, and Tacoma Park.

TORNADO HIRA SUMMARY

Tornadoes often occur in conjunction with other hazards such as thunderstorms, hail, and lightning and can occur year-round, though they are more common from March-June. Tornado events can disrupt transportation, power transmission and even communications. Mitigation measures may include enhanced building codes, planned deployment of resources, underground utility lines for critical facilities, and increased tree trimming along utilities. Weather data is limited by the observations reported; many events are never reported or recorded with the National Weather Service or other archiving agencies.

Figure 2-26


Map illustrates locations where tornadoes have touched down within the years of 1950-2010.
SCALE
WIND ESTIMATE (MPH)
F0 <73
F1 73-112
F2 113-157
F3 158-206
F4 207-260
F5 261-318
Montgomery County Hazard Mitigation Plan
Tornado History (1950-2010)
Historical Tornado Track
Tornadoes
Fujita Scale
F0
F1
F2
Montgomery
Source: NOAA-NWS, 2011; ESRI Basemap, 2009.
Locator Map
PA
MD
NJ
WV
DC
DE
VA
7/1/1959 F1
11/5/2003 F1
11/5/2003 F1
8/20/1991 F1
9/5/1979 F2
8/26/1967 F1
11/5/2003 F0
9/22/1995 F1
7/19/1996 F0
5/12/1974 F1
9/17/2004 F1
5/27/2001 F1
7/19/1996 F0
6/4/2008 F0
6/21/2000 F1
10/18/1990 F1
8/31/1952 F1
9/27/1993 F1
N
0 1 2 3 4 5 10 Miles

EARTHQUAKE/SEISMIC ACTIVITY

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING
Earthquake	0.3	0.3	0.6	0.4	0.2	**1.8**
LOW RISK HAZARD (0.1-1.9)						

HAZARD IDENTIFICATION

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10 – 20 miles of the Earth's crust. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking which is dependent upon amplitude and duration of the earthquake (FEMA, 1997).

Earthquake Mechanics

Regardless of the source of the earthquake, the associated energy travels in waves radiating outward from the point of release. When these waves travel along the surface, the ground shakes and rolls, fractures form, and water waves may be generated. Earthquakes generally last a matter of seconds but the waves may travel for long distances and cause damage well after the initial shaking at the point of origin has subsided.

Breaks in the crust associated with seismic activity are known as "faults" and are classified as either active or inactive. Faults may be expressed on the surface by sharp cliffs or scarps or may be buried below surface deposits.

"Foreshocks," minor releases of pressure or slippage, may occur months or minutes before the actual onset of the earthquake. "Aftershocks," which range from minor to major, may occur for months after the main earthquake. In some cases, strong aftershocks may cause significant additional damage, especially if the initial earthquake impacted emergency management and response functions or weakened structures.

Factors Contributing to Damage

The damage associated with each earthquake is subject to four primary variables:

- The nature of the seismic activity
- The composition of the underlying geology and soils
- The level and quality of development of the area struck by the earthquake
- The time of day

Seismic Activity: The properties of earthquakes vary greatly from event to event. Some seismic activity is localized (a small point of energy release), while other activity is widespread (e.g., a major fault letting loose all at once). Earthquakes can be very brief (only a few seconds) or last for a minute or more. The depth of release and type of seismic waves generated also play roles in the nature and location of damage; shallow quakes will hit the area close to the epicenter harder, but tend to be felt across a smaller region than deep earthquakes.

Geology and Soils: The surface geology and soils of an area influence the propagation (conduction) of seismic waves and how strongly the energy is felt. Generally, stable areas (e.g., solid bedrock) experience less destructive shaking than unstable areas (e.g., fill soils). The siting of a community or even individual buildings plays a strong role in the nature and extent of damage from an event**.**

Development: An earthquake in a densely populated area which results in many deaths and considerable damage may have the same magnitude as a shock in a remote area that has no direct impact. Large magnitude earthquakes that occur beneath the oceans may not even be felt by humans.

Time of Day: The time of day of an event controls the distribution of the population of an affected area. On work days, the majority of the community will transition between work or school, home, and the commute between the two. The relative seismic vulnerability of each location can strongly influence the loss of life and injury resulting from an event.

Types of Damage

While damage can occur by movement at the fault, most damage from earthquake events is the result of shaking. Shaking also produces a number of phenomena that can generate additional damage:

- Ground displacement
- Landslides and avalanches
- Liquefaction and subsidence
- Seiches

Shaking: In minor events, objects fall from shelves and dishes are rattled. In major events, large structures may be torn apart by the forces of the seismic waves. Structural damage is generally limited to older structures that are poorly maintained, constructed, or designed in all but the largest quakes. Un-reinforced masonry buildings and wood frame homes not anchored to their foundations are typical victims.

Loose or poorly secured objects also pose a significant hazard when they are loosened or dropped by shaking. These “non-structural falling hazard” objects include bookcases, heavy wall hangings, and building facades. Home water heaters pose a special risk due to their tendency to start fires when they topple over and rupture gas lines. Crumbling chimneys may also be responsible for injuries and property damage.

Dam and bridge failures are significant risks during stronger earthquake events, and due to the consequences of such failures, may result in considerable property damage and loss of life. In areas of severe seismic shaking hazard, Intensity VII or higher can be experienced even on solid bedrock. In these areas, older buildings especially are at significant risk.

Ground Displacement: Often, the most dramatic evidence of an earthquake results from displacement of the ground along a fault line.

Landslides and Avalanches: Even small earthquake events can cause landslides. Rock falls are common as unstable material on steep slopes is shaken loose, but significant landslides or even debris flows can be generated if conditions are ripe. Roads may be blocked by landslide activity, hampering response and recovery operations. Avalanches are possible when the snowpack is sufficient.

Liquefaction and Subsidence: Soils may liquefy and/or subside when impacted by the seismic waves. Fill and previously saturated soils are especially at risk. The failure of the soils can lead to possibly widespread structural damage. The oscillation and failure of the soils may result in increased water flow and/or failure of wells as the subsurface flows are disrupted and sometimes permanently altered. Increased flows may be dramatic, resulting in geyser-like water spouts and/or flash floods. Similarly, septic systems may be damaged creating both inconvenience and health concerns.

Seiches: Seismic waves may rock an enclosed body of water (e.g., lake or reservoir), creating an oscillating wave referred to as a "seiche." Although not a common cause of damage in earthquakes, there is a potential for large, forceful waves similar to tsunami ("tidal waves") to be generated on the large lakes of the state. Such a wave would be a hazard to shoreline development and pose a significant risk on dam-created reservoirs. A seiche could either overtop or damage a dam leading to downstream flash flooding.

HAZARD PROFILE

Figure 2-28, depicts the location and extent for where earthquake events have occurred in relation to Montgomery County. For earthquake magnitude is often measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. Table 2-49 summarizes Richter Scale magnitudes as they relate to the spatial extent of impacted areas.

Table 2-49: Richter scale magnitudes and associated earthquake size effects.

RICHTER MAGNITUDES	EARTHQUAKE EFFECTS
Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
5.4- 6.0	At most, slight damage to well-designed buildings; can cause major damage to poorly constructed buildings over small regions.

Table 2-49: Richter scale magnitudes and associated earthquake size effects.

RICHTER MAGNITUDES	EARTHQUAKE EFFECTS
6.1-6.9	Can be destructive up to about 100 kilometers from epicenter.
7.0-7.9	Major earthquake; can cause serious damage over large areas.
8.0 or greater	Great earthquake; can cause serious damage in areas several hundred kilometers across.

The impact an earthquake event has on an area is typically measured in terms of earthquake intensity. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. A detailed description of the Modified Mercalli Intensity Scale is shown in Table below.

Table 2-50: Modified Mercalli Intensity

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

Table 2-50: Modified Mercalli Intensity

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER SCALE MAGNITUDE
XII	Catastrophic	Total destruction, trees fall, ground rises and falls in waves	>8.1

One way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. Peak ground acceleration (PGA) measures the strength of ground movements in this manner. PGA represents the rate in change of motion of the earth's surface during an earthquake as a percent of the established rate of acceleration due to gravity.

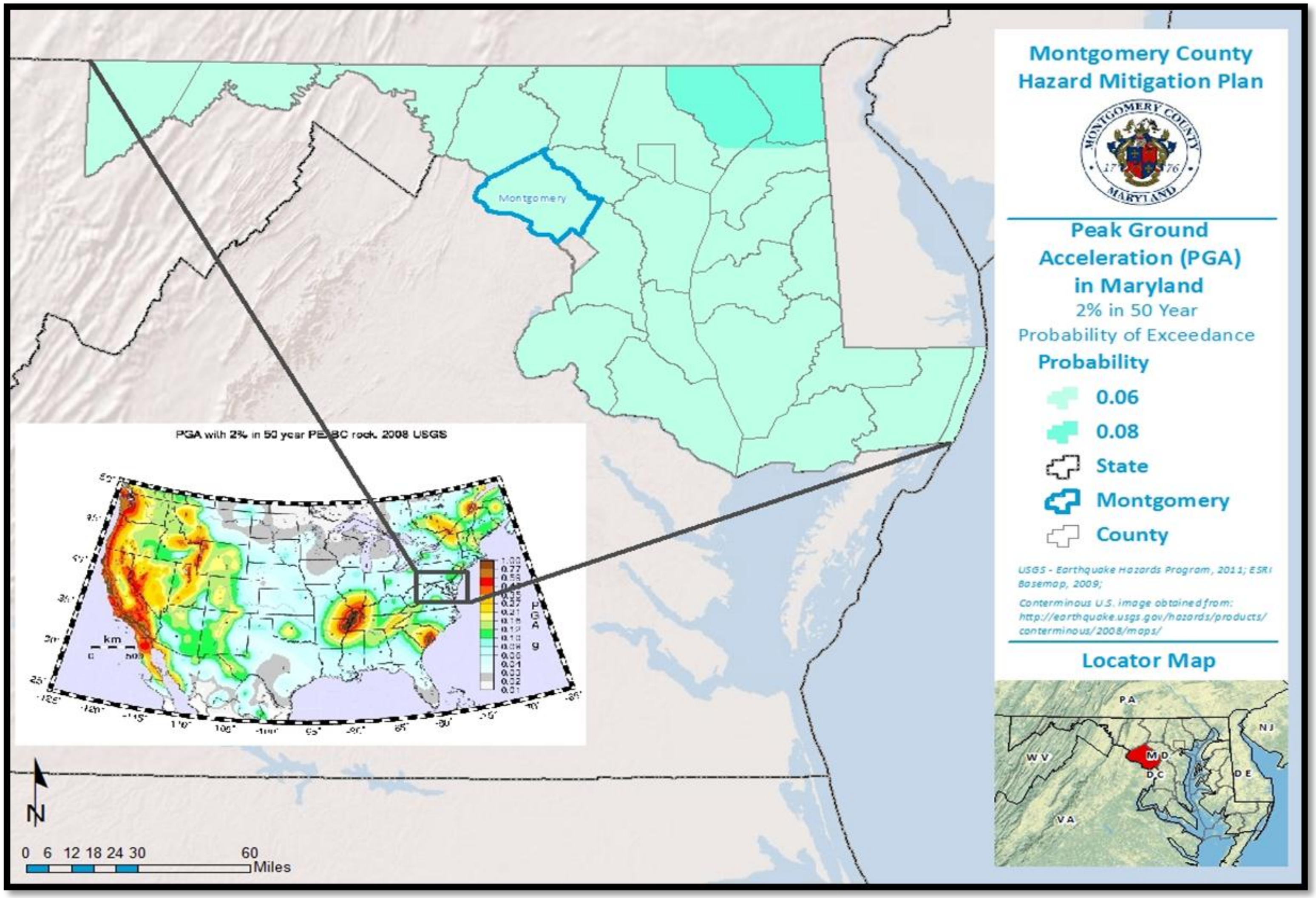
The lack of noticeable activity in Montgomery County can be partly attributed to the PGA. PGA is partly determined by what soils and bedrocks are present in the area. In regards to Montgomery County, the PGA is relatively low. As shown in the figure below, Montgomery County is in the area of 0.06 PGA.

The earliest recorded earthquake in Maryland was located in Annapolis on April 24, 1758 and measured between 3.5 and 3.7 on the Richter Scale. The last recorded earthquake event in Montgomery County was recorded on July 16, 2010 and measured 3.4 on the Richter Scale. Maryland has recorded 68 earthquakes since 1758. None of these earthquakes were reported to cause major damage or loss of life. Most sources in the geology science predict that the largest magnitude earthquake that might occur in the state of Maryland would register between 4 and 4.5. Maryland has a very low probability of experiencing a destructive earthquake in a 50-year period.

When the peak acceleration nears .1g, damage may be caused to poorly constructed buildings while acceleration nearing .2 would create loss of balance and greater damage to lesser quality structures. As mentioned previously, Montgomery County has peak acceleration much below that number, thus providing a buffer from most seismic activity. On a local basis, community members within Montgomery County have made reports of ground shakings. With this in mind, seismic activity will be a lessened priority in this plan. Environmental impacts of earthquakes can be numerous, widespread, and devastating, particularly if indirect impacts are considered. Some examples are shown below, but are unlikely to occur in Montgomery County:

- Induced flooding and landslides;
- Poor water quality;
- Damage to vegetation; and
- Breakage in sewage or toxic material containments

Figure 2-27


Montgomery County
Hazard Mitigation Plan
Peak Ground Acceleration (PGA) in Maryland
2% in 50 Year
Probability of Exceedance
Probability
0.06
0.08
State
Montgomery
County
USGS - Earthquake Hazards Program, 2011; ESRI Basemap, 2009;
Conterminous U.S. image obtained from: http://earthquake.usgs.gov/hazards/products/conterminous/2008/maps/
Locator Map
PA
NJ
WV
MD
DC
DE
VA
Montgomery
PGA with 2% in 50 year PE. BC rock. 2008 USGS
N
0 6 12 18 24 30 60
Miles

The likelihood of a hazard event happening is usually expressed in terms of frequency. It is critically important to establish a probability of occurrence so that community officials can make informed decisions about the sustainability of future development and determine the feasibility of proposed mitigation projects. The exact probability of an earthquake is very site-specific, and no one map will illustrate the probability, but USGS has spatial data illustrating seismic hazard nationwide, expressed in terms of peak ground acceleration (percent of gravity) with a 2, 5, or 10% probability of exceedance in 50 years. The figure on the next page shows the 2% probability of exceedance in 50 years. Damage starts to occur at around 10-15% g (percent of gravities). Maryland falls in the 4-10% g range which could mean an expected magnitude earthquake of 4.0-4.5. The higher the Peak Ground Acceleration (PGA), the higher the probability of future earthquake events. This data can be accessed via the National Atlas, http://nationalatlas.gov/index.html. Since predicting future hazard events is not an exact science, it is also acceptable to base the prediction of future hazard occurrences on past history - for example, dividing the number of events by the number of years' data exists to calculate the number of events per year. The more historical data you can obtain, the more accurate your calculated probability of future occurrence will be for a given hazard.

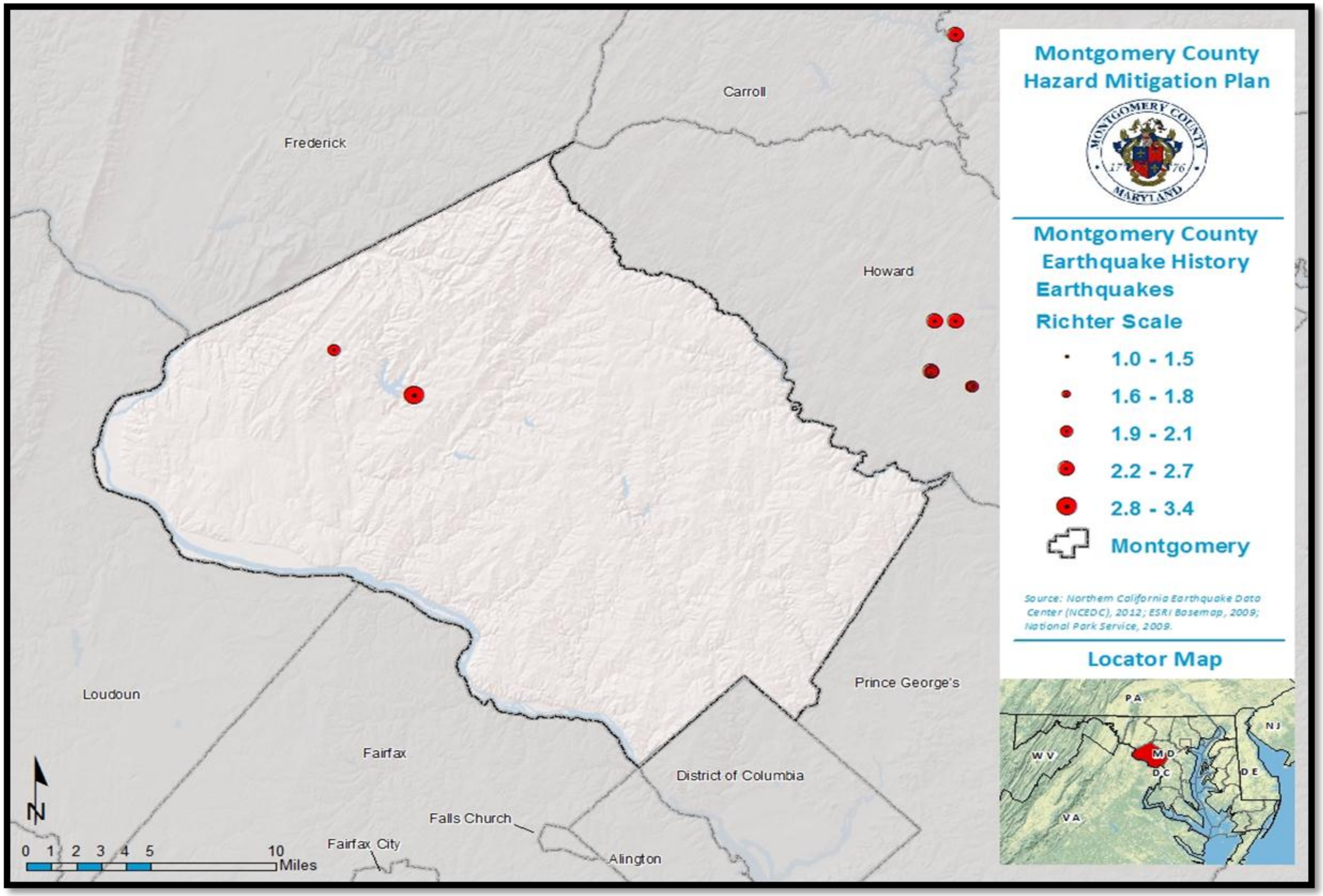
INVENTORY ASSETS EXPOSED TO EARTHQUAKE/SEISMIC ACTIVITY

Earthquakes are low probability, high-consequence events. Although earthquakes may occur infrequently they can have devastating impacts. Ground shaking can lead to the collapse of buildings and bridges; disrupt gas, life lines, electric, and phone service. Deaths, injuries, and extensive property damage are possible vulnerabilities from this hazard. Some secondary hazards caused by earthquakes may include fire, hazardous material release, landslides, flash flooding, avalanches, tsunamis, and dam failure. Moderate and even very large earthquakes are inevitable, although very infrequent, in areas of normally low seismic activity. Consequently, buildings in these regions are seldom designed to deal with an earthquake threat; therefore, they are extremely vulnerable.

Most property damage and earthquake-related injuries and deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site, and regional geology. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (mountain regions and along hillsides), and liquefaction, in which ground soil loses shear strength and the ability to support foundation loads. In the case of liquefaction, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

A mitigation action will be created to develop a countywide inventory of existing structures and infrastructure susceptible to Earthquake/Seismic Activity in order to address this specific plan element in the next Plan update.

Figure 2-28


Montgomery County
Hazard Mitigation Plan
Montgomery County
Earthquake History
Earthquakes
Richter Scale
1.0 - 1.5
1.6 - 1.8
1.9 - 2.1
2.2 - 2.7
2.8 - 3.4
Montgomery
Source: Northern California Earthquake Data Center (NCEDC), 2012; ESRI Basemap, 2009; National Park Service, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
Carroll
Frederick
Howard
Loudoun
Prince George's
Fairfax
District of Columbia
Falls Church
Fairfax City
Arlington
N
0 1 2 3 4 5 10
Miles

POTENTIAL LOSSES

In the event of an earthquake, the magnitude and location in the County would determine the possible loss of life and infrastructure affected.

LAND USE & DEVELOPMENT TRENDS

The effects of an earthquake (if the hazard exists) could potentially be anything from detected only on seismographs to ground water wells collapsing to total destruction, trees falling, ground rises and falls in waves. Continued enforcement of the unified construction code should mitigate this vulnerability.

MULTI-JURISDICTIONAL DIFFERENCES

As stated previously, the probability for a seismic event in Montgomery County is low. However, if for some reason an event was to occur with the epicenter near the county, there is no way to comprehend the amount of damage that could be sustained by the county.

EARTHQUAKE/SEISMIC ACTIVITY HIRA SUMMARY

Earthquakes give little to no warning. They are capable of having a large impact on an area. The impacts of an earthquake can be similar to that of a tornado. After-effects from an earthquake can include impacted roadways, downed power and communication lines, and damages to structures (especially poorly built, or those already in disrepair). Earthquakes are not a seasonal hazard, and thus can be experienced year round. This can present its own set of issues.

LAND SUBSIDENCE

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING (PRIORITY)
Land Subsidence	1 (.3)	1 (.3)	1 (.2)	4 (.4)	1 (.1)	**1.3**
LOW RISK (0.1 – 1.9)						

HAZARD IDENTIFICATION

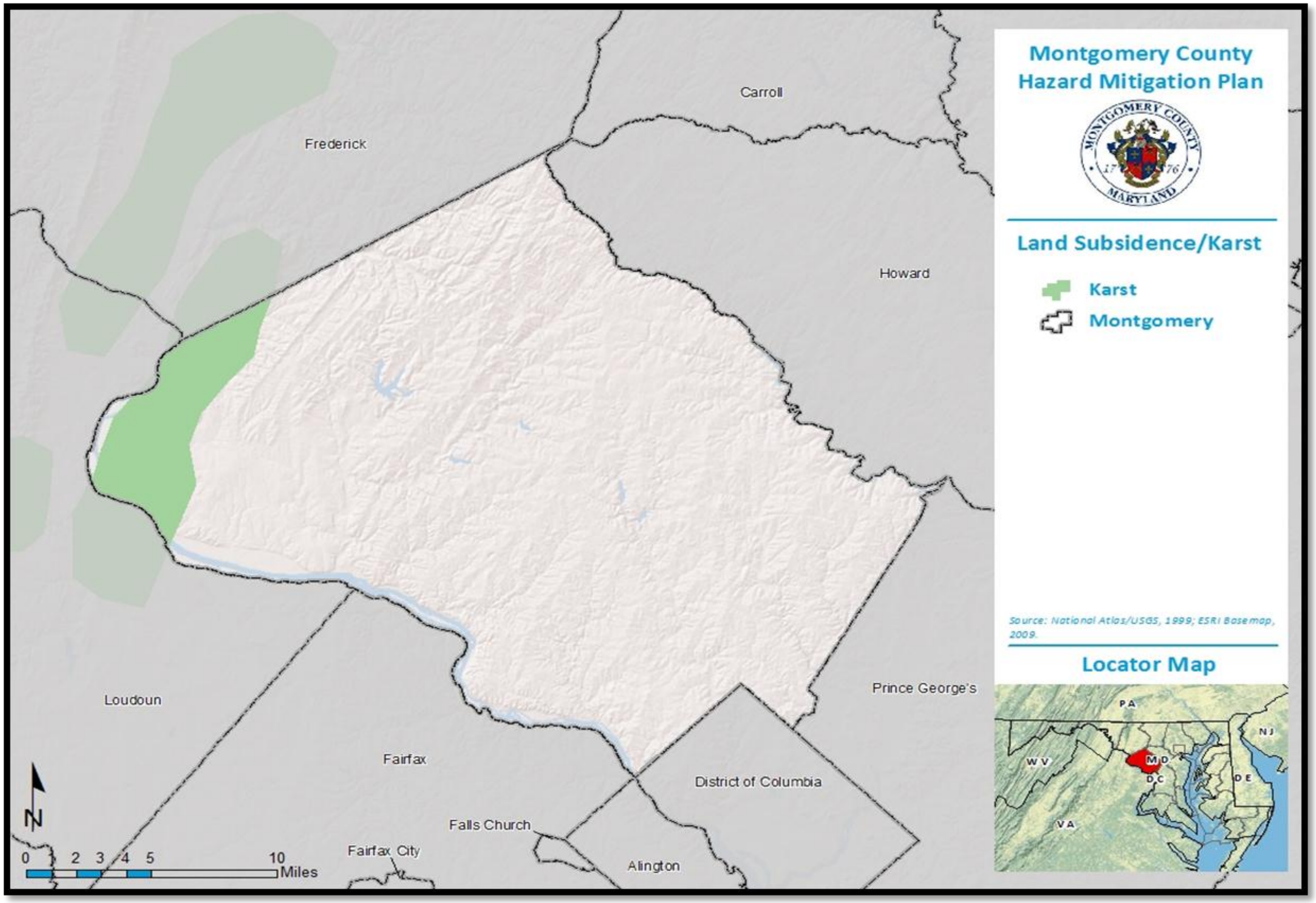
Land subsidence is the sinking or settling movement of the earth's surface, the result of this movement is commonly referred to as a sinkhole. There are several common causes of subsidence in Maryland, each of which can cause subsidence or sinkholes in different areas of Montgomery County. The 2011 draft Maryland State Hazard Mitigation plan lists the causes as follows: 1) drainage of organic soils, 2) mining, 3) hydrocompaction, 4) aquifer system compaction, 5) natural compaction, 6) sinkholes, and 7) thawing permafrost. The State Plan further describes that water-related subsidence is typically caused by dissolution and collapse of susceptible rocks, drainage of soils, and the compaction of aquifer systems. Subsidence can occur quickly or gradually and cover varying amounts of land area.

Water passing through naturally occurring fractures, joints, and bedding planes dissolves bedrock and leaves voids below the surface. Eventually, overburden on top of the voids collapses, leaving surface depressions resulting in karst topography. Characteristic structures associated with karst topography include sinkholes, linear depressions and caves. In Maryland, limestone, dolostone, and marble, or carbonate rock underlie most Karst topography, according to the State Plan. Often, sub-surface solution of limestone will not result in the immediate formation of karst features. Collapse sometimes occurs only after a large amount of activity, or when a heavy burden is placed on the overlying material.

Maryland is part of six distinct physiographic provinces: 1) the Atlantic Continental Shelf, 2) the Coastal Plain, 3) the Piedmont Plateau, 4) the Blue Ridge, 5) the Ridge and Valley, and 6) the Appalachian Plateaus Provinces. Montgomery County lies principally within the Upland Section of the Piedmont Plateau Province, according to the Maryland Geological Survey. Though the majority of Montgomery County has limestone formations, the only areas of karst topography are in the western portion of the County, as shown in the figure below.

Karst formations develop in specific ways that are influenced by unique local conditions. Sinkholes can be induced through natural or human causes. Sinkholes that occur naturally usually form by the slow downward dissolution of carbonate rock though bedrock collapse in areas that overlie caverns. Human induced sinkholes can be triggered by simple alteration in the local hydrology. Inadequate drainage along highways and increased runoff from pavements can also be sources of sinkhole development. The Maryland Geological Survey describes that in the past, many minerals such as iron ore, gold and slate were mined throughout the Piedmont Plateau Province. Currently, crushed stone is extracted from the province for use in cement, lime and aggregate, but other mining activity has stopped. As mining activity has declined in the region, so has the risk of subsidence from mining.

Figure 2-29


Montgomery County
Hazard Mitigation Plan
Land Subsidence/Karst
Karst
Montgomery
Source: National Atlas/USGS, 1999; ESRI Basemap, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
Carroll
Frederick
Howard
Loudoun
Prince George's
Fairfax
District of Columbia
Falls Church
Fairfax City
Arlington
0 1 2 3 4 5 10 Miles
N

The figure on the previous page illustrates where land subsidence/karst topography exists in Montgomery County.

HAZARD PROFILE

Montgomery County is located in an area of low susceptibility and incidence based on the USGS Landslide Overview Map of the Conterminous United States. However, there are several past occurrences of sinkholes and subsidence in the county. There is no established database for recording or researching land subsidence and sinkhole incidents in the state of Maryland, but many news articles and technical reports document most occurrences.

A 1996 water resources study on the Patuxent River by the U.S. Army Corps of Engineers indicated that increased withdrawals of groundwater may be causing land subsidence as well as salt water intrusion in the Patuxent watershed area.

A sinkhole formed underneath a historic statue in Bethesda Maryland in 2004. According to the Gazette, a water main break was the cause of the sinkhole, which led to the temporary relocation of the Madonna of the Trail statue to a nearby school in Rockville. Two years later, heavy rain in June led to sinkholes developing along the side of Woodcrest Drive in Rockville Maryland.

A large sinkhole developed near the bridge on Randolph Road over Rock Creek in February 2007, causing road delays to allow for repairs. In December of 2010, a Chevy Chase resident lost his car when a sinkhole formed below the vehicle, collapsing his parking spot into the hole. The hole developed due to a local water main break prior to the incident.

INVENTORY ASSETS EXPOSED TO HAZARD

Buildings, ground water, and residents in the western portion of the County with Karst topography may be more vulnerable to subsidence, but sinkholes and subsidence can occur in any part of Montgomery County. Land subsidence primarily impacts infrastructure and groundwater, but can endanger buildings, people, and utility lines as well.

POTENTIAL LOSSES

The most important environmental issues with respect to karst are the sensitivity of karst aquifers to groundwater contamination and foundation engineering problems. Groundwater contamination is universal among all karst regions in the United States that underlie populated areas.

Typical foundation engineering problems include differential compaction and settling, subsurface erosion, and collapse sinkholes, according to the Maryland Geological Survey. Potential effects are the collapse of a building or pavement, the slow sinking of a building or pavement, or cracks developing in building or structure foundations.

LAND USE & DEVELOPMENT TRENDS

Development of land for building and roadway construction should avoid filling wetlands or streams to reduce vulnerability to land subsidence. All building projects should require detailed engineering design to avoid or plan for subsidence.

MULTI-JURISDICTIONAL DIFFERENCES

All of Montgomery County could be affected by land subsidence. However, the greatest threat likely resides in the western portion of the County, as shown in the figure 2-29 to have the greatest concentration of Karst formations in the County . Subsidence can damage roadways, buildings, and utilities and lead to groundwater contamination, thus it can greatly inconvenience or endanger any community within Montgomery County.

HIRA SUMMARY

Land subsidence may occur due to natural or manmade causes. Impacts can include sinkhole collapses, differential foundation settlement, and groundwater contamination. Due to its geology, Montgomery County is not at great risk from land subsidence, but the hazard will sometimes occur. It is important to ensure that all development is built to code to withstand impacts from land subsidence and that sinkhole collapse will be better documented in the future in order to increase understanding of this hazard.

HAZARDOUS MATERIALS

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING (PRIORITY)
Hazardous Materials	0.9	0.9	0.4	0.4	0.2	**2.8**
MODERATE RISK HAZARD (2.0 – 2.9)						

HAZARD IDENTIFICATION

Hazardous materials cover a broad category of substances that pose a potential risk to life, health, the environment, or property when not properly contained. These hazardous materials may be in solid, liquid, or gaseous forms that exhibit explosive, flammable, combustible, corrosive, reactive, poisonous, biological, or radioactive characteristics.

Hazardous material incidents are usually accidental events that arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials. The consequences of such incidents are usually unintended. Incidents most often occur due to human error, natural hazards, or a breakdown in equipment or monitoring systems. An accidental or intentional release of hazardous materials could produce a health hazard to those in the area, downwind, and/or downstream with immediate, prolonged, and/or delayed effects. The spread of the material may additionally be defined by weather conditions and topography of the area.

A hazardous material incident can come from a fixed facility, transportation, or an intentional release such as terrorism. Fixed facilities are buildings and other stationary structures on a single sit that manufacture, produce, use, transfer, store, supply, or distribute any hazardous materials. Examples of fixed facilities in Montgomery County include rail yards, truck terminals, water treatment plants, swimming pools, gas stations, and supply stores containing substances such as fuel, farm chemicals, propane, fuel oil, paint, and small amounts of chlorine.

A hazardous material release may also occur due to a transportation accident. The most likely locations for a transportation-related hazardous material release are along the highways and major roads running throughout the county. Gas, propane, and other hazardous materials are delivered throughout the county year round. The need for gas, propane, fertilizers, and other toxic materials in daily life creates a larger risk for a hazardous materials release.

HAZARD PROFILE

A hazardous materials release in Montgomery County may not only contaminate dirt or surface material but potentially contaminate flowing water in ditches, rivers, or small streams. The widest area of vulnerability to the public occurs during airborne releases of acutely toxic gases. Other potential concerns for spills/leaks are icy road conditions during winter months, sabotage, and terrorism.

The US EPA's Toxic Release Inventory (TRI) program, tracks hazardous materials release and disposal data for US counties and states. Since 1994, there have been no significant reported releases in Montgomery County. However, the TRI does note many substances that have been safely disposed in the County. Disposals include nitroglycerin, arsenic, chromium, manganese, mercury, nickel, nitric acid, sulfuric acid, and zinc. The TRI data does not provide data regarding the effect on the public of releases or disposals of hazardous materials.

Montgomery County conducted a Hazardous Materials Commodity Flow Survey to assist the County and the Local Emergency Planning Committee understands what commodities are shipped near or through the County. Results of the above survey identified potential risk areas (PRAs) between known and perceived problem areas and the overall critical infrastructure within Montgomery County. PRAs are defined as locations or modes of transportation vulnerable because of the presence or movement of hazardous materials which may pose a threat to lives and property within the County.

Several roads and transportation routes within the County were deemed a PRA: Interstate (I) – 495, I-270, Maryland State Road (MD) 355, and U.S. Route (US) 29, as shown in Figure 2-30. I-495 is registered as a National Hazardous Materials Route; based on Commodity Flow Surveys conducted in recent years in Montgomery, Prince George's, and Frederick counties, I-270 was noted as a thoroughfare used to transport hazardous materials. MD355 and US 29 are major roadways in the County and the greater Washington Metropolitan Region that provide access to neighboring jurisdictions as well as to industrial parks within the County. Additionally, hazardous materials incidents can occur on railroads; the CSX Mainline is the only railway operating within Montgomery County, also shown in Figure 2-30 and has been deemed a PRA due to the lack of information regarding the precise amount of hazardous materials transported. Gas pipelines, also shown in Figure 2-31 are also considered a PRA since there needs to be content verification. In addition to surveying these transportation routes, as much as practicable, the County sent surveys to 171 fixed facilities that store, manufacture, use, or ship hazardous materials. These fixed facilities were pulled from the database of the County's HAZMAT permitting program and selected based on their increased likelihood of transporting hazardous materials on a regular basis.

The most common types of hazardous materials identified during the surveys include:

- Corrosive Materials – Acids and bases
- Hazardous Gases – Carbon dioxide, methane, and ammonia
- Flammable Substances in Gas or Liquid Form – Gasoline and diesel fuel, pesticides, cleaning agents, and various paint solvents

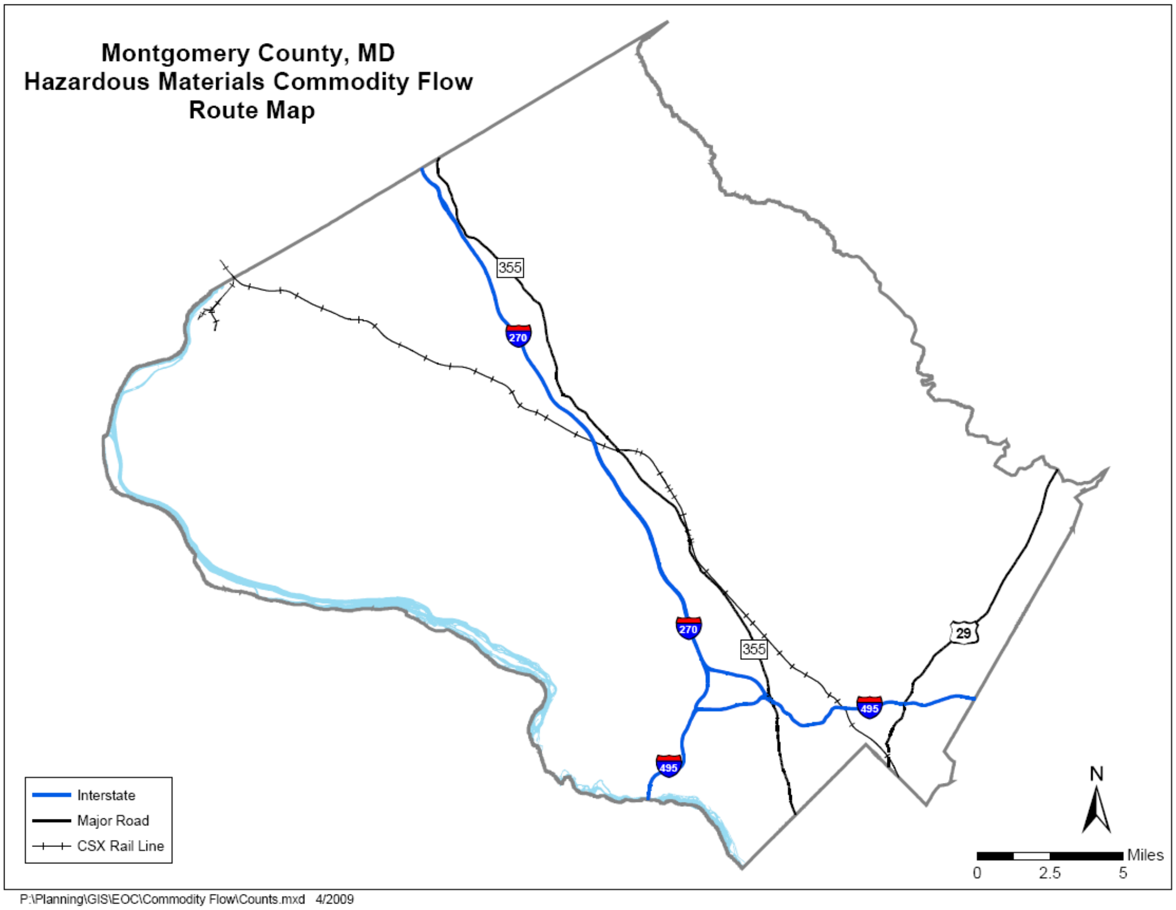


Figure 2-30: ***Source: Montgomery County, MD Hazardous Materials Commodity Flow Survey***

With a hazardous material release, whether accidental or intentional, there are potentially exacerbating or mitigating circumstances that will affect its severity or impact. Mitigating conditions are precautionary measures taken in advance to reduce the impact of a release on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place protects people and property from the harmful effects of a hazardous material release. Exacerbating conditions, characteristics that can enhance or magnify the effects of a hazardous material release include:

- **Weather conditions:** affects how the hazard occurs and develops
- **Micro-meteorological effects of buildings and terrain:** alters dispersion of hazardous materials
- **Non-compliance with applicable codes (e.g. building or fire codes) and maintenance failures (e.g. fire protection and containment features):** can substantially increase the damage to the facility itself and to surrounding buildings

The severity of the incident is dependent not only on the circumstances described above, but also with the type of material released and the distance and related response time for emergency response teams.

Montgomery County has a Hazardous Incident Response Team (HIRT), organized in 1981 and part of the Montgomery County Fire and Rescue Service. The HIRT is a highly-trained and equipped response team comprised of a four station response which enables HIRT to quickly assemble personnel and equipment. HIRT responds with a minimum of 12 HazMat Technicians to ensure safety and efficiency. Stations 7, 20, 26, and 28 provide the County's HazMat protection. In addition to the standard hazmat training topics, team members receive training on how to manage the consequences of incidents involving weapons of mass destruction (WMD). Through in-service and specialized training programs, personnel receive information on terrorism and radiological, biological and chemical warfare agents. Additionally, , training is provided on explosives recognition and safety. Part of the ongoing training includes gaining proficiency in the use of specialized chemical agent detection instruments, materials and equipment. During the past few months HIRT has spent substantial time developing chemical/biological decontamination procedures. In addition to its emergency response and training activities, HIRT conducts State of Maryland and SARA Title III inspections, other hazmat-related inspections, and participates in the county's Annual Household Hazardous Materials Clean-Up Program.

The areas within closest proximity to the releases are generally at greatest risk, yet depending on the agent, a release can travel great distances or remain present in the environment for a long period of time (e.g. centuries to millennia for radioactive materials), resulting in extensive impacts on people and the environment.

The events that can produce a hazardous materials release vary greatly and therefore future releases are statistically independent of past events. The fact that all releases have a human component makes prediction difficult.

[Vulnerability]

Hazardous materials incidents can have an obvious, direct environmental impact and cause long-term, insidious environmental damage. Water pollution is an immediate concern for direct human consumption, recreation, crop irrigation, and fish and wildlife consumption. Depending on the material, pollutants can bioaccumulate to differing degrees, affecting animals high on the food chain long after a spill. Hazardous material incidents would not likely affect geology, but could significantly impact soils and farmlands, requiring expensive remediation. Unless a spill is directly adjacent, hazardous materials incidents are unlikely to affect historic or archeological sites.

In terms of location and extent, when a hazard material incident occurs in Montgomery County, there is a chance it will not only involve dirt or surface material but will also involve flowing water in ditches, rivers, or small streams. Other potential concerns for spills/leaks are icy road conditions during winter months, sabotage, and terrorism. Additionally, airborne releases of toxic gases have the widest area of vulnerability.

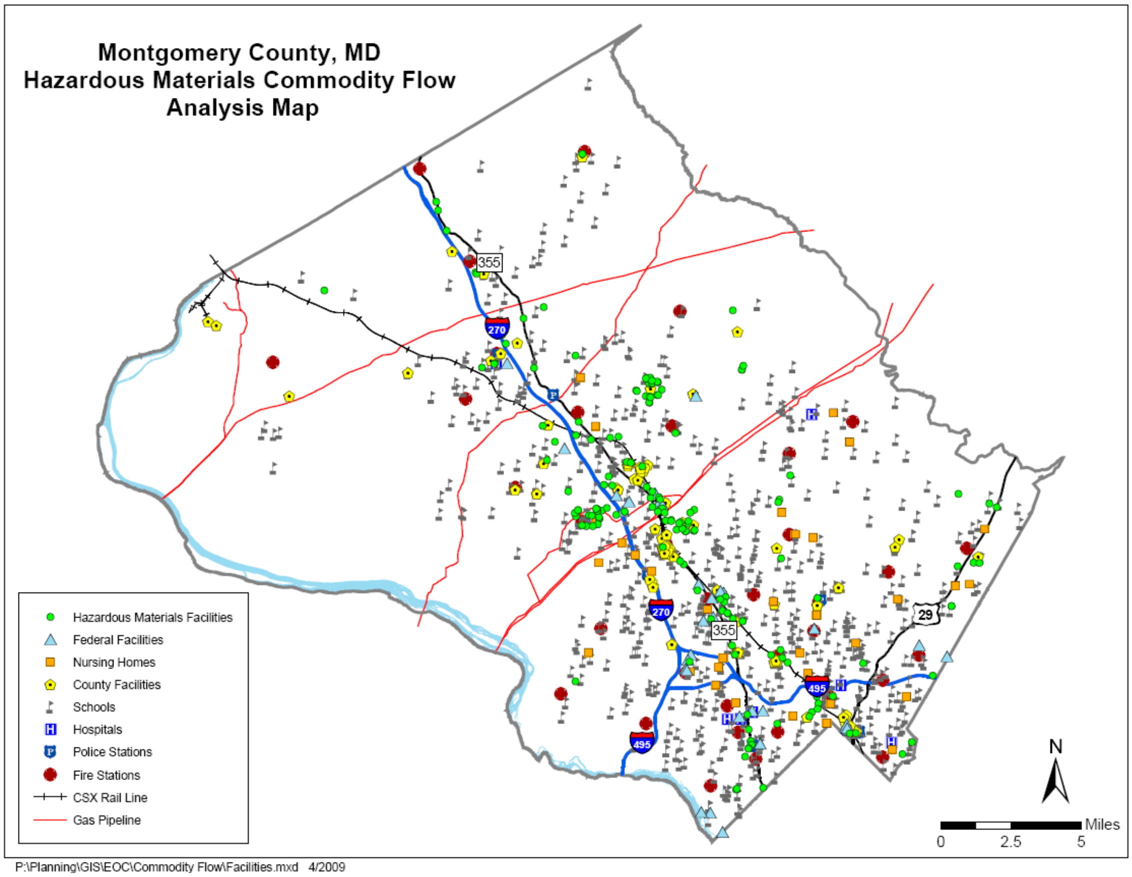


Figure 2-31: ***Source: Montgomery County, MD Hazardous Materials Commodity Flow Survey***

INVENTORY ASSETS EXPOSED TO HAZARD

As part of the Hazardous Materials Commodity Flow Survey, the County identified places and points along the major traffic routes that are at a higher level of risk in the event of an accident. These vulnerable facilities are shown in Figure 2-31 and include schools, day/childcare centers, health care facilities, senior centers, medical facilities, dense population centers, and public gathering points (e.g., convention centers and other points of interest). Additional points of interest were emergency response facility locations, including fire stations, emergency medical facilities, and police stations. If an incident occurred, there may need to be an evacuation of these facilities.

POTENTIAL LOSSES

Most hazardous material releases do not usually have an effect on infrastructure, particularly underground infrastructure. Some critical facilities use hazardous materials to operate such as chlorine for water treatment and PCB's for electric transformers. Similarly, the contamination of the water supply may be treated like a hazardous material release. Propane, oil, and natural gas, necessary fuels for heating, can also be hazardous if released during their delivery due to their explosive potential. Transportation may be limited if a key roadway or railway is blocked by an incident.

Possible losses to critical facilities include:

- Critical functional losses
- Contamination
- Structural and contents losses, if an explosion is present

Possible losses to structures include:

- Inaccessibility
- Contamination
- Structural and contents losses, if an explosion is present

Possible economic losses include:

- Business closures and associated business disruption losses

Possible ecologic losses include:

- Loss of wildlife
- Habitat damage
- Reduced air and water quality

Possible social losses include:

- Cancelled activities
- Emotional impacts of significant population losses and illnesses

The population impacts are often greater than the structural impacts during a hazardous material a release. Depending on the material, the health impacts to humans can be long and short term. A release in Montgomery County could threaten the population. Greater population concentrations may be found in communities, special needs facilities, and businesses. Generally, an incident will affect only a subset of the total population at risk. In a hazardous material release, those in the immediate isolation area would have little to no warning, whereas, the population further away in the dispersion path may have some time to evacuate, depending on the weather conditions, material released, and public notification.

As the population increases, development will also continue to increase in these areas thereby exposing a greater number of individuals to the risk of a hazardous materials release. Increase development will lead to increased vulnerability and increased potential losses.

MULTI-JURISDICTIONAL DIFFERENCES

As the major road thoroughfares, railway corridor, and gas pipelines traverse through and around Montgomery County, much of the County could potentially be affected by a hazardous spill or radiological event. The Emergency Planning and Right-To-Know Act require that the USEPA be notified of releases. The USEPA, DOT and U.S. Coast Guard also maintain hazardous materials spill data.

HAZARDOUS MATERIALS HIRA SUMMARY

Hazardous materials incidents can pose a series of threats to human safety and welfare, as well as the environment. Incidents occur regularly, but are not often of a size to cause a significant threat. However, it seems likely that incidents will continue and the potential for a significant release is present. Incidents often occur in conjunction with, or as a result of, natural hazards impacting facilities that house hazardous materials. Depending upon the materials released, as well as atmospheric conditions, an incident has the potential to cause significant disruption to Montgomery County and its jurisdictions along with injury or even death to residents in the immediate area.

Education is very important when it comes to hazardous material mitigation. Workers should receive proper training in the use, safety, and regulations regarding hazardous materials. Workers and emergency response personnel should be trained in the appropriate techniques and safety measures for dealing with spills and incidents. The general public should be made aware of the hazards of household chemical products and of methods for properly disposing of these products. Montgomery County utilizes the Household Hazardous Waste Disposal Program that helps residents safely dispose of household hazardous chemicals and materials. In addition, numerous regulations and codes have been created to address containment, hazard communication, and controls. A brochure can be found below.

Hazardous materials are best managed through suitable containment. When properly contained hazardous materials are unlikely to cause harm. The design of chemical containers for transportation and storage should be based on chemical and physical characteristics, the degree of hazard offered by the product, and to some extent on economic considerations. Most regulations and codes require containers to resist the most severe stresses that may reasonably be expected during normal handling, storage and use.

Hazard communication is also an important regulatory measure. Where required by the United States Department of Transportation (USDOT) regulations, hazard communication information is provided in the form of container markings and labels, vehicle placarding, and shipping paper entries. Facilities are required to identify chemicals in buildings, tanks and other storage facilities using the (National Fire Protection Association) NFPA 704 system.

USDOT regulations impose certain controls on the types of chemicals that may be shipped together, how they must be loaded and secured on vehicles, levels of allowable radiation exposure and radiological contamination and, for certain high level radioactive shipments, highway routing. Codes and zoning requirement may address allowable locations for chemical storage and use.

DAM & LEVEE FAILURE

NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	RF RATING (PRIORITY)
Dam Failure	0.9	0.9	0.4	0.4	0.2	**2.8**
MODERATE RISK HAZARD (2.0 – 2.9)						

HAZARD IDENTIFICATION

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings. A dam failure is the collapse, breach, or other failure of the water barrier, often resulting in down-stream flooding. Figure 2-32 depicts an example of a concrete buttress dam 23 FT in Height near White Oak, Maryland.

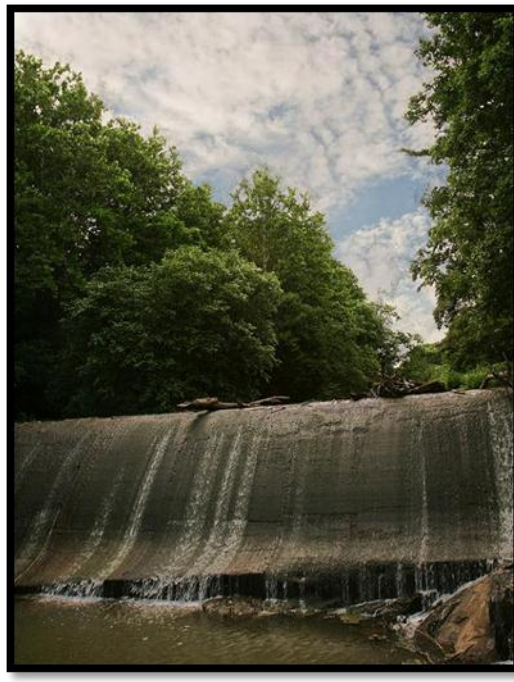


Figure 2-32: Burnt Mills Dam near White Oak, MD

Dam failures typically occur when spillway capacity is inadequate and excess flow overtops the dam, or when internal erosion (piping) through the dam or foundation occurs. Complete failure occurs if internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-laden water that rushes downstream.

Dams built in Montgomery County are built for a variety of uses. Uses include agriculture, flood protection, power generation, recreation, and water supply. Dam failure can occur with little warning and can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding, which cause most failures;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross section of the dam and abutments, or maintain gates, valves, and other operational components;
- Improper design, including the use of improper construction materials and construction practices;
- Negligent operation, including the failure to remove or open gates or valves during high flow periods;
- Failure of upstream dams on the same waterway;

- Landslides into reservoirs, which cause surges that result in overtopping;
- High winds, which can cause significant wave action and result in substantial erosion; and
- Earthquakes, which typically cause longitudinal cracks at the tops of the embankments, which can weaken entire structures.

The two most common modes of dam failure for embankment dams are piping and over-topping. High and significant hazard dams are designed to prevent over-topping during most storm events occurring in the County. The high hazard structures are designed to prevent over-topping during PMF, an extreme event well in excess of a 100-year storm. As the name suggests the likelihood of an extreme event is very low.

Dam failures due to piping may occur at any time. Piping is internal erosion inside the dam embankment. This condition may take years to develop, and may be difficult to detect. Piping failure may be prevented through proper inspection and maintenance. MDE requires annual inspections of high hazard dams and corrective actions to be taken if conditions are observed through inspections.

A levee is a man-made barrier constructed of soil along a water course for the primary purpose of providing flood protection.

HAZARD PROFILE

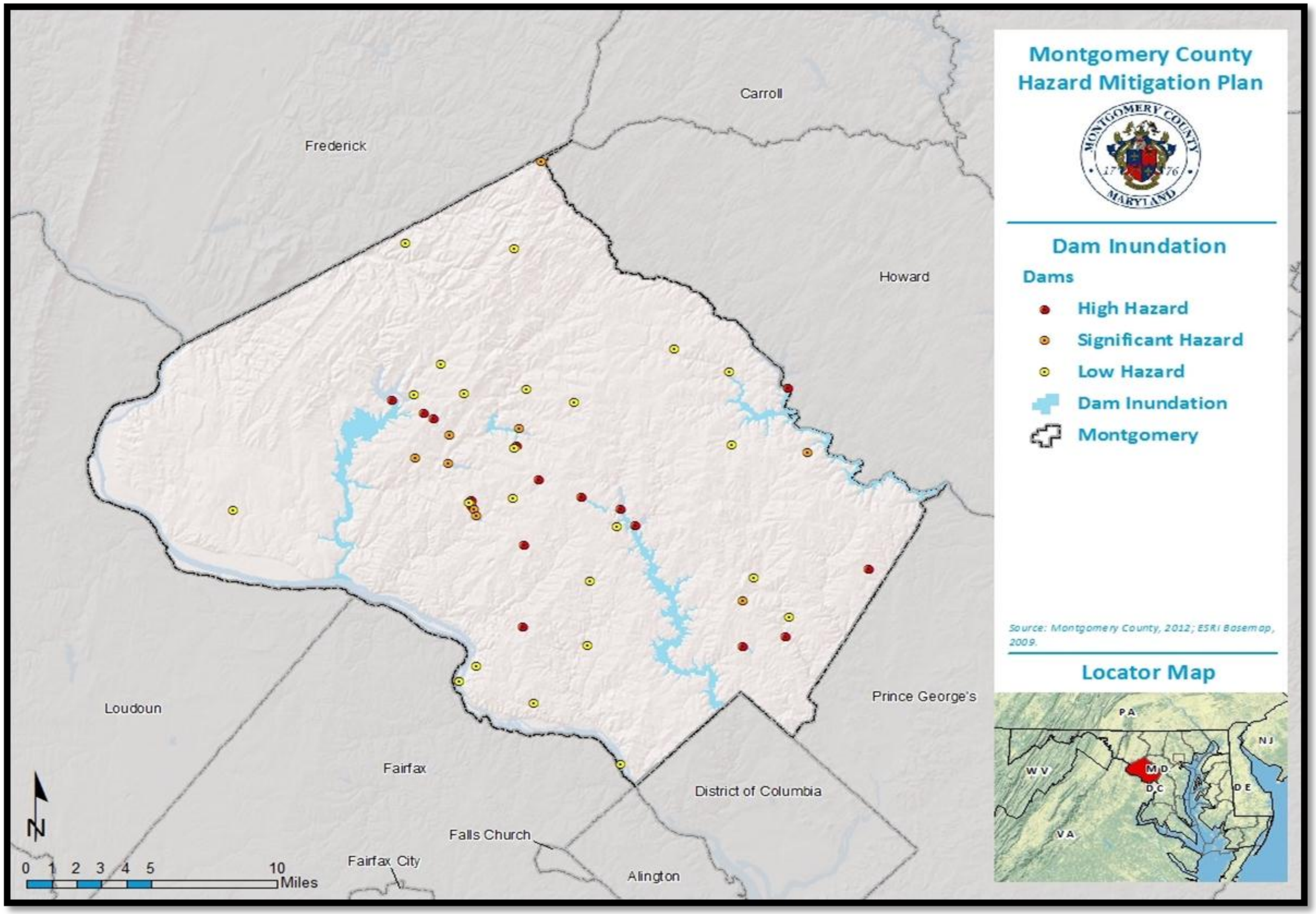
Dams are considered to be localized hazards are most likely to affect inundation areas downstream and immediate areas around a particular dam or levee in Montgomery County. Discharge from a dam breach is usually several times the 1% chance flood, and, therefore, typical flood studies are of limited use in estimating the extent of flooding.

The Maryland Department of the Environment, Dam Safety Division (MDE), regulatory agency for the State, defines a dam as "any obstruction, wall, or embankment, together with its appurtenant works constructed for the purpose of storing water, temporarily or permanently." Most of the dams in Montgomery County consist of an earthen embankment in combination with spillways, and a majority of these dams are built as storm water management structures.

The dams represent the greatest risk to the people who live below the dam in the area designated as the "inundation zone" for overflow or catastrophic failure. Based on the hazard potential and the possible inundation zone location, the dams in Maryland are classified in three categories:

- High Hazard Dams: Probable loss of life; major increases in existing flood levels at houses, buildings, major interstates and state roads with more than 6 lives in jeopardy.
- Significant Hazard Dams: Possible loss of life, significant increased flood risks to roads and buildings with no more than 2 houses or 6 lives in jeopardy.
- Low Hazard Dams: Unlikely loss of life; minor increases to existing flood levels at road and buildings.

Figure 2-33


Montgomery County
Hazard Mitigation Plan
Dam Inundation
Dams
High Hazard
Significant Hazard
Low Hazard
Dam Inundation
Montgomery
Source: Montgomery County, 2012; ESRI Basemap, 2009.
Locator Map
PA
NJ
WV
MD
DC
DE
VA
Carroll
Frederick
Howard
Loudoun
Prince George's
Fairfax
District of Columbia
Falls Church
Fairfax City
Arlington
N
0 1 2 3 4 5 10
Miles

Of the 50 dams or impoundments located in Montgomery County, there are currently 15 dams that are classified as high hazard dams. Of these 15 designated high hazard dams, 4 are owned and operated by Montgomery County's Department of Environmental Protection (DEP). Beyond the county, other major owners of dams include Washington Suburban Sanitary Commission (WSSC), Maryland National Capital Park and Planning Commission (M-NCPPC), and the City of Gaithersburg. Condition ratings for each dam were conducted according to procedures established by the Association of State Dam Safety Officials.

Table 2-51: Dams within Montgomery Count.

DAM NAME	HAZARD CLASS	EAP	CONDITION	OWNER
Brighton Dam	HIGH	Yes	FAIR	WSSC
Lake Needwood	HIGH	Yes	EXCELLENT	MNCPPC-Upper Rock Creek
Lake Frank	HIGH	Yes	EXCELLENT	MNCPPC-Upper Rock Creek
Lake Walker Dam - Pond 1	HIGH	Yes	POOR	Lake Forest Associates
Wheaton Branch Storm Water Management	HIGH	Yes	GOOD	Montgomery County DEP
Inspiration Lake	HIGH	Yes	GOOD	City of Gaithersburg
Crabbs Branch SWM Facility	HIGH	yes	FAIR	Montgomery County DEP
Little Seneca Dam	HIGH	Yes	ACCEPTABLE	WSSC
Lake Helene Dam	HIGH	Yes	GOOD	City of Gaithersburg
Summit Hall Park Dam	HIGH	Yes	GOOD	City of Gaithersburg
Railroad Branch SWM Pond	HIGH	Yes	GOOD	Montgomery County DEP
Burnt Mills Dam	HIGH	Yes	ACCEPTABLE	MNCPPC-Burnt Mills
Falls Road Golf Course	HIGH	Yes	EXCELLENT	Montgomery County Revenue Authority
Gudelsky Pond	HIGH	Yes	GOOD	Montgomery County DEP
Fairfield East Dam	HIGH	Yes	GOOD	F.F. Development, L.P.
Montgomery Auto Park	LOW	Yes	(Temporarily Drained)	Montgomery County DEP
Sunshine Acres Pond	LOW	No	GOOD	Hunting Ridge Homeowner Assoc.
Lake Walker Dam - Pond 2	LOW		POOR	Lake Forest Associates
Goldberg Pond	LOW		GOOD	David Goldberg
Churchill Town Sector Dam	LOW	No	ACCEPTABLE	Churchill Foundation
Poolesville Public Golf Course	LOW	No	GOOD	Town of Poolesville
Little Falls Dam - Potomac River	LOW		GOOD	US Army Corps of Engineers
Great Falls Estate Dam	LOW		FAIR	Potomac Falls Nature Conservancy Assoc.
Avenel - TPC Dam #3	LOW	No	FAIR	Tpc At Avenel, Inc.
Little Bennett Golf Course	LOW	Yes	GOOD	MNCPPC
North Creek Dam	LOW		GOOD	Montgomery Village Found., Inc.
Hallowell SWM Dam	LOW	Yes	FAIR	Montgomery County DEP
Montgomery College (Damascus Campus) SWM Pond	LOW	Yes	GOOD	Montgomery Community College
Brighton West SWM Pond	LOW		GOOD	City of Gaithersburg
Tower Oaks	LOW	Yes	GOOD	Tower-Dawson Ltd Partnership
Southlawn Industrial Ctr	LOW	Yes	GOOD	Ward Corporation
Damascus High School SWM Dam	LOW	No	GOOD	Montgomery County Public Schools

Table 2-51: Dams within Montgomery Count.

DAM NAME	HAZARD CLASS	EAP	CONDITION	OWNER
Dumont Oaks SWM Pond	LOW		FAIR	Montgomery County DEP
Milestone SWM Pond	LOW	No	FAIR	South Montgomery Realty Corp
Tivoli Stormwater Management Pond	LOW	No	POOR	Tivoli Community Association
Lakeview Dam/Westlake Dam	LOW		GOOD	Westlake Park Rec Council
Great Falls Tavern, Lock No. 20	LOW		UNKNOWN	US DOI NPS C&O Canal Nat Hist Park
Izaak Walton League Sligo Creek Pond	LOW		POOR	Unknown - Corporation
Lake Lynette	LOW	Yes	GOOD	City of Gaithersburg
Seneca State Park Dam	SIGNIFICANT	Yes	GOOD	MD DNR-Public Lands, Engineering & Constr-Central
Gunners Lake	SIGNIFICANT	Yes	FAIR	Montgomery County DEP
Lake Whetstone	SIGNIFICANT	Yes	EXCELLENT	Montgomery Village Found., Inc.
Lake Nirvana Dam	SIGNIFICANT	Yes	GOOD	City of Gaithersburg
Lake Placid Dam	SIGNIFICANT	Yes	GOOD	City of Gaithersburg
Wheaton Regional Park Dam	SIGNIFICANT	Yes	GOOD	MNCPPC Montgomery Parks
Rattlewood Golf Course	SIGNIFICANT	Yes	ACCEPTABLE	Montgomery County Revenue Authority
Cloppers Mill West Pond F	SIGNIFICANT		FAIR	Montgomery County DEP
Ashton Pond Dam	SIGNIFICANT		UNKNOWN	Ashton Pond Community Association (APCA)
Montgomery College (Rockville Campus) SWM Dam	SIGNIFICANT		NEW Construction	
Horsepen Branch Dam	N/A	No	BREACHED	Islamic Saudi Academy

Heavy rain volumes in Maryland starting on June 25, 2006, yielded 10 to 15 inches in less than 12 hours in some parts of the state. These precipitation levels correspond to approximately 500 to 1,000-year storm based on the National Weather Service latest rainfall charts (eMDE, 2006).

Even with these dramatic rainfall totals, dams in Maryland performed well. During the June 2006 storms (which eventually lead to a FEMA declared disaster), the only failures in Maryland were to five low hazard dams, all located on the Eastern Shore. When storms exceed the 100-year storm, which is extremely rare, some low hazard dam failure can be expected. The cost of repairs from these failures tends to be less than the increased cost of improving the design and construction required of greater hazard dams (eMDE, 2006).

However, on June 27 2006, conditions at both Lake Frank and Lake Needwood in Rockville, Montgomery County made it necessary to activate their emergency action plans (EAPs). Montgomery County's Lake Needwood had swelled to 25 feet above normal water surface elevations. Concerns over the stability of the Lake Needwood Dam as a result of major seepage on the downstream embankment forced safety officials to evacuate more than 2200 people from their homes downstream. Repairs on the dam have been made since the potential failure incident. The two lakes are owned by MNCPPC. Figure 2-35 on the following page exhibits the swelling of Lake Needwood. Figure 2-34 exhibits the discharge pipe down reach of the Lake Needwood dam during record level flood stages.

Figure 2-35: Lake Needwood Dam

Figure 2-34: Water flows at record levels from Montgomery County's Lake Needwood into Rock Creek.

Picture courtesy of Aaron Skolnik, FEMA.

There are two flood control levees in Montgomery County, Montclair Manor and Turkey Branch, both built by Montgomery County.

Montclair Manor levee is located near a townhouse development on Veirs Mill Road (MD Rt. 586) between Valleywood Drive and Claridge Road in Wheaton, MD. The levee was constructed in 2008 by Montgomery County Department of Environmental Protection (DEP) to protect 12 townhouses from flooding. The facility is being maintained by DEP.

Turkey Branch levee is located along Turkey Branch north of intersection of Georgia Avenue (MD Rte. 97) and Hewitt Avenue in Aspen Hill, MD. The levee was constructed in 1988 by DEP to protect two apartment complexes and a church from flooding. The levee is comprised of three distinct sections running along both sides of the stream. The maintenance responsibility is shared by the property owners and the County.

POPULATION AT RISK

Seven dams within the county have the potential to threaten more than 48,000 persons. Montgomery County's 2010 population data from the U.S. Census Bureau, was aggregated by census block and GIS was used to estimate populations within each danger reach zone. According to the GIS analysis, a catastrophic failure of any of these dams could cause major flooding in areas with population and have a significant impact on Montgomery County. The potential magnitude of a dam failure depends on the time of year and the base flow of the river when the failure occurs. During the winter months, when river flows are higher, the impact to the area would be much greater and evacuation times much less. Table 2-52 details the dams, floodway, reservoir capacity and area/population threatened from the above mentioned dams.

Table 2-52: Population at Risk Due to Dam Failures

HIGH HAZARD DAM INUNDATION ZONE	POP. AT-RISK
Little Seneca	6,811
Railroad Branch SWM	2,609
Inspiration Lake	2,101
Lake Whetstone	8,479
Summit Hall Park	3,219
Brighton	6,453
Needwood and Frankdams	18,987
TOTAL	**48,659**

Note: Inundation maps prepared by dam owners are on file with the County, and for national security purposes, can only be accessed through the Montgomery County OEMHS. The dam owners with the county have developed an evacuation plan that specifies emergency procedures for evacuation, control, and re-entry of areas at risk for possible dam inundation.

INVENTORY ASSETS EXPOSED TO HAZARD

The MDE requires dam owners to develop an Emergency Action Plan (EAP) for each high and significant hazard dam. The purpose of the EAP is to provide the Dam Operator with procedures to follow in order to safeguard the lives and property of the citizens living downstream and predict the dam inundation path to allow for proper evacuation and land uses below the dam.

As a part of the State of Maryland requirements dam owners and operators have provided danger reach maps for all high hazard dams delineating the areas downstream that would be impacted as a result of potential dam breach. These maps are included in the EAPs and include extent of the dam inundation zone, wave arrival times, and velocity of water at time of wave arrival. This assists emergency personnel to understand population, county facilities and critical facilities at risk when planning for a localized hazard incident such as dam failure.

Dam failure inundation zones can also be used to run exposure analysis for population, value and critical infrastructure at risk. Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described.

POTENTIAL LOSSES

Determining the impact of flooding is difficult to accomplish, especially for estimating loss of life. Loss of life is a function of the time of day, warning time, awareness of those affected and particular failure scenarios. Many dam safety agencies have used "population at risk", a more quantifiable measurement of the impact to human life, rather than "loss of life". Population at risk is the number of people in structures within the inundation area that would be subject to significant personal danger, if they took no action to evacuate. The impacts of a dam failure are contingent on many factors and, therefore, cannot be concisely described.

LAND USE & DEVELOPMENT TRENDS

Land use and new development in or near the danger reach of a dam can be de-conflicted through proper preparedness and mitigation planning. Montgomery County Department of Permitting Services provides the permitting for dam structures within the county. A dam breach analysis is needed to delineate the area potentially impacted should a dam fail. These maps are used to aid dam classification for any existing and proposed facilities. A dam breach analysis may be required for:

- Any proposed pond construction that could potentially affect the downstream properties or right of way.
- Any existing upstream pond embankment that could potentially affect proposed downstream construction.
- Establishment of a dam hazard class for embankments as part of the development.

Most of the safety analysis is done through modeling a dam failure scenario and mapping the "danger reach" in the form of an inundation zone. To minimization of loss of life and property damage land use and development restrictions can be implemented local legislation.

Staff from the County Office of Emergency Management annually works with dam operators and owners to update the EAPs and operators are required to notify OEM immediately whenever there are changes to dam operating procedures.

HIRA SUMMARY

Dam failure flooding can occur as the result of partial or complete collapse of an impoundment. Dam failures often result from prolonged rainfall and flooding. The primary danger associated with dam failure is the high velocity flooding of those properties downstream of the dam.

A dam failure can range from a small, uncontrolled release to a catastrophic failure. Secondary losses would include loss of the multi-use functions of the facility and associated revenues that accompany those functions.

This section of the Plan provides the "blueprint" for Montgomery County and participating municipalities to become less vulnerable to natural and technological hazards. It is based on the general consensus of the Montgomery County Mitigation Planning Committee along with the findings of the Hazard Identification and Risk Assessment. This section consists of the following subsections:

- **INTRODUCTION**
- **GOALS AND OBJECTIVES UPDATE SUMMARY**
- **COMMUNITY VALUES, HISTORIC AND SPECIAL CONSIDERATIONS**
- **THUNDERSTORMS MITIGATION STRATEGY**
- **WINTER STORM MITIGATION STRATEGY**
- **EXTREME HEAT MITIGATION STRATEGY**
- **FIRE MITIGATION STRATEGY**
- **FLOOD MITIGATION STRATEGY**
- **HURRICANE/TROPICAL STORM MITIGATION STRATEGY**
- **WATER SHORTAGE/DROUGHT MITIGATION STRATEGY**
- **TORNADO MITIGATION STRATEGY**
- **EARTHQUAKE MITIGATION STRATEGY**
- **LAND SUBSIDENCE/KARST MITIGATION STRATEGY**
- **HAZARDOUS MATERIALS MITIGATION STRATEGY**
- **DAM FAILURE MITIGATION STRATEGY**

INTRODUCTION

MITIGATION STRATEGY

The intent of the Mitigation Strategy is to provide Montgomery County and participating municipalities with the goals that will serve as the guiding principles for future mitigation policy and project administration, along with a list of proposed actions deemed necessary to meet those goals and reduce the impact of natural hazards. It is designed to be comprehensive and strategic in nature. The development of the strategy included a thorough review of natural hazards and identified policies and projects intended to not only reduce the future impacts of hazards, but also to help Montgomery County and participating municipalities achieve compatible economic, environmental and social goals. The development of this section is also intended to be strategic, in that all policies and projects are linked to establish priorities assigned to specific departments or individuals responsible for their implementation and assigned target completion deadlines. Funding sources are identified that can be used to assist in project implementation.

- *Mitigation goals* are general guidelines that explain what the County wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results.

- *Mitigation objectives* describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date.

- *Mitigation Actions* provide more detailed descriptions of specific work tasks to help the County and its municipalities achieve prescribed goals and objectives.

Based on participation from the Montgomery County Mitigation Planning Committee, the mitigation strategy was modified and updated. Objectives were clarified to better document roles and responsibilities. Completed actions were noted and deleted. New actions have been added to address particular hazards facing Montgomery County and the consensus achieved in how to address those actions.

MITIGATION ACTION PLAN

The last step in updating the Mitigation Strategy is the creation of jurisdictionally specific Mitigation Action Plans (MAPs). The MAPs represent the key outcome of the mitigation planning process. MAPs include a prioritized list of proposed hazard mitigation actions (policies and projects) for Montgomery County and its municipalities, including accompanying information such as those agencies or individuals assigned responsibility for their implementation, potential funding sources, estimated target date for completion, and a current status. The MAPs provide those individuals or agencies responsible for implementing mitigation actions with a clear roadmap that also serves as an important tool for monitoring progress over time. The collection of actions listed in each jurisdiction’s MAP also serves as an easily understood synopsis of activities for local decision makers.

COLLABRATIVE PLANNING

The Maryland-National Capital Park and Planning Commission (M-NCPPC) is a bi-county agency empowered by the State of Maryland in 1927 to acquire, develop, maintain and administer a regional system of parks within Montgomery and Prince George's Counties, and to provide land use planning for the physical development of Montgomery and Prince George's counties. In Montgomery County, the M-NCPPC operates through a five-member Planning Board which has full and final authority to administer the Subdivision Ordinance, the site plan process, and the optional method development process in Montgomery County.

With continued growth over the past 30 years the county has had to carefully manage future growth. In its 2009-2011 Growth Policy the county recognized that it has nearly run out of developable *Greenfields* and must direct future growth toward smarter, mixed-use redevelopment and infill to accommodate future growth and protect the Agricultural Reserve.

Until 2009, the county's growth policy was reviewed and adopted every 2 years. The new policy, renamed the ***Subdivision Staging Policy*** (SSP) will now be updated every 4 years. The SSP will report on growth and development trends and assess the status of infrastructure and environmental conditions that result. It will also recommend how facilities and service improvements should be programmed to best accommodate future growth. Below is a link to the full version of the SSP in use by the Montgomery County Planning Department.

http://www.montgomeryplanning.org/research/growth_policy/subdivision_staging_policy/2012/

The County also limits developments and new structures in floodplains through the Planning Board's Environmental Guidelines and Forest Conservation Law. These directives work together to permanently protect floodplains and stream buffers as natural areas through the subdivision process. The County's Floodplain District Requirements limit and control disturbances within any flood plain.

Below is a link to the Environmental Guidelines used by the Planning Department to determine stream buffers.

http://www.montgomeryplanning.org/environment/forest/guidelines_0100/toc_environ_guide.shtm

The Montgomery County 2013 Mitigation Plan update had the M-NCPPC as a member of its core planning team, which has continued into the development of the County's Pre-Disaster Recovery Plan which was just recently completed. While Montgomery County already controls building in flood prone areas by prohibiting new structures in floodplains and stream buffers, the collaborative effort between the Office of Emergency Management and Homeland Security (OEMHS) and M-NCPPC will result in a much better understanding of each other's programs and lead to better incorporation of mitigation measures in the planning and assessment processes.

STAPLEE

In preparing their own Mitigation Action Plan, each jurisdiction considered their overall hazard risk and capability to mitigate identified hazards, in addition to meeting the adopted countywide mitigation goals. Prioritizing mitigation actions for each jurisdiction was completed using FEMA's STAPLEE methodology.

The STAPLEE approach allows for a careful review of the feasibility of mitigation actions by using seven criteria. The criteria are described below:

- *S - Social*
- *T - Technical*
- *A - Administrative*

- *P - Political*
- *L - Legal*
- *E - Economic*
- *E - Environmental*

FEMA mitigation planning requirements indicate that any prioritization system used shall include a special emphasis on the extent to which benefits are maximized according to a cost-benefit review of the proposed projects. To do this in an efficient manner that is consistent with FEMA's guidance on using cost-benefit review in mitigation planning, the STAPLEE method was adapted to include a higher weighting for two elements of the economic feasibility factor – Benefits of Action and Costs of Action. This method incorporates concepts similar to those described in Method C of FEMA 386-5: Using Benefit Cost Review in Mitigation Planning (FEMA, 2007).

For the individual action plans, a STAPLEE score was calculated based on the number of favorable considerations that can be found on the STAPLEE document. Up to 23 considerations can be used to prioritize each action using this evaluation methodology.

MITIGATION CATEGORIES

In order to ensure that a broad range of mitigation actions were considered, the Montgomery County Mitigation Planning Committee analyzed a comprehensive range of specific mitigation actions for each hazard after it had completed the risk assessment. This helped to ensure that there was sufficient span and creativity in the mitigation actions considered.

There are six categories of mitigation actions which Montgomery County considered in developing its mitigation action plan. Those categories include:

- **Prevention**: Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning, zoning, building codes, subdivision regulations, hazard specific regulations (such as floodplain regulations), capital improvement programs, and open-space preservation and stormwater regulations.

- **Property Protection**: Actions that involve modifying or removing existing buildings or infrastructure to protect them from a hazard. Examples include the acquisition, elevation and relocation of structures, structural retrofits, flood-proofing, storm shutters, and shatter resistant glass. This category also includes insurance.

- **Public Education and Awareness:** Actions to inform and educate citizens, elected officials, and property owners about potential risks from hazards and potential ways to mitigate them. Such actions include hazard mapping, outreach projects, library materials dissemination, real estate disclosures, the creation of hazard information centers, and school age / adult education programs.

- **Natural Resource Protection**: Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, forest and vegetation management, wetlands restoration or preservation, slope stabilization, and historic property and archeological site preservation.

- **Structural Project Implementation**: Mitigation projects intended to lessen the impact of a hazard by using structures to modify the environment. Structures include stormwater controls (culverts); dams, dikes, and levees; and safe rooms.

- **Emergency Services**: Actions that typically are not considered mitigation techniques but reduce the impacts of a hazard event on people and property. These actions are often taken prior to, during, or in response to an emergency or disaster. Examples include warning systems, evacuation planning and management, emergency response training and exercises, and emergency flood protection procedures.

GOALS AND OBJECTIVES UPDATE SUMMARY (2013-2018)

The Mitigation Planning Committee reviewed the current plan, identified new information that needed to be included in the Plan update and incorporated it as required by state and federal guidelines. The planning committee was also tasked with collecting all accurate data from plan participants and provided outreach to the public and business stakeholders to ensure that everyone's information is included in this Plan update.

The following table is an update summary to the goals and objectives from the 2007 Montgomery County Hazard Mitigation Plan conducted by the Montgomery County Mitigation Planning Team on April 4, 2012.

Table 3-1: 2007-2012 Goals and Objectives Update

Current Goal	Objective	Continue	Change	Delete	Status/Reason
Department of Public Works and Transportation's computerized maintenance management system (CMMS) for trees within electrical transmission corridors that pose a risk to critical facilities operations. (Will be GIS compatible)	n/a			X	Not implemented. Removed as a goal. The current goal reflects an action/strategy.
Montgomery County Fire and Rescue Service proposed purchase of back-up emergency generators and pre-wiring of stations.	n/a			X	**Goal completed** Removed as a future goal.

Table 3-1: 2007-2012 Goals and Objectives Update					
Current Goal	**Objective**	**Continue**	**Change**	**Delete**	**Status/Reason**
Montgomery County Recreation Centers. Secure funding for pre-wiring of facilities for generators. These facilities may be used as emergency shelters.	n/a			X	Planning process begun. Removed as a goal and retained as an ongoing action strategy.
City of Rockville's stormwater management projects to secure mitigation funds, if available, to engineer, design and construct improved stormwater management facilities.	n/a			X	Removed as a goal. The current goal reflects an action/strategy.
Town of Kensington, mitigation of flood hazard on Silver Creek	n/a		X		Removed as a goal and placed as an action/strategy.
Thunderstorm, Hurricane/Tropical Storm	n/a		X		NEW TEXT To minimize the losses of life and property due to thunderstorms in Montgomery County
Blizzards/Ice Storms – To be profiled under Winter Storms	n/a		X		NEW TEXT To minimize the losses of life and property due to winter storms in Montgomery County
Hazardous Materials	n/a		X		NEW TEXT To minimize the losses of life and property due to hazardous materials in Montgomery County
Dam Failure	Continue to identify appropriate and effective measures to notify individuals with disabilities and residents who live near the dam's danger reach areas of emergencies.		X		NEW TEXT To minimize the losses of life and property due to dam failure in Montgomery County
Flooding	n/a		X		NEW TEXT To minimize the losses of life and property due to flooding in Montgomery County

Table 3-1: 2007-2012 Goals and Objectives Update

Current Goal	Objective	Continue	Change	Delete	Status/Reason
Hurricane/Tropical Storm	Identify critical facilities for high wind retrofits		X		NEW TEXT To minimize the losses of life and property due to hurricanes and tropical storms in Montgomery County
Drought	n/a		X		Now to include water shortage in addition to drought. NEW TEXT To minimize the losses of life and property due to water shortage and drought in Montgomery County
Earthquake	n/a		X		NEW TEXT To minimize the losses of life and property due to earthquake in Montgomery County

Table 3-2: 2013-2018 "NEW" Goals and Objectives

Goal	Objective	New
To minimize the losses of life and property due to extreme heat in Montgomery County	To minimize the impact of extreme heat on life and property to include buildings, infrastructure, critical facilities, and critical infrastructure	X
To minimize the losses of life and property due to fire in Montgomery County	To protect both people and property to the devastating effects of wildfire	X
To minimize the losses of life and property due to tornadoes in Montgomery County	To minimize the effects of high winds to life and property to include buildings, infrastructure, critical facilities, and critical infrastructure	X
To minimize the losses of life and property due to land subsidence and karst in Montgomery County	To minimize the effects of land subsidence and karst to include buildings, infrastructure, critical facilities, and critical infrastructure	X
To minimize the losses of life and property due to natural, technological, and/or threat induced hazards to include buildings, infrastructure, critical facilities, and critical infrastructure	To minimize the impact of natural, technological, and/or threat induced hazards to include buildings, infrastructure, critical facilities, and critical infrastructure	X

2013 MONTGOMERY COUNTY MITIGATION GOALS AND OBJECTIVES

Goal 1: To minimize the losses of life and property due to thunderstorms in Montgomery County

- ✓ **Objective 1.1**: To minimize the effects of electrical storms to public and private property in Montgomery County
- ✓ **Objective 1.2**: To minimize the effects the high winds to public and private property in Montgomery County

Goal 2: To minimize the losses of life and property due to winter storms in Montgomery County

- ✓ **Objective 2.1**: To minimize the impact of winter storm events on life and property to include buildings, infrastructure, critical facilities, and critical infrastructure

Goal 3: To minimize the losses of life and property due to extreme heat in Montgomery County

- ✓ **Objective 3.1**: To minimize the impact of extreme heat on life and property to include buildings, infrastructure, critical facilities, and critical infrastructure

Goal 4: To minimize the losses of life and property due to fire in Montgomery County

- ✓ **Objective 4.1**: To protect both people and property to the devastating effects of wildfire

Goal 5: To minimize the losses of life and property due to flooding in Montgomery County

- ✓ **Objective 5.1**: To minimize the impact of flooding to life and property to include buildings, infrastructure, critical facilities, and critical infrastructure
- ✓ **Objective 5.2**: To reduce the impact of flooding through education and outreach of flood mitigation techniques
- ✓ **Objective 5.3**: Pursue flood mitigation projects in repetitive flood areas to improve storm water management

Goal 6: To minimize the losses of life and property due to hurricanes and tropical storms in Montgomery County

- ✓ **Objective 6.1**: To minimize the wind and flooding effects of hurricanes and tropical storms on life and property to include buildings, infrastructure, critical facilities, and critical infrastructure

Goal 7: To minimize the losses of life and property due to water shortage and drought in Montgomery County

- ✓ **Objective 7.1**: To educate the citizens of Montgomery County on methods to reduce the effects of drought
- ✓ **Objective 7.2**: Minimize the effects of drought through education and outreach on water saving techniques

Goal 8: To minimize the losses of life and property due to tornadoes in Montgomery County

- ✓ **Objective 8.1**: To minimize the effects of high winds to life and property to include buildings, infrastructure, critical facilities, and critical infrastructure

Goal 9: To minimize the losses of life and property due to earthquake in Montgomery County

- ✓ **Objective 9.1**: To minimize the effects of seismic activity to life and property to include buildings, infrastructure, critical facilities, and critical infrastructure

Goal 10: To minimize the losses of life and property due to land subsidence and karst in Montgomery County

- ✓ **Objective 10.1**: To minimize the effects of land subsidence and karst to include buildings, infrastructure, critical facilities, and critical infrastructure

Goal 11: To minimize the losses of life and property due to hazardous materials in Montgomery County

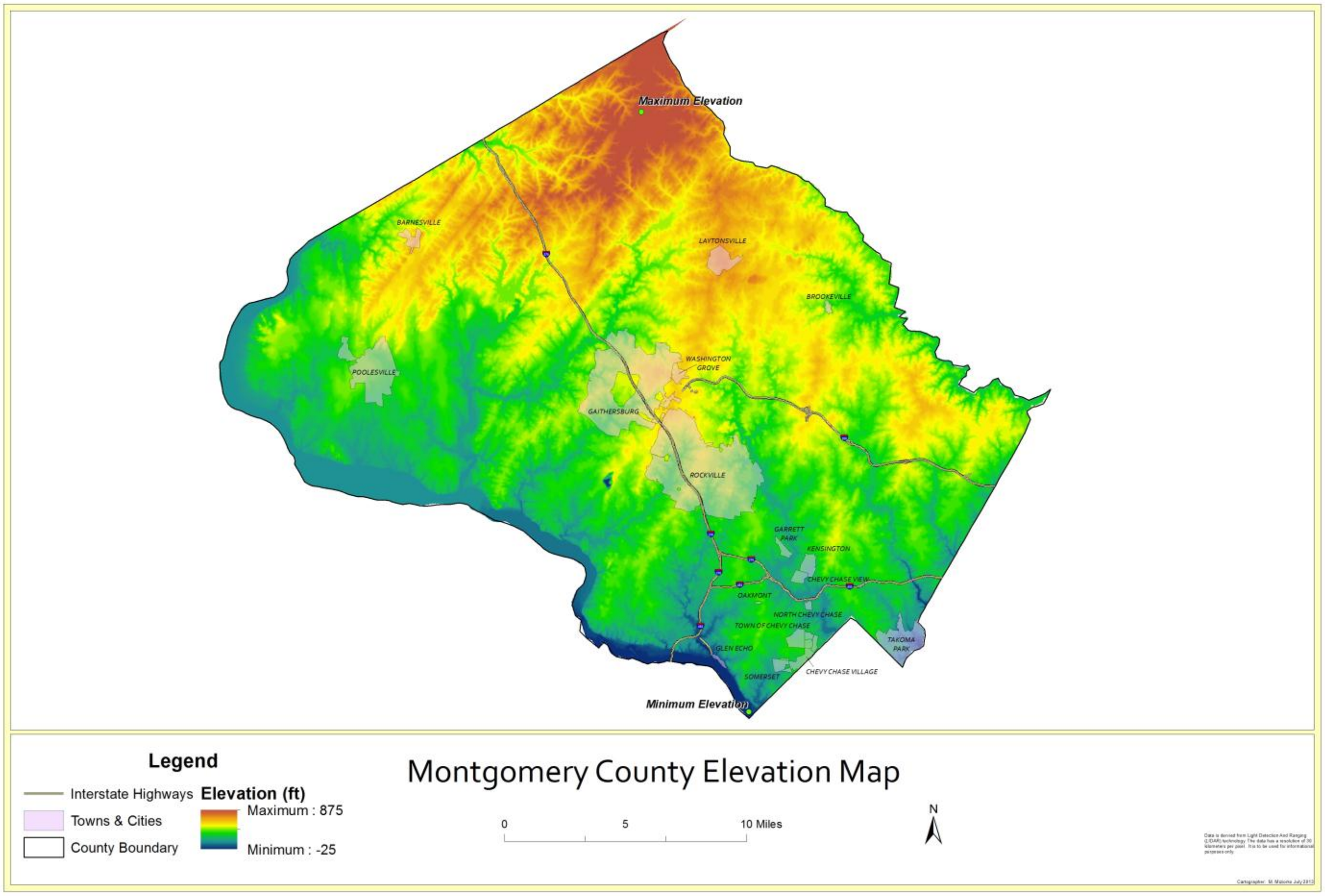
- ✓ **Objective 11.1**: To continue to provide enhanced trainings, equipment, and plans for hazardous materials emergency response and mitigation in Montgomery County

Goal 12: To minimize the losses of life and property due to dam failure in Montgomery County

- ✓ **Objective 12.1**: To minimize the impact of dam failure to life and property to include buildings, infrastructure, critical facilities, and critical infrastructure
- ✓ **Objective 12.2**: To continue to provide education and outreach to Montgomery County citizens and business owners on dam failure inundation areas

Goal 13: To minimize the losses of life and property due to natural, technological, and/or threat induced hazards to include buildings, infrastructure, critical facilities, and critical infrastructure

- ✓ **Objective 13.1**: To minimize the impact of natural, technological, and/or threat induced hazards to include buildings, infrastructure, critical facilities, and critical infrastructure



This topographic map of Montgomery County is provided as a general reference and resource.

THUNDERSTORMS MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

GOAL 1: To minimize the losses of life and property due to thunderstorms in Montgomery County

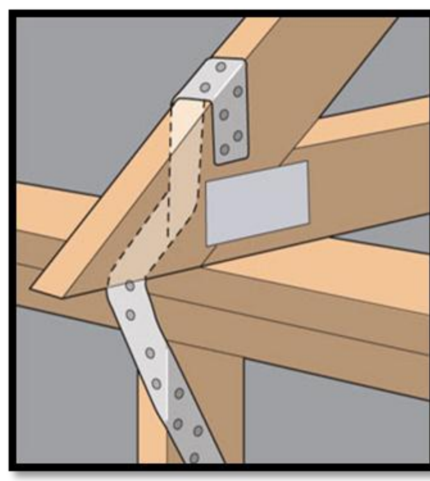
IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the Severe Weather Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE

Mitigation of building damage has been most successful where strict building codes for high-wind influence areas and designated special flood hazard areas have been adopted and enforced by local governments and complied with by builders. County and municipal construction and zoning ordinances are applicable within their respective jurisdictions.

NEW BUILDINGS AND INFRASTRUCTURE



Mitigation opportunities for severe winds are similar to mitigation measures for other wind hazards (such as severe thunderstorms and lightning). Attention to the type of structure used in tornado-prone areas may yield benefits, particularly by avoiding highly susceptible manufactured or mobile homes. The greatest protection is afforded by quality construction and reinforcement of walls, floors, and ceilings. Proper anchoring of walls to foundations and roofs to walls is essential for a building to withstand certain wind speeds. Code adoption by local jurisdictions, compliance by builders, and local government inspection of new homes could reduce the risk of destruction in high wind-prone areas.

EXISTING BUILDINGS AND INFRASTRUCTURE

Existing manufactured or mobile homes are most exposed to damage from severe thunderstorms. Even if anchored, mobile homes do not withstand high wind speeds as well as some permanent, site-built structures. Existing structures can be retrofitted to withstand higher winds and safe rooms may be constructed in existing buildings or as standalone facilities. Safe room construction includes very specific design and engineering standards set forth by FEMA for structures to withstand tornado force winds. Retrofitting existing structures to meet safe room criteria involves making improvements to walls, roofs, window, doors, among other structural elements of the building.

MITIGATION ACTION PLAN

- ✓ ***GOAL 1****: To minimize the losses of life and property due to <u>thunderstorms</u> in Montgomery County*
  - ✓ ***OBJECTIVE 1.1****: To minimize the effects of electrical storms to public and private property in Montgomery County*

GOAL 1; OBJECTIVE 1.1; Mitigation Action 1.1.1	
INSTALL UNINTERRUPTIBLE POWER SUPPLIES ON CRITICAL ELECTRONIC EQUIPMENT IN COUNTY AND MUNICIPAL FACILITIES	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	$1,000-$10,000 PER FACILITY
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS, FEMA HMA GRANTS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	NEW

GOAL 1; OBJECTIVE 1.1; Mitigation Action 1.1.2	
COORDINATE WITH THE MD STATE HIGHWAY ADMINISTRATION TO PROVIDE BACKUP POWER FOR TRAFFIC SIGNALS ON AT LEAST 10 MAJOR STATE ROADS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS, DOT AND SHA
ANTICIPATED COST	$15,000 PER UNIT ($150,000 TOTAL)
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS, FEMA DHS GRANTS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	HIGH
STATUS (DEFERRED OR NEW)	NEW

GOAL 1; OBJECTIVE 1.1; Mitigation Action 1.1.3	
PROVIDE BACK UP POWER GENERATION FOR WATER AND WASTEWATER TREATMENT AND PIPELINE SYSTEMS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	TBD
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS, FEMA HMA GRANTS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	3 YEARS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 1; OBJECTIVE 1.1; Mitigation Action 1.1.4	
PURCHASE AN EARLY WARNING SYSTEM TO ALERT THE PUBLIC TO TAKE SHELTER	
RESPONSIBLE DEPARTMENT	ROCKVILLE
ANTICIPATED COST	TBD
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL FUNDS, FEMA HMA GRANTS
JURISDICTION	ROCKVILLE
TIMEFRAME	3 YEARS

STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 1; OBJECTIVE 1.1; Mitigation Action 1.1.5	
PURCHASE EMERGENCY BACKUP POWER FOR CRITICAL FACILITIES	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY AND ALL MUNICIPALITIES
ANTICIPATED COST	TBD
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL/COUNTY FUNDS, FEMA DHS GRANTS
JURISDICTION	MONTGOMERY COUNTY AND ALL MUNICIPALITIES
TIMEFRAME	3 YEARS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	NEW

✓ ***OBJECTIVE 1.2****: To minimize the effects of high winds to public and private property in Montgomery County*

GOAL 1; OBJECTIVE 1.2; Mitigation Action 1.2.1	
TREE BRANCH/BRUSH CLEARANCE AND VEGETATION PLANTING RESTRICTIONS NEAR/BENEATH POWER LINES	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY DOT, GARRETT PARK
ANTICIPATED COST	$2,000,000 (COUNTY), $10,000-$100,000 (MUNICIPAL)
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS, MUNICIPAL FUNDS
JURISDICTION	MONTGOMERY COUNTY, GARRETT PARK
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 1; OBJECTIVE 1.2; Mitigation Action 1.2.2	
DEVELOP PUBLIC AWARENESS CAMPAIGN INFORMING RESIDENTS OF THE POTENTIAL IMPACT OF HIGH WINDS DUE TO SEVERE THUNDERSTORMS	
RESPONSIBLE DEPARTMENT	CHEVY CHASE, SECTION 5
ANTICIPATED COST	$1,500
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL FUNDS, FEMA HMA FUNDS
JURISDICTION	CHEVY CHASE, SECTION 5
TIMEFRAME	1 YEAR
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 1; OBJECTIVE 1.2; Mitigation Action 1.2.3	
PUBLIC OUTREACH FOR THE USE OF THE ALERT MONTGOMERY SYSTEM	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	$5,000
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY, FEMA UASI FUNDS
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM

STATUS (ONGOING OR NEW)	NEW

GOAL 1; OBJECTIVE 1.2; Mitigation Action 1.2.4	
COORDINATE WITH STATE HIGHWAY ADMINISTRATION AND LOCAL OFFICIALS TO ENSURE EMERGENCY ROUTES AND MAJOR ROADS ARE CLEARED OF DEBRIS AND DOWNED WIRES	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	ONGOING

COMPLETED, ONGOING, DELETED OR NEW ACTION STEPS FROM THE 2007 PLAN

Table 3-3: Updated Actions for Montgomery County - Goal 1 (Thunderstorms)

2007 ACTION	2013 UPDATE ACTION	STATUS	NOTES
	Install uninterruptible power supplies on critical electronic equipment in county and municipal facilities	New	
	Coordinate with SHA to provide backup power for traffic signals on major state roads.	New	Provide backup power for ten (10) traffic signals
	Provide backup power generation for water treatment and distribution facilities	New	
	Purchase an early warning system to alert the public to take shelter	New	
	Purchase emergency backup power for critical facilities	New	
	Tree branch/brush clearance and limit how close vegetation can be planted near/beneath power lines	New	
	Develop a public awareness campaign informing residents of the potential impact of high winds due to severe thunderstorms	New	
	Public outreach for the use of the Alert Montgomery System	New	
	Coordinate with SHA and DOT to ensure major roads are cleared of debris/wires.	New	

WINTER STORMS MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

Goal 2: To minimize the losses of life and property due to winter storms in Montgomery County

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the Winter Storms Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE

Standard building codes have the opportunity to provide Montgomery County with reasonable guidance for development throughout unincorporated and incorporated areas. However, contractors and builders should be aware of winter hazards such as extreme cold, high winds, and snow loads that can result from winter weather.

NEW BUILDINGS AND INFRASTRUCTURE

As development grows in the County and its municipalities, it will be a priority to improve the roads, utilities, and storm-water management systems in the area. Any structures and infrastructure built should be considered vulnerable to severe winter weather. New structures and infrastructure built in Montgomery County should take into account snow loads when constructed it may be the case of going above and beyond what current codes require.

Montgomery County Code, Chapter 8, Buildings, adopts the ICC International Building Code (IBC) as the County's basic building code. The IBC regulates construction materials and methods for all structures except one and two family dwellings. These buildings are covered by the International Residential Code (IRC). The IBC and IRC are kept current through an Executive Regulation process. These codes establish building criteria that resists damage to natural hazards. Pre-existing buildings do not have to meet new requirements except for new additions and complete rebuild. This leaves older buildings less resistant to damage from natural hazards.

EXISTING BUILDINGS AND INFRASTRUCTURE

The entire inventory in the County is vulnerable to winter storms. Winter storms in Montgomery County cause widespread impacts with the greatest threat to public safety being travel on major roads and highways. Power outages caused by snow, ice, and wind accompanied by cold temperatures creates needs for additional shelter. It is the priority of Montgomery County to continue operation of existing buildings and infrastructure, especially critical facilities and services like emergency services and hospitals in times of severe winter weather and winter storms.

MITIGATION ACTION PLAN

Goal 2: *To minimize the losses of life and property due to winter storms in Montgomery County*

- ✓ ***Objective 2.1***: *To minimize the impact of winter storm events on life and property to include buildings, infrastructure, critical facilities, and critical infrastructure*

GOAL 2; OBJECTIVE 2.1; Mitigation Action 2.1.1	
CONTINUE TO RESEARCH AND PROVIDE ALTERNATIVE MEASURES TO NOTIFY INDIVIDUALS WITH DISABILITIES OF WINTER EMERGENCIES	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	ONGOING

GOAL 2; OBJECTIVE 2.1; Mitigation Action 2.1.2	
PROVIDE SHELTERS FOR BOTH RESIDENTS AND ANIMALS DURING SEVERE WINTER WEATHER	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS, POOLESVILLE, TAKOMA PARK
ANTICIPATED COST	TBD
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS, MUNICIPAL FUNDS
JURISDICTION	MONTGOMERY COUNTY, POOLESVILLE, TAKOMA PARK
TIMEFRAME	CONTINOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 2; OBJECTIVE 2.1; Mitigation Action 2.1.3	
PROVIDE 4WD VEHICLES FOR LAW ENFORCEMENT PERSONNEL DURING HEAVY SNOW ACTIVITY	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY DOT/POLICE
ANTICIPATED COST	SIX (6) UNITS AT $25,000 EACH
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	TWO (2) UNITS PER YEAR FOR THREE (3) YEARS
STAPLEE PRIORITY	MEDIUM

STATUS (ONGOING OR NEW)	NEW

COMPLETED, ONGOING, DELETED OR NEW ACTION STEPS FROM THE 2007 PLAN

Table 3-4: Updated Actions for Montgomery County - Goal 2 (Winter Storms)			
2007 ACTION	**2013 UPDATE ACTION**	**STATUS**	**NOTES**
Continue to research and provide alternative measures to notify individuals with disabilities of winter emergencies		Ongoing	
	Provide shelters for both residents and animals during severe winter weather	New	Montgomery County, Poolesville, and Takoma Park
	Provide 4WD vehicles for law enforcement personnel during heavy snow activity	New	

EXTREME HEAT MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

Goal 3: To minimize the losses of life and property due to extreme heat in Montgomery County

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the Temperature Extremes Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE

Although damage to buildings can occur, more commonly people themselves are impacted by temperature extreme events. The affect temperature extremes will have on the County will vary due to population density, age of population, and the age of structures. Nonetheless, facilities need to be maintained to ensure that they operate in appropriate conditions for people. Temperature advisories, watches, and warnings are issued by the National Weather Service relating the impacts associated with extreme temperatures. The County can assist with lessening the impact by ensuring that those residents in more remote areas are being notified about temperature extremes and what to do during an event.

The County has a "Shelter Task Force" that can open shelters as needed for the general population. In addition the County has shelters for cooling purposes for the population who may be homeless.

NEW BUILDINGS AND INFRASTRUCTURE

Encouraging residents to purchase energy efficient appliances and ensuring properties are built to code and it proper working order can help mitigate a possible electrical overload.

EXISTING BUILDINGS AND INFRASTRUCTURE

It is unlikely that an entire building would be impacted by an extreme temperature event. Extreme temperature events can cause damage to buildings or contents by overheating HVAC or air conditioning. Extreme temperature events can also result in elevated utility costs. Encouraging residents to purchase energy efficient appliances and ensuring properties are built to code and all in proper working order can help mitigate a possible electrical overload.

MITIGATION ACTION PLAN

***Goal 3**: To minimize the losses of life and property due to* extreme heat *in Montgomery County*

✓ ***Objective 3.1**: To minimize the impact of extreme heat on life and property to include buildings, infrastructure, critical facilities, and critical infrastructure*

GOAL 3; OBJECTIVE 3.1; Mitigation Action 3.1.1	
PROVIDE RELIEF FOR THOSE HIGHLY IMPACTED BY HEAT BY OPENING COOLING CENTERS THAT ALSO ACCOUNT FOR SPECIAL NEEDS POPULATIONS AND CONDUCT EDUCATION AND OUTREACH REGARDING SPECIAL NEEDS POPULATIONS.	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS, POOLESVILLE, TAKOMA PARK
ANTICIPATED COST	$10,000 - $20,000 PER CENTER
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY, POOLESVILLE, TAKOMA PARK
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	NEW

COMPLETED, MODIFIED OR DELETED ACTION STEPS FROM THE 2007 PLAN

Table 3-5: Updated Actions for Montgomery County - Goal 3 (Extreme Heat)

2007 ACTION	2013 UPDATE ACTION	STATUS	NOTES
Develop an plan to notify residents and businesses to reduce demand for electricity to help reduce emissions from electric power generators in the event of an air quality incident		Deleted	Does not align w/ extreme heat mitigation
Determine sources and potential strategies that may reduce levels of emissions from generation sources within the County…		Deleted	Does not align w/ extreme heat mitigation
Continue County policy to shift generation to clean or renewable sources as appropriate…		Deleted	Does not align w/ extreme heat mitigation
Purchase and locate additional air-monitoring stations		Deleted	Does not align w/ extreme heat mitigation
Post signs for County facilities warning of “Code Red” air-quality days		Deleted	Does not align w/ extreme heat mitigation
Continue to coordinate with DPWT regarding use of messaging on major highways to warn of impending air pollution incidents		Deleted	Does not align w/ extreme heat mitigation
Develop a database for air emissions inventory		Deleted	Does not align w/ extreme heat mitigation
Purchase instruments to monitor leaking gas caps		Deleted	Does not align w/ extreme heat mitigation
Develop policy for hybrid vehicle use		Deleted	Does not align w/ extreme heat mitigation
	Provide relief for those highly impacted by heat by opening cooling centers that also	New	

	account for special needs populations and conduct education and outreach regarding special needs populations.		

FIRE MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

Goal 4: To minimize the losses of life and property due to fire in Montgomery County

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the Wildfire Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE

Montgomery County is experiencing a rapid population growth and because of this, there has been a substantial change in land use as well as the wildland urban interface over the years bringing a diverse range of challenges. Therefore, Montgomery County adheres to a comprehensive list of policies and regulations including the National Fire Protection Association Codes, International Fire Code, and county ordinances. It is also a priority for Montgomery County to address the primary concern regarding protection of existing and future development in the wildland urban interface areas within the county.

NEW BUILDINGS AND INFRASTRUCTURE

As residential developments expand into wild land areas, people and property are increasingly at risk from wildfire. A cleared safety zone of at least 30 feet (100 feet in pine forests) should be maintained between structures and combustible vegetation, and fire-resistant ground cover, shrubs, and trees should be used for landscaping (for example, hardwood trees are less flammable than pines, evergreens, eucalyptus or firs). Only fire-resistant or non-combustible materials should be used on roofs and exterior surfaces. Roofs and gutters should be regularly cleaned and chimneys should be equipped with spark arrestors. Vents, louvers, and other openings should be covered with wire mesh to prevent embers and flaming debris from entering. Overhangs, eaves, porches, and balconies can trap heat and burning embers and should also be avoided or minimized and protected with wire mesh. Windows allow radiated heat to pass through and ignite combustible materials inside, but dual- or triple-pane thermal glass, fire-resistant shutters or drapes, and noncombustible awnings can help reduce this risk.

The term fireproof does not necessarily mean that an item cannot ever burn: It relates to measured performance under specific conditions of testing and evaluation. Fireproofing does not allow treated items to be entirely unaffected by any fire, as conventional materials are not immune to the effects of fire at a sufficient intensity and/or duration.

As stated above, safety zones can be created around structures by reducing or eliminating brush, trees, and vegetation around a home or facility. FEMA recommends using a 30-foot safety zone; including keeping grass below 2 feet tall and clearing all fallen leaves and branches promptly.

Firebreaks are areas of inflammable materials that create a fuel break and reduce the ability for fires to spread and roads and pathways can be planned and designed to serve as breaks. The use of Geographic Information System-based wildfire hazard assessment tools for use by Montgomery County should be considered for future planning and mitigation efforts.

Increased public education on fire safety is critical in Montgomery County due to its rapidly growing population, especially when many of the areas being developed are larger lots scattered throughout wildland fuels.

EXISTING BUILDINGS AND INFRASTRUCTURE

Wildfire mitigation in the urban/wildland interface has primarily been the responsibility of property owners who choose to build and live in vulnerable zones. In practice, successful wildfire strategies can be quite involved. The most important aspect of successful suppression is disruption of the continuity of fuels, achieved by creating breaks or defensible areas. For interface fires, where homes and other structures fill the space, fuel reduction is best accomplished before the fires begin.

The Maryland Forest Service provides several services that help reduce wildfire risk. These include community outreach and education, fuels management, development review, hazardous activity permitting, fire danger monitoring, operational support, burn bans and restrictions, grant administration, and a volunteer program. This rigorous mitigation strategy shares responsibilities amongst agencies, and promotes safer communities in the process.

MITIGATION ACTION PLAN

Goal 4: *To minimize the losses of life and property due to fire in Montgomery County*

- ✓ ***Objective 4.1***: *To protect both people and property to the devastating effects of wildfire*

GOAL 6; OBJECTIVE 6.1; Mitigation Action 6.1.1	
DEVELOP A PUBLIC AWARENESS CAMPAIGN TO HEIGHTEN AWARENESS ABOUT BRUSH FIRES AND PREVENTATIVE MAINTENANCE FOR HOMEOWNERS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

COMPLETED, ONGOING, DELETED OR NEW ACTION STEPS FROM THE 2007 PLAN

Table 3-6: Updated Actions for Montgomery County – Goal 4, Objective 4.1 (Fire)			
2007 ACTION	2013 UPDATE ACTION	STATUS	NOTES
	Develop a public awareness campaign to heighten awareness about brush fires and preventative maintenance for homeowners	New	

FLOOD MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

Goal 5*: To minimize the losses of life and property due to <u>flooding</u> in Montgomery County*

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the Flood Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

With sufficient warning of a flood, a community and its residents can take protective measures such as moving personal property, cars, and people out of harm's way. New radar technologies, improved river forecast models, computer visualization, automated data transmission, and improved data collection techniques hold significant promise for improving the timeliness and accuracy of flood forecasts and warnings.

A comprehensive education and outreach program is critical to the success of early warning systems so that the general public, operators of critical facilities, and emergency response personnel will know what actions to take when warning is disseminated.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE

Floodplain management ordinances are intended to addresses methods and practices to minimize flood damage to new and substantial home improvement projects as well as address zoning and subdivision ordinances and state regulations. With that said, Montgomery County joined the National Flood Insurance Program (NFIP) on July 18, 1975 and continues to participate and support floodplain management. Floodplain management is required under the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. There are approximately 1,938 flood insurance properties in Montgomery County.

As of 2013, all incorporated municipalities within Montgomery County participate in the NFIP with the exception of Friendship Heights (Non-Participating), Chevy Chase Village Section 3 (Sanctioned), and North Chevy Chase (Sanctioned).

Montgomery County's zoning laws are reflected in the ordinances of local jurisdictions with the land-use control authority. The Maryland-National Capital Park and Planning Commission's Montgomery County Planning Department developed a general plan in 1964 to guide development in Montgomery County. This plan has been updated several times and specifically states that protecting lives and property is the basis for regulations that limit or prohibit development in the floodplain.

Montgomery County's Department of Permitting Service has responsibility for enforcing countywide codes by restricting development in areas through a site planning approval process. Some of the incorporated jurisdictions located in the County have enforcement authority of their own ordinances. Floodplain estimates are based on the 100-year estimates of fully developed land and require large-scale impoundments such as Lake Frank and Lake Needwood.

Montgomery County Code, Chapter 8: Buildings, prohibits building in any 100-year floodplain or stream or drainage course (riverine and flash flood mitigation). These sections of the code also prohibit building in any area that is subject to flooding, erosion, un-stabilized slope or fill within the danger reach of a high-hazard dam.

NEW BUILDINGS AND INFRASTRUCTURE

The greatest protection is afforded by quality construction and compliance with local ordinances which exceed NFIP requirements. Code adoption by local jurisdictions, compliance by builders, and local government inspection of new homes can reduce the risk of flooding. Montgomery County will continue to support monitoring, analysis, modeling, and the development of decision-support systems and geographic information applications for floodplain activities.

EXISTING BUILDINGS AND INFRASTRUCTURE

In addition to land-use planning, zoning, and codes applicable to new development, flood mitigation measures include structural and non-structural measures to address susceptibility of existing structures. Flood mitigation measures such as acquisition, relocation, elevation-in-place, wet/dry floodproofing, and enhanced storm drainage systems all have the potential to effectively reduce the impact of flood in Montgomery County.

MITIGATION ACTION PLAN

Goal 5*: To minimize the losses of life and property due to <u>flooding</u> in Montgomery County*

- ✓ ***Objective 5.1****: To minimize the impact of flooding to life and property to include buildings, infrastructure, critical facilities, and critical infrastructure*

GOAL 5; OBJECTIVE 5.1; Mitigation Action 5.1.1	
CONTINUE ONGOING LAND USE POLICIES THAT PROHIBIT NEW DEVELOPMENT IN THE SFHA	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY AND ALL JURISDICTIONS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY/MUNICIPAL FUNDS
JURISDICTION	MONTGOMERY COUNTY, ALL JURISDICTIONS
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	ONGOING
CONTINUED COMPLIANCE WITH NFIP	**YES**

GOAL 5; OBJECTIVE 5.1; Mitigation Action 5.1.2	
EXPLORE MITIGATION SOLUTIONS FOR ALL OCCUPIED PROPERTIES LOCATED IN THE SFHA	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY AND ALL JURISDICTIONS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY/MUNICIPAL FUNDS, FEMA HMA GRANTS
JURISDICTION	MONTGOMERY COUNTY, ALL JURISDICTIONS
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	ONGOING

GOAL 5; OBJECTIVE 5.1; Mitigation Action 5.1.3	
CONTINUE TO SURVEY MUNICIPAL OWNED OR LEASED PROPERTY FOR POTENTIAL FLOODING PROBLEMS AND IDENTIFY FLOOD MITIGATION STRATEGIES FOR STRENGTHENING FLOOD RESILIENCE	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY AND ALL JURISDICTIONS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY/MUNICIPAL FUNDS, FEMA HMA GRANTS
JURISDICTION	MONTGOMERY COUNTY, ALL JURISDICTIONS
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	ONGOING

GOAL 5; OBJECTIVE 5.1; Mitigation Action 5.1.4	
AMEND ZONING REQUIREMENTS TO INCLUDE FLOODPLAIN LANGUAGE INTO CONSERVATION EASEMENTS	
RESPONSIBLE DEPARTMENT	POOLESVILLE and all Municipalities
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL FUNDS
JURISDICTION	POOLESVILLE
TIMEFRAME	3 YEARS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

- ✓ ***Objective 5.2***: *To reduce the impact of flooding through education and outreach of flood mitigation techniques*

GOAL 1; OBJECTIVE 5.2; Mitigation Action 5.2.1	
ESTABLISH COMMUNITY OUTREACH REGARDING THE NFIP AND APPLY FOR THE COMMUNITY RATING SYSTEM	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY AND ALL JURISDICTIONS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY/MUNICIPAL FUNDS
JURISDICTION	MONTGOMERY COUNTY, ALL JURISDICTIONS
TIMEFRAME	5 YEARS

STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	ONGOING
CONTINUED COMPLIANCE WITH NFIP	**YES**
GOAL 1; OBJECTIVE 5.2; Mitigation Action 5.2.2	
CREATE A FLOOD RISK PUBLIC AWARENESS CAMPAIGN FOR THE RESIDENTS OF CHEVY CHASE, SECTION 5	
RESPONSIBLE DEPARTMENT	VILLAGE OF CHEVY CHASE, SECTION 5
ANTICIPATED COST	
EXISTING & POTENTIAL FUNDING SOURCES	
JURISDICTION	VILLAGE OF CHEVY CHASE, SECTION 5
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

- ✓ ***Objective 5.3***: *Pursue flood mitigation projects in repetitive flood areas to improve storm water management*

GOAL 5; OBJECTIVE 5.3; Mitigation Action 5.3.1	
EXPLORE MITIGATION PROJECTS IN AREAS THAT FREQUENTLY FLOOD, INCLUDING STORM WATER MANAGEMENT IMPROVEMENTS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY AND ALL JURISDICTIONS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY/MUNICIPAL FUNDS
JURISDICTION	MONTGOMERY COUNTY, ALL JURISDICTIONS
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	ONGOING

GOAL 5; OBJECTIVE 5.3; Mitigation Action 5.3.2	
COORDINATE WITH DOT TO CONTINUE TO CLEAR AND MAINTAIN STORM DRAINS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	2 YEARS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	ONGOING

GOAL 5; OBJECTIVE 5.3; Mitigation Action 5.3.3	
DEVELOP A STORM DRAIN EVALUATION PROGRAM DESIGNED FOR FUTURE IMPROVEMENTS AND HAZARD MITIGATION	
RESPONSIBLE DEPARTMENT	GARRETT PARK
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL FUNDS
JURISDICTION	GARRETT PARK

TIMEFRAME	3 YEARS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 5; OBJECTIVE 5.3; Mitigation Action 5.3.4	
RECONSTRUCT UNDERSIZED STORM DRAINS THROUGHOUT GARRETT PARK	
RESPONSIBLE DEPARTMENT	GARRETT PARK
ANTICIPATED COST	
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL FUNDS
JURISDICTION	GARRETT PARK
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	NEW

GOAL 5; OBJECTIVE 5.3; Mitigation Action 5.3.5	
MAINTAIN AND UPGRADE STORM WATER DRAINAGE WHERE UNDERSIZED INFRASTRUCTURE EXISTS	
RESPONSIBLE DEPARTMENT	POOLESVILLE, Montgomery County and all municipalities
ANTICIPATED COST	
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL FUNDS
JURISDICTION	POOLESVILLE
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 5; OBJECTIVE 5.3; Mitigation Action 5.3.6	
EVALUATE UNDERSIZED STORMWATER INFRASTRUCTURE AND PRIORITIZE HAZARD MITIGATION PROJECTS TO ADDRESS IDENTIFIED INFRASTRUCTURE IMPROVEMENT NEEDS	
RESPONSIBLE DEPARTMENT	ROCKVILLE
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL FUNDS
JURISDICTION	ROCKVILLE
TIMEFRAME	3 YEARS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 5; OBJECTIVE 5.3; Mitigation Action 5.3.7	
DEVELOP AND IMPLEMENT A STORM DRAIN EVALUATION PROGRAM TO IDENTIFY UNDERSIZED INFRASTRUCTURE	
RESPONSIBLE DEPARTMENT	COUNTYWIDE
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	3 YEARS

STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 5; OBJECTIVE 5.3; Mitigation Action 5.3.8	
CONDUCT A STORMWATER IMPROVEMENT PROJECT ON SILVER CREEK WITHIN THE TOWN OF KENSINGTON AND ADJOINING MONTGOMERY COUNTY	
RESPONSIBLE DEPARTMENT	TOWN OF KENSIGNTON
ANTICIPATED COST	
EXISTING & POTENTIAL FUNDING SOURCES	HMGP OR PDM GRANT FUNDS
JURISDICTION	TOWN OF KENSIGNTON
TIMEFRAME	3 YEARS
STAPLEE PRIORITY	HIGH
STATUS	NEW

COMPLETED, ONGOING, DELETED OR NEW ACTION STEPS FROM THE 2007 PLAN

Table 3-7: Updated Actions for Montgomery County – Goal 5 (Flood)

2007 ACTION	2013 UPDATE ACTION	STATUS	NOTES
Establish community outreach regarding the NFIP, Apply for the CRS, and encourage all municipalities to participate		Ongoing	County does have interest in applying in the CRS
Continue ongoing land use policies that prohibit new development in the SFHA		Ongoing	n/a
Explore mitigation solutions to the 199 homes located in the SFHA	Explore mitigation solutions for all occupied properties located in the SFHA	Changed, Ongoing	n/a
Explore mitigation projects in areas that frequently flood, including SWM improvements		Ongoing	n/a
Coordinate with DPWT to continue to clear and maintain storm drains	Coordinate with DOT to continue to clear and maintain storm drains	Changed, Ongoing	n/a
Use newsletters, email and other methods to provide safety messages	Use newsletters, e-mail, and other methods for public outreach to provide safety messages for all hazards	Changed, Deleted, Moved	Being moved to Goal 13: All-Hazards
Participate in the County's Technical Planning Committee annual review of mitigation strategies	County and municipal officials to participate in the County's Technical Planning Committee annual review of mitigation strategies	Changed, Deleted, Moved	Being moved to Goal 13: All-Hazards
Pursue mitigation projects in areas that frequently flood to improve storm water management, including large culverts, channelization, retention ponds, on-going maintenance of storm water systems, etc.	n/a	Deleted	This action is now being considered an objective as it is defining a strategy or implementation step in order to attain the identified goal for flood in this Plan.
Identify mitigation projects to reduce flooding where structures or roadways	n/a	Deleted	Action lacks specific detail and reflects more as an objective and is repetitive of current flood objectives identified in this Plan.

Table 3-7: Updated Actions for Montgomery County – Goal 5 (Flood)			
2007 ACTION	**2013 UPDATE ACTION**	**STATUS**	**NOTES**
are impacted			
Continue to survey municipal owned or leased property for potential flooding problems and identify flood mitigation strategies for strengthening flood resilience		Ongoing	n/a
	Create a flood risk public awareness campaign for the residents of Chevy Chase, Section 5	New	Village of Chevy Chase, Section 5.
	Develop a storm drain evaluation program designed for future improvements and hazard mitigation	New	Garrett Park
	Reconstruct undersized storm drains throughout Garrett Park	New	Garrett Park
	Amend zoning requirements to include floodplain language into conservation easements	New	Poolesville
	Maintain and upgrade storm water drainage where undersized infrastructure exists	New	Poolesville
	Evaluate undersized stormwater infrastructure and prioritize hazard mitigation projects to address	New	Rockville
	Develop and implement a storm drain evaluation program to identify undersized infrastructure	New	Countywide
	Conduct a Stormwater improvement project on Silver Creek within the Town of Kensington	Revised	Kensington

HURRICANE/TROPICAL STORMS MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

Goal 6: To minimize the losses of life and property due to hurricanes and tropical storms in Montgomery County

An uprooted tree fell onto a home in Chevy Chase, MD, during Hurricane Irene's rains and high winds. (Photo credit Montgomery Patch 2011)

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the Hurricane Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

With sufficient warning of a hurricane, a community and its residents can take protective measures such as moving personal property, cars, and people out of harm's way. New radar technologies, improved forecast models, computer visualization, automated data transmission, and improved data collection techniques hold significant promise for improving the timeliness and accuracy of hurricane forecasts and warnings.

A downed pole and tree fell on top of a vehicle in Takoma Park, MD, following high winds and rains from Hurricane Irene. (Photo credit Montgomery Patch 2011)

A comprehensive education and outreach program is critical to the success of early warning systems so that the general public, operators of critical facilities, and emergency response personnel will know what actions to take when warning is disseminated.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE

Maryland's building codes, enforcement officials, and contractor licensing system ranks in the middle of the pack among states subject to hurricanes, according to the above referenced study. Montgomery County is susceptible to hurricanes and the current Emergency Operations Plan for Montgomery County; dated June 2009 takes this into consideration when planning for potential evacuation events. The County is prepared to evacuate out of the jurisdiction and to receive evacuees from other jurisdictions as necessary in the case of a major hurricane event.

Prior to the beginning of hurricane season (June 1 through November 30 for the Atlantic coast), Montgomery County's Homeland Security Department in collaboration with the County's Public

Information Office issues a press release on hurricane emergency preparedness. Montgomery County also participates in a multi-jurisdictional hurricane exercise on or around June 1 of each year. The County includes interested jurisdictions and utilities in these exercises.

The County has the capacity to use text messaging technology (ALERT MONTGOMERY) and mass voice messaging technology (Reverse 911) to notify citizens of emergencies from hurricanes and other events. The County also has a procedure for tracking hurricane damage through windshield assessment surveys. The data collected from these surveys after a hurricane event is input into a GIS and used to help County Managers and PEPCO staff in their prioritization and decision-making process post-event. The County's Traffic Management Center operates a traffic signal control system with the ability to monitor and adjust signal operations in response to events.

NEW BUILDINGS AND INFRASTRUCTURE

The State of Maryland does very well with regards to building regulations for hurricanes when compared to the rest of the coastal states in the nation according to a January 12, 2012 study by the Institute for Business and Home Safety because they adopted the 2009 International Residential Code, including the fire sprinkler requirement, with very few amendments. However, Maryland allows local jurisdictions to make amendments to the code which makes the code not uniform and weakens wind protections especially in vulnerable coastal areas.

The greatest protection is afforded by quality construction and compliance with local ordinances which exceed NFIP requirements. Code adoption by local jurisdictions, compliance by builders, and local government inspection of new homes can reduce the risk of damage from hurricanes. Montgomery County prohibits development in regions through restrictive zoning and subdivision requirements, New construction is prohibited within floodplains of the major waterways of the Northwest Branch, Paint Branch, Rock Creek, and Sligo Creek. These waterways, which flow through the most heavily populated areas of the county, are protected.

EXISTING BUILDINGS AND INFRASTRUCTURE

In addition to land-use planning, zoning, and codes applicable to new development, flood mitigation measures include structural and non-structural measures to address susceptibility of existing structures. Flood mitigation measures such as acquisition, relocation, elevation-in-place, wet/dry floodproofing, and enhanced storm drainage systems all have the potential to effectively reduce the impact of hurricane damage in Montgomery County.

MITIGATION ACTION PLAN

Goal 6: *To minimize the losses of life and property due to <u>hurricanes and tropical storms</u> in Montgomery County*

- ✓ ***Objective 6.1***: *To minimize the wind and flooding effects of hurricanes and tropical storms on life and property to include buildings, infrastructure, critical facilities, and critical infrastructure*

GOAL 6; OBJECTIVE 6.1; Mitigation Action 6.1.1	
DEVELOP A PLAN TO ADDRESS THAT EMERGENCY ROUTES ARE CLEARED OF DEBRIS AND DOWNED POWER LINES POST EVENT	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	2 YEARS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	ONGOING

GOAL 6; OBJECTIVE 6.1; Mitigation Action 6.1.2	
DEVELOP MANAGEMENT RULES AND POLICIES FOR UTILITY RIGHT-OF-WAYS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

COMPLETED, ONGOING, DELETED OR NEW ACTION STEPS FROM THE 2007 PLAN

Table 3-8 Updated Actions for Montgomery County – Goal 6 (Hurricane/Tropical Storm)

2007 ACTION	2013 UPDATE ACTION	STATUS	NOTES
Develop a plan to address that emergency routes are cleared of debris and downed power lines post event		Ongoing	
Develop management rules and policies for utility right-of-ways		New	

WATER SHORTAGE/DROUGHT MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

***Goal 7**: To minimize the losses of life and property due to water shortage and drought in Montgomery County*

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the Water Shortage and Drought Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE

As Montgomery County continues to grow, it will consider practical guidelines for determining the impacts of water shortage and drought such as measuring the economic value of water in alternative uses and objective methods for quantifying non-market impacts of drought on those uses.

The County's Fire and Rescue Service (MCFRS) has certified drafting sites for water (certified drafting sites must have reliable water levels, even during a drought). In addition, MCFRS now has six tankers, each holding 3,000 to 3,500 gallon capacity. These tankers are located strategically throughout the County (*source of quoted material: Scott Gutschick, MCFRS' Senior Planner*). The County's Department of Environmental Protection is responsible for protecting both the public and private drinking water supply for the County, the water quality of streams, etc., and the wildlife dependent on those systems. The County has protocols for "drought emergency stages" based on the State of Maryland's Drought Monitoring and Response Plan (dated November 2000), and the Metropolitan Washington Water Supply and Drought Awareness Response Plan Potomac River System, created June 2000 and updated May 2001. The former pertains to citizens using wells and the latter to those who receive water supply from a municipality or water authority.

Drought emergency stages are:

- ✓ *Stage One - Normal Condition*
- ✓ *Stage Two - Drought Watch*
- ✓ *Stage Three - Drought Warning*
- ✓ *Stage Four - Drought Emergency*

At each stage, appropriate measures are initiated to ensure an adequate and safe drinking water supply. For more information, see the Montgomery County Emergency Operations Plan: Severe Weather Annex and Damage Assessment Annex, a dated June 2009. The County is a member of the Metropolitan Washington Council of Governments, and participates in the following plans and agreements:

- ✓ Metropolitan Washington Water Supply and Drought Awareness Response Plan (June 2000): This document provides a plan of action that would be implemented during drought conditions for the purpose of coordinated regional response. The Plan consists of two interrelated components: (1) a year-round plan emphasizing wise water use and conservation; and (2) a water supply and drought awareness and response plan. The year-round wise water use program applies to the entire region and is under development; what is presented is the basic framework and initial key messages. The Water Supply and Drought Awareness Plan contains four stages and is primarily designed for those customers who use the Potomac River for their drinking water supply. The Plan will eventually be expanded to incorporate all water supply systems throughout the region.

- ✓ Metropolitan Washington Water Supply Emergency Plan (2009): The 2009 Water Supply Emergency Plan replaces the 2004 Water Supply Emergency Plan (originally drafted in 1994). The new plan provides regional coordination and communication guidance in the event of a disruption, outage, or threat to regional water supplies and as those supplies might relate to wastewater operations. Such events would or could potentially have the ability to disrupt fire protection, sanitation, and potable water services within the Metropolitan Washington region. In general, the plan addresses all incidents and emergencies that involve water treatment and/or its conveyance systems within the metropolitan Washington region. This plan is designed to coordinate the actions to be taken by local, state and federal government agencies and water supply utilities in the Washington region in the event of a regional water emergency.

- ✓ Metropolitan Washington Water Supply Emergency Agreement (1979): Adopted in 1979 to create coordinated area wide water conservation as well as curtail water use during periods when available water supplies were insufficient to meet the water supply demands of the utilities due to drought or water outages. It provides inter-jurisdictional assistance and coordination to conserve water and provide for necessary curtailment of water use during critical water supply situations. Signatories to the agreement include fifteen metropolitan Washington local government jurisdictions, including Montgomery County, as well as the Fairfax County Water Authority, Loudoun County Sanitation Authority, Washington Suburban Sanitary Commission and the Metropolitan Washington Council of Governments.

- ✓ Low Flow Allocation Agreement (Original 1978, Modified 1982): Originally signed in 1978 and modified in 1982 this agreement, which is administered by the Army Corps of Engineers, defines the severity of a water supply shortage in stages and established the allowable withdrawal of water from the Potomac River during low flow. Signatories to the agreement include: Commonwealth of Virginia, State of Maryland, District of Columbia, Corps of Engineers /Washington Aqueduct Division, Washington Suburban Sanitary Commission, and the Fairfax County Water Authority.

- ✓ Statewide Water Conservation Plan: Since May of 2001, the State of Maryland has had a comprehensive water conservation plan. State facility water conservation was phased-in, beginning with a usage reduction goal of 7% by 2003; 8% by 2005; 9% by 2007 and achieving 10% by 2010. In Maryland, 1.4 billion gallons of water are used every day, with the average home using about 250 gallons a day. If all residents of Maryland reduced their water usage by 10% the water conserved would be enough to provide additional water for 440,000 homes daily.

- ✓ Montgomery County Comprehensive Water Supply and Sewerage Systems Plan 2003-2012: The Montgomery County government addresses this responsibility through the Ten-Year Comprehensive Water Supply and Sewerage Systems Plan (Water and Sewer Plan), which ensures that existing and future water supply and wastewater disposal needs are coordinated in a manner that is timely and cost-effective, well integrated with land use planning efforts, protects the health, safety, and welfare of residents, businesses, and institutions, protects the quality of the environmental resources of the county, the state, and the Chesapeake Bay region, and helps to improve the quality of the environmental resources of the county, state, and region. The Water and Sewer Plan is a functional master plan for providing water and sewer services throughout Montgomery County. As such, it provides an important link between the County's land use and development planning and the actual construction of the water supply and sewerage systems needed to implement that planning effort.

NEW BUILDINGS AND INFRASTRUCTURE

New water and sewer systems or significant well and septic sites could use up more of the water available, particularly during periods of drought. Public water systems are monitored, but individual wells and septic systems are not as strictly regulated. Therefore, future development could have an impact on the drought vulnerabilities to new buildings and infrastructure.

EXISTING BUILDINGS AND INFRASTRUCTURE

Although drought conditions rarely affect existing buildings, infrastructure, and critical infrastructure, the economic livelihood could be negatively impacted due to crop loss, timberland damage, water shortages, and wildfires as a result of drought. Possible losses/impacts to critical facilities include the loss of critical function due to low water supplies.

MITIGATION ACTION PLAN

Goal 7: *To minimize the losses of life and property due to water shortage and drought in Montgomery County*

- ✓ ***Objective 7.1***: *To minimize the effects of Montgomery County on methods to reduce the effects of drought*

GOAL 7; OBJECTIVE 7.1; Mitigation Action 7.1.1	
DEVELOP A WATER SOURCE ALTERNATE INTERCONNECTION PLAN AND IMPLEMENT DESIGN	
RESPONSIBLE DEPARTMENT	POOLESVILLE
ANTICIPATED COST	$100,000 (PLAN), $12,000,000 (CONSTRUCTION)
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL FUNDS, STATE/FEDERAL GRANTS (TBD)
JURISDICTION	POOLESVILLE
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 5; OBJECTIVE 7.1; Mitigation Action 7.1.2	
CONTINUE TO DEVELOP INCENTIVES FOR WATER CONSERVATION DURING DROUGHT CONDITIONS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	ONGOING

GOAL 5; OBJECTIVE 7.1; Mitigation Action 7.1.3	
CONTINUE TO COORDINATE WITH WSSC, ROCKVILLE, AND POOLESVILLE REGARDING WATER SUPPLY CAPACITY DURING DROUGHT CONDITIONS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY, ROCKVILLE, POOLESVILLE
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY/MUNICIPAL FUNDS
JURISDICTION	MONTGOMERY COUNTY, ROCKVILLE, POOLESVILLE
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	ONGOING

GOAL 5; OBJECTIVE 7.1; Mitigation Action 7.1.4	
PURCHASE ADDITIONAL WATER QUALITY MONITORING EQUIPMENT AND INSTRUMENTS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY
ANTICIPATED COST	TBD
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS AND STATE GRANTS (TBD)
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	ONGOING

GOAL 5; OBJECTIVE 7.1; Mitigation Action 7.1.5	
UPDATE STORM DRAINAGE INVENTORY USING GIS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY
ANTICIPATED COST	TBD
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	ONGOING

COMPLETED, ONGOING, DELETED OR NEW ACTION STEPS FROM THE 2007 PLAN

Table 3-9: Updated Actions for Montgomery County - Goal 7, (Drought/Water Shortage)

2007 ACTION	2013 UPDATE ACTION	STATUS	NOTES
	DEVELOP A WATER SOURCE ALTERNATE INTERCONNECTION PLAN AND IMPLEMENT DESIGN	NEW	
CONTINUE TO DEVELOP INCENTIVES FOR WATER CONSERVATION DURING DROUGHT CONDITIONS		Ongoing	
CONTINUE TO COORDINATE WITH WSSC, ROCKVILLE, AND POOLESVILLE REGARDING WATER SUPPLY CAPACITY DURING DROUGHT CONDITIONS		Ongoing	
PURCHASE ADDITIONAL WATER QUALITY MONITORING EQUIPMENT AND INSTRUMENTS		Ongoing	
UPDATE STORM DRAINAGE INVENTORY USING GIS		Ongoing	

TORNADO MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

Goal 8: To minimize the losses of life and property due to tornadoes in Montgomery County

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the Tornado Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE

Mitigation of building damage has been most successful where strict building codes for high-wind influence areas and designated special flood hazard areas have been adopted and enforced by local governments and complied with by builders. County and municipal construction and zoning ordinances are applicable within their respective jurisdictions.

NEW BUILDINGS AND INFRASTRUCTURE

Mitigation opportunities for tornadoes are similar to mitigation measures for general high wind hazards. Attention to the type of structure used in, for example hurricane-prone areas may yield benefits, particularly by avoiding highly susceptible manufactured or mobile homes.

The greatest protection is afforded by quality construction and reinforcement of walls, floors, and ceilings. Proper anchoring of walls to foundations and roofs to walls is essential for a building to withstand certain wind speeds. Code adoption by local jurisdictions, compliance by builders, and local government inspection of new homes could reduce the risk of destruction in tornado prone areas.

Construction of safe rooms has also shown great success in protecting life and reducing injuries during severe storm events. These are typically areas within an existing structure that are reinforced to serve as temporary shelters during the duration of an event. Walls and other structural components are heavily reinforced with concrete and rebar to provide an area designed to withstand high wind speeds and protect occupants from windborne debris. Safe rooms can be constructed not only in critical facilities such as police stations and hospitals but also in residential and commercial buildings. They can be built into any new structure during the construction phase which often proves to be the most cost beneficial time to do such an activity. Montgomery County along with its municipalities will consider incorporating safe room areas into all new construction projects as well as retrofitting existing facilities to include safe room areas. All projects should be designed to meet FEMA 320 standards or beyond.

EXISTING BUILDINGS AND INFRASTRUCTURE

High wind and tornadoes affect the entire planning area, including all above ground structures and utilities. Due to the erratic movement of tornadoes, destruction is often random. Buildings constructed prior to adoption of buildings codes remain more susceptible to damage. Some retrofit projects, for example, specially designed shutters and windows for public schools and retrofitted saferooms are expected to reduce future damage and reduce loss of life and injury. Modification of existing buildings to incorporate wind-resistant measures may come about slowly as buildings are substantially improved. Post-disaster mitigation efforts include retrofits and the construction of saferooms.

MITIGATION ACTION PLAN

Goal 8: *To minimize the losses of life and property due to tornadoes in Montgomery County*

- ✓ ***Objective 8.1***: *To minimize the effects of high winds to life and property to include buildings, infrastructure, critical facilities, and critical infrastructure*

GOAL 8; OBJECTIVE 8.1; Mitigation Action 8.1.1	
EVALUATE THE FEASIBILITY FOR CONSTRUCTING SAFE ROOMS IN COMMUNITY FACILITIES	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS, ALL MUNICIPALITIES
ANTICIPATED COST	\$150 ,000 - \$250,000 PER SAFEROOM
EXISTING & POTENTIAL FUNDING SOURCES	FEMA HMA GRANTS, COUNTY GENERAL FUND, MUNICIPAL FUNDS
JURISDICTION	MONTGOMERY COUNTY, ALL MUNICIPALITIES
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	NEW

GOAL 8; OBJECTIVE 8.1; Mitigation Action 8.1.2	
PROMOTE ENHANCED ANCHORING OF MANUFACTURED HOMES	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUND
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 8; OBJECTIVE 8.1; Mitigation Action 8.1.3	
PUBLIC EDUCATION AND OUTREACH CONCERNING THE DANGERS OF TORNADOES AND HIGH WINDS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	$500
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY GENERAL FUND
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	3 YEARS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

COMPLETED, ONGOING, DELETED OR NEW ACTION STEPS FROM THE 2007 PLAN

Table 3-10 Updated Actions for Montgomery County – Goal 8 (Tornado)

2007 ACTION	2013 UPDATE ACTION	STATUS	NOTES
	Evaluate the feasibility for constructing a community saferoom	New	
	Promote enhanced anchoring of manufactured homes	New	
	Public education and outreach concerning the dangers of tornadoes and high winds	New	

EARTHQUAKE MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

Goal 9: To minimize the losses of life and property due to earthquake in Montgomery County

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the Earthquake Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE

Standard building codes have the opportunity to provide Montgomery County with reasonable guidance for development throughout unincorporated and incorporated areas. However, contractors and builders should be aware of applicable codes and regulations designed to reduce losses sustained by new and existing construction due to seismic hazards.

NEW BUILDINGS AND INFRASTRUCTURE

The light weight of wood frame buildings results in less force from inertia. Less force means less damage. Wood's natural flexibility also is an advantage when seismic forces are brought to bear and the nailed joints in wood frame buildings dissipate energy and motion.

Figure 3-12

But wood's inherent earthquake resistance must be accompanied by design and construction techniques that take advantage of those characteristics. Structural wood panels nailed to wall framing add rigid bracing, help resist lateral loads and help tie framing members together. Bolted connections at the sill plate/foundation joint help keep the structure in one spot. Securely connected wall, floor and roof framing also help tie a structure together and make it a single, solid structural unit. Proper connections will do more to hold a house together during an earthquake than any other single seismic design element.

As development grows in the County and its municipalities, it will be important for citizens to consult with local building codes as modern building codes generally require seismic design elements for new construction.

EXISTING BUILDINGS AND INFRASTRUCTURE

The entire inventory in the County is vulnerable to earthquake. An earthquake occurring in Montgomery County could cause widespread impacts with the greatest threat to public safety on major roads and highways. Power outages caused down power lines could impact critical facilities such as fire protection, law enforcement, and hospitals. It is the priority of Montgomery County to continue operation of existing buildings and infrastructure, especially critical facilities and infrastructure after an earthquake has occurred.

MITIGATION ACTION PLAN

Goal 9: *To minimize the losses of life and property due to earthquake in Montgomery County*

- ✓ ***Objective 9.1***: *To minimize the effects of seismic activity to life and property to include buildings, infrastructure, critical facilities, and critical infrastructure*

GOAL 9; OBJECTIVE 9.1; Mitigation Action 9.1.1	
CONTINUE TO PROMOTE EARTHQUAKE PREPAREDNESS THROUGH PUBLIC OUTREACH	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY, ALL MUNICIPALITIES
ANTICIPATED COST	TBD
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS, MUNICIPAL FUNDS
JURISDICTION	MONTGOMERY COUNTY, ALL MUNICIPALITIES
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	LOW
STATUS (ONGOING OR NEW)	ONGOING

COMPLETED, ONGOING, DELETED OR NEW ACTION STEPS FROM THE 2007 PLAN

Table 3-11: Updated Actions for Montgomery County - Goal 9 (Earthquake)

2007 ACTION	2013 UPDATE ACTION	STATUS	NOTES
	Continue to promote earthquake preparedness through public outreach	Ongoing	

LAND SUBSIDENCE/KARST MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

Goal 10: To minimize the losses of life and property due to land subsidence and karst in Montgomery County

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the Land Subsidence/Karst Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE

Restricting the use of land and establishing minimum standards for avoiding areas prone to landslide, erosion, and mine subsidence is one approach that Montgomery County is aware of and will continue to remain proactive in future planning endeavors.

NEW BUILDINGS AND INFRASTRUCTURE

As development grows in the County and its municipalities, it will be a priority to cross-check these at-risk areas with new development. Further, there is a high potential for soil piping and/or erosion caused by leakage from drainage pipes, culverts, etc. and should also be taken into account for both new and existing infrastructure.

Areas that are generally prone to landslide hazards include previous landslide areas; the bases of steep slopes; the bases of drainage channels; and developed hillsides where leach-field septic systems are used. Areas that are typically considered safe from landslides include areas that have not moved in the past; relatively flat-lying areas away from sudden changes in slope; and areas at the top or along ridges, set back from the tops of slopes.

EXISTING BUILDINGS AND INFRASTRUCTURE

It should be considered that minor landslide events are possible for buildings and infrastructure located in localized, steep-slope areas during extremely wet conditions. If an existing building and/or infrastructure are located in a mine subsidence area, mitigation action can and should be taken to avoid further risk and potential losses.

MITIGATION ACTION PLAN

Goal 10: *To minimize the losses of life and property due to land subsidence and karst in Montgomery County*

- ✓ ***Objective 10.1***: *To minimize the effects of land subsidence and karst to include buildings, infrastructure, critical facilities, and critical infrastructure*

GOAL 10; OBJECTIVE 10.1; Mitigation Action 10.1.1	
ENCOURAGE COUNTY AND MUNICIPAL OFFICES TO REVIEW REGULATIONS PERTAINING TO THEIR JURISDICTION TO ENSURE THAT ADEQUATE LOCAL REGULATIONS ARE IN PLACE TO REDUCE FUTURE DEVELOPMENT IN HIGH HAZARD AREAS	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS, ALL MUNICIPALITIES
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUND, MUNICIPAL FUNDS
JURISDICTION	MONTGOMERY COUNTY, ALL MUNICIPALITIES
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

COMPLETED, ONGOING, DELETED OR NEW ACTION STEPS FROM THE 2007 PLAN

Table 3-12: Updated Actions for Montgomery County - Goal 10 (Land Subsidence/Karst)

2007 ACTION	2013 UPDATE ACTION	STATUS	NOTES
No Action for 2007	Encourage County and Municipal offices to review regulations pertaining to their jurisdiction to ensure that adequate local regulations are in place to reduce future development in high hazard areas	New	

HAZARDOUS MATERIALS MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

Goal 11: To minimize the losses of life and property due to hazardous materials in Montgomery County

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the Hazardous Materials Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE

Restricting the use of land and establishing minimum standards for avoiding hazardous sites and conditions are one approach that Montgomery County is aware of and will continue to be proactive in this regard.

NEW BUILDINGS AND INFRASTRUCTURE

Physical adjustments for avoiding the effects of hazardous materials with new buildings and infrastructure include planning and building HAZMAT facilities to withstand prevalent natural hazards and identifying sites where hazards are highly likely to occur. It also is a priority for Montgomery County to institute public awareness campaigns in areas prone to hazards in the vicinity of HAZMAT sites and areas.

EXISTING BUILDINGS AND INFRASTRUCTURE

Transportation accidents/incidents are a major concern and vulnerability for Montgomery County. The continued increase in the number of shipments also brings the potential increase in frequency of accidents/incidents.

MITIGATION ACTION PLAN

***Goal 11**: To minimize the losses of life and property due to hazardous materials in Montgomery County*

- ✓ ***Objective 11.1**: To continue to provide enhanced trainings, equipment, and plans for hazardous materials emergency response and mitigation in Montgomery County*

GOAL 11; OBJECTIVE 11.1; Mitigation Action 11.1.1	
EXPAND CURRENT PUBLIC MESSAGING SYSTEM TO ALLOW GREATER RESILIENCY	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	TBD BY SCOPE
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	NEW

GOAL 11; OBJECTIVE 11.1; Mitigation Action 11.1.2	
ENHANCED TRAINING AND COORDINATION WITH MONTGOMERY COUNTY LEPC	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 11; OBJECTIVE 11.1; Mitigation Action 11.1.3	
PROMOTE GENERAL AWARENESS OF POTENTIAL HAZARDOUS MATERIALS ACCIDENTS OCCURRING ON RAILWAYS	
RESPONSIBLE DEPARTMENT	GARRETT PARK
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL FUNDS
JURISDICTION	GARRETT PARK
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	NEW

COMPLETED, MODIFIED OR DELETED ACTION STEPS FROM THE 2007 PLAN

Table 3-13: Updated Actions for Montgomery County – Goal 11 (Hazardous Materials)

2007 ACTION	2013 UPDATE ACTION	STATUS	NOTES
	Expand current public messaging system to allow greater resiliency	New	
	Enhanced training and coordination with Montgomery County LEPC	New	
	Promote general awareness of potential hazardous materials accidents occurring on railways	New	

DAM FAILURE MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

Goal 12: To minimize the losses of life and property due to <u>dam failure</u> in Montgomery County

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The primary rationale for mitigating dams and levees is the potential loss of life and economic loss due to dam and/or levee failure. Dam and levee failures result from the failure of manmade water impoundment structures, which often results in catastrophic down grade flooding. Dam-safety and dam construction, although improving, remains imperfect and the necessity for hazard mitigation remains.

Mitigation of hazards associated with dam failure differs depending on whether the hazard is associated with a new or existing dam. New dams can be designed to meet stringent safety criteria, including passage of extreme flood discharges and resistivity to earthquakes. Land downstream of new dams can be zoned or other-wise regulated to limit new construction and exposure.

NEW BUILDINGS AND INFRASTRUCTURE

As new buildings and infrastructure are developed and constructed in inundation areas resulting in population growth and rural-to-urban migration, the potential for greater losses and impact rises. This development pattern will continue for the foreseeable future unless proper mitigation measures are taken. Public awareness measures such as notices on final plats and public education on dam safety are proactive mitigation measures that should be implemented by local communities.

This situation may create more potential debris flow during major flood events or dam failures and could damage or destroy downstream dams. Any additional development downstream of a dam and within the inundation area could elevate the dam hazard ranking and the level of risk.

EXISTING BUILDINGS AND INFRASTRUCTURE

Inundation maps are required for each dam with an Emergency Action Plan (EAP). An inundation map illustrates which properties may be affected by floodwaters and show the extent of flooding expected spatially within a geographic area. These maps will not be included in this Plan for security reasons, but remain on file with the owners of the dam associated with the EAP.

MITIGATION ACTION PLAN

Goal 12*: To minimize the losses of life and property due to <u>dam failure</u> in Montgomery County*

- ✓ ***Objective 12.1****: To minimize the impact of dam failure to life and property to include buildings, infrastructure, critical facilities, and critical infrastructure*

GOAL 12; OBJECTIVE 12.1; Mitigation Action 12.1.1	
CREATE A DATABASE TO CONTACT AND TRACK PROPERTY OWNER EVACUATIONS DURING TIMES OF EMERGENCY	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUND
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

✓ ***Objective 12.2****: To continue to provide education and outreach to Montgomery County citizens and business owners in dam failure inundation areas*

GOAL 12; OBJECTIVE 12.1; Mitigation Action 12.2.1	
FUND UPGRADE TO THE 'ALERT MONTGOMERY COUNTY' AND 911 SYSTEM IN ORDER TO BE FULLY IPAWS COMPLIANT	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS, MONTGOMERY COUNTY GIS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUND
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	NEW

GOAL 12; OBJECTIVE 12.1; Mitigation Action 12.2.2	
WORK WITH DAM OWNERS/OPERATORS TO ESTABLISH MONITORING PROCEDURES	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUND
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	NEW

GOAL 12; OBJECTIVE 12.1; Mitigation Action 12.2.3	
GIS MAPPING OF DAM INUNDATION ZONES	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS, MONTGOMERY COUNTY GIS
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUND
JURISDICTION	MONTGOMERY COUNTY
TIMEFRAME	1 YEAR

STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	NEW

GOAL 12; OBJECTIVE 12.1; Mitigation Action 12.2.4	
PROVIDE PUBLIC SERVICE ANNOUNCEMENTS FOR RESIDENTS IN DAM INUNDATION AREAS	
RESPONSIBLE DEPARTMENT	GAITHERSBURG
ANTICIPATED COST	TBD
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL FUNDS
JURISDICTION	GAITHERSBURG
TIMEFRAME	CONTINUOUS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

GOAL 12; OBJECTIVE 12.1; Mitigation Action 12.2.5	
ELECTRONIC MONITORING OF DAM AND UPSTREAM/DOWNSTREAM CONDITIONS	
RESPONSIBLE DEPARTMENT	GAITHERSBURG
ANTICIPATED COST	TBD
EXISTING & POTENTIAL FUNDING SOURCES	MUNICIPAL FUNDS
JURISDICTION	GAITHERSBURG
TIMEFRAME	2 YEARS
STAPLEE PRIORITY	HIGH
STATUS (ONGOING OR NEW)	NEW

COMPLETED, ONGOING, DELETED OR NEW ACTION STEPS FROM THE 2007 PLAN

Table 3-14: Updated Actions for Montgomery County - Goal 12 (Dam Failure)

2007 ACTION	2013 UPDATE ACTION	STATUS	NOTES
	Create a database to contact and track property owner evacuations during times of emergency	New	Montgomery County, OEMHS
	Fund upgrades to the 'Alert Montgomery' program in order to be fully IPAWs complaint	New	Montgomery County, OEMHS, Police
	Work with private property owners to establish monitoring procedures	New	Montgomery County, OEMHS
	GIS mapping of dam inundation areas	New	Montgomery County, OEMHS
	Provide public service announcements for residents in dam inundation areas	New	Gaithersburg
	Electronic monitoring of dam and upstream/downstream conditions	New	Gaithersburg

ALL HAZARDS MITIGATION STRATEGY

COMMUNITY MITIGATION GOALS

Goal 13: To minimize the losses of life and property due to natural, technological, and/or threat induced hazards to include buildings, infrastructure, critical facilities, and critical infrastructure

IDENTIFICATION AND ANALYSIS OF RANGE OF MITIGATION OPTIONS

The Montgomery County Mitigation Planning Committee considered a range of mitigation options for the All Hazards Mitigation Strategy. See the six categories of mitigation measures that Montgomery County considered in the introduction of this section.

EXISTING POLICIES, REGULATIONS, ORDINANCES, AND LAND USE / NEW BUILDINGS AND INFRASTRUCTURE

Regulations, codes, standards, and best practices will guide the design of buildings to resist natural hazards. For new buildings, code requirements serve to define the minimum mitigation requirements, but compliance with regulations in building design is not sufficient to guarantee that a facility will perform adequately when impacted by the forces for which it was designed. Indeed, individual evaluation of the costs and benefits of specific hazard mitigation alternatives can lead to effective strategies that will exceed the minimum requirements. Additionally, special mitigation requirements may be imposed on projects in response to locale-specific hazards. When a change in use or occupancy occurs, the designer must determine whether this change triggers other mitigation requirements and must understand how to evaluate alternatives for meeting those requirements.

EXISTING BUILDINGS AND INFRASTRUCTURE

Buildings in any geographic location are subject to a wide variety of natural phenomena such as windstorms, floods, wildfire, and other hazards. While the occurrence of these incidents cannot be precisely predicted, their impacts are well understood and may be reduced through a comprehensive program of hazard mitigation planning.

A variety of techniques are available to mitigate the effects of natural hazards on the built environment. Depending on the hazards identified, the location and construction type of a proposed building or facility, and the specific performance requirements for the building, the structure can be designed to resist hazard effects such as induced loads. Later in the building's life cycle, additional opportunities to further reduce the risk from natural hazards may exist when renovation projects and repairs of the existing structure is undertaken. When incorporating disaster reduction measures into building design, some or all of the issues outlined below should be considered in order to protect lives, properties, and operations from damages caused by natural hazards.

MITIGATION ACTION PLAN

Goal 13: To minimize the losses of life and property due to natural, technological, and/or threat induced hazards to include buildings, infrastructure, critical facilities, and critical infrastructure

- ✓ **Objective 13.1**: To minimize the impact of natural, technological, and/or threat induced hazards to include buildings, infrastructure, critical facilities, and critical infrastructure

GOAL 13; OBJECTIVE 13.1; Mitigation Action 13.1.1	
CONDUCT PUBLIC EDUCATION AND OUTREACH ON ALL NATURAL, TECHNOLOGICAL, AND THREAT INDUCED HAZARDS FOR THE CITIZENS OF MONTGOMERY COUNTY	
RESPONSIBLE DEPARTMENT	MONTGOMERY COUNTY OEMHS, ALL MUNICIPALITIES
ANTICIPATED COST	STAFF TIME AND RESOURCES
EXISTING & POTENTIAL FUNDING SOURCES	COUNTY FUNDS, MUNICIPAL FUNDS
JURISDICTION	MONTGOMERY COUNTY, ALL MUNICIPALITIES
TIMEFRAME	5 YEARS
STAPLEE PRIORITY	MEDIUM
STATUS (ONGOING OR NEW)	NEW

COMPLETED, ONGOING, DELETED OR NEW ACTION STEPS FROM THE 2007 PLAN

Table 3-15: Updated Actions for Montgomery County - Goal 13 (All Hazards)			
2007 ACTION	**2013 UPDATE ACTION**	**STATUS**	**NOTES**
	Conduct public education and outreach on all natural, technological, and thread induced hazards for the citizens of Montgomery County	New	

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

- ✓ IMPLEMENTATION ACTION PLAN
- ✓ EVALUATION, MONITORING, UPDATING
- ✓ PLAN UPDATE AND MAINTENANCE

IMPLEMENTATION ACTION PLAN

ADMINISTRATIVE ACTIONS

As with the 2007 Plan, the 2013 planning process was overseen by the Office of Emergency Management and Homeland Security (OEMHS) on behalf of Montgomery County.

The Montgomery County Executive has authorized the submission of this Plan to both the Maryland Emergency Management Agency and the Federal Emergency Management Agency for their respective reviews and subsequent approvals. Formal state and federal (FEMA) approval of this plan is contingent upon the formal adoption of this Plan by the Montgomery County Council and each of the respective municipalities identified in the plan.

EVALUATION, MONITORING, UPDATING

Monitoring, evaluating, and updating this plan is critical to maintaining its value and success in Montgomery County's hazard mitigation efforts. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for maintenance activities and what those responsibilities entail. It also provides a methodology and schedule of maintenance activities including a description of how the public will be involved on a continued basis. While the methodology and schedule are similar to what is outlined in the 2007 Montgomery County Hazard Mitigation Plan, slight revisions were made based on the County's experience with actually maintaining the existing plan between 2007 and 2013.

The Montgomery County Mitigation Planning Committee established for this 2013 Plan update is designated to lead plan maintenance processes of monitoring, evaluation and updating with support and representation from all participating municipalities. The Mitigation Planning Committee will coordinate maintenance efforts, but the input needed for effective periodic evaluations will come from community representatives, local emergency management coordinators and planners, the general public, and other important stakeholders. In addition, the committee will serve in an advisory capacity to the Montgomery County OEMHS.

Each municipality will designate a community representative to monitor implementation of mitigation activities and hazard events within their respective communities. This individual will be asked to work with the Montgomery County Mitigation Planning Committee to provide updates on applicable mitigation actions and feedback on changing hazard vulnerabilities within their community.

In addition, the municipal monitor will be responsible for reviewing the planning and land use regulatory element of the municipality's capability assessment to identify potential opportunities for incorporating appropriate elements of this Plan into local planning mechanisms and will also identify locally generated plans, information, reports, etc.

The Mitigation Planning Committee will oversee the progress made on the implementation of action items identified and modify actions, as needed, to reflect changing conditions. The Montgomery County Mitigation Planning Committee will meet annually to evaluate the plan and discuss specific coordination efforts that may be needed with participating jurisdictions and other stakeholders. The annual evaluation may include the participation of individual municipal monitors, or at least will include reports prepared by them.

The annual evaluation of the 2013 Hazard Mitigation Plan will not only include an investigation of whether mitigation actions were completed, but also an assessment of how effective those actions were in mitigating losses. A review of the qualitative and quantitative benefits (or avoided losses) of mitigation activities will support this assessment. Results of the evaluation will then be compared to the goals and objectives established in the plan and decisions will be made regarding whether actions should be discontinued, or modified in any way in light of new developments in the community. Progress will be documented by the Mitigation Planning Committee for use in the next Hazard Mitigation Plan update and submitted to the Montgomery County OEMHS. Finally, the Mitigation Planning Committee will monitor and incorporate elements of this Plan into other planning mechanisms. The annual reviews will be led by the Director of the Montgomery County OEMHS.

This Plan will be updated by the FEMA approved five year anniversary date, as required by the Disaster Mitigation Act of 2000, or following a disaster event. Future plan updates will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. During the five-year review process, the following questions will be considered as criteria for assessing the effectiveness of the Montgomery County Hazard Mitigation Plan.

- Has the nature or magnitude of hazards affecting the County changed?
- Are there new hazards that have the potential to impact the County?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the plan?
- Should additional local resources be committed to address identified hazards?

Issues that arise during monitoring and evaluation which require changes to the local hazard, risk and vulnerability summary, mitigation strategy, and other components of the plan will be incorporated during future updates.

Update process for plan prior to 5-year update. Any interested party wishing for an update of this Plan sooner than the 5-year update will submit such a request to the Montgomery County OEMHS for consideration through the Director of the Montgomery County OEMHS and Chairman of the Montgomery County Mitigation Planning Committee. The request shall be accompanied by a detailed rationale. The Montgomery County OEMHS will evaluate all such requests and determine whether the update request should be acted upon. If the decision is in the affirmative, an assignment will be made for an individual to author the update. The draft updated section along with a detailed rationale will be submitted to the Montgomery County Mitigation Planning Committee. The committee will circulate the draft updated section to every jurisdiction participating in the plan for comment and after an appropriate period of time, the committee shall make a decision to update the plan at least partially based on the feedback received from the other jurisdiction. County and municipal adoptions will then occur.

PLAN UPDATE AND MAINTENANCE

As was done during the development of both the 2007 and 2013 Hazard Mitigation Plans, the Montgomery County Mitigation Planning Committee will involve the public during the evaluation and update of this Plan through any workshops and meetings. The public will have access to the current Plan through their local municipal office and the Montgomery County OEMHS. Information on upcoming events related to this Plan or solicitation for comments will be announced via newsletters, newspapers, mailings, and the County website. The public is encouraged to submit comments on the Plan at any time. The Montgomery County Mitigation Planning Committee will review and determine relevant comments to include during the next update of the hazard mitigation plan. As a result of initiating the hazard mitigation planning process, Montgomery County officials have obtained a great deal of information and knowledge regarding the County's disaster history, the presence of natural hazards, the likelihood of each of these hazards occurring within the County, and the potential impacts, losses, and challenges these hazards present to the community.

The general planning process picked up from where the 2007 Plan left off and that is with the identification and re-evaluation of hazards that have occurred within Montgomery County throughout the past. This was followed with data collection throughout the County and within its communities. Assessments were then made to determine the vulnerability of the community to various hazards, and to determine hazard-specific losses. After evaluation of potential losses within the community, mitigation goals, objectives, and related action items were then re-evaluated and prioritized using FEMA's STAPLEE method.

The planning process included the re-convening of the Montgomery County Mitigation Planning Committee which for the development of this 2013 update. Two public outreach activities were conducted, providing Montgomery County residents with the opportunity to comment on, and offer suggestions concerning disaster mitigation actions within the community both during the development and draft stages of the Plan update.

The mission of the Montgomery County Mitigation Planning Committee for this 2013 update remains similar to that of 2007:

To make the residents of Montgomery County less vulnerable to the effects of natural hazards through a coordinated effort by identifying risks, community vulnerabilities, developing wise mitigation strategies, and seeking hazard mitigation grant funding to implement chosen strategies.

The committee feels that this Plan update, when implemented, will help to make all of Montgomery County a safer place to live and work for all of its residents.

APPENDIX A:

COUNTY & MUNICIPAL RESOLUTIONS

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THIS SECTION WILL BE FILLED WITH THE COUNTY AND MUNICIPALITY RESOLUTIONS.

APPENDIX B:

PLANNING MEETINGS

<u>Hazard Mitigation Plan: EMG Meeting notes</u>
November 4, 2011

- Discussion on man-made hazards such as terrorism, intentional bio-hazards, and influenza as part of mitigation strategy.
- MMRS is an example of mitigation project for a pandemic.
- Question as to whether or not DEP is coordinating with OEMHS on dollars for storm management and flood control. Storm drains in this county need a proactive system that could start with creating an inventory.
- Discussion on communication systems to mitigate impacts of an event and how people will be alerted since not everyone is signed up for alert Montgomery.
- 311 works reactively but could work with citizens in registering for alert Montgomery via email. They could proactively be used as in mitigation efforts as a communication tool as they are contacted by 10,000-11,000 citizens weekly.
- One major mitigation project would be in surround policies for employees. For example, during this past year's snow events employee leave policies created significant issues.
- Recreation Center's do not have back-up generators and this issue has been discussed after every emergency. White Oak, the new facility will have a back-up generator and can be used as a critical shelter.
- DOT: Winter storm mapping is now available and is linked in with Pepco's high outage areas in order to re-deploy resources to speed up restoration process and to at least clear the roads for those without power for a significant amount of time. Leafing program used for road closures and is paid for through grand dollars. DOT is working with DEP on this.
- County council is looking to prioritize projects and improve funding initiatives
- Montgomery College is susceptible to a wide array of hazards including winter storms, power outages, and flooding. Any projects that could mitigate the impacts would be greatly beneficial.
- Gaithersburg: There are 6 high-hazards dams in the municipality and would like to have a remote system to monitor these dams as there aren't enough staff and certain storms deem monitoring unsafe. Would also like to have back-up generators for the police stations and an expanding generator for Boher Park.
- Takoma Park: Several major intersections that are most likely state owned but need either back-up generators or battery operated back-up especially along New Hampshire Av. , College Park Ave?
- Discussion on left over funds from the state that could be used for mitigation projects.

Sign In Sheet

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Ligia Moss	McDOT	240-777-7154	ligia.moss@_ _ _ _

Hazard Mitigation Meeting: Montgomery County Municipalities
Meeting Minutes

Town of Somerset:
- Concern with trees and their impact on power outages

City of Rockville
- Winter mitigation
- Issues with drought
- No record of property damage for events

Town of Washington Grove:
- Primarily concerned with increase of trains and influx of Hazmat's

Poolesville:
- Schools in Poolesville but no recreation centers and issues with those needing shelters but unable to get out of town. Limited options for shelter operations.

Montgomery Village:
- Increased rail traffic and incidents.
- Have a number of high-hazard dams that County owns most of the infrastructure to. Power is an issue and a concern.
- Colonial pipeline raises concern and questionable as to whether or not residents know what is going through this pipeline.

Town of Chevy Chase View:
- Same issues with trees
- Issues with snow removal
- Issues with flooding as a result of County storm drains not clear and their continual maintenance.

Village of Martin's Addition"
- Need for shelters and issues with transporting of citizens to these shelters in accommodating the special needs populations

Bethesda:
- Same issues addressed county-wide

Gaithersburg:
- Shelters need for warming or cooling centers
- Look into expanding fire stations during storms in order to put resources into greater use.

Chevy Chase Village:
- Storm water management and flooding
- Wondering about state survey conducted on generator's update
- Have 1 facility and issues if this facility was not operational during an event. Need to harden infrastructure.
- Generator for cooling and warming centers is not fully capable and does not back up HVCA unit.
- Issues with traffic and NCR evacuation

Rockville Project Update:

Sign In Sheet

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Sign In Sheet

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Richard Charnovich	Town of Somerset	301-657-3211	manager@townofsomerset.com

Montgomery County Mitigation Plan Update
Kickoff Meeting Minutes

DATE: March 2, 2012

TIME: 9:30 am- 12:30

LOCATION: Stella B. Warner Council Office Building, 100 Maryland Avenue, Rockville, MD

The following people were in attendance:

Name	Organization/ Affiliation
The Training Outreach/Baker Team Johnson	Training Outreach
Ed Coursey	City of Takoma Park
Bill Carroll	Maryland Emergency Management Agency (MEMA)
Becky McKinney	Fairfax County OEM
John Reginaldi	MEMA
David Humpton	Montgomery Village Foundation
Michael Goldfarb	Montgomery County OEMHS
Clark Beil	Montgomery County HHS
Adrienne Oleck	Private citizen/White Ribbon Alliance
Earl Stoddard	Montgomery County OEMHS
Granville Campbell	Permitting Service DPS Montgomery County
Mark James	MEMA
Wanda Wesley-Major	Maryland National Capital Park
Pete Pedersen	Pepco
Arnold Remsamny	Montgomery County Parks
Steve Martin	DEP
Tony Alexiou	Montgomery County OEMHS
Steve Maloney	Montgomery College
Dan Sadler	Montgomery County DTS-GIS
Apollo Teng	Montgomery County DTS-GIS
Chris Voss	Montgomery County OEMHS
Chuck Crisostomo	Montgomery County OEMHS
Lisa Connor	Montgomery County OEMHS
Mehrab Karim	Montgomery County OEMHS
The Training Outreach/Baker Team	Michael Baker Jr., Inc.

MEETING HANDOUTS:

- Agenda
- What is Hazard Mitigation One-pager
- Hazard Identification Worksheet

- Risk Factor Ranking Worksheet
- Capability Assessment Survey

MEETING OVERVIEW

1) INTRODUCTION

The purpose of this meeting is to kick-off the update to Montgomery County's Hazard Mitigation Plan. Introductions were made by all presenters and attendees.
A short video explaining the mitigation planning process was played. An audience member commented that the video was focused more for middle class viewers and also commented that is was only in English.

The Training Outreach/Baker Team explained that planning is an important first step and is not the end result. Communities that have well-thought out plans are the most successful in getting grant monies to implement their projects down the road.

The Training Outreach/Baker Team discussed: What is Hazard mitigation? (See "What is Hazard Mitigation" one-pager) and what is a HM plan (See "What is Hazard Mitigation" one-pager). Why do you need a HM plan? (To reduce loss of life and property from Natural Hazards. Also, the county and jurisdictions need to be eligible for certain FEMA funding that is contingent upon having an up to date approved plan.)

The Training Outreach/Baker Team explained that jurisdictions need to participate in the process in order to be eligible for certain FEMA funding. Simply adoption he completed plan is not enough. (The only municipality in attendance was Takoma Park.) There are 19 jurisdictions. (The County noted that They City of Rockville was able to purchase a generator with funds coming through this program.) The Training Outreach/Baker Team encouraged people in the meeting to reach out the jurisdictions, and encouraged people to take copies of the handouts.

A Montgomery Village representative asked if Montgomery Village was able to secure funds even though it was not a jurisdiction. A representative from the Maryland Emergency Management Agency confirmed, yes, since Montgomery Village is a non-profit entity.

2) PLAN UPDATE PROCESS

PROJECT OVERVIEW and OBJECTIVES
The Training Outreach/Baker Team described the approval process (FEMA/MEMA). The County asked how much funding has been distributed state-wide during the last several years. The Training Outreach/Baker Team stated around $20M.

PLANNING PROCESS/ PLAN COMPONENTS
The Training Outreach/Baker Team stressed that this plan is meant to focus on natural hazards and not include non-natural hazards. If you have a natural hazard mitigation process, you may be able to include human hazards. The Training Outreach/Baker Team emphasized the mitigation projects are not intended to be a short-term recovery plan.

Another question was asked how to work with the other plans (The Training Outreach/Baker Team confirmed there is plan integration.)

Comment on GIS data for flood hazard. FIRM – FEMA was brought up that the FIRM map needs to be more robust. Word is FEMA has stopped county by county projects. MDE still wants to push this, and he urged the County to push this so we can have good flood hazard data for Montgomery County. (The Training Outreach/Baker Team confirmed how this process works – MDE receives grant money to do mapping for Montgomery County.)

Comment [CU1]: Can you spell out? I'm not sure what this stands for.

The Training Outreach/Baker Team suggested contacting Maryland Department of the Environment.

REVIEW PROCESS/WEBSITE/TIMELINE
Once the first jurisdiction adopts the plan, the 5 year update timeframe begins.

3) PLAN REVIEW EXERCISE

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1) 5-YEAR PLAN REVIEW EXERCISE

Review of the 2007 plan. Identified which hazards were profiled in the old plan, which where profiled in the State plan and decided as a group, which would be profiled and ranked for the plan update.

The Training Outreach/Baker Team reminded that anything we identify as a hazard has to tie to a plan on how to mitigate it. The Training Outreach/Baker Team reiterated that we need a manageable list of hazards. A question was asked about natural and manmade – and a suggestion was made that we clarify this in the plan. MEMA suggested an appendix be used. The County asked how many counties have taken a hard line and not included man-made hazards. MEMA confirmed most eastern shore counties have done this. Nova did a complete analysis mostly because they are so close to Washington DC. (They've had waste water treatment flood, etc.) They had dams towards the top. Also because of their timeline, they didn't look at the census data. They had hazmat as a standalone. County recommended including hazmat in the plan because the number of facilities in the county. The Training Outreach/Baker Team said they would include in the plan and requested the study. The County has a commodity study that they will provide to the Training Outreach/Baker Team.
All agreed to include dam failure.
All agreed to include winter storm.
Drought / Extreme heat – should we keep separate? How do you categorize this if it's combined? It was agreed to keep them in the plan and separate.
Earthquake – all agreed to include in the plan.
Extreme Cold – it was agreed to combine with this with winter storms.
Brush fires - - just call this "Fires" Data will be on wildfires.
Flooding – all agreed to include in plan.
Hurricane/tropical storm – all agreed to include in plan
Tornado – to include in plan.

Soil movement/mudslides and sink holes – all agreed it to call it land subsidence and sinkholes karst.
Windstorms/thunderstorms – to include in plan.

Natural Hazards
Winterstorms (including extreme cold)
Water Shortage
Extreme Heat
Drought
Fire
Flooding
Hurricane/Tropical Storm
Tornado
Land Subsidence/Sinkhole Karst
Windstorms and Thunderstorms
Dam Failure
Hazardous Materials

2) RISK ASSESSMENT AND UPDATE EXERCISE

We used the risk factor approach to rank each of the identified hazards. The RF approach combines historical data, local knowledge, and consensus opinions to produce numerical values that allow identified hazards to be ranked against one another. These criteria were used to evaluate hazards and identify the highest risk hazard.

The RF approach produces numerical values that allow identified hazards to be ranked against one another (the higher the RF value, the greater the hazard risk). RF values are obtained by assigning varying degrees of risk to five categories for each hazard: probability, impact, spatial extent, warning time, and duration. Each degree of risk is assigned a value ranging from 1 to 4. Based upon any unique concerns for the planning area, the MPC may also adjust the RF weighting scheme. To calculate the RF value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the example equation below:

**RF Value = [(Probability x .30) + (Impact x .30) +
(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]**

The table below was given to each committee member to help them determine the criteria for each degree of risk.

Risk Assessment Category	Degree of Risk Level	Criteria	Index	Weight Value
PROBABILITY What is the likelihood of a hazard event occurring in a given year?	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY	**1**	**30%**
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	**2**	
	LIKELY	BETWEEN 10 &100% ANNUAL PROBABILITY	**3**	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY	**4**	
IMPACT ***In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?***	**MINOR**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	**1**	**30%**
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	**2**	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.	**3**	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	**4**	
SPATIAL EXTENT	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED	**1**	**20%**

How large of an area could be impacted by a hazard event? Are impacts localized or regional?	**SMALL**	BETWEEN 1 & 10% OF AREA AFFECTED	**2**	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	**3**	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	**4**	
WARNING TIME ***Is there usually some lead time associated with the hazard event? Have warning measures been implemented?***	**MORE THAN 24 HRS**	SELF DEFINED	**1**	**10%**
	12 TO 24 HRS	SELF DEFINED	**2**	
	6 TO 12 HRS	SELF DEFINED	**3**	
	LESS THAN 6 HRS	SELF DEFINED	**4**	
DURATION ***How long does the hazard event usually last?***	**LESS THAN 6 HRS**	SELF DEFINED	**1**	**10%**
	LESS THAN 24 HRS	SELF DEFINED	**2**	
	LESS THAN 1 WEEK	SELF DEFINED	**3**	
	MORE THAN 1 WEEK	SELF DEFINED	**4**	

As a committee we assigned a value for probability, impact, spatial extent, warning time, and duration for each identified hazard. The results are in the table below.

	Natural Hazards	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Factor
1	Winter Storm	3	0.9	3	0.9	4	0.8	2	0.2	3	0.3	**3.1**
2	Water Shortage	2	0.6	1	0.3	4	0.8	2	0.2	3	0.3	**2.2**
2	Earthquake	1	0.3	1	0.3	3	0.6	4	0.4	2	0.2	**1.8**
4	Extreme Heat	3	0.9	3	0.9	4	0.8	1	0.1	3	0.3	**3**
5	Fire	3	0.9	2	0.6	2	0.4	3	0.3	2	0.2	**2.4**
6	Flooding	3	0.9	2	0.6	2	0.4	3	0.3	2	0.2	**2.4**
7	Hurricane/Tropical Storm	3	0.9	1	0.3	4	0.8	1	0.1	3	0.3	**2.4**
8	Tornado	2	0.6	1	0.3	2	0.4	4	0.4	2	0.2	**1.9**
9	Thunderstorms	4	1.2	2	0.6	4	0.8	3	0.3	3	0.3	**3.2**
10	Land Subsidence/Sinkhole Karst	1	0.3	1	0.3	1	0.2	4	0.4	1	0.1	**1.3**
	Non-natural Hazards	**Probability**		**Impact**		**Spatial Extent**		**Warning Time**		**Duration**		**RF Factor**
1	Dam Failure	2	0.6	3	0.9	2	0.4	3	0.3	3	0.3	**2.5**
2	Hazardous Materials	3	0.9	3	0.9	2	0.4	4	0.4	2	0.2	**2.8**

The conclusions drawn from the assessment, combined with final determinations from the Committee, were fit into three categories for a final summary of hazard risk based on *High*, *Moderate*, or *Low* risk designations. It should be noted that although some hazards are classified as posing Low risk, their occurrence of varying or unprecedented magnitudes is still possible and will continue to be reevaluated during future updates of this plan.

Conclusions on Hazard Risk	
HIGH RISK (3.0 – 4.0)	
Thunderstorma	3.2
Winterstorm	3.1
Exteme Heat	3.0
MODERATE RISK (2.0 – 2.9)	
Hazardous Materials	2.8
Dam Fail	2.5
Fire	2.4
Flooding	2.4
Hurricane/Tropical Storm	2.4
Water Shortage	2.2
LOW RISK (0.1 – 1.9)	
Tornado	1.9
Earthquake	1.8
Land Subsidence/ Sinkhole Karst	1.2

3) CAPABILITY ASSESSMENT EXERCISE

A Hazard Mitigation Capability Assessment Survey is needed to conduct an assessment of Montgomery County's existing capabilities to implement hazard mitigation activities and is being requested as part of the Montgomery County 2012 Hazard Mitigation Plan update. A 9-page survey was given to all committee members and they were asked to complete the survey. The survey collected information on the county's or the jurisdiction's planning and regulatory capability, administrative and technical capability, fiscal capability, community political capability, community resiliency capability after an event, and a self-assessment of capability.

The information provided in response to this survey will help paint a picture of how local programs are currently being used to lessen the impacts of potential hazards.
This survey was handed out and also emailed after the meeting with a request to return to nmaccherone@mbakercorp.com within one week.

4) OTHER

It was encouraged to discuss impact on how drought would impact agriculture. Speak with MD Dept of Agriculture about this.

5) ADJOURN

Montgomery County, MD
Hazard Mitigation Plan Update Kick-off Meeting
Stella B. Warner Council Office Building, 100 Maryland Avenue, Rockville MD
March 2, 2012, 9:30 a.m. – 12:30 p.m.

Sign-In Sheet

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Adrienne Oleck	self	240 305 7831	aoleck@comcast.net

Montgomery County, MD
Hazard Mitigation Plan Update Kick-off Meeting
Stella B. Warner Council Office Building, 100 Maryland Avenue, Rockville MD
March 2, 2012, 9:30 a.m. – 12:30 p.m.

Sign-In Sheet

NAME	ORGANIZATION	PHONE	E-MAIL
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Pete Pedersen	Pepco	301-469-5247	oppedersen@pepco.com
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STEVE MARTIN	DEP	240-777-7746	Steve.Martin@m—

Montgomery County, MD

Hazard Mitigation Plan Update Kick-off Meeting

Stella B. Warner Council Office Building, 100 Maryland Avenue, Rockville MD

March 2, 2012, 9:30 a.m. – 12:30 p.m.

Sign-In Sheet

NAME	ORGANIZATION	PHONE	E-MAIL
Tony Alexin	MCOEMHS	240.777.2329	anthony.alexin@montgomerycountymd.gov
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Apollo Teng	"	2883	apollo.teng@
Nicolle Macchesone	Baker	4107300725	nmacchesone@mbakercorp.com

safermaternity

Adrienne Oleck	aoLeck@comcast.net 240-305 7831		white ribbon alliance – maternal + infant health
	vulnerable populations		women in international security
	particularly pregnant women		women in government Relations
	lactating women infants		
	+ prevention of sexual violence during emergencies		

March 2, 2012 Montgomery County Hazard Mitigation Update Kickoff meeting (~29 people in the room, including staff)

Cultural emphasis – video was very middle class.

Carver: planning is important first step and is not the end result. Communities that have well-thought out plans are the most successfully in getting grant monies to implement their projects down the road.

Carver discussed: What is Hazard mitigation? (see sheet) and What is a HM plan (see sheet). Why do you need a HM plan? (money! – county needs to be eligible for funding.)

Necolle reminded us that we have jurisdictions that need to participate in the process in order to be eligible for funding. (The only municipality in attendance was Takoma Park.) There are 19 jurisdictions. (Chris: Rockville was able to purchase a generator with funds coming through this program.) Necolle encouraged people in the meeting to reach out the jurisdictions, and encouraged people to take copies of the handouts.

Mont Village asked if he was able to secure funds, and Mark James confirmed, yes, since he is a non-profit.

PROJECT OVERVIEW and OBJECTIVES

Carver described the approval process (FEMA/MEMA). Chris Voss asked how much funding has been distributed during the last several years. (Carver stated around $20M.

PLANNING PROCESS/ PLAN COMPONENTS

The question was asked if only natural hazards were included. Another question was asked how to we work with the other plans (Necolle confirmed there is plan integration.) Chris confirmed that funding typically goes to response projects. The dollars are diminishing. Our plan is a good vehicle for certain programs, but it takes time. Emergency repairs are not a typical use of this project. Carver confirmed these projects take a long time (5-6 years) from development to implementation – it is not quick process. If you have a natural hazard mitigation process, you may be able to include human hazards. Sometimes there is a cross-over. Carver emphasized the mitigation projects are not intended to be a short-term recovery plan. Chris confirmed more than 50% of the projects he submitted for needed (at a previous jurisdiction) to be changed because by the time the dollars came in, the projects were not existing. Carver discussed case study for housing buy-up. Bt the time it got funded, the real estate market had increased that they could only buy up half the houses.

Question: Is there a tracking mechanism since this is a long term project? Yes! Once this plan gets adopted, it will be suggested the planning committee reconvene yearly. How do you know where your project is in the pipeline?

FEMA has 5 different mitigation programs, and you can over subscribe to those (once one is approved, you have to drop the others.)

Comment on GIS data for flood hazard. FIRM – FEMA was brought up that the FIRM map needs to be more robust. Word is FEMA has stopped county by county projects. MDE still wants to push this, and he urged Chris to push this so we can have good flood hazard data for Montgomery County. (Necolle confirmed how this process works – MDE receives grant money to do mapping for Mont County.) Necolle suggested she contact Kevin Wagner. She also talked about MBE matching for the mapping program. Necolle said there has been a switch, and FEMA's doing a new thing called risk mapping (done by water-shedding.)

REVIEW PROCESS/WEBSITE/TIMELINE

Carver made the point that a difference in this year to last time, is once the county adopts the plan, the clock starts ticking (as opposed to each jurisdiction.)

QUESTIONS

Exercise #1 (about 27 people in room)

Necolle reminded that any thing we identify as a hazard has to tie to a plan on how to mitigate it. Chris said to stay away from rail.   A question was asked about natural and manmade – someone suggested we clarify this in the plan. Mark James suggested the appendix be used. Chris asked how many counties have taked a hard line – Mark confirmed most eastern shore states have done this. Nova did a complete analysis mostly because they are so close to Washington DC. (They've had waste water treatment flood, etc.) They had dams towards the top. Also because of their timeline, they didn't look at the census data. They had hazmat as a standalone. Chris is leaning towards hazmat in the plan because the # of facilities in the county. He asked everyone for their opinion. Chuck confirmed they are fairly small facilities. "Is there a serious hazmat facility we should be concerned about?" (MC has done a commodity flow study.) Necolle said they would include in the plan and requested the study.

All agree to dam failure.

Call blizzards/icestorm – winter storm (all agreed.) Necolle confirmed we need to justify this is consistent with the MD State plan.

Drought / Extreme heat – should we keep separate? How do you categorize this if it's combined? We don't have a huge agriculture piece to consider… Necolle said from a plan writing perspective, it's easier to have them as one. If you are going to strategize, the strategies are different (Carver recommends splitting them up.). The FEMA gentleman suggested we treat all hazards equally. Necolle confirmed we have to address those that are more prevalent, so we don't want to apply the same "energy" to all. From a health perspective, response is very different. It was agreed to keep them in the plan and separate.

Earthquake – all agreed. There was discussion this is unlikely, but Chris Voss confirmed there are financial reasons to keep this in the plan. Necolle confirmed we need a manageable list.

Extreme Cold – it was agreed to combine with this with winter storms.

Brush fires - - just call this "Fires" We will get data on Wild fire.

Flooding – all agreed.

Hurricane/tropical storm – all agreed to keep is hurricane/tropical storm

Tornado – all agreed.

Soil movement/mudslides and sink holes – all agreed it to land subsidence and sinkholes karst.

Windstorms/thunderstorms – all agreed

Exercise #2 (2 people from public stayed.)

Question was asked if duration was the actual event, or did it include recovery (Chris thinks of it as the immediate aftermath or "duration of the impact")

Definition of drought was questioned. Chris wants to change drought to water shortage. (this allows us to include water main breaks and allows Chris to ask for money on this.)

Necolle emphasized this is not a "written in stone" list.

Earthquake – impact was discussed. Chuck confirmed historical data is minor impact. NOVA suggested to examine your geography (a 5 or 6 in California is less destructive than a 5 or 6 here.) Chris is between a 2 and 3 for duration. **We later changed the ranking for this, and lowered the spatial extent from 4 to 3.**

Extreme Heat is when you open your cooling stations. It's the #1 hazard in the state as far as fatalities go. It doesn't impact populations. We voted in 3 because it includes death.

Dam – we have 22 high hazard dams. There was a lot if discussion on this ranking. As for warning time. You have to consider reason for breach. Was it a sunny day breach, or was it due to heavy rains? Make sure to make a notation on the plan about this. Note that various warning times were considered.

Winter storm ranking was also changed to meet extreme heat categorizations.

Fire was also discussed, but ranking were kept the same.

OTHER

It was encouraged to discuss impact on how drought would impact agriculture. Speak with MD Dept of Agriculture about this.

It was discussed there would be more likely to be a tornado over an earthquake. Necolle confirmed she would take all info to the GIS team to do the risk assessment. Info will be used to develop our mitigation strategies.

Wrap-up

It was requested we send out the rankings.

Meeting minutes will also be posted

Montgomery County Mitigation Plan Update
Hazard Mitigation Planning Meeting II
Risk Assessment Review
Minutes

DATE: April 4, 2012

TIME: 9:30 am- 12:30

LOCATION: Montgomery County EMA, 1300 Quince Orchard Boulevard, Gaithersburg, MD

The following people were in attendance:

Name	Organization/ Affiliation
Kevin Grubbs	Montgomery County OEMHS
Mehrab Karim	Montgomery County OEMHS
Jean Sperling	Village of Martins Addition
Jana Coe	Chevy Chase View
Wade Yost	Poolesville
Mary Challstrom	Washington Grove
Laura Johnson	Training Outreach
Ted Pratt	Town of Garrett Park
Steve Maloney	Montgomery College
Skip Lanham	Gaithersburg
Phil Raum	Montgomery County Police
Ed Coursey	Takoma Park
Mike Fitzgerald	Department of Health and Human Services
Dan Sadler	Montgomery County
Michael Younes	Chevy Chase Village
Matt Hochstein	Hagerty – private firm
Katie Freeman	Hagerty – private firm
John Higgins	Section 5 Chevy Chase
Sanford W. Daily	Town of Kensington
Rich Charrovich	Town of Somerset
Clark Beil	Department of Health & Human Services
Jeremy V. Criss	Dept Economic Development- Agriculture Services
Kay Aaby	Dept Health & Human Service/Public Health System
Pete Pedersen	PEPCO
Keith Compton	Department of Transportation

MEETING HANDOUTS:

- Agenda
- Goals and Objectives Update worksheet

MEETING OVERVIEW

1) INTRODUCTION

The purpose of this meeting is to review the risk assessments for identified hazards that have been generated based on information obtained from the county, national sources and the Maryland State Hazard Mitigation Plan. Also, to determine the status of Goals and Objectives that were identified in the previous plan and consider any new Goals and Objectives that may be appropriate to add.

Introductions were made by all presenters and attendees.

The Training Outreach/Baker Team explained that feedback from our initial assessment and with regard to plan goals and objectives is important to ensure an accurate final product.

2) RISK ASSESSMENT REVIEW AND PRIORITIZE HAZARDS

The group reviewed the hazards that were identified in the last meeting and the data that was compiled as a result of the risk assessment. The group was reminded that the hazards covered in this plan are natural hazards. Hazards identified include:

- Winter Storm
- Fire
- Dam Failure
- Water Shortage, including Drought
- Earthquake
- Winter Storm
- Extreme Heat
- Flooding
- Hazardous Materials
- Hurricane/Tropical Storm
- Land Subsidence/Sinkhole Karst
- Tornado
- Thunderstorm

Specific adjustments requested to the data presented are captured in these minutes below:

- <u>Fire:</u> Request that the Training Outreach team add the 2011 Darnestown brushfire event to the fire summary. We talked about a Continuity of Service plan as it relates to Montgomery County Fire and Rescue. Chuck confirmed we are working on this plan.

- Dam Failure: No additional comments. The Hazardous Materials Summary and Dam Failure will be redacted from the public report.
- Water Shortage, including Drought: Concerns about crop damage data was expressed Damages outlined in the draft ($812) may be too low.
- Earthquake: No additional comments.
- Winter Storm (includes extreme cold): No additional comments.
- Extreme Heat: Definition of extreme heat requested. This will be added to the report. It was recommended that the Training Outreach Team check Department of Health and Mental Hygiene (DHMH) for both extreme heat and extreme cold.
- Flooding: It was asked if water main breaks were calculated in flooding summary. Water main breaks were calculated when it comes to flooding but not to damages. Dam breaks are profiled separately. The Sept 2011 flood event that washed out some bridges and that data needs to be added. Request to add flooding at Silver Creek. It has also been requested that the County add this to the Capital Improvement Plan. Currently seeking a conduit for the funding. Silver Creek flooding should be noted as an additional mitigation project.
- Hazardous Materials: County confirmed they have traffic flow studies to identify hazmat issues. The Hazardous Materials Summary and Dam Failure will be redacted from the public report.
- Hurricane/Tropical Storm: No additional comments
- Land Subsidence/Sinkhole Karst: Confirmation that sinkholes exist in the highly populated parts of the county. It was asked if certain types of sinkholes are eligible for mitigation grants. Mitigation grants can't be used for projects used by deferred maintenance. The Training Outreach/Baker Team will include information on the location of the sinkholes, the cause, and any dollar amount data which allows us to track.
- Tornado: Request to include in the data a tornado in 1932 that caused fatalities.
- Thunderstorm: Some of the information depicted may be out of date, especially as it relates to the lightning and storm injuries and fatalities. Thunderstorms happen annually and have caused much damage and expense. PEPCO has spent millions on restoring power. Can we include these costs in our figures? In July 2010, almost 80% of the county lost power. The Training Outreach/Baker Team suggested we revise project description to work with the public service commission. An attendee stated the Montgomery County has difficult with maintenance around the lines. Suggested we have good management guidelines for the ground beneath the power lines. It was suggested the County better manage transition corridors and work with public utility providers to properly manage it to prevent further damage. It was suggested that we establish a policy and understand the legality. It was suggested that we reach out to subject matter expert, Brett Linkletter. Art Holmes may be able to involve Brett. The County is on board as far as easement rights and establishing management rules. Outreach and education on what we can and can't do is important – rules and regulations that allow for permissions to go on private property. Grants funds on

training and education for the county may be available for this. Comments on the ability of the county to maintain lines if a homeowner disallows tree maintenance and involving the County attorney to look at the easement law were made.

- General recommendations: Use the word rural rather than “less inhabited.” Request to the State to look at the root causes of these hazards to allow jurisdictions to better understand why these hazards are occurring.
  It was suggested that damage values get adjusted for inflation.

3) MITIGATION GOALS AND OBJECTIVES UPDATE EXERCISE

The group reviewed the goals and objectives, projects and strategies from the current plan in order to fulfill requirement that plan maintenance from previous plan has been completed and to obtain early feedback from the local mitigation planning committee on the plan update to incorporate into the update process.

The status of projects that were identified in the previous planned was determined as well as whether to retain, change, or delete these projects and the reason why.

Please see the Goals and Objectives Update Worksheet for the results of this exercise.

4) ADJOURN

Sign In Sheet – Montgomery County
Hazard Mitigation Planning Meeting II
April 4, 2012

Manager@chevychasesection5.org

Name	Organization	Title	Phone Number	Email Address
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Katie Freeman	Hagerty	Recovery Planning		katie.freeman@hagertyconsulting.com
JOHN HIGGINS	Sec 5 Chevy Chase	Atty	301-986-5481	~~[illegible]~~
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Keith Compton	DOT	Chief, Highway Svs	240-777-7607	Keith.compton@mont......

Sign In Sheet – Montgomery County
Hazard Mitigation Planning Meeting II
April 4, 2012

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Mary Challstrom	Wash Grove	Treasurer	301-926-4498	spinner5@comcast.net
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Montgomery County Mitigation Plan Update
Hazard Mitigation Planning Meeting III
Mitigation Solutions
Minutes

DATE: May 3, 2012

TIME: 9:00 am- 12:00

LOCATION: Montgomery County EMA, 1300 Quince Orchard Boulevard, Gaithersburg

The following people were in attendance:

Name	Organization/ Affiliation
Ted Pratt	Town of Garrett Park
Ed Coursey	Takoma Park
Necolle Maccherone	Training Outreach/ Baker Team
Bill Kelly	Montgomery County Public Health
Steven Werts	Town of Washington Grove
Bill Robertson	Town of Washington Grove
Kevin Grubbs	Montgomery County OEMHS
Tom Stanton	Gaithersburg
Keith Lerchenko	Montgomery County Council Staff
Phil Raum	Montgomery County Police
Wade Yost	Poolesville
Mike Fitzgerald	Dept. Health & Human Services
Tim Marsh	Rockville City Police
Leo Galanko	Dept. of Permitting Services
Steve Suprata	Montgomery County Department of Transportation
Mehrab Karim	Montgomery County OEMHS
Frances L Higgins	Chevy Chase Village Section 5

MEETING HANDOUTS:

- Agenda
- Goals and Objectives Update worksheet
- Mitigation Strategy Action Plan Template
- Mitigation Strategy Action Evaluation
- Potential Mitigation Actions

MEETING OVERVIEW

1) INTRODUCTION

The purpose of this meeting is to review what information we have received from the county and jurisdictions and to select and evaluate mitigation actions and strategies.

Introductions were made by all presenters and attendees.

2) OVERVIEW OF JURIDICTIONAL RISK MATRIX

At our first planning meeting we identified several natural hazards that impacted Montgomery County and worked through an exercise where we developed a risk factor for each of the hazards. The risk factor was determined based on ranking of probability, impact, spatial extent, warning time and duration for each identified hazard.
As part of the plan update we are required by FEMA to compare each jurisdictions risk for these hazards compared to the county in general.

Reviewed jurisdictions' response. See PowerPoint for results

A question was asked (during the categorization of counties on their particular hazards) if the areas that are unincorporated – are there concessions for that? (Necolle confirmed they will fall under the county's risk factor.)

3) SHORT ICEBREAKER ACTIVITY

4) SELECT MITIGATION ACTIVITIES

The attendees were broken into small working groups. Each group completed three exercises.

a. Interactive Exercise: Brainstorming & list development for mitigation actions
b. Interactive Exercise: Brainstorming & list development for mitigation actions related to NFIP Compliance
c. Interactive Exercise: Evaluate and prioritize mitigation actions using STAPLEE

The results of these exercises will be used in the creation of mitigation activities for the plan update

5) DEVELOP MITIGATION ACTION PLANS

The workgroups were then instructed to take the actions that they had developed in the earlier exercise and complete a mitigation strategy action plan for each activity

6) WRAP UP AND ADJOURN

Next steps, a timeline and what to expect in the coming weeks was discussed. The tentative timeline includes the following:

Date	Task Item
November 2011	Planning Process began
March 2, 2012	Official Project Kick-off Meeting
February through March 2012	Data Collection and Risk Assessment
March 2012	Capability Assessment Collection
Mid-Late March 2012	Risk Assessment Presentation and Feedback Meeting
Mid April 2012	Hazard Mitigation Strategy Development Workshop/Meeting
May 2012	Hazard Mitigation Strategy Development
June 2012	Draft available for Public Review
July 2012	Deliver to MEMA/FEMA for Review
September 2012	Distribute to Municipalities for Adoption

Attendees were encouraged to check the project website for the draft plan, project info and other announcements. http://www.montgomerycountyhmpu.com/

Questions were asked pertaining to when jurisdictions have to be adopt the plan and what occurs if a disaster were to occur before the plan was adopted. The plan should be adopted once the county is notified by FEMA of FEMA's "approval pending adoption." The county will notify the jurisdictions most likely by memo. As long as the plan update is in process the jurisdictions will not be penalized if a disaster occurs between FEMA's "approval pending adoption" and the jurisdictions'' adoption. However the jurisdictions should attempt to adopt the plan as soon as possible.

Montgomery County, MD

Montgomery County Hazard Mitigation Plan Update
Mitigation Solutions Meeting

Thursday, May 3, 2012
9:00 a.m. – 12:00 p.m.

Sign-In Sheet

NAME	ORGANIZATION	PHONE	E-MAIL
Ted Pratt	Town of Garrett Park	301-933 7488	garrett-park@comcast.net
Ed Coursey	Takoma Park	301-891-7105	edwardc@takomagov.org
Necolle Maccherone	Training Outreach Baker	410.689.3460	
Bill Kelly	MC Public Health	240 777 9805	bill.kelly@montgomerycountymd.gov
Steven Wertz	Town of Washington Grove	301 775-2874	WERTZ AT EARTHLINK.NET
Bill Robertson	Town of Washington Grove	240-912-6080	robrez2@comcast.net
Kevin Grubbs	OEMHS		Kevin.grubbs@montgomerycountymd.gov
Tom Stanton	Gaithersburg PD	301-258-6400	TStanton@Gaithersburgmd.gov

Mit. Sol. Meeting

NAME	ORGANIZATION	PHONE	E-MAIL
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Phil Raum	County Police	240-876-2206	
WADE YOST	Poolesville	301-428-8927	wyost@comcast.net
Mike Fitzgerald	DHHS	301-970-5047	fmfitzgerald@comcast.net
TIM MARSH	Rockville City Police	240-314-8960	tmarsh@rockvillemd.gov
Leo Galanko	MC DPS	240-777-6242	leo.galanko@montgomerycountymd.gov
Steve Suprata	MC DOT	(leo.galanko@montgomerycountymd.gov) 240-777-7635	Steven.suprata@montgomerycountymd.gov
Mehrab Karim	OEMHS	(240) 773-0081	Mehrab.Karim@montcomd.gov
Frances L Higgins	Section 5 of the Village of Chevy Chase	301-986-5481	manager@chevychasesection5.org manager@chevychasesection5.org

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APPENDIX C:

LOCAL MITIGATION PLAN REVIEW CROSSWALK

INSTRUCTIONS FOR USING THE PLAN REVIEW CROSSWALK FOR REVIEW OF LOCAL MITIGATION PLANS

Attached is a Plan Review Crosswalk based on the ***Local Multi-Hazard Mitigation Planning Guidance***, published by FEMA in July, 2008. This Plan Review Crosswalk is consistent with the *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (Stafford Act), as amended by Section 322 of the *Disaster Mitigation Act of 2000* (P.L. 106-390), the *National Flood Insurance Act of 1968,* as amended by the *National Flood Insurance Reform Act of 2004* (P.L. 108-264) and *44 Code of Federal Regulations (CFR) Part 201 – Mitigation Planning,* inclusive of all amendments through October 31, 2007.

SCORING SYSTEM
N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.
S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Each requirement includes separate elements. All elements of a requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a summary score of "Satisfactory." A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing.

When reviewing single jurisdiction plans, reviewers may want to put an N/A in the boxes for multi-jurisdictional plan requirements. When reviewing multi-jurisdictional plans, however, all elements apply. States that have additional requirements can add them in the appropriate sections of the *Local Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements. Optional matrices for assisting in the review of sections on profiling hazards, assessing vulnerability, and identifying and analyzing mitigation actions are found at the end of the Plan Review Crosswalk.

The example below illustrates how to fill in the Plan Review Crosswalk.:

Example

Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): *[The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include an **overall summary** description of the jurisdiction's **vulnerability** to each hazard?	Section II, pp. 4-10	Submitting Jurisdiction input in Green. State comments in Blue. FEMA requirements & reviewer comments in Red. The plan describes the types of assets that are located within geographically defined hazard areas as well as those that would be affected by winter storms.		☐
B. Does the **new or updated** plan address the **impact** of each hazard on the jurisdiction?	Section II, pp. 10-20	The plan does not address the impact of two of the five hazards addressed in the plan. **Required Revisions:** • Include a description of the impact of floods and earthquakes on the assets. **Recommended Revisions:** This information can be presented in terms of dollar value or percentages of damage.	☐	
		SUMMARY SCORE	☐	

LOCAL MITIGATION PLAN REVIEW SUMMARY

The plan cannot be approved if the plan has not been formally adopted. Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk. A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. Reviewer's comments must be provided for requirements receiving a **"Needs Improvement"** score.

Prerequisite(s) (Check Applicable Box)	NOT MET	MET
1. Adoption by the Local Governing Body: §201.6(c)(5) OR		
2. Multi-Jurisdictional Plan Adoption: §201.6(c)(5) **AND**		
3. Multi-Jurisdictional Planning Participation: §201.6(a)(3)		

Planning Process	N	S
4. Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)		

Risk Assessment	N	S
5. Identifying Hazards: §201.6(c)(2)(i)		
6. Profiling Hazards: §201.6(c)(2)(i)		
7. Assessing Vulnerability: Overview: §201.6(c)(2)(ii)		
8. Assessing Vulnerability: Addressing Repetitive Loss Properties. §201.6(c)(2)(ii)		
9. Assessing Vulnerability: Identifying Structures, Infrastructure, and Critical Facilities: §201.6(c)(2)(ii)(B)		
10. Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)		
11. Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)		
12. Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii)		

*States that have additional requirements can add them in the appropriate sections of the *Local Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

SCORING SYSTEM

Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Mitigation Strategy	N	S
13. Local Hazard Mitigation Goals: §201.6(c)(3)(i)		
14. Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)		
15. Identification and Analysis of Mitigation Actions: NFIP Compliance. §201.6(c)(3)(ii)		
16. Implementation of Mitigation Actions: §201.6(c)(3)(iii)		
17. Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)		

Plan Maintenance Process	N	S
18. Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(ii)		
19. Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)		
20. Continued Public Involvement: §201.6(c)(4)(iii)		

State		
Multi-jurisdictional: Letter of Commitment for each jurisdiction		
Summary of mitigation projects		
Summary of hazards		

LOCAL MITIGATION PLAN APPROVAL STATUS

PLAN NOT APPROVED ☐

See Reviewer's Comments

PLAN APPROVED ☐

Local Mitigation Plan Review and Approval Status

Jurisdiction: Montgomery County	**Title of Plan:** Montgomery County Multijurisdictional Hazard Mitigation Plan 2012	**Date of Plan:** August 2012
Local Point of Contact: NAME	**Address:** PO Box 4117 Gaithersburg, MD 20885-4117	
Title: Director		
Agency: Montgomery County Emergency Management		
Phone Number: 555-555-5555	**E-Mail:** name@montgomerycounty.org	

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region [Insert #]		
Plan Not Approved		
Plan Approved		
Date Approved		

Jurisdiction:	**DFIRM in plan?**	**Adopted**	**Participating**	**Risk Assessment**	**Mitigation Action**	**NFIP Status**			
	Y/N	**Y/N**	**Y/N**	**Y/N**	**Y/N**	**Y/N**	**N/A**	**CRS Review Y/N**	**CRS Class**
1. Gaithersburg						Y			
2. Rockville						Y			
3. Takoma Park						Y			
4. Barnesville						Y			

6. Brookesville						Y			
7. Chevy Chase						Y			
8. Chevy Chase View						Y			
9. Chevy Chase Village						Y			
10. Garrett Park						Y			
11. Glen Echo						Y			
12. Kensington						Y			
13. Laytonsville						Y			
14. Poolesville						Y			
15. Somerset						Y			
16. Washington Grove						Y			
17. Chevy Chase, Section 3						Y			
18. Chevy Chase, Section 5						Y			
19. Martin's Additions						Y			
20. North Chevy Chase						Y			

*** Notes: Y = Participating N = Not Participating N/A = Not Mapped**

PREREQUISITE(S)

1. Adoption by the Local Governing Body

***Requirement §201.6(c)(5)**: [The local hazard mitigation plan **shall** include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Has the local governing body adopted **new or updated** plan?		This is a multi-jurisdictional plan.	X	
B. Is supporting documentation, such as a resolution, included?		This is a multi-jurisdictional plan.	X	
		SUMMARY SCORE	X	

2. Multi-Jurisdictional Plan Adoption

***Requirement §201.6(c)(5)**: For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Does the **new or updated** plan indicate the specific jurisdictions represented in the plan?	Pg. 16	The Plan update lists Montgomery County and the municipalities of Gaithersburg, Rockville, Takoma Park, Barnesville, Brookesville, Chevy Chase, Chevy Chase View, Chevy Chase Village, Garret Park, Glen Echo, Kensington, Laytonsville, Poolesville, Somerset, Washington Grove, Chevy Chase Section 3, Chevy Chase Section 5, Martin's Additions, and North Chevy Chase as participants in the Plan update.		X
B. For each jurisdiction, has the local governing body adopted the **new or updated** plan?		Montgomery County and its jurisdictions will adopt the plan update upon notification of and Approved Pending Adoption by FEMA from MEMA.	X	
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?		Adoption resolutions will be included in the plan and also provided to MEMA for submission to FEMA after adoption.	X	
		SUMMARY SCORE	X	

3. Multi-Jurisdictional Planning Participation

***Requirement §201.6(a)(3)**: Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process … Statewide plans will not be accepted as multi-jurisdictional plans.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Does the **new or updated** plan describe **how** each	Pg. 16	The plan describes how each jurisdiction participated in the		X

jurisdiction participated in the plan's development?		plan's development.		
B. Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?	Pg. 16	The updated plan identifies all participating jurisdictions participating in the plan update and that they participated in the previous plan.		X
		SUMMARY SCORE		X

PLANNING PROCESS: *§201.6(b): An open public involvement process is essential to the development of an effective plan.*

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:*
(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): *[The plan **shall** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan indicate who was involved in the **current** planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, *etc*.?)	Pg. 7-10	The plan provides a description of the process followed to prepare the updated plan.		X
B. Does the **new or updated** plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)	Pg. 10-13	The updated plan indicates who was involved in the planning process.		X
C. **Does the new or updated plan discuss the** opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?	Pg. 13-17	The updated plan discusses opportunities for stakeholders to be involved in the planning process.		X
D. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?	Pg. 17-20	The updated plan describes the review and incorporation of existing plans, and other documents.		X
E. Does the plan provide a narrative description of the process followed to prepare the **new or updated** plan?	Pg. 5-7	The updated plan provides a description of the process followed to prepare the update plan.		X
F. Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part	Pg. 5-10, 16-17, 184-185	The updated plan describes how the planning team reviewed and analyzed each section of the plan and whether each		X

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process* ***shall*** *include:*
(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): *[The plan* ***shall*** *document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

	Location in the		SCORE	
of the update process?		section was revised as part of the update process.		
		SUMMARY SCORE		**X**

RISK ASSESSMENT: *§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

5. Identifying Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment* ***shall*** *include a] description of the type … of all natural hazards that can affect the jurisdiction.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include **a description** of the types of **all natural hazards** that affect the jurisdiction?	Pg. 32-40 - Thunderstorms Pg. 41-47 – Winter Storms Pg. 47-54 – Extreme Heat Pg. 54-60 – Fire Pg. 61-73 – Flooding Pg. 74-84 – Hurricane/Tropical Storms Pg. 85-96 – Water Shortage/Drought Pg. 97-104 – Tornado Pg. 105-113 - Earthquake Pg. 114-117 – Land Subsidence Pg. 118-124 – Hazardous Materials Pg. 125-133 – Dam Failure	The Risk Factor approach can be referenced to FEMA's Comprehensive Preparedness Guide (CPG) 101, 3-11. It discusses an effective method for organizing hazard or threat information by using a matrix based on probability, magnitude, intensity/severity, time available to warn, location, potential size, speed of onset, and duration. The five categories found in our Risk Factor approach reflect what is found in CPG 101. This is a fairly common platform that is used nationwide in mitigation planning. The format itself has several names but is primarily called a calculated priority risk index.		X
		SUMMARY SCORE		**X**

6. Profiling Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment* ***shall*** *include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan* ***shall*** *include information on previous occurrences of hazard events and on the probability of future hazard events.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the risk assessment identify the **location** (*i.e.*, geographic area affected) of each natural hazard addressed in the **new or updated** plan?	Pg. 32-133	Plan provides information on location and/or geographic area for each hazard profiled.		X
B. Does the risk assessment identify the **extent** (*i.e.*, magnitude or severity) of each hazard addressed in the **new or updated** plan?	Pg. 32-133	The risk assessment identifies the magnitude or severity of each hazard addressed in the updated Plan. A discussion of what the jurisdictions could anticipate was supported by technical measures and scientific scales.		X
C. Does the plan provide information on **previous occurrences** of each hazard addressed in the **new or updated** plan?	Pg. 32-133	Plan provides information on previous occurrences of each identified hazard by discussion of recorded history of each identified hazard in the plan.		X
D. Does the plan include the **probability of future events** (*i.e.*, chance of occurrence) for each hazard addressed in the **new or updated** plan?	Pg. 32-133	Plan includes the probability of future events for each identified hazard.		X
		SUMMARY SCORE		X

7. Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): *[The risk assessment* ***shall*** *include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description* ***shall*** *include an overall summary of each hazard and its impact on the community.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include an **overall summary** description of the jurisdiction's **vulnerability** to each hazard?	Pg. 32-133	Plan provides adequate information on the vulnerability of each jurisdiction to the hazard.		X
B. Does the **new or updated** plan address the **impact** of each hazard on the jurisdiction?	Pg. 32-133	Each hazard includes a discussion of the overall impact of the hazard on each of the jurisdictions participating in the plan. This includes a discussion of the impact of the hazards on the built environment.		X
		SUMMARY SCORE		X

8. Assessing Vulnerability: Addressing Repetitive Loss Properties

Requirement §201.6(c)(2)(ii): *[The risk assessment]* ***must*** *also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S

A. Does the new or updated plan describe vulnerability in terms of the types and numbers of *repetitive loss properties* located in the identified hazard areas?	Pg. 73	***Note: This requirement becomes effective for all local plans approved after October 1, 2008.***		X
		SUMMARY SCORE		X

9. Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): *The plan* ***should*** *describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area … .*

Element	**Location in the Plan** (section or annex and page #)	**Reviewer's Comments**	**SCORE** N	**SCORE** S
A. Does the **new or updated** plan describe vulnerability in terms of the **types and numbers** of **existing** buildings, infrastructure, and critical facilities located in the identified hazard areas?		***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
B. Does the **new or updated** plan describe vulnerability in terms of the **types and numbers** of **future** buildings, infrastructure, and critical facilities located in the identified hazard areas?		***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
		SUMMARY SCORE		

10. Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): *[The plan* ***should*** *describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate … .*

Element	**Location in the Plan** (section or annex and page #)	**Reviewer's Comments**	**SCORE** N	**SCORE** S
A. Does the **new or updated** plan estimate **potential dollar losses** to vulnerable structures?		***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
B. Does the **new or updated** plan describe the **methodology** used to prepare the estimate?		***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
		SUMMARY SCORE		

11. Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): *[The plan* ***should*** *describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Element	**Location in the Plan** (section or annex and page #)	**Reviewer's Comments**	**SCORE** N	**SCORE** S
A. Does the **new or updated** plan describe land uses and development trends?	Pg. 32-133	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		

				N	S
			SUMMARY SCORE		

12. Multi-Jurisdictional Risk Assessment

Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment* ***must*** *assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?	Pg. 40, 47, 54, 73, 84, 95, 103, 113, 117	Risk is mapped for each jurisdiction. Hazard profiles for specific geographic extent are assessed on participating jurisdictional basis as required.		X
		SUMMARY SCORE		X

MITIGATION STRATEGY: *§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

13. Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy* ***shall*** *include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A Does the **new or updated** plan include a description of mitigation **goals** to reduce or avoid long-term vulnerabilities to the identified hazards?	Pg. 138-140	Goals can be found on pg. 141 and are hazard specific.		X
		SUMMARY SCORE		X

14. Identification and Analysis of Mitigation Actions

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

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan identify and analyze a **comprehensive range** of specific mitigation actions and projects for each hazard?	Pg. 141-142	The updated plan identifies and analyzes a comprehensive range of specific mitigation actions and projects for each hazard.		X
B Do the identified actions and projects address reducing the effects of hazards on **new** buildings and infrastructure?	Pg. 144-183	The identified actions and projects address reducing the effects of hazards on new building and infrastructure.		X

C. Do the identified actions and projects address reducing the effects of hazards on **existing** buildings and infrastructure?	Pg. 144-183	The identified actions and projects address reducing the effects of hazards on existing building and infrastructure.		X
		SUMMARY SCORE		X

15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Requirement: §201.6(c)(3)(ii): *[The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the new or updated plan describe the jurisdiction (s) participation in the NFIP?	Pg. 63, 160	***Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008.*** The updated plan describes the jurisdictions participation in the NFIP		X
B. Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?	Pg. 155-161	***Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008.***		X
		SUMMARY SCORE		X

16. Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): *[The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** mitigation strategy include how the actions are **prioritized**? (For example, is there a discussion of the process and criteria used?)	Pg. 135-136	The updated mitigation strategy details how STAPLEE criteria were used as the basis for establishing priority.		X
B. Does the **new or updated** mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources and the timeframe to complete each action?	Pg. 144-183	The Updated Plan shows action, which hazard is addressed, who will be responsible, STAPLEE score, funding sources and timeframe.		X
C. Does the **new or updated** prioritization process include an emphasis on the use of a **cost-benefit review** to maximize benefits?	Pg. 144-183	The Plan has the information required on benefit-cost analysis through conducting and incorporating the STAPLEE methodology		X
D. Does the **updated** plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (*i.e.*, deferred), does the updated plan describe why no changes occurred?	Pg. 138-140	The Plan update has identified through a matrix, the completed, deleted, or deferred actions as a benchmark for progress. An explanation of changes has also been included in this matrix.		X
		SUMMARY SCORE		X

17. Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A Does the **new or updated** plan include identifiable **action items** for each jurisdiction requesting FEMA approval of the plan?	Pg. 138-140	The Updated Plan includes action steps for all of the jurisdictions in Montgomery County.		X
B. Does the **updated** plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (*i.e.*, deferred), does the updated plan describe why no changes occurred?	Pg. 138-140	The Updated Plan has identified through a matrix, the completed, deleted, or deferred actions as a benchmark for progress. An explanation of changes has also been included in this matrix.		X
		SUMMARY SCORE		X

PLAN MAINTENANCE PROCESS

18. Monitoring, Evaluating, and Updating the Plan

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

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan describe the method and schedule for **monitoring** the plan, including the responsible department?	Pg. 184-187	The Plan update includes a description of the method and schedule for monitoring and provides point of contact. An inclusion of all information discussed during these annual evaluation meetings shall be included in the 5-year update.		X
B. Does the **new or updated** plan describe the method and schedule for **evaluating** the plan, including how, when and by whom (*i.e.* the responsible department)?	Pg. 184-187	The Plan update describes evaluating sections and who is responsible and the method for each evaluation. An inclusion of all information discussed during these annual evaluation meetings shall be included in the 5-year update.		X
C. Does the **new or updated** plan describe the method and	Pg. 184-187	The Plan update describes that the next update must		

schedule for **updating** the plan within the five-year cycle?		be FEMA approved prior to the anniversary date OR the plan will lapse. An inclusion of all information discussed during these annual evaluation meetings shall be included in the 5-year update.		X
		SUMMARY SCORE		X

19. Incorporation into Existing Planning Mechanisms

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

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?	Pg. 184-187	The Plan update refers to planning mechanisms.		X
B. Does the **new or updated** plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (*e.g.*, risk assessment) into other planning mechanisms, when appropriate?	Pg. 184-187	The Plan update has the information provided.		X
C. Does the **updated** plan explain how the local government incorporated the mitigation strategy and other information contained in the plan (*e.g.*, risk assessment) into other planning mechanisms, when appropriate?	Pg. 184-187	The Plan update states the Montgomery County MPC will encourage jurisdictions to incorporate the findings into their plans and revise existing local planning and regulatory tools.		X
		SUMMARY SCORE		X

Continued Public Involvement

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

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan explain how **continued public participation** will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)	Pg. 184-187	The Plan discusses how continued public participation will take place. The Plan update will be readily accessible online to maximize continued public participation and comment.		X

		SUMMARY SCORE		X

MATRIX A: PROFILING HAZARDS

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that their plan addresses each natural hazard that can affect the jurisdiction. **Completing the matrix is not required**.

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each *applicable* ***hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.***

To check boxes, double click on the box and change the default value to "checked."

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Location		B. Extent		C. Previous Occurrences		D. Probability of Future Events	
	Yes	N	S	N	S	N	S	N	S
Avalanche	☐	☐	☐	☐	☐	☐	☐	☐	☐
Coastal Erosion	☐	☐	☐	☐	☐	☐	☐	☐	☐
Coastal Storm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dam Failure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Drought	☐	☐	☐	☐	☐	☐	☐	☐	☐
Earthquake	☐	☐	☐	☐	☐	☐	☐	☐	☐
Expansive Soils	☐	☐	☐	☐	☐	☐	☐	☐	☐
Levee Failure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flood	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hailstorm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hurricane	☐	☐	☐	☐	☐	☐	☐	☐	☐
Land Subsidence	☐	☐	☐	☐	☐	☐	☐	☐	☐
Landslide	☐	☐	☐	☐	☐	☐	☐	☐	☐
Severe Winter Storm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tornado	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tsunami	☐	☐	☐	☐	☐	☐	☐	☐	☐
Volcano	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wildfire	☐	☐	☐	☐	☐	☐	☐	☐	☐
Windstorm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other ________________	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other ________________	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other ________________	☐	☐	☐	☐	☐	☐	☐	☐	☐

Legend:

§201.6(c)(2)(i) Profiling Hazards
A. Does the risk assessment identify the location (*i.e.*, geographic area affected) of each hazard addressed in the **new or updated** plan?
B. Does the risk assessment identify the extent (*i.e.*, magnitude or severity) of each hazard addressed in the **new or updated** plan?
C. Does the plan provide information on previous occurrences of each natural hazard addressed in the **new or updated** plan?
D. Does the plan include the probability of future events (*i.e.*, chance of occurrence) for each hazard addressed in the plan?

MATRIX B: ASSESSING VULNERABILITY

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that the new or updated plan addresses each requirement. **Completing the matrix is not required**.

*Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each **applicable** hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk. Note: Receiving an N in the shaded columns will not preclude the plan from passing.*

To check boxes, double click on the box and change the default value to "checked."

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	§201.6(c)(2)(ii) Assessing Vulnerability: Overview	A. Overall Summary Description of Vulnerability		B. Hazard Impact		§201.6(c)(2)(ii) Assessing Vulnerability: Identifying Structures	A. Types and Number of Existing Structures in Hazard Area (Estimate)		B. Types and Number of Future Structures in Hazard Area (Estimate)		§201.6(c)(2)(ii) Assessing Vulnerability: Estimating Potential Losses	A. Loss Estimate		B. Methodology	
	Yes		N	S	N	S		N	S	N	S		N	S	N	S
Avalanche	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Coastal Erosion	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Coastal Storm	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Dam Failure	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Drought	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Earthquake	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Expansive Soils	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Levee Failure	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Flood	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Hailstorm	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Hurricane	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Land Subsidence	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Landslide	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Severe Winter Storm	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Tornado	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Tsunami	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Volcano	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Wildfire	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Windstorm	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Other ______	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Other ______	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Other ______	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐

Legend:

§201.6(c)(2)(ii) Assessing Vulnerability: Overview

A. Does the **new or updated** plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
B. Does the **new or updated** plan address the impact of each hazard on the jurisdiction?

§201.6(c)(2)(ii)(A) Assessing Vulnerability: Identifying Structures

A. Does the **new or updated** plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
B. Does the **new or updated** plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(B) Assessing Vulnerability: Estimating Potential Losses

A. Does the **new or updated** plan estimate potential dollar losses to vulnerable structures?
B. Does the **new or updated** plan describe the methodology used to prepare the estimate?

MATRIX C: IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure consideration of a range of actions for each hazard. **Completing the matrix is not required.**

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each ***applicable*** *hazard. An "N" for any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.*

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Comprehensive Range of Actions and Projects	
	Yes	N	S
Avalanche	☐	☐	☐
Coastal Erosion	☐	☐	☐
Coastal Storm	☐	☐	☐
Dam Failure	☐	☐	☐
Drought	☐	☐	☐
Earthquake	☐	☐	☐
Expansive Soils	☐	☐	☐
Levee Failure	☐	☐	☐
Flood	☐	☐	☐
Hailstorm	☐	☐	☐
Hurricane	☐	☐	☐
Land Subsidence	☐	☐	☐
Landslide	☐	☐	☐
Severe Winter Storm	☐	☐	☐
Tornado	☐	☐	☐
Tsunami	☐	☐	☐
Volcano	☐	☐	☐
Wildfire	☐	☐	☐
Windstorm	☐	☐	☐
Other ______________	☐	☐	☐
Other ______________	☐	☐	☐
Other ______________	☐	☐	☐

To check boxes, double click on the box and change the default value to "checked."

Legend:
§201.6(c)(3)(ii) Identification and Analysis of Mitigation Actions
A. Does the **new or updated** plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?

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APPENDIX D:

RISK ASSESSMENT SUPPORTING DATA

Jurisdictional Risk Factor Evaluation

Name/Title Michael Acierno/President of Commisioners

Jurisdiction/Organization Brookeville

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	HAZARD	RISK ASSESSMENT CATEGORY					RISK FACTOR	Comparative Jurisdictional Risk <, >, = (and notes)
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	*4*	*2*	*4*	*3*	*3*	***3.2***	=
HIGH	*Winter Storm*	*3*	*3*	*4*	*2*	*3*	***3.1***	=
HIGH	*Extreme Heat*	3	3	4	1	3	***3.0***	<
MODERATE	*Hazardous Materials*	*3*	*3*	*2*	*4*	*2*	***2.8***	<
MODERATE	*Dam Failure*	2	3	2	3	3	**2.5**	<
MODERATE	*Fire*	3	2	2	3	2	**2.4**	**> Brookeville has many very old historic homes made of wood. A fire at one structure can quickly involve many structures.**

Jurisdictional Risk Factor Evaluation

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	=
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	=
	Water Shortage	2	1	4	2	3	**2.2**	=
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	=
	Earthquake	1	1	3	4	2	**1.8**	=
	Land Subsidence	1	1	1	4	1	**1.3**	=

< Means LESS than the County Risk Factor **>** Means GREATER than the County Risk Factor **=** Means equal to the County Risk Factor

Jurisdictional Risk Factor Evaluation

All Jurisdictions

JURISDICTION	ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	COMMENTS
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville	=	=	<	<	<	>	=	=	=	=	=	=	
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

< Means LESS than the County Risk Factor **>** Means GREATER than the County Risk Factor **=** Means equal to the County Risk Factor

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title Frances L. Higgins, manager

Jurisdiction/OrganizationSection 5 of the Village of Chevy Chase

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	HAZARD	RISK ASSESSMENT CATEGORY					RISK FACTOR	Comparative Jurisdictional Risk <, >, = (and notes)
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	*4*	*2*	*4*	*3*	*3*	***3.2***	=
	Winter Storm	*3*	*3*	*4*	*2*	*3*	***3.1***	=
	Extreme Heat	3	3	4	1	3	***3.0***	=
MODERATE	*Hazardous Materials*	*3*	*3*	*2*	*4*	*2*	***2.8***	<
	Dam Failure	2	3	2	3	3	**2.5**	<
	Fire	3	2	2	3	2	**2.4**	=

Jurisdictional Risk Factor Evaluation

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	<
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	=
	Water Shortage	2	1	4	2	3	**2.2**	=
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	=
LOW	Earthquake	1	1	3	4	2	**1.8**	=
LOW	Land Subsidence	1	1	1	4	1	**1.3**	<

< Means LESS than the County Risk Factor **>** Means GREATER than the County Risk Factor **=** Means equal to the County Risk Factor

All Jurisdictions

JURISDICTION	ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	COMMENTS
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

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Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title **Michael Younes, Director of Municipal Operations**

Jurisdiction/Organization **Chevy Chase Village**

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	4	2	4	3	3	***3.2***	**> due to dense tree canopy**
	Winter Storm	3	3	4	2	3	***3.1***	**> due to dense tree canopy**
	Extreme Heat	3	3	4	1	3	***3.0***	**=**
MODERATE	*Hazardous Materials*	3	3	2	4	2	***2.8***	**=**
	Dam Failure	2	3	2	3	3	**2.5**	**<**
	Fire	3	2	2	3	2	**2.4**	**=**

Jurisdictional Risk Factor Evaluation

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	=
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	**> due to dense tree canopy**
	Water Shortage	2	1	4	2	3	**2.2**	=
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	**> due to dense tree canopy**
	Earthquake	1	1	3	4	2	**1.8**	=
	Land Subsidence	1	1	1	4	1	**1.3**	=

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Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

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Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	COMMENTS
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title_William (Skip) Lanham/Emergency Management Coor_ Jurisdiction/Organization_Gaithersburg____________

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	HAZARD	RISK ASSESSMENT CATEGORY					RISK FACTOR	Comparative Jurisdictional Risk <, >, = (and notes)
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	*4*	*2*	*4*	*3*	*3*	***3.2***	**= Centrally located in the county & equally impacted**
HIGH	*Winter Storm*	*3*	*3*	*4*	*2*	*3*	***3.1***	**= Centrally located in the county & equally impacted**
HIGH	*Extreme Heat*	3	3	4	1	3	***3.0***	**= Centrally located in the county & equally impacted**
MODERATE	*Hazardous Materials*	*3*	*3*	*2*	*4*	*2*	***2.8***	**= Centrally located in the county & equally impacted**
MODERATE	*Dam Failure*	2	3	2	3	3	**2.5**	**> The City has (7) dams within the corporate limits. While none are are large that number is a significant portion of the total high hazard dams**
MODERATE	*Fire*	3	2	2	3	2	**2.4**	**= Centrally located in the county & equally impacted**

Jurisdictional Risk Factor Evaluation

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	**= Centrally located in the county & equally impacted**
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	**= Centrally located in the county & equally impacted**
	Water Shortage	2	1	4	2	3	**2.2**	**= Centrally located in the county & equally impacted**
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	**= Centrally located in the county & equally impacted**
	Earthquake	1	1	3	4	2	**1.8**	**= Centrally located in the county & equally impacted**
	Land Subsidence	1	1	1	4	1	**1.3**	**< No Karst topography within the City limits**

< Means LESS than the County Risk Factor **>** Means GREATER than the County Risk Factor **=** Means equal to the County Risk Factor

Jurisdictional Risk Factor Evaluation

All Jurisdictions

JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

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Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

< Means LESS than the County Risk Factor **>** Means GREATER than the County Risk Factor **=** Means equal to the County Risk Factor

Jurisdictional Risk Factor Evaluation

Name/Title: **Edwin Pratt, Jr., Town Administrator** Jurisdiction/Organization: **Town of Garrett Park**

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	*4*	*2*	*4*	*3*	*3*	***3.2***	**>: Greater Potential for Tree Damage (Above average canopy)**
	Winter Storm	*3*	*3*	*4*	*2*	*3*	***3.1***	**>: Greater Potential for Tree Damage (Above average canopy)**
	Extreme Heat	3	3	4	1	3	***3.0***	**=**
MODERATE	*Hazardous Materials*	*3*	*3*	*2*	*4*	*2*	***2.8***	**>: Low probability, very high impact, train derailment – lots of tank cars go through Garrett Park**
	Dam Failure	2	3	2	3	3	**2.5**	**<: Very low or no impact**
	Fire	3	2	2	3	2	**2.4**	**=: No obvious above average risks of fire**

Jurisdictional Risk Factor Evaluation

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	**<: very small flood plain area, there are a few properties subject to flooding due to poor drainage, but most of the Town is high and dry**
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	**>: Greater Potential for Tree Damage (Above average canopy)**
	Water Shortage	2	1	4	2	3	**2.2**	**=: We rely on WSSC**
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	**>: Greater Potential for Tree Damage (Above average canopy)**
	Earthquake	1	1	3	4	2	**1.8**	**=**
	Land Subsidence	1	1	1	4	1	**1.3**	**<: no susceptible geology**

< Means LESS than the County Risk Factor **>** Means GREATER than the County Risk Factor **=** Means equal to the County Risk Factor

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park	>	>	=	>	<	=	<	>	=	>	=	<	
Glen Echo													
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

< Means LESS than the County Risk Factor **>** Means GREATER than the County Risk Factor **=** Means equal to the County Risk Factor

Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title__________________ Jurisdiction/Organization_____________________

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	4	2	4	3	3	***3.2***	=
	Winter Storm	3	3	4	2	3	***3.1***	= **Our town has all above ground electric wires and no natural gas lines, as a result when the power goes out, most residents have no heat.**
	Extreme Heat	3	3	4	1	3	***3.0***	=
MODERATE	*Hazardous Materials*	3	3	2	4	2	***2.8***	=
	Dam Failure	2	3	2	3	3	**2.5**	=
	Fire	3	2	2	3	2	**2.4**	=

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	=
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	=
	Water Shortage	2	1	4	2	3	**2.2**	=
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	=
	Earthquake	1	1	3	4	2	**1.8**	=
	Land Subsidence	1	1	1	4	1	**1.3**	=

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All Jurisdictions

JURISDICTION	ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	COMMENTS
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo	=	=	=	=	=	=	=	=	=	=	=	=	=
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

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All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title_________________ Jurisdiction/Organization____________________

Countywide ranking of hazard types based on Risk Factor (RF) methodology.

HAZARD RISK	HAZARD	RISK ASSESSMENT CATEGORY					RISK FACTOR	Comparative Jurisdictional Risk <, >, = (and notes)
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	*4*	*2*	*4*	*3*	*3*	***3.2***	
HIGH	*Winter Storm*	*3*	*3*	*4*	*2*	*3*	***3.1***	
HIGH	*Extreme Heat*	3	3	4	1	3	***3.0***	
MODERATE	*Hazardous Materials*	*3*	*3*	*2*	*4*	*2*	***2.8***	
MODERATE	*Dam Failure*	2	3	2	3	3	**2.5**	
MODERATE	*Fire*	3	2	2	3	2	**2.4**	

Jurisdictional Risk Factor Evaluation

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk** **<, >, =** **(and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	
	Water Shortage	2	1	4	2	3	**2.2**	
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	
	Earthquake	1	1	3	4	2	**1.8**	
	Land Subsidence	1	1	1	4	1	**1.3**	

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Jurisdictional Risk Factor Evaluation

All Jurisdictions

JURISDICTION	ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

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All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title Jean Sperling

Jurisdiction/Organization Village of Martin's Additions

Countywide ranking of hazard types based on Risk Factor (RF) methodology.

HAZARD RISK	HAZARD	RISK ASSESSMENT CATEGORY					RISK FACTOR	Comparative Jurisdictional Risk <, >, = (and notes)
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	4	2	4	3	3	3.2	= There is nothing unique to our community that would alter our risk vis a vis the county.
HIGH	*Winter Storm*	3	3	4	2	3	3.1	= The storm's intensity should by the same as the county. The clean up effort might be somewhat greater due to the narrowness of our streets and dense tree canopy.
HIGH	*Extreme Heat*	3	3	4	1	3	3.0	= It is possible that the dense tree canopy could reduce the impact of heat a bit, but I'd have to know how our canopy compares to the County
MODERATE	*Hazardous Materials*	3	3	2	4	2	2.8	< Although Connecticut Ave. and Brookville Road, both state high-ways run through our municipality neither roads are considered trucks routes.
MODERATE	*Dam Failure*	2	3	2	3	3	2.5	< no dams anywhere nearby
MODERATE	*Fire*	3	2	2	3	2	2.4	= or > There are a lot of older wooden homes close to each other (small lots) it is possible that our risk of fire spreading is higher than the county but I don't have any comparative data on housing construction material

Martin's Additions, continued

Jurisdictional Risk Factor Evaluation

Countywide ranking of hazard types based on Risk Factor (RF) methodology.

HAZARD RISK	HAZARD	RISK ASSESSMENT CATEGORY					RISK FACTOR	Comparative Jurisdictional Risk <, >, = (and notes)
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	< our area has no low lying section that could flood easily
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	=
	Water Shortage	2	1	4	2	3	**2.2**	=
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	=
	Earthquake	1	1	3	4	2	**1.8**	=
	Land Subsidence	1	1	1	4	1	**1.3**	< There are no known areas of Karst topography anywhere nearby.

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All Jurisdictions

JURISDICTION	**ROLED UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	*3.1*	*3*	*2.8*	2.5	2.4	2.4	2.4	2.2	*1.9*	1.8	1.3	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin's Additions	=	=	=	<	<	= or >	<	=	=	=	=	<	
North Chevy Chase													

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All Jurisdictions

JURISDICTION	ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	COMMENTS
	3.2	*3.1*	*3*	*2.8*	2.5	2.4	2.4	2.4	2.2	*1.9*	1.8	1.3	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title D. Wade Yost, Town Manager Jurisdiction/Organization Poolesville

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	*4*	*2*	*4*	*3*	*3*	***3.2***	=
	Winter Storm	*3*	*3*	*4*	*2*	*3*	***3.1***	=
	Extreme Heat	3	3	4	1	3	***3.0***	=
MODERATE	*Hazardous Materials*	*3*	*3*	*2*	*4*	*2*	***2.8***	=
	Dam Failure	2	3	2	3	3	**2.5**	**< No dams near Poolesville**
	Fire	3	2	2	3	2	**2.4**	=

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	=
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	=
	Water Shortage	2	1	4	2	3	**2.2**	**> Community soley dependent upon groundwater**
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	=
	Earthquake	1	1	3	4	2	**1.8**	=
	Land Subsidence	1	1	1	4	1	**1.3**	=

< Means LESS than the County Risk Factor

> Means GREATER than the County Risk Factor

= Means equal to the County Risk Factor

Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

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Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville	=	=	=	=	<	=	=	=	>	=	=	=	
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title Tim Ward City of Rockville

Jurisdiction/OrganizationSection 5 of the Village of Chevy Chase

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	*4*	*2*	*4*	*3*	*3*	***3.2***	=
	Winter Storm	*3*	*3*	*4*	*2*	*3*	***3.1***	=
	Extreme Heat	3	3	4	1	3	***3.0***	=
MODERATE	*Hazardous Materials*	*3*	*3*	*2*	*4*	*2*	***2.8***	=
	Dam Failure	2	3	2	3	3	**2.5**	**< only have three small dams that barely meet the dam requirement**
	Fire	3	2	2	3	2	**2.4**	=

Jurisdictional Risk Factor Evaluation

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	**= Ongoing CIP for flooding**
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	**=**
	Water Shortage	2	1	4	2	3	**2.2**	**> Pump our own water. Anything that damages our off-site pumping purification system.**
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	**=**
	Earthquake	1	1	3	4	2	**1.8**	**=**
	Land Subsidence	1	1	1	4	1	**1.3**	**<**

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Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin’s Addition													
North Chevy Chase													

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Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title______Roll up of Montgomery County, MD___________ Jurisdiction/Organization_________All___________

All Jurisdictions

JURISDICTION	*Thunderstorms*	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	COMMENTS
	ROLLED UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON												
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase	=	=	=	<	>	=	<	=	=	=	=	=	
Chevy Chase View													
Chevy Chase Village	> dense tree canopy	> dense tree canopy	=	=	<	=	=	> Dense tree canopy	=	> Dense tree canopy	=	=	
Chevy Chase Village Section 3													
Chevy Chase Village Section 5	=	=	=	<	<	=	<	=	=	=	=	<	
Gaithersburg	=	=	=	=	> 7 within	=	=	=	=	=	=	< No Karst topography	

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All Jurisdictions													
JURISDICTION	**ROLLED UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												**COMMENTS**
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
					city.							within the City limits.	
Garrett Park	> Dense tree canopy	> Dense tree canopy	=	> Many tank cars go through Garrett Park	<	=	< very small fp area	> Dense tree canopy	=	> Dense tree canopy	=	< no susceptible geology	
Glen Echo	=	=	=	=	=	=	=	=	=	=	=	=	All above ground electric wires and no natural gas lines. When the power goes out, most residents have no heat.
Kensington													
Laytonsville													
Martin's Addition	=	=	=	<	< no dams	=	< no low lying	=	=	=	=	< no karst topograph	

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All Jurisdictions													
JURISDICTION	**ROLLED UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												**COMMENTS**
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
					nearby		sections					y	
North Chevy Chase													
Poolesville	=	=	=	=	< no dams nearby	=	=	=	> soley relies on graound water	=	=	=	
Rockville													
Somerset	> aboveground powerlines and dense tree canopy	> aboveground powerlines and dense tree canopy	=	< no haz mat facilities and no major travel routes	<	=	=	=	=	=	=	<	
Takoma Park	> Dense, mature tree canopy	> Dense, mature tree canopy	=	=	< no identified dams nearby	=	=	=	=	=	=		
Washington Grove	> Dense, mature tree canopy	> Dense, mature tree	< tree cover	> proximity	<	> narrow	< non flood prone	=	=	> Dense, mature	=	<	

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All Jurisdictions													
JURISDICTION	ROLLED UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	COMMENTS
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
		canopy		to rr tracks		access roads, heavily forested	community			tree canopy			

< Means LESS than the County Risk Factor > Means GREATER than the County Risk Factor = Means equal to the County Risk Factor

Jurisdictional Risk Factor Evaluation

Name/Title______Rich Charnovich, Manager___________
Jurisdiction/Organization__Somerset__________________1,200 within Chevy Chase smaller

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	*4*	*2*	*4*	*3*	*3*	***3.2***	**> due to above ground power lines and heavy tree canopy**
	Winter Storm	*3*	*3*	*4*	*2*	*3*	***3.1***	**> due to above ground power lines and heavy tree canopy**
	Extreme Heat	3	3	4	1	3	***3.0***	**=**
MODERATE	*Hazardous Materials*	*3*	*3*	*2*	*4*	*2*	***2.8***	**< no facilities within bounds and no major travel routes for hazard materials to be transported**
	Dam Failure	2	3	2	3	3	**2.5**	**<**
	Fire	3	2	2	3	2	**2.4**	**= Many wooded areas and heavy tree canopy. Travel routes not easily accessible to fire fighters**

Jurisdictional Risk Factor Evaluation

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	=
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	=
	Water Shortage	2	1	4	2	3	**2.2**	=
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	=
LOW	Earthquake	1	1	3	4	2	**1.8**	=
LOW	Land Subsidence	1	1	1	4	1	**1.3**	<

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All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

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All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title: Capt. Edward E. Coursey

Jurisdiction/Organization: City of Takoma Park

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	*4*	*2*	*4*	*3*	*3*	***3.2***	**> all of Takoma Park is an older neighborhood than the County in general, and has older, mature trees and older infrastructure**
	Winter Storm	*3*	*3*	*4*	*2*	*3*	***3.1***	**> all of Takoma Park is an older neighborhood than the County in general, and has older, mature trees and older infrastructure**
	Extreme Heat	3	3	4	1	3	***3.0***	**=**
MODERATE	*Hazardous Materials*	*3*	*3*	*2*	*4*	*2*	***2.8***	**=**
	Dam Failure	2	3	2	3	3	**2.5**	**< none of the identified high risk dams in the County provide a threat of any type to the City of Takoma Park**
	Fire	3	2	2	3	2	**2.4**	**=**

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	=
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	=
	Water Shortage	2	1	4	2	3	**2.2**	=
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	=
	Earthquake	1	1	3	4	2	**1.8**	=
	Land Subsidence	1	1	1	4	1	**1.3**	=

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All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

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Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title____Todd Hoffman_____________ Jurisdiction/Organization________Town of Chevy Chase_____

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	*4*	*2*	*4*	*3*	*3*	***3.2***	=
	Winter Storm	*3*	*3*	*4*	*2*	*3*	***3.1***	=
	Extreme Heat	3	3	4	1	3	***3.0***	=
MODERATE	*Hazardous Materials*	*3*	*3*	*2*	*4*	*2*	***2.8***	<
	Dam Failure	2	3	2	3	3	**2.5**	>
	Fire	3	2	2	3	2	**2.4**	=

Jurisdictional Risk Factor Evaluation

Countywide ranking of hazard types based on Risk Factor (RF) methodology.

HAZARD RISK	HAZARD	RISK ASSESSMENT CATEGORY					RISK FACTOR	Comparative Jurisdictional Risk <, >, = (and notes)
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	<
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	=
	Water Shortage	2	1	4	2	3	**2.2**	=
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	=
	Earthquake	1	1	3	4	2	**1.8**	=
	Land Subsidence	1	1	1	4	1	**1.3**	=

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All Jurisdictions

JURISDICTION	ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	COMMENTS
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
Chevy Chase Village Section 5													
Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

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Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove													

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Jurisdictional Risk Factor Evaluation

Name/Title Mary M. Challstrom, Treasurer Jurisdiction/Organization Town of Washington Grove

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
HIGH	*Thunderstorms*	*4*	*2*	*4*	*3*	*3*	***3.2***	=
	Winter Storm	*3*	*3*	*4*	*2*	*3*	***3.1***	=
	Extreme Heat	3	3	4	1	3	***3.0***	< tree cover
MODERATE	*Hazardous Materials*	*3*	*3*	*2*	*4*	*2*	***2.8***	> proximity to railroad tracks
	Dam Failure	2	3	2	3	3	**2.5**	<
	Fire	3	2	2	3	2	**2.4**	> narrow access roads, heavily forested

Countywide ranking of hazard types based on Risk Factor (RF) methodology.								
HAZARD RISK	**HAZARD**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR**	**Comparative Jurisdictional Risk <, >, = (and notes)**
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION		
	Flooding	3	2	2	3	2	**2.4**	**< non-floodprone community**
	Hurricane/Tropical Storm	3	1	4	1	3	**2.4**	=
	Water Shortage	2	1	4	2	3	**2.2**	=
LOW	*Tornado*	*2*	*1*	*2*	*4*	*2*	***1.9***	=
	Earthquake	1	1	3	4	2	**1.8**	=
	Land Subsidence	1	1	1	4	1	**1.3**	=

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Jurisdictional Risk Factor Evaluation

All Jurisdictions													
JURISDICTION	**ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON**												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	**COMMENTS**
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Barnesville													
Brookeville													
Chevy Chase													
Chevy Chase View													
Chevy Chase Village													
Chevy Chase Village Section 3													
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Gaithersburg													
Garrett Park													
Glen Echo													
Kensington													
Laytonsville													
Martin's Addition													
North Chevy Chase													

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Jurisdictional Risk Factor Evaluation

All Jurisdictions

JURISDICTION	ROLELD UP IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR COMPARISON												
	Thunderstorms	*Winter Storm*	*Extreme Heat*	*Hazardous Materials*	*Dam Failure*	*Fire*	Flooding	Hurricane/Tropical Storm	Water Shortage	*Tornado*	Earthquake	Land Subsidence	COMMENTS
	3.2	***3.1***	***3***	***2.8***	**2.5**	**2.4**	**2.4**	**2.4**	**2.2**	***1.9***	**1.8**	**1.3**	
Poolesville													
Rockville													
Somerset													
Takoma Park													
Washington Grove	=	=	<	>	<	>	<	=	=	=	=	=	

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Montgomery County Mitigation Plan Update
Hazard Mitigation Planning Meeting II
Risk Assessment Review
Minutes

DATE: April 4, 2012

TIME: 9:30 am- 12:30

LOCATION: Montgomery County EMA, 1300 Quince Orchard Boulevard, Gaithersburg, MD

The following people were in attendance:

Name	Organization/ Affiliation
Kevin Grubbs	Montgomery County OEMHS
Mehrab Karim	Montgomery County OEMHS
Jean Sperling	Village of Martins Addition
Jana Coe	Chevy Chase View
Wade Yost	Poolesville
Mary Challstrom	Washington Grove
Laura Johnson	Training Outreach
Ted Pratt	Town of Garrett Park
Steve Maloney	Montgomery College
Skip Lanham	Gaithersburg
Phil Raum	Montgomery County Police
Ed Coursey	Takoma Park
Mike Fitzgerald	Department of Health and Human Services
Dan Sadler	Montgomery County
Michael Younes	Chevy Chase Village
Matt Hochstein	Hagerty – private firm
Katie Freeman	Hagerty – private firm
John Higgins	Section 5 Chevy Chase
Sanford W. Daily	Town of Kensington
Rich Charrovich	Town of Somerset
Clark Beil	Department of Health & Human Services
Jeremy V. Criss	Dept Economic Development- Agriculture Services
Kay Aaby	Dept Health & Human Service/Public Health System
Pete Pedersen	PEPCO
Keith Compton	Department of Transportation

MEETING HANDOUTS:

- Agenda
- Goals and Objectives Update worksheet

MEETING OVERVIEW

1) INTRODUCTION

The purpose of this meeting is to review the risk assessments for identified hazards that have been generated based on information obtained from the county, national sources and the Maryland State Hazard Mitigation Plan. Also, to determine the status of Goals and Objectives that were identified in the previous plan and consider any new Goals and Objectives that may be appropriate to add.

Introductions were made by all presenters and attendees.

The Training Outreach/Baker Team explained that feedback from our initial assessment and with regard to plan goals and objectives is important to ensure an accurate final product.

2) RISK ASSESSMENT REVIEW AND PRIORITIZE HAZARDS

The group reviewed the hazards that were identified in the last meeting and the data that was compiled as a result of the risk assessment. The group was reminded that the hazards covered in this plan are natural hazards. Hazards identified include:

- Winter Storm
- Fire
- Dam Failure
- Water Shortage, including Drought
- Earthquake
- Winter Storm
- Extreme Heat
- Flooding
- Hazardous Materials
- Hurricane/Tropical Storm
- Land Subsidence/Sinkhole Karst
- Tornado
- Thunderstorm

Specific adjustments requested to the data presented are captured in these minutes below:

- <u>Fire:</u> Request that the Training Outreach team add the 2011 Darnestown brushfire event to the fire summary. We talked about a Continuity of Service plan as it relates to Montgomery County Fire and Rescue. Chuck confirmed we are working on this plan.

- Dam Failure: No additional comments. The Hazardous Materials Summary and Dam Failure will be redacted from the public report.
- Water Shortage, including Drought: Concerns about crop damage data was expressed Damages outlined in the draft ($812) may be too low.
- Earthquake: No additional comments.
- Winter Storm (includes extreme cold): No additional comments.
- Extreme Heat: Definition of extreme heat requested. This will be added to the report. It was recommended that the Training Outreach Team check Department of Health and Mental Hygiene (DHMH) for both extreme heat and extreme cold.
- Flooding: It was asked if water main breaks were calculated in flooding summary. Water main breaks were calculated when it comes to flooding but not to damages. Dam breaks are profiled separately. The Sept 2011 flood event that washed out some bridges and that data needs to be added. Request to add flooding at Silver Creek. It has also been requested that the County add this to the Capital Improvement Plan. Currently seeking a conduit for the funding. Silver Creek flooding should be noted as an additional mitigation project.
- Hazardous Materials: County confirmed they have traffic flow studies to identify hazmat issues. The Hazardous Materials Summary and Dam Failure will be redacted from the public report.
- Hurricane/Tropical Storm: No additional comments
- Land Subsidence/Sinkhole Karst: Confirmation that sinkholes exist in the highly populated parts of the county. It was asked if certain types of sinkholes are eligible for mitigation grants. Mitigation grants can't be used for projects used by deferred maintenance. The Training Outreach/Baker Team will include information on the location of the sinkholes, the cause, and any dollar amount data which allows us to track.
- Tornado: Request to include in the data a tornado in 1932 that caused fatalities.
- Thunderstorm: Some of the information depicted may be out of date, especially as it relates to the lightning and storm injuries and fatalities. Thunderstorms happen annually and have caused much damage and expense. PEPCO has spent millions on restoring power. Can we include these costs in our figures? In July 2010, almost 80% of the county lost power. The Training Outreach/Baker Team suggested we revise project description to work with the public service commission. An attendee stated the Montgomery County has difficult with maintenance around the lines. Suggested we have good management guidelines for the ground beneath the power lines. It was suggested the County better manage transition corridors and work with public utility providers to properly manage it to prevent further damage. It was suggested that we establish a policy and understand the legality. It was suggested that we reach out to subject matter expert, Brett Linkletter. Art Holmes may be able to involve Brett. The County is on board as far as easement rights and establishing management rules. Outreach and education on what we can and can't do is important – rules and regulations that allow for permissions to go on private property. Grants funds on

training and education for the county may be available for this. Comments on the ability of the county to maintain lines if a homeowner disallows tree maintenance and involving the County attorney to look at the easement law were made.

- General recommendations: Use the word rural rather than "less inhabited." Request to the State to look at the root causes of these hazards to allow jurisdictions to better understand why these hazards are occurring.
  It was suggested that damage values get adjusted for inflation.

3) MITIGATION GOALS AND OBJECTIVES UPDATE EXERCISE

The group reviewed the goals and objectives, projects and strategies from the current plan in order to fulfill requirement that plan maintenance from previous plan has been completed and to obtain early feedback from the local mitigation planning committee on the plan update to incorporate into the update process.

The status of projects that were identified in the previous planned was determined as well as whether to retain, change, or delete these projects and the reason why.

Please see the Goals and Objectives Update Worksheet for the results of this exercise.

4) ADJOURN

Creating Value …

… Delivering Solutions

Montgomery County, Maryland
Hazard Mitigation Plan Update

Planning Meeting

April 4, 2012

2012 Montgomery Co. HMPU Hazards

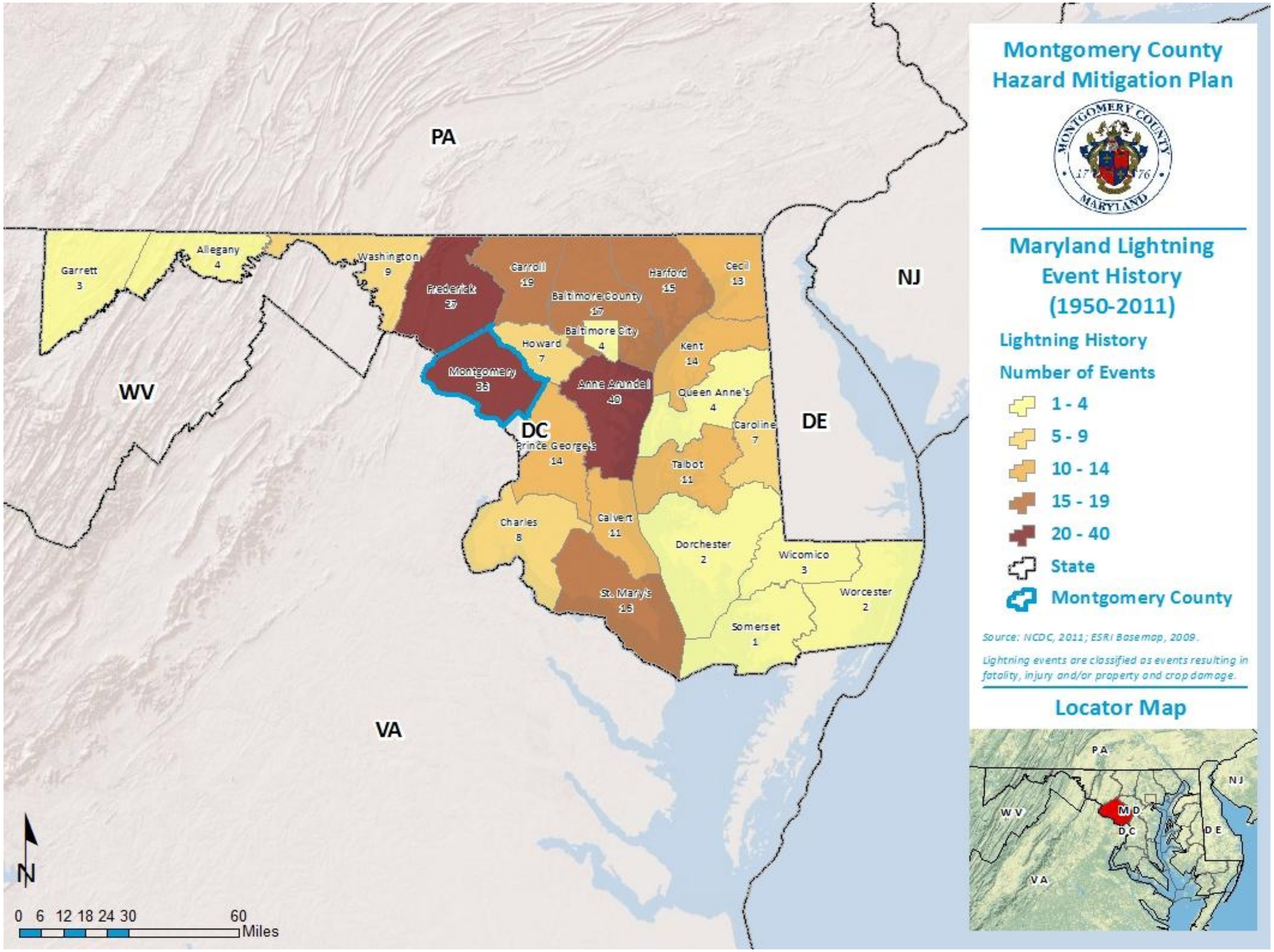
Evaluation of Hazards for Inclusion in 2012 HIRA Summary			
2007 HAZARD	**STATUS**	**NOTES**	**2012 HAZARD**
Blizzard/Ice Storms	Revised	Revised to winter storm, with the addition of extreme cold	Winter Storm
Brushfire/Conflagration	Revised	Revised to include naturally caused fires	Fire
Dam Failure	No Change		Dam Failure
Drought	Revised	Revised to Water Shortage	Water Shortage, including Drought
Earthquake	No Change		Earthquake
Extreme Cold	Revised	Consolidated into Winter Storm hazard	Winter Storm
Extreme Heat	No Change		Extreme Heat
Flooding/Flash Flooding	Revised	Single category of Flooding includes both flooding and flash flooding	Flooding
Haz-Mat Fire and Haz-Mat Spill	Revised	Consolidated into a single hazard	Hazardous Materials
Hurricane/Tropical Storm	No change		Hurricane/Tropical Storm
Mudslides/Sinkholes	Revised		Land Subsidence/Sinkhole Karst
Tornado/Thunderstorm	Revised	Divided into two distinct hazards	Tornado and Thunderstorm

Thunderstorm Summary

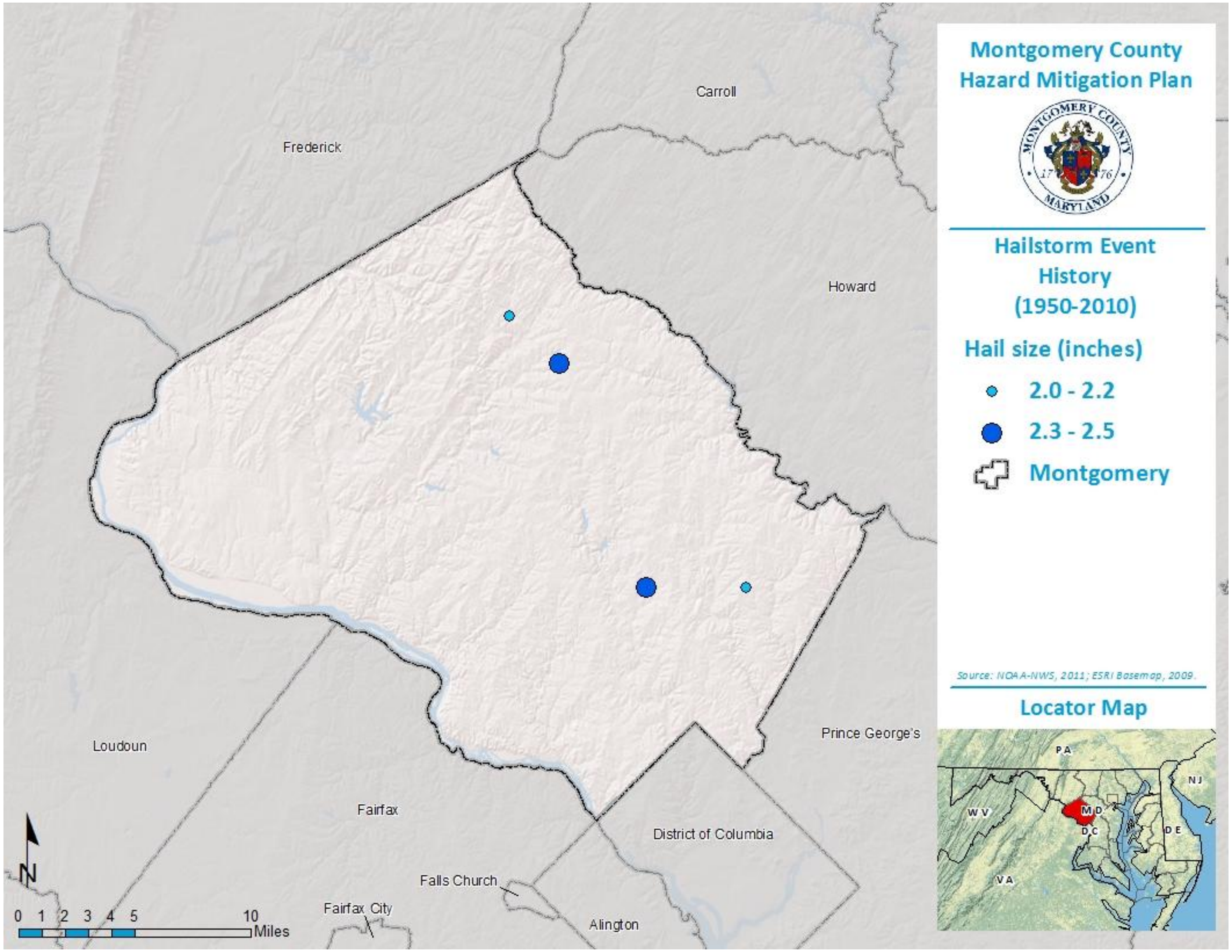
- **100% probability that severe thunderstorms will impact the County annually**
- **Lightning Strike from 5/25/94 storm caused four homes to catch fire, causing $600k in damages**

Severe Thunderstorms Since 1950	
Jurisdiction Affected	Montgomery County
Number of Events	147
Number of Injuries	4
Number of Fatalities	1
Property Damages	$16,330,792

Thunderstorm Summary



Thunderstorm Summary

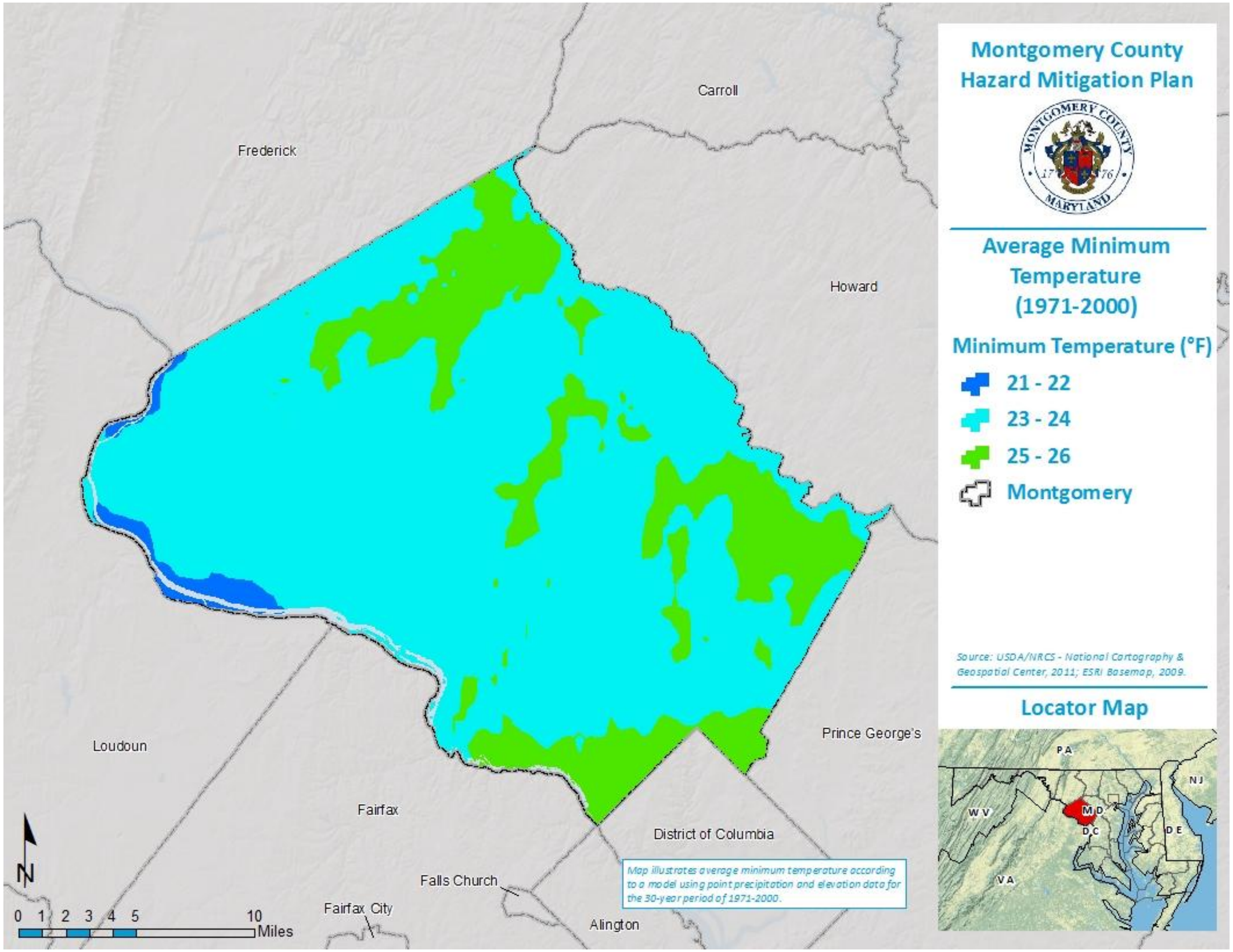


Winter Storms/Extreme Cold Summary

- **Average annual snowfall is 20-30 inches**
- **Feb. 2010 storm resulted in 40 inches of snow, and 80,000 power outages**
- **Extreme Cold has caused 1.54 injuries and .16 fatalities in the County since 1960**

Severe Winter Storms Since 1960	
# of Events	71
# of Injuries	69.15
# of Fatalities	8.07
Property Damages	$3,634,043
Crop Damages	$812

Winter Storms/Extreme Cold Summary

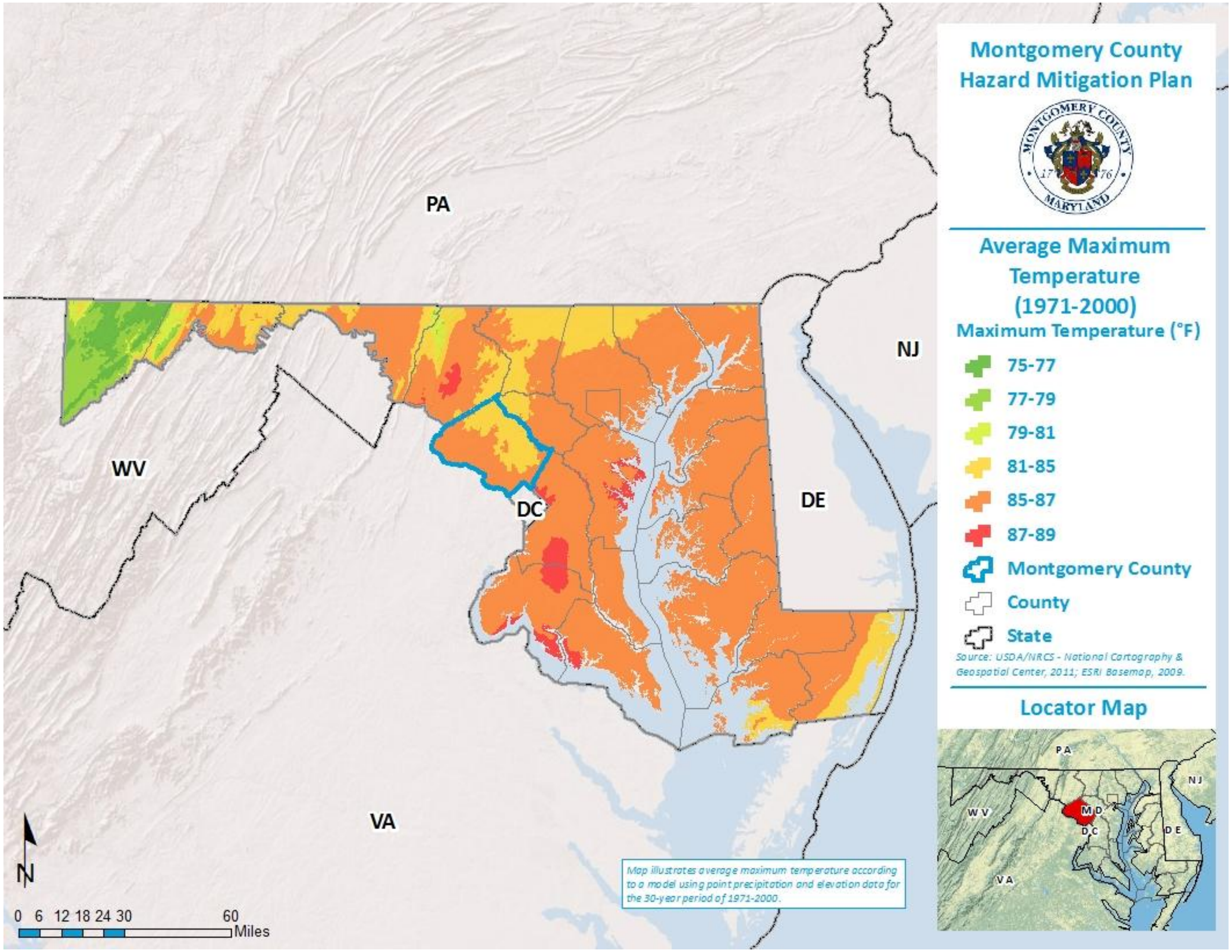


Extreme Heat Summary

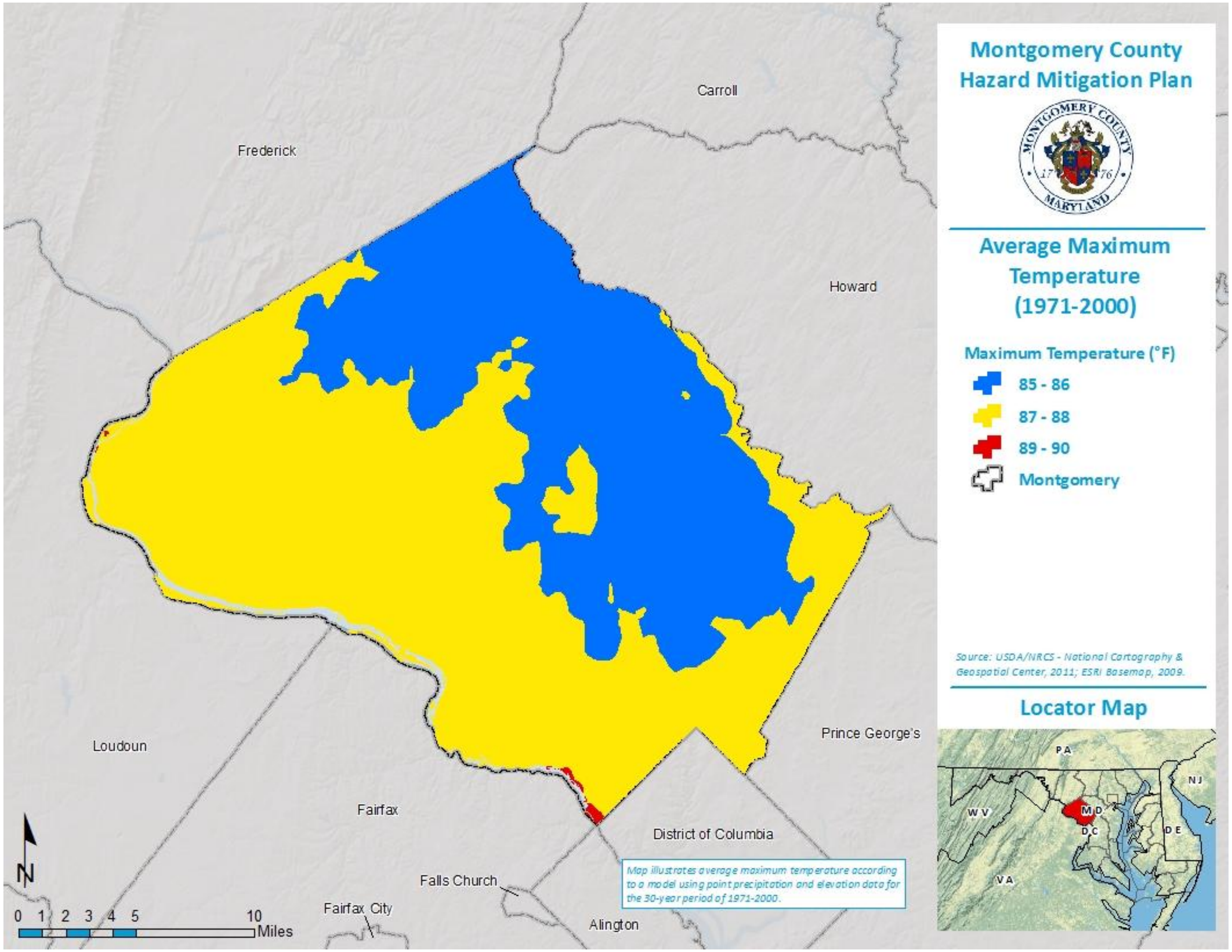
- **Causes more fatalities than floods, lightning, tornados and hurricanes combined**
- **Effects of extreme heat vary due to**
  - Population Density
  - Age of Population
  - Age of Structures
  - Duration of Extreme Heat Conditions

Extreme Heat Events Since 1983	
Number of Events	22
Number of Injuries	34.62
Number of Fatalities	8.90
Recorded Property Damages	$5,533

Extreme Heat Summary

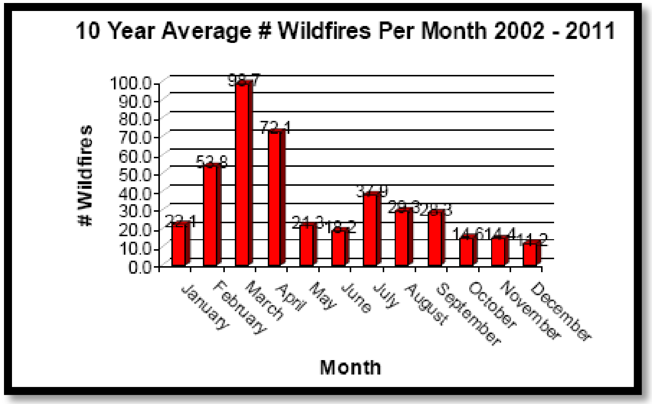


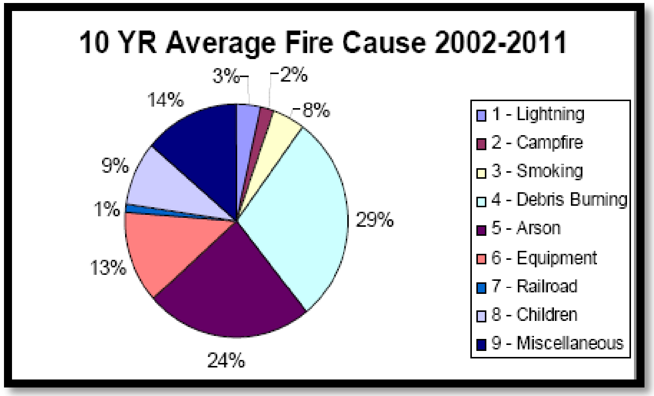
Extreme Heat Summary



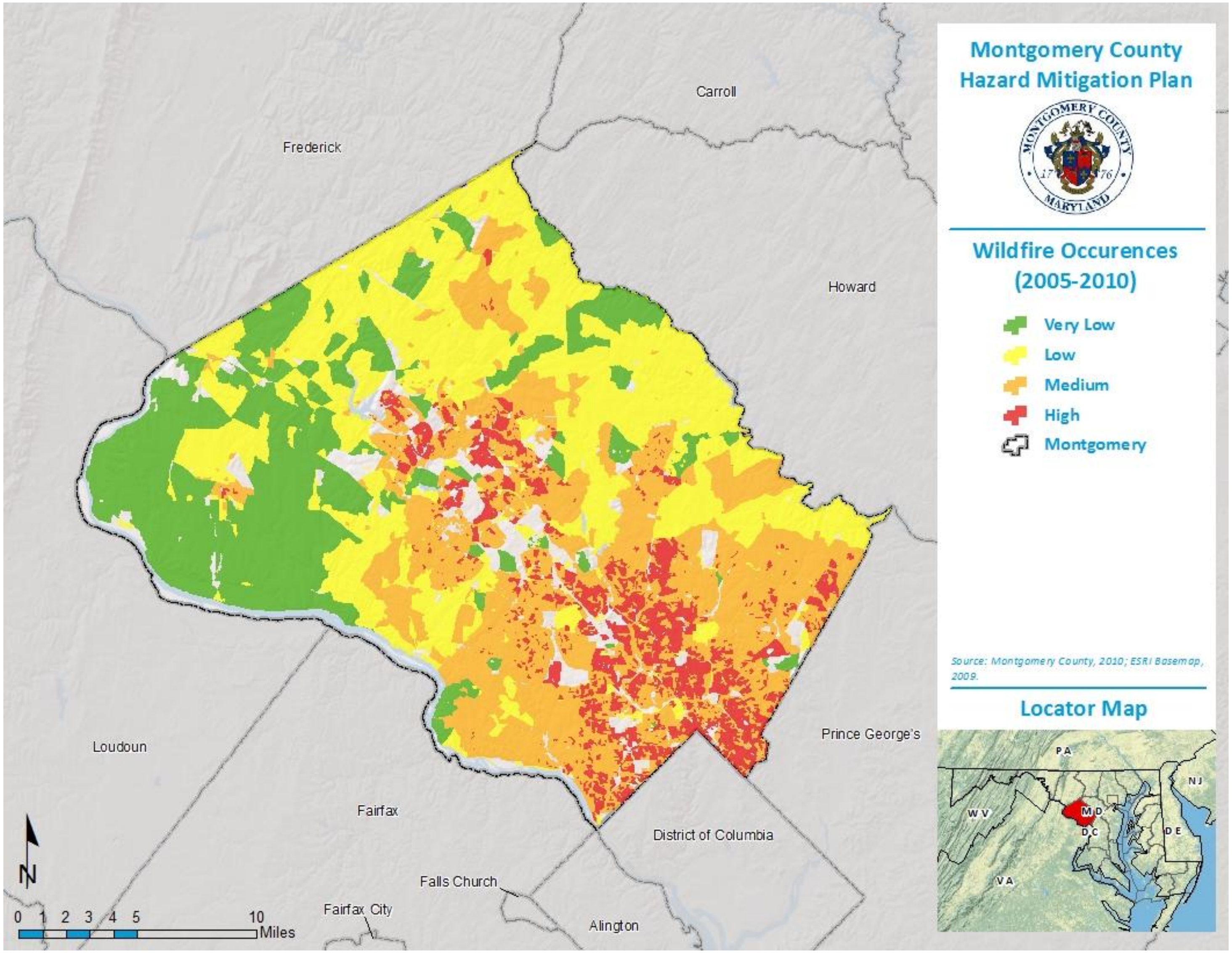
Fire Summary

- **22 wildfire occurrences in the County since 2005**
- **Over 50 acres burned**
- **Cause of fires**
  - Arson – 7
  - Smoking – 5
  - Misc. Combustion – 3
  - Equipment – 2
  - Children – 2
  - Lightning, Campfire, Debris Burning - 3

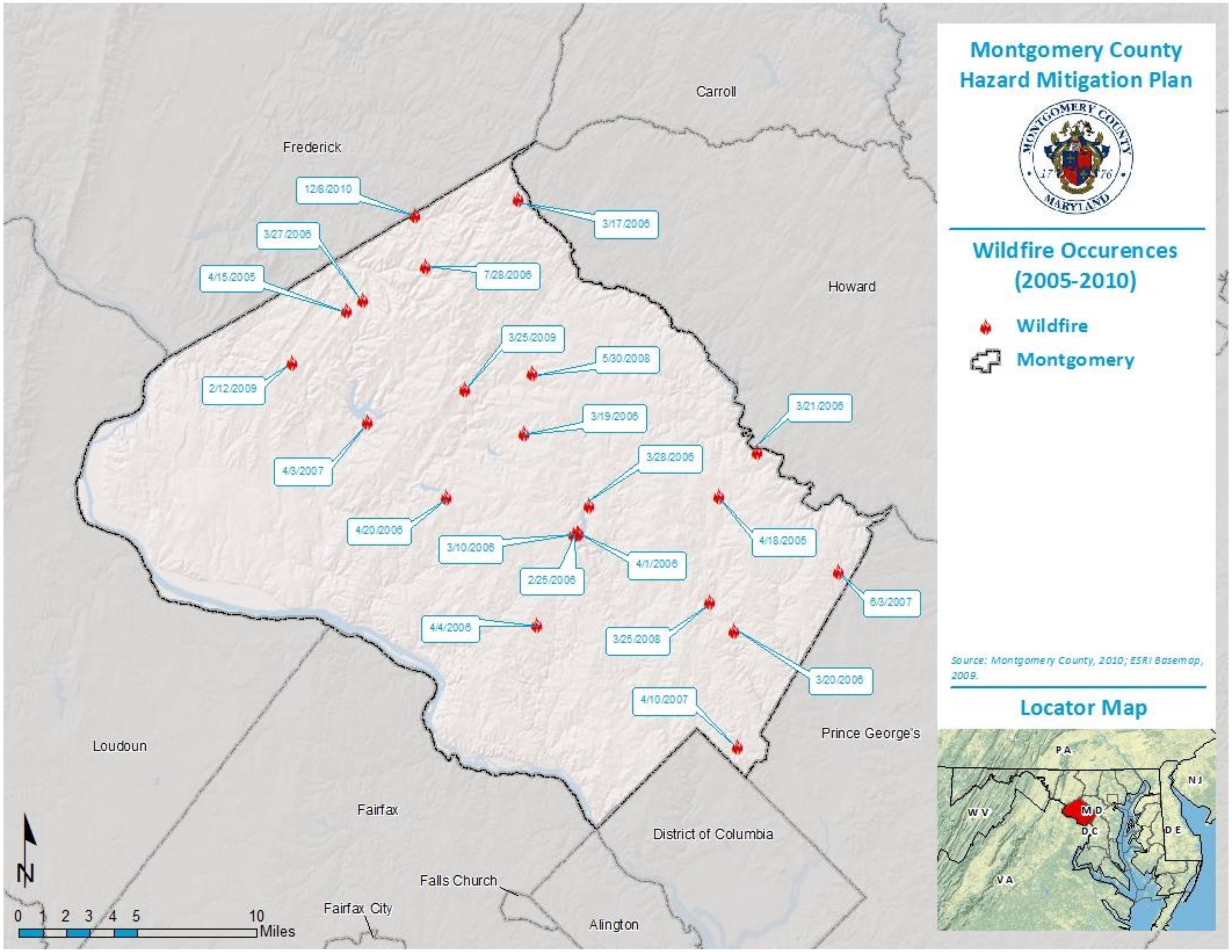




Fire Summary



Fire Summary



Flooding Summary

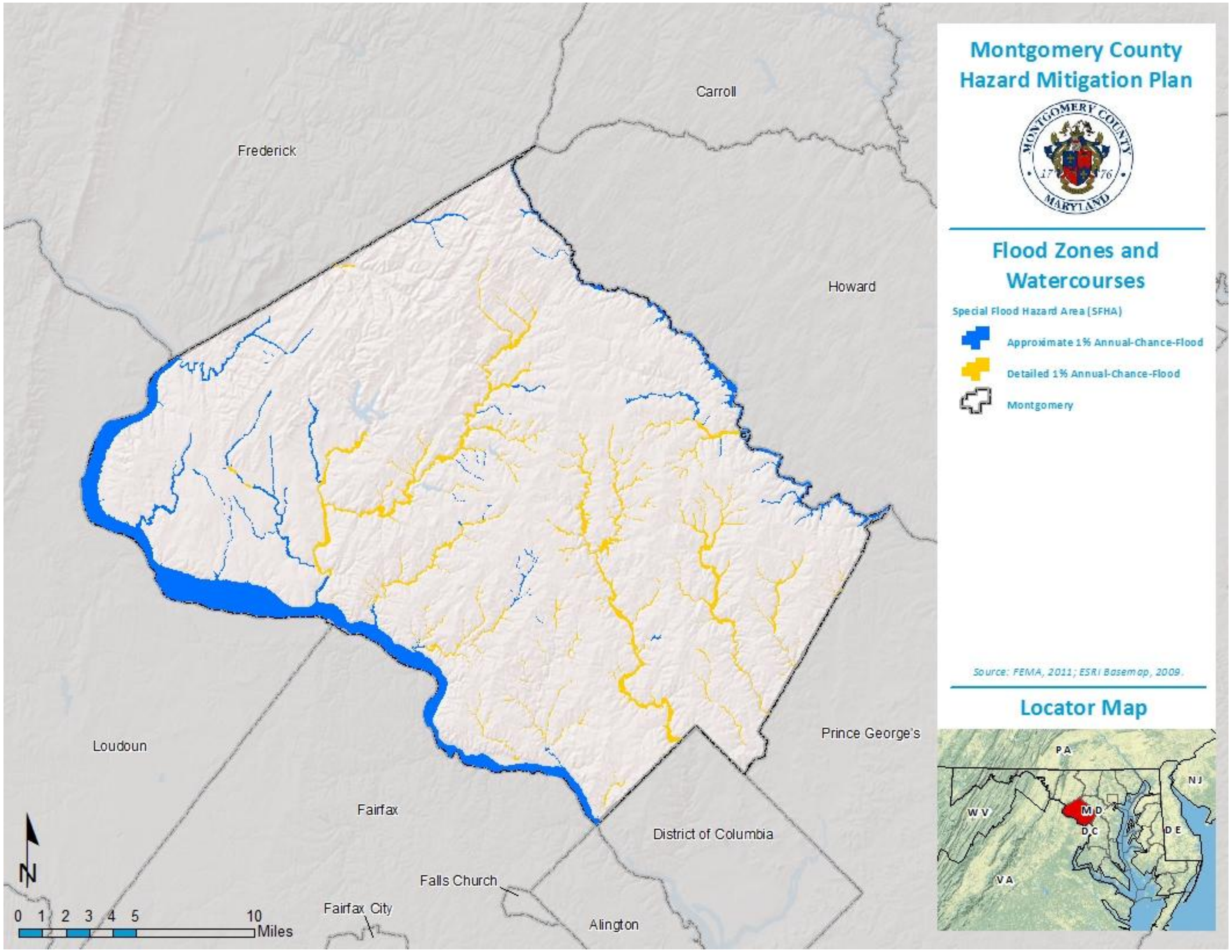
- **Flooding is one of the most common disasters in the County, with notable events including:**
  - **Hurricane Floyd – 1999**
  - **Tropical Storm Isabel – 2003**
  - **June 2006 Flooding**

Total Flood Events 1993-2010	
Total Events	112
Annualized Events	6.22
Flash Flood Events	57
Flash Flood Annualized	3.17

NFIP Policy Information	
# Policies in Force	2,019
Coverage Value	$522,941,700
Annual Premiums	$937,038
Number of Claims	408
Claims Value	$1,929,185
Average Claim	$4,728

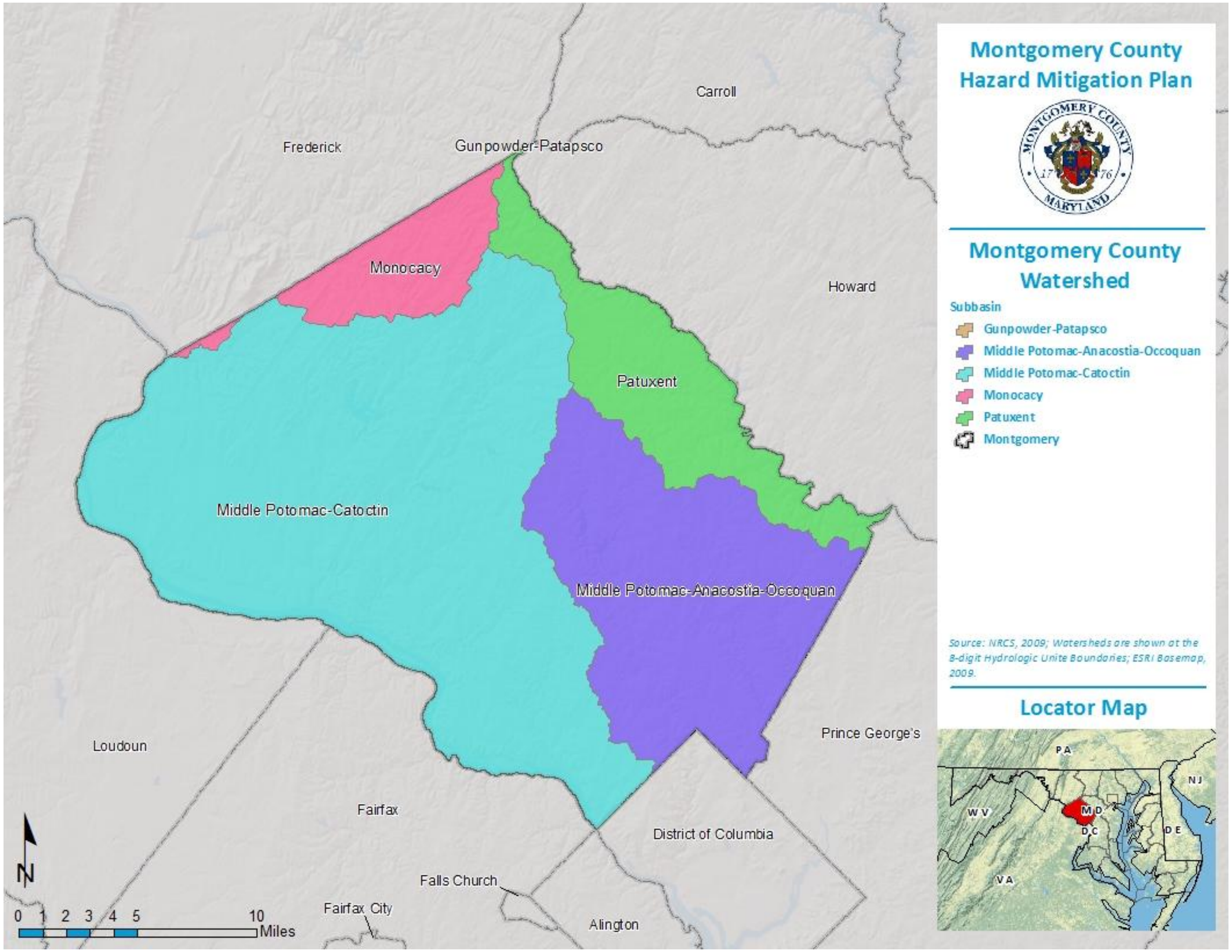
Baker

Flooding Summary



Training Outreach

Flooding Summary

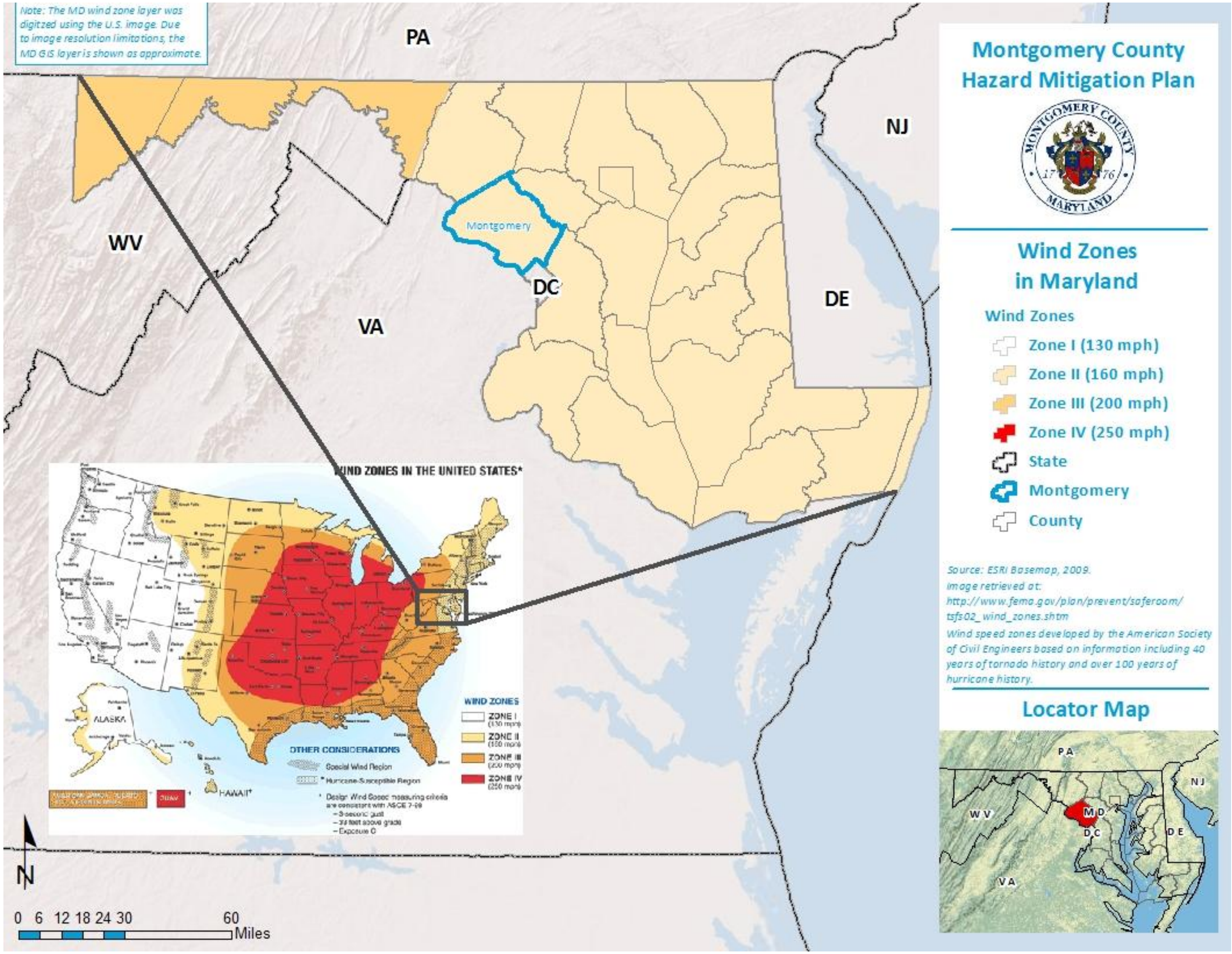


Hurricane/Tropical Storm Summary

- **Most hurricanes that make landfall in MD have been downgraded to tropical storms or depressions**
- **Downgraded storms can and do cause significant damage**

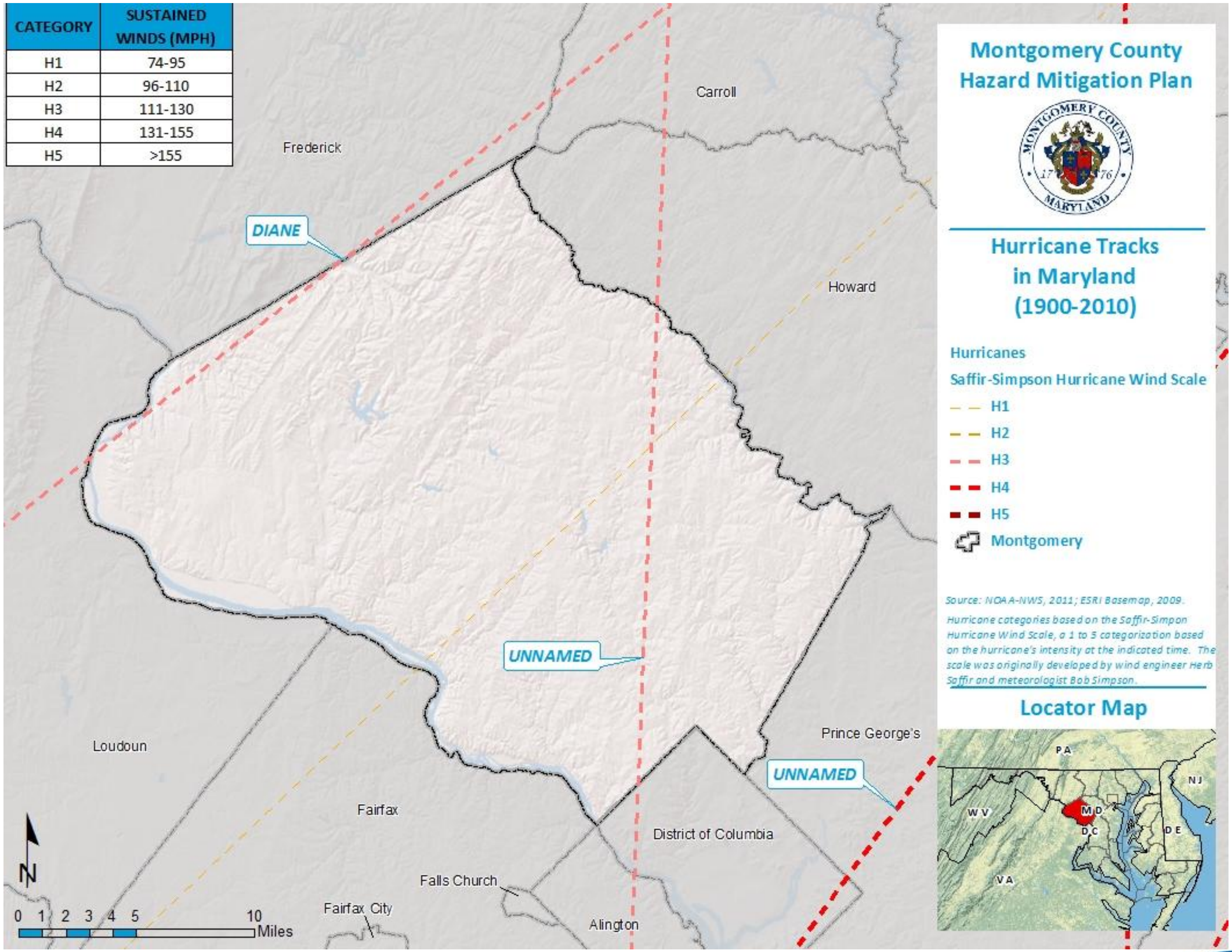
Hurricane Wind Annualized Loss Estimates by Occupancy	
Agricultural	$4,000
Commercial	$181,000
Educational	$8
Government	$10,000
Industrial	$24,000
Non-Profit	$16,000
Residential	$1,977,000
Total:	**$2,212,008**

Hurricane/Tropical Storm Summary



Baker

Hurricane/Tropical Storm Summary



CATEGORY	SUSTAINED WINDS (MPH)
H1	74-95
H2	96-110
H3	111-130
H4	131-155
H5	>155

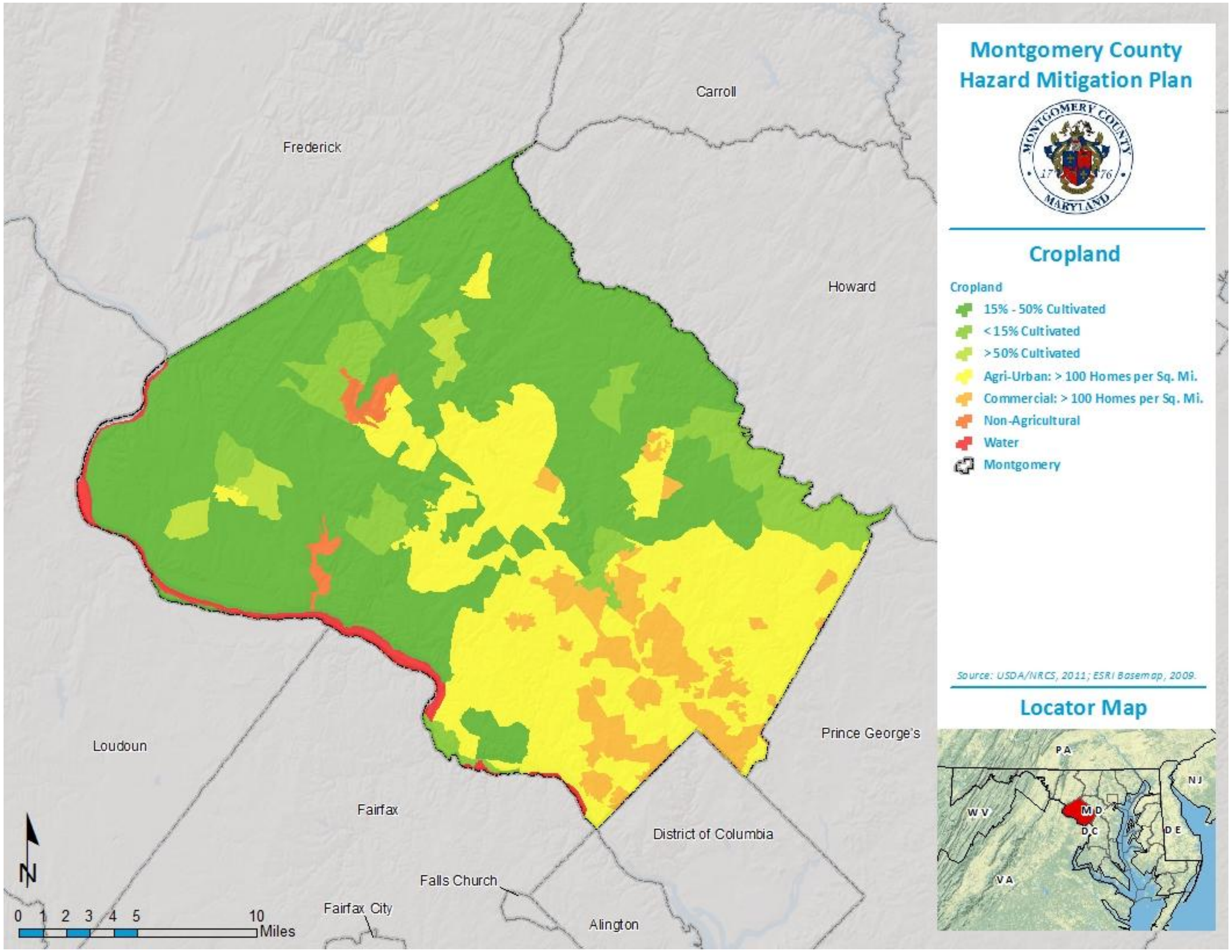
Training Outreach

Water Shortage/Drought Summary

- **Four types of drought profiled:**
  - Meteorological (dryness)
  - Agricultural (soil moisture)
  - Hydrological (water supply)
  - Socioeconomic (water management)

Previous Occurances of Drought Events	
1930-1932	Most severe drought recorded in Maryland. Rainfall was 40% below average.
1953-1956	Affected most of MD, including Montgomery Co. Recurrence interval exceeded 25 years.
1958-1971	Longest drought on record, was the most severe departure from average stream flow.
1980-1983	Widespread in the State, recurrence interval of 10-25 years, with minimal agricultural impacts.
1984-1988	Widespread agricultural losses, and disaster declarations. Losses estimated at $302 million.
1995	Dry weather and extreme heat caused widespread crop damages. Montgomery Co. damages $100m.

Water Shortage/Drought Summary

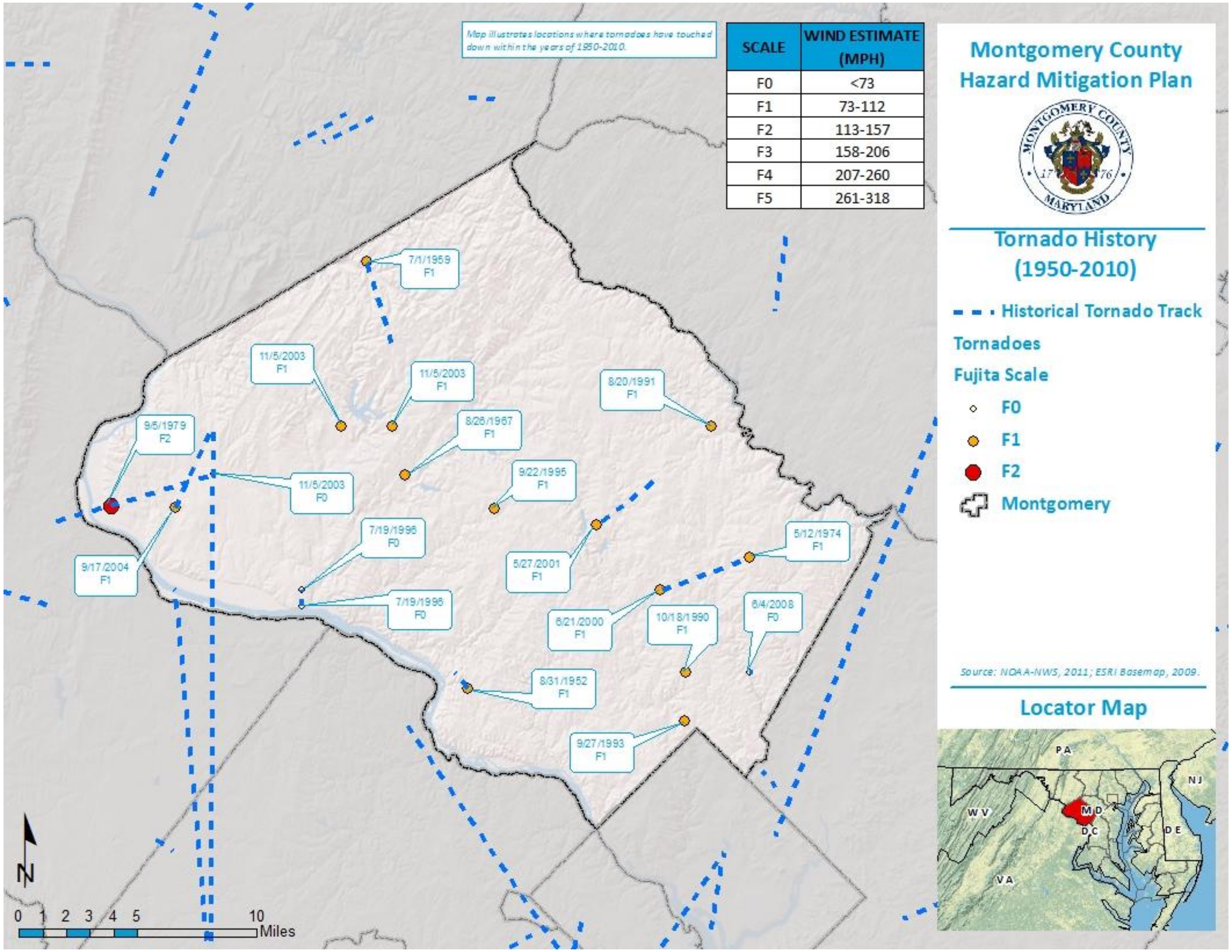


Tornado Summary

- **A total of 17 tornados confirmed in the County since 1950**
- **10/18/90 tornado struck Kensington, causing $500k in damage and one injury**
- **Two tornados on 11/5/03 caused an estimated $1.2 M in damages, with no injuries**

Total Tornado Property and Crop Damage	
Property Damage (Total)	$7,277,477
Property Damage (Annualized)	$119,303
Crop Damage (Total)	$49,522
Crop Damage (Annualized)	$812
Total Damage	$7,326,999
Total Damage (Annualized)	$120,115

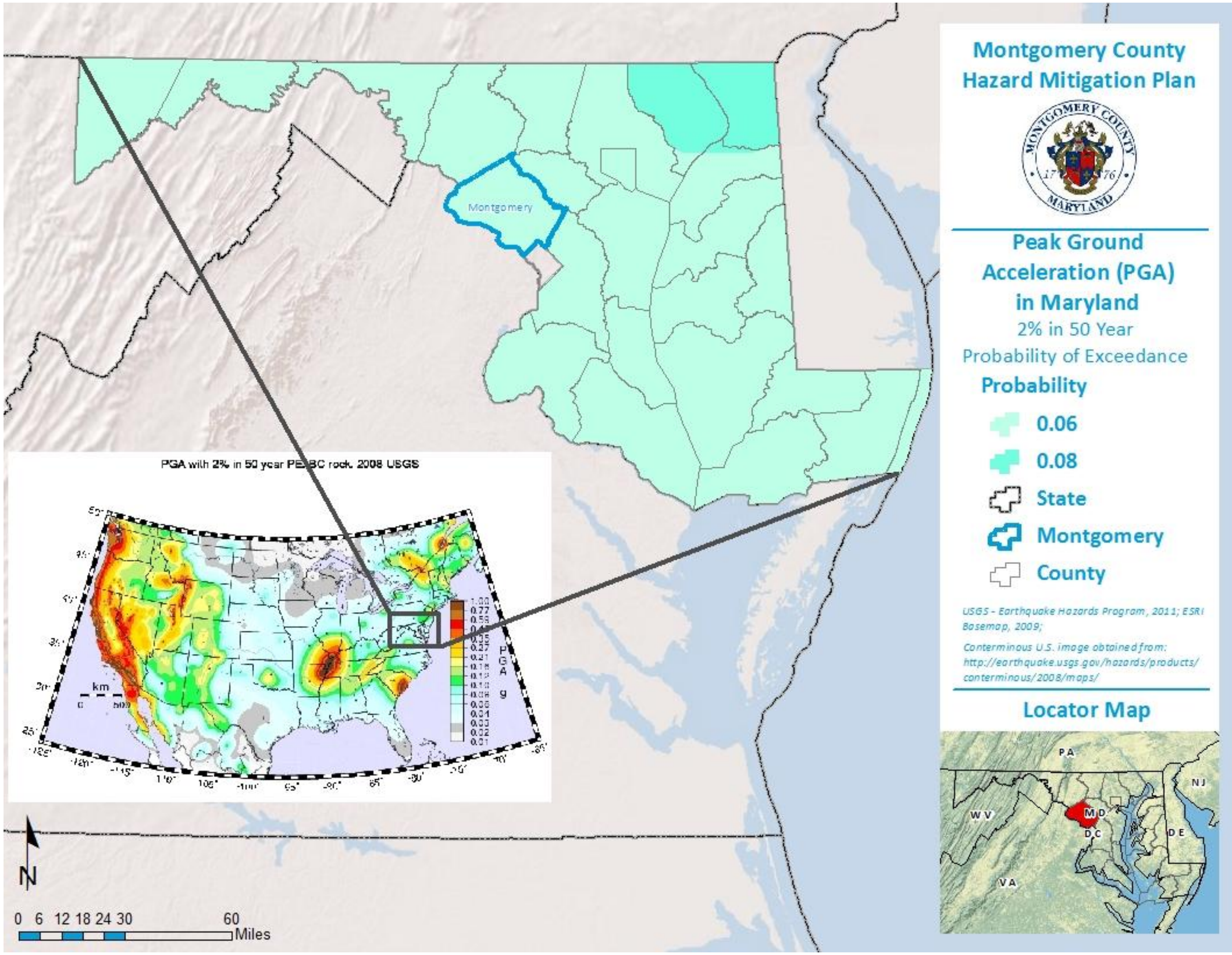
Tornado Summary



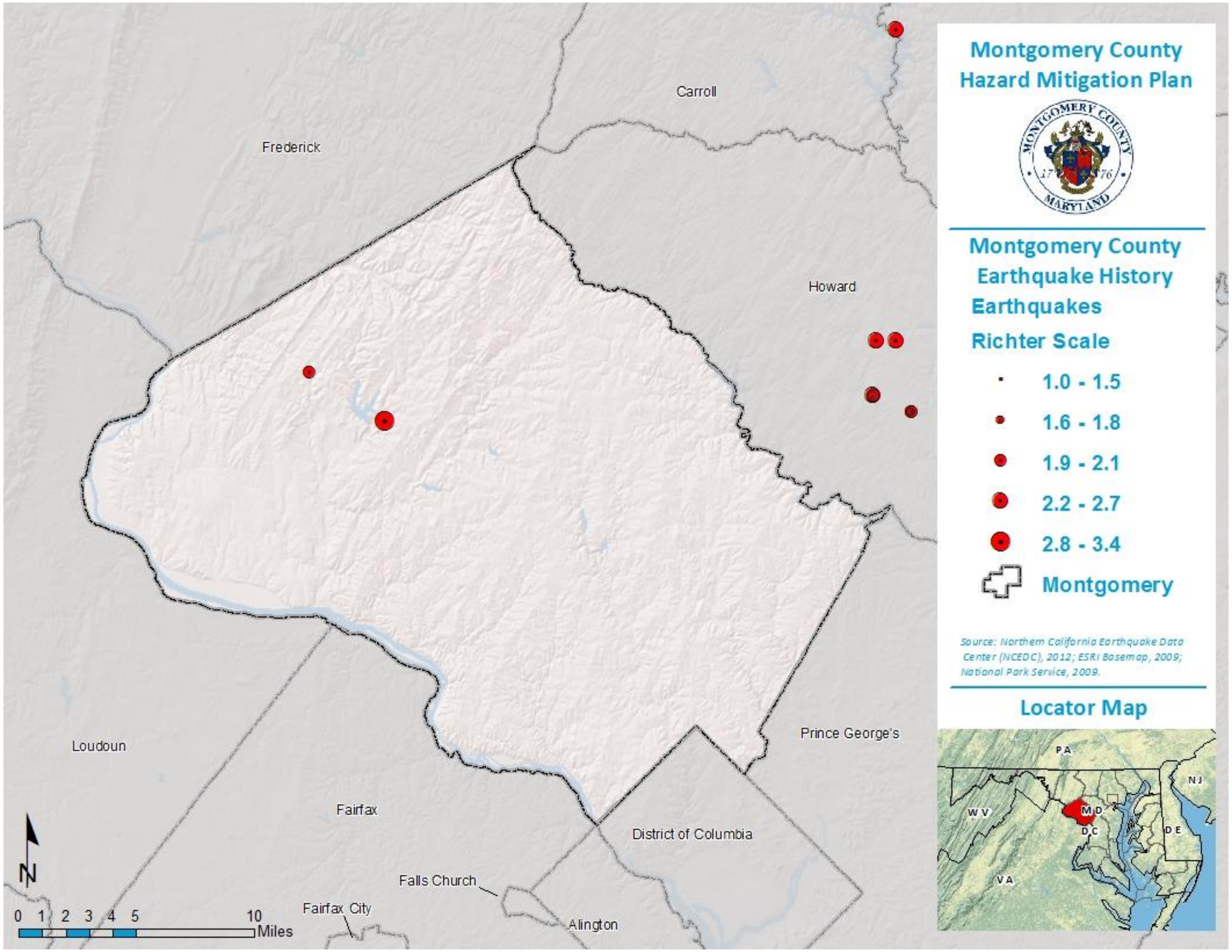
Earthquake Summary

- **Earliest earthquake recorded in Maryland was in 1758, with an estimated 3.6 magnitude**
- **68 earthquakes have been recorded in the State since 1758**
- **Last recorded earthquake originating in Montgomery County was a 3.4 on July 16, 2010**
- **On August 23, 2011 a 5.8 magnitude quake centered in Louisa County Virginia was felt in Montgomery County**

Earthquake Summary



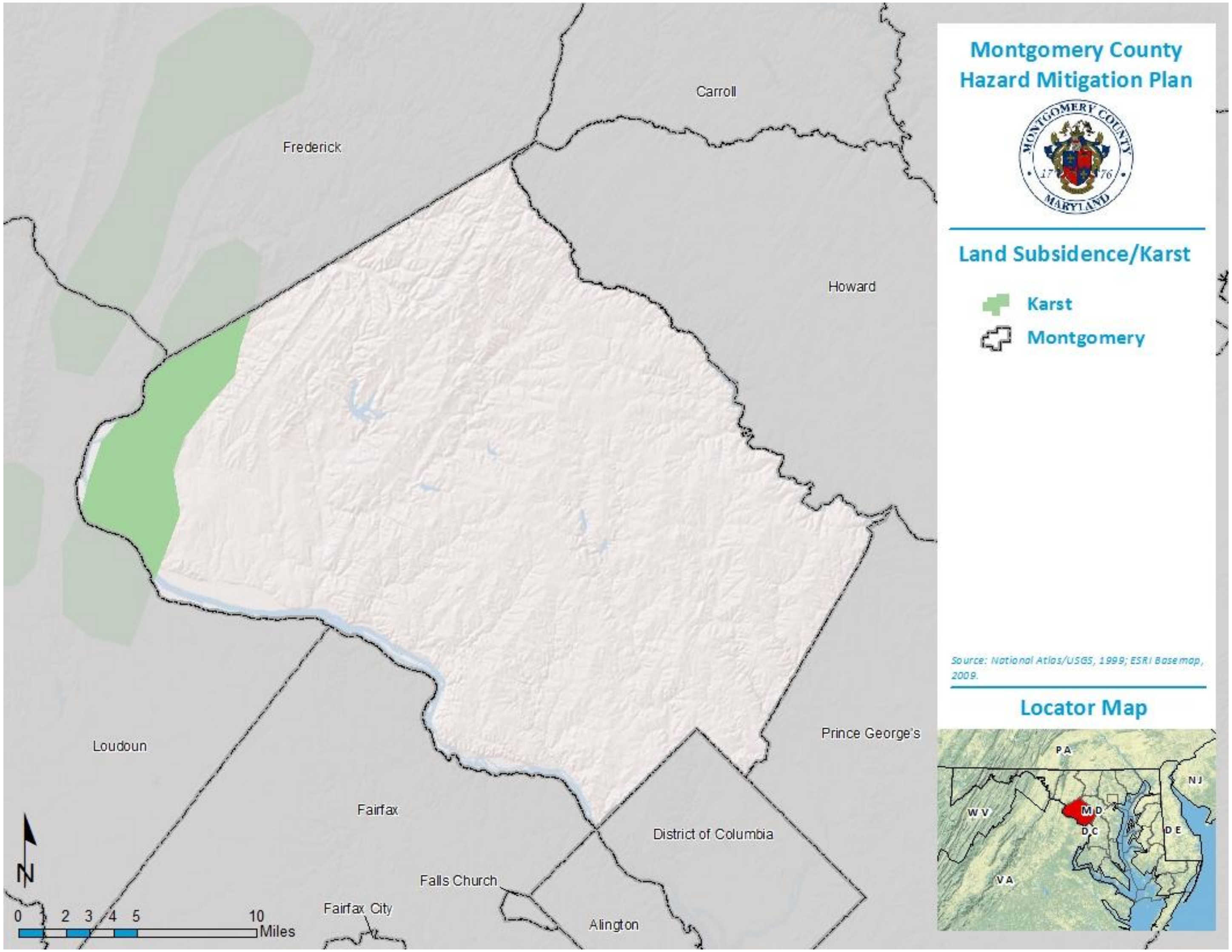
Earthquake Summary



Land Subsidence/Karst Summary

- County is in an area of low susceptibility according to the USGS Landslide Overview Map, but sinkholes occur regularly
- 2004 sinkhole in Bethesda, due to a water main break
- 2006, two sinkholes in Rockville following heavy rains
- 2007 large sinkhole in Randolph Rd over Rock Creek
- 2010 large sinkhole in Chevy Chase

Land Subsidence/Karst Summary



Hazardous Materials Summary

- **Due to the sensitive nature of this topic, its contents can be requested for review by contacting the Montgomery County Office of Emergency Management & Homeland Security.**

Hazardous Materials Summary

Due to the sensitive nature of this topic, its contents can be requested for review by contacting the Montgomery County Office of Emergency Management & Homeland Security.

Dam Failure Summary

Due to the sensitive nature of this topic, its contents can be requested for review by contacting the Montgomery County Office of Emergency Management & Homeland Security.

Dam Failure Summary

Due to the sensitive nature of this topic, its contents can be requested for review by contacting the Montgomery County Office of Emergency Management & Homeland Security.

- **Questions**

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APPENDIX E:

CAPABILITY ASSESSMENTS

These Capability Assessments were completed by the designees from each jurisdiction. They may not represent the full width and breadth of the respective jurisdiction's capabilities.

This Hazard Mitigation Capability Assessment Survey is needed to conduct an assessment of Montgomery County's existing capabilities to implement hazard mitigation activities and is being requested as part of the Montgomery County 2012 Hazard Mitigation Plan update. The information provided in response to this survey will help provide a broad overview of how local programs are currently being used to lessen the impacts of potential hazards. In order to accurately assess your jurisdiction's capability, it is critical that representatives who are familiar with existing local government programs help complete this survey.

A capability assessment has two components: an inventory of a jurisdiction's existing planning and regulatory tools and an analysis of its capacity to carry them out. The assessment process will help identify existing gaps, conflicts, and/or weaknesses that may need to be addressed through future mitigation planning goals and actions. It will also highlight the measures in place or already being performed that should continue to be supported and enhanced through future mitigation efforts. Finally, the capability assessment will help to ensure that proposed mitigation actions are deemed practical, considering the local ability to implement them.

PLEASE PROVIDE THE FOLLOWING CONTACT INFORMATION:

JURSIDICTION	Town of Brookeville
NAME / TITLE	Michael Acierno/President of Commissioners
PHONE	301 570 4465
E-MAIL	clerk@townofbrookevillemd.org

1. **PLANNING AND REGULATORY CAPABILITY —** Please indicate whether the following planning or regulatory tools (plans, ordinances, codes, or programs) are currently in place or under development for your jurisdiction by placing an "X" in the appropriate box, followed by the date of adoption/update. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Support, Neutral, or Hinder) with the appropriate symbol, and also indicate if there has been a change in the ability of the tool/program to result in loss reduction. Finally, please provide additional comments or explanations in the space provided.

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
EXAMPLE: Hazard Mitigation Plan	*X*	*1/1/2006*		*Hazard County EMA*	+	+	*Interim update in 2008 revised mitigation strategy; completed one action.*
Hazard Mitigation Plan			x				
Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	x	19/09/10		Brookeville Planning Commission	0	+	
Floodplain Management Plan				Montgomery County			
Open Space Management Plan (or Parks/Rec or Greenways Plan)				Montgomery County			
Stormwater Management Plan/Ordinance				Montgomery County			
Natural Resource Protection Plan				Montgomery County			
Flood Response Plan				Montgomery County			
Emergency Operations Plan			x	Montgomery County			
Continuity of Operations Plan			x				

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Evacuation Plan							
Disaster Recovery Plan							
Capital Improvement Plan							
Economic Development Plan							
Historic Preservation Plan	x			BPC/HPC			BPC=Brookeville Planning Commission HPC=Historic Preservation Committee
Floodplain Regulations							
Zoning Regulations							
Subdivision Regulations							
Unified Development Ordinance							
Post-Disaster Redevelopment/ Reconstruction Ordinance							
Building Code							
Fire Code							
National Flood Insurance Program							
National Flood Insurance Program – CRS							

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Firewise							
Storm Ready							
Farmland Preservation							
Other:							
Other:							
Other:							
Other:							

2. **ADMINISTRATIVE AND TECHNICAL CAPABILITY —** Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "X" in the appropriate box. Then, if "yes," please identify the department or agency they work under and provide any other comments you may have in the space provided or with attachments.

Staff/Personnel Resources	Yes	No	Department/Agency	Comments
Planners with knowledge of land development/management practices	x		Brookeville Planning Commission	
Engineers or professionals trained in construction practices related to buildings and/or infrastructure (includes building inspectors)		x		
Planners or engineers with an understanding of natural and/or human-caused hazards		x		
Emergency manager		x		
Floodplain manager		x		
Land surveyors		x		
Scientist familiar with the hazards of the community		x		
Staff with the education or expertise to assess the community's vulnerability to hazards		x		
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program		x		
Resource development staff or grant writers		x		
Fiscal staff to handle large/complex grants		x		
Other:				

3. FISCAL CAPABILITY — Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources ***for hazard mitigation purposes*** (including match funds for state or federal mitigation grant funds). Then, identify the primary department or agency responsible for its administration or allocation and provide any other comments you may have in the space provided or with attachments.

Financial Resources	Yes	No	Department/Agency	Comments
Capital improvement programming		x		
Community Development Block Grants (CDBGs)		x		
Special purpose taxes		x		
Gas/electric utility fees		x		
Water/sewer fees		x		
Stormwater utility fees		x		
Development impact fees		x		
General obligation, revenue, and/or special tax bonds		x		
Partnering arrangements or intergovernmental agreements	x		Brookeville Commissioners	
Other:				
Other:				

4. COMMUNITY POLITICAL CAPABILITY — Political capability in this instance is being measured by the degree to which local political leadership (including appointed boards) *is willing* to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (e.g., building codes, floodplain management, etc.). Rate the jurisdiction's political capability to enact policies and programs that reduce hazard vulnerabilities on a scale from 0 to 5: generally, the higher the score, the higher degree of community political capability.

5-Very Willing **3-Moderately Willing** **0-Unwilling to Adopt Policies/Programs** **SCORE: _____4_____**

5. COMMUNITY RESILIENCY CAPABILITY AFTER AN EVENT (CONSEQUENCE ANALYSIS) — Community capability to recover after an event can be measured by considering consequences of an event on several community systems. The question below uses an impact score to describe how the particular community system would be impacted after a large hazard event. Please use a scale of 0 to 5 for the impact score as described below. Then, provide a general description of potential consequences that would occur for each system element. Generally, the lower the impact scores are, the higher degree of community resiliency capability there will be.

5-Significantly Impacted **3-Moderately Impacted** **0-No Impacts to System**

Impacted System	Impact Score	Potential Consequences If Significant Event Occurs
Public	1	Brookeville provides trash and recycling services. All other public services are provided by Montgomery County and the State.
Responders	0	Brookeville does not employ any responders. Rely upon Montgomery County.
Continuity of operations of local government, including continued delivery of services	2	Local government is made up of Brookeville residents. Being neighbors, we cam communicate and coordinate under emergency conditions.
Property, facilities, and infrastructure	5	Limited ingress/egress to Brookeville can potentially isolate the town for extended periods of time. The town is responsible for local roads, the historic Brookeville Academy, and the historic schoolhouse.
Environment	2	Environmental hazards to the town have been realted to extreme snow events and damage due to high winds and falling trees.
Economic condition of the jurisdiction	4	Serious damage to infrastructure and/or historic buildings wouldp ose a significant threat to the town’s finances and economic health.

Public confidence in the jurisdiction's governance	1	Past events have brought the town residents and local government together in a productive way. The small size of the town and government made up od resident volunteers fosters a greater sense of community and working together.

6. SELF-ASSESSMENT OF CAPABILITY — Please provide an approximate measure of your jurisdiction's capability to effectively implement hazard mitigation strategies to reduce hazard vulnerabilities. Using the following table, please place an "X" in the box marking the most appropriate degree of capability (Limited, Moderate, or High) based upon best available information and the responses provided in Sections 1-5 of this survey.

AREA	DEGREE OF CAPABILITY		
	LIMITED	MODERATE	HIGH
Planning and Regulatory Capability	x		
Administrative and Technical Capability	x		
Fiscal Capability	x		
Community Political Capability			x
Community Resiliency Capability			x

This Hazard Mitigation Capability Assessment Survey is needed to conduct an assessment of Montgomery County's existing capabilities to implement hazard mitigation activities and is being requested as part of the Montgomery County 2012 Hazard Mitigation Plan update. The information provided in response to this survey will help provide a broad overview of how local programs are currently being used to lessen the impacts of potential hazards. In order to accurately assess your jurisdiction's capability, it is critical that representatives who are familiar with existing local government programs help complete this survey.

A capability assessment has two components: an inventory of a jurisdiction's existing planning and regulatory tools and an analysis of its capacity to carry them out. The assessment process will help identify existing gaps, conflicts, and/or weaknesses that may need to be addressed through future mitigation planning goals and actions. It will also highlight the measures in place or already being performed that should continue to be supported and enhanced through future mitigation efforts. Finally, the capability assessment will help to ensure that proposed mitigation actions are deemed practical, considering the local ability to implement them.

PLEASE PROVIDE THE FOLLOWING CONTACT INFORMATION:

JURSIDICTION	Chevy Chase Village
NAME / TITLE	Michael Younes, Director of Municipal Operations
PHONE	301-654-7300
E-MAIL	Michael.younes@montgomerycountymd.gov

1. **PLANNING AND REGULATORY CAPABILITY —** Please indicate whether the following planning or regulatory tools (plans, ordinances, codes, or programs) are currently in place or under development for your jurisdiction by placing an "X" in the appropriate box, followed by the date of adoption/update. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Support, Neutral, or Hinder) with the appropriate symbol, and also indicate if there has been a change in the ability of the tool/program to result in loss reduction. Finally, please provide additional comments or explanations in the space provided.

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
EXAMPLE: Hazard Mitigation Plan	*X*	*1/1/2006*		*Hazard County EMA*	+	+	*Interim update in 2008 revised mitigation strategy; completed one action.*
Hazard Mitigation Plan	X	1/2007		Montgomery County EMA	+	+	
Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)							
Floodplain Management Plan							
Open Space Management Plan (or Parks/Rec or Greenways Plan)							
Stormwater Management Plan/Ordinance							
Natural Resource Protection Plan							
Flood Response Plan							
Emergency Operations Plan	X	6/2011		Chevy Chase Village Admin.	+	+	
Continuity of Operations Plan	X	5/2011		Chevy Chase Village Admin.	+	+	

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Evacuation Plan							
Disaster Recovery Plan							
Capital Improvement Plan	X	4/2011	X	Chevy Chase Village Board of Managers	+	+	Currently under development for FY2013
Economic Development Plan							
Historic Preservation Plan							
Floodplain Regulations							
Zoning Regulations							
Subdivision Regulations							
Unified Development Ordinance							
Post-Disaster Redevelopment/ Reconstruction Ordinance							
Building Code	X	Ongoing		Chevy Chase Village Board of Managers	+	+	
Fire Code							
National Flood Insurance Program	X	3/2006		Chevy Chase Village Admin.	+	+	
National Flood Insurance Program – CRS							
Tool/Program	Status			Dept. /	Effect on Loss	Change	Comments:

	In Place	Date Adopted or Updated	Under Develop-ment	Agency Responsible	Reduction: + Support O Neutral -- Hinder	Since Last Plan: + Positive -- Negative	
Firewise							
Storm Ready							
Farmland Preservation							
Other:							
Other:							
Other:							
Other:							

2. **ADMINISTRATIVE AND TECHNICAL CAPABILITY —** Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "X" in the appropriate box. Then, if "yes," please identify the department or agency they work under and provide any other comments you may have in the space provided or with attachments.

Staff/Personnel Resources	Yes	No	Department/Agency	Comments
Planners with knowledge of land development/management practices		X		
Engineers or professionals trained in construction practices related to buildings and/or infrastructure (includes building inspectors)	X		Administration and Capital Projects/Contracts	
Planners or engineers with an understanding of natural and/or human-caused hazards	X		Administration and Capital Projects/Contracts	
Emergency manager	X		Administration and Capital Projects/Contracts	
Floodplain manager		X		
Land surveyors		X		
Scientist familiar with the hazards of the community		X		
Staff with the education or expertise to assess the community's vulnerability to hazards	X		Administration and Capital Projects/Contracts	
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program	X		Administration and Capital Projects/Contracts	
Resource development staff or grant writers	X		Administration and Capital Projects/Contracts and Police	
Fiscal staff to handle large/complex grants	X		Administration and Capital Projects/Contracts and Police	
Other:				

3. FISCAL CAPABILITY — Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources ***for hazard mitigation purposes*** (including match funds for state or federal mitigation grant funds). Then, identify the primary department or agency responsible for its administration or allocation and provide any other comments you may have in the space provided or with attachments.

Financial Resources	Yes	No	Department/Agency	Comments
Capital improvement programming	X		Administration and Capital Projects/Contracts	
Community Development Block Grants (CDBGs)		X		
Special purpose taxes		X		
Gas/electric utility fees		X		
Water/sewer fees		X		
Stormwater utility fees		X		
Development impact fees		X		
General obligation, revenue, and/or special tax bonds		X		
Partnering arrangements or intergovernmental agreements		X		
Other:				
Other:				

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5-Significantly Impacted **3-Moderately Impacted** **0-No Impacts to System**

Impacted System	Impact Score	Potential Consequences If Significant Event Occurs
Public	1	
Responders	3	
Continuity of operations of local government, including continued delivery of services	4	
Property, facilities, and infrastructure	4	
Environment	2	
Economic condition of the jurisdiction	2	
Public confidence in the jurisdiction's governance	1	

6. SELF-ASSESSMENT OF CAPABILITY — Please provide an approximate measure of your jurisdiction's capability to effectively implement hazard mitigation strategies to reduce hazard vulnerabilities. Using the following table, please place an "X" in the box marking the most appropriate degree of capability (Limited, Moderate, or High) based upon best available information and the responses provided in Sections 1-5 of this survey.

AREA	DEGREE OF CAPABILITY		
	LIMITED	MODERATE	HIGH
Planning and Regulatory Capability		X	
Administrative and Technical Capability		X	
Fiscal Capability		X	
Community Political Capability		X	
Community Resiliency Capability		X	

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PLEASE PROVIDE THE FOLLOWING CONTACT INFORMATION:

JURSIDICTION	Town of Chevy Chase, MD (TOCC)
NAME / TITLE	Todd Hoffman, Town Manager
PHONE	301-654-7144
E-MAIL	thoffman@townofchevychase.org

1. **PLANNING AND REGULATORY CAPABILITY** — Please indicate whether the following planning or regulatory tools (plans, ordinances, codes, or programs) are currently in place or under development for your jurisdiction by placing an "X" in the appropriate box, followed by the date of adoption/update. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Support, Neutral, or Hinder) with the appropriate symbol, and also indicate if there has been a change in the ability of the tool/program to result in loss reduction. Finally, please provide additional comments or explanations in the space provided.

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EXAMPLE: Hazard Mitigation Plan	*X*	*1/1/2006*		*Hazard County EMA*	+	+	*Interim update in 2008 revised mitigation strategy; completed one action.*
Hazard Mitigation Plan							
Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	X	3-07		TOCC	O		Strategic Plan
Floodplain Management Plan							
Open Space Management Plan (or Parks/Rec or Greenways Plan)							
Stormwater Management Plan/Ordinance							
Natural Resource Protection Plan							
Flood Response Plan							
Emergency Operations Plan							
Continuity of Operations Plan							

Tool/Program	Status: In Place	Status: Date Adopted or Updated	Status: Under Develop-ment	Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
Evacuation Plan							
Disaster Recovery Plan							
Capital Improvement Plan	X			TOCC	O		
Economic Development Plan							
Historic Preservation Plan							
Floodplain Regulations							
Zoning Regulations	X			TOCC	O		
Subdivision Regulations							limited
Unified Development Ordinance							
Post-Disaster Redevelopment/ Reconstruction Ordinance							
Building Code	X			TOCC	+		
Fire Code							
National Flood Insurance Program	X			TOCC	+		
National Flood Insurance Program – CRS							

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Firewise							
Storm Ready							
Farmland Preservation							
Other:							
Other:							
Other:							
Other:							

2. **ADMINISTRATIVE AND TECHNICAL CAPABILITY** — Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "X" in the appropriate box. Then, if "yes," please identify the department or agency they work under and provide any other comments you may have in the space provided or with attachments.

Staff/Personnel Resources	Yes	No	Department/Agency	Comments
Planners with knowledge of land development/management practices				
Engineers or professionals trained in construction practices related to buildings and/or infrastructure (includes building inspectors)	X		TOCC	
Planners or engineers with an understanding of natural and/or human-caused hazards				
Emergency manager				
Floodplain manager				
Land surveyors				
Scientist familiar with the hazards of the community				
Staff with the education or expertise to assess the community's vulnerability to hazards				
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program	X		TOCC	
Resource development staff or grant writers				
Fiscal staff to handle large/complex grants				
Other:				

3. FISCAL CAPABILITY — Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources ***for hazard mitigation purposes*** (including match funds for state or federal mitigation grant funds). Then, identify the primary department or agency responsible for its administration or allocation and provide any other comments you may have in the space provided or with attachments.

Financial Resources	Yes	No	Department/Agency	Comments
Capital improvement programming	X		TOCC	
Community Development Block Grants (CDBGs)				
Special purpose taxes				
Gas/electric utility fees				
Water/sewer fees				
Stormwater utility fees				
Development impact fees				
General obligation, revenue, and/or special tax bonds	X		TOCC	
Partnering arrangements or intergovernmental agreements	X		TOCC	County Hazard Mitigation Plan County Debris Mgmt. Plan
Other:				
Other:				

4. COMMUNITY POLITICAL CAPABILITY — Political capability in this instance is being measured by the degree to which local political leadership (including appointed boards) *is willing* to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (e.g., building codes, floodplain management, etc.). Rate the jurisdiction's political capability to enact policies and programs that reduce hazard vulnerabilities on a scale from 0 to 5: generally, the higher the score, the higher degree of community political capability.

5-Very Willing **3-Moderately Willing** **0-Unwilling to Adopt Policies/Programs**

SCORE: 4

5. COMMUNITY RESILIENCY CAPABILITY AFTER AN EVENT (CONSEQUENCE ANALYSIS) — Community capability to recover after an event can be measured by considering consequences of an event on several community systems. The question below uses an impact score to describe how the particular community system would be impacted after a large hazard event. Please use a scale of 0 to 5 for the impact score as described below. Then, provide a general description of potential consequences that would occur for each system element. Generally, the lower the impact scores are, the higher degree of community resiliency capability there will be.

5-Significantly Impacted ←→ **3-Moderately Impacted** ←→ **0-No Impacts to System**

Impacted System	Impact Score	Potential Consequences If Significant Event Occurs
Public	3	
Responders	3	
Continuity of operations of local government, including continued delivery of services	3	
Property, facilities, and infrastructure	3	
Environment	3	
Economic condition of the jurisdiction	3	

Public confidence in the jurisdiction's governance	3	

6. SELF-ASSESSMENT OF CAPABILITY — Please provide an approximate measure of your jurisdiction's capability to effectively implement hazard mitigation strategies to reduce hazard vulnerabilities. Using the following table, please place an "X" in the box marking the most appropriate degree of capability (Limited, Moderate, or High) based upon best available information and the responses provided in Sections 1-5 of this survey.

AREA	DEGREE OF CAPABILITY		
	LIMITED	MODERATE	HIGH
Planning and Regulatory Capability	X		
Administrative and Technical Capability	X		
Fiscal Capability		X	
Community Political Capability		X	
Community Resiliency Capability		X	

This Hazard Mitigation Capability Assessment Survey is needed to conduct an assessment of Montgomery County's existing capabilities to implement hazard mitigation activities and is being requested as part of the Montgomery County 2012 Hazard Mitigation Plan update. The information provided in response to this survey will help provide a broad overview of how local programs are currently being used to lessen the impacts of potential hazards. In order to accurately assess your jurisdiction's capability, it is critical that representatives who are familiar with existing local government programs help complete this survey.

A capability assessment has two components: an inventory of a jurisdiction's existing planning and regulatory tools and an analysis of its capacity to carry them out. The assessment process will help identify existing gaps, conflicts, and/or weaknesses that may need to be addressed through future mitigation planning goals and actions. It will also highlight the measures in place or already being performed that should continue to be supported and enhanced through future mitigation efforts. Finally, the capability assessment will help to ensure that proposed mitigation actions are deemed practical, considering the local ability to implement them.

PLEASE PROVIDE THE FOLLOWING CONTACT INFORMATION:

JURSIDICTION	Gaithersburg, Maryland
NAME / TITLE	William Lanham / Emergency Management Coordinator
PHONE	301-258-6400
E-MAIL	wlanham@gaithersburgmd.gov

1. **PLANNING AND REGULATORY CAPABILITY —** Please indicate whether the following planning or regulatory tools (plans, ordinances, codes, or programs) are currently in place or under development for your jurisdiction by placing an "X" in the appropriate box, followed by the date of adoption/update. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Support, Neutral, or Hinder) with the appropriate symbol, and also indicate if there has been a change in the ability of the tool/program to result in loss reduction. Finally, please provide additional comments or explanations in the space provided.

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
EXAMPLE: Hazard Mitigation Plan	*X*	1/1/2006		Hazard County EMA	+	+	*Interim update in 2008 revised mitigation strategy; completed one action.*
Hazard Mitigation Plan		2007					Signatory to County Hazard Mitigation Plan
Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	X	LU 12/19/2012 Growth 4/14/2009		Planning & Code Administration	+	+	
Floodplain Management Plan	X	9/29/2006		Planning & Code Administration	+	+	
Open Space Management Plan (or Parks/Rec or Greenways Plan)	X	12/1999		Parks, Recreation & Culture	+	+	
Stormwater Management Plan/Ordinance	X	6/21/2010		Public Works & Planning & Code Admin.	+	+	
Natural Resource Protection Plan	X	5/4/2010		Planning & Code Admin.	+	+	
Flood Response Plan							
Emergency Operations Plan	X	4/19/2010		Police	+	+	
Continuity of Operations Plan							

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Evacuation Plan							
Disaster Recovery Plan							
Capital Improvement Plan	*X*			*City Manager's Office*	+	+	
Economic Development Plan	*X*			*City Manager's Office*	+	+	
Historic Preservation Plan	*X*	*9/27/2010*		*Planning & Code Administration*	0		
Floodplain Regulations	*X*	*9/5/2006*		*Planning & Code Administration*	+	+	
Zoning Regulations	*X*	*10/24/2011*		*Planning & Code Administration*	+	+	
Subdivision Regulations	*X*	*4/5/2010*		*Planning & Code Administration*	+	+	
Unified Development Ordinance							
Post-Disaster Redevelopment/ Reconstruction Ordinance							
Building Code	*X*	*5/9/2011*	*X - Revision*	*Planning & Code Administration*	+	+	
Fire Code	*X*	*5/9/2011*	*X - Revision*	*Planning & Code Administration*	+	+	
National Flood Insurance Program	*X*	*9/5/2006*		*Planning & Code Administration*	+	+	
National Flood Insurance Program – CRS							

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Firewise							
Storm Ready							
Farmland Preservation							
Other:							
Other:							
Other:							
Other:							

2. **ADMINISTRATIVE AND TECHNICAL CAPABILITY —** Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "X" in the appropriate box. Then, if "yes," please identify the department or agency they work under and provide any other comments you may have in the space provided or with attachments.

Staff/Personnel Resources	Yes	No	Department/Agency	Comments
Planners with knowledge of land development/management practices	X		*Planning & Code Administration*	
Engineers or professionals trained in construction practices related to buildings and/or infrastructure (includes building inspectors)	X		*Planning & Code Administration Public Works*	
Planners or engineers with an understanding of natural and/or human-caused hazards	X		*Planning & Code Administration Public Works*	
Emergency manager	X		*Police*	
Floodplain manager	X		*Planning & Code Administration*	
Land surveyors		X		
Scientist familiar with the hazards of the community		X		
Staff with the education or expertise to assess the community's vulnerability to hazards	X		*Police & Planning & Code Administration*	
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program	X		*Planning & Code Administration*	
Resource development staff or grant writers	X		*Finance*	
Fiscal staff to handle large/complex grants	X		*Finance*	
Other:				

3. FISCAL CAPABILITY — Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources ***for hazard mitigation purposes*** (including match funds for state or federal mitigation grant funds). Then, identify the primary department or agency responsible for its administration or allocation and provide any other comments you may have in the space provided or with attachments.

Financial Resources	Yes	No	Department/Agency	Comments
Capital improvement programming	X		*City Manager's Office*	
Community Development Block Grants (CDBGs)	X		*Finance*	
Special purpose taxes		X		
Gas/electric utility fees		X		
Water/sewer fees		X		*Handled by Washington Suburban Sanitary Commission*
Stormwater utility fees				This is under consideration
Development impact fees	X		*Planning & Code Administration*	Payments made to Montgomery County
General obligation, revenue, and/or special tax bonds		X		
Partnering arrangements or intergovernmental agreements	X		*City Manager's Office*	
Other:				
Other:				

4. COMMUNITY POLITICAL CAPABILITY — Political capability in this instance is being measured by the degree to which local political leadership (including appointed boards) *is willing* to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (e.g., building codes, floodplain management, etc.). Rate the jurisdiction's political capability to enact policies and programs that reduce hazard vulnerabilities on a scale from 0 to 5: generally, the higher the score, the higher degree of community political capability.

5-Very Willing **3-Moderately Willing** **0-Unwilling to Adopt Policies/Programs** **SCORE:** 4

5. COMMUNITY RESILIENCY CAPABILITY AFTER AN EVENT (CONSEQUENCE ANALYSIS) — Community capability to recover after an event can be measured by considering consequences of an event on several community systems. The question below uses an impact score to describe how the particular community system would be impacted after a large hazard event. Please use a scale of 0 to 5 for the impact score as described below. Then, provide a general description of potential consequences that would occur for each system element. Generally, the lower the impact scores are, the higher degree of community resiliency capability there will be.

5-Significantly Impacted **3-Moderately Impacted** **0-No Impacts to System**

Impacted System	Impact Score	Potential Consequences If Significant Event Occurs
Public	3	Without specifics as to the nature of the event, it is difficult to assess the impact in any area. The community's ability for self sustainment could be an issue. There is a strong commitment from the city and community to provide support and services as needed
Responders	3	The City Police Department is prepared to work with County emergency responders
Continuity of operations of local government, including continued delivery of services	3	The City has a COOP and is prepared to provide services as required under various circumstances
Property, facilities, and infrastructure	3	Facilities will be effected by the ability of utilities provide services, however operations can be moved to multiple locations within the City as required.
Environment	3	Environmental (Natural) events have impacted the community and government, however everyone has pulled together to resolve incidents and ensure the safety and welfare of the community.
Economic condition of the jurisdiction	4	The City is in a strong economic condition, despite the current state of the economy.
Public confidence in the jurisdiction's governance	4	Recent surveys have shown strong confidence from the community in the operation and direction of City government

6. SELF-ASSESSMENT OF CAPABILITY — Please provide an approximate measure of your jurisdiction's capability to effectively implement hazard mitigation strategies to reduce hazard vulnerabilities. Using the following table, please place an "X" in the box marking the most appropriate degree of capability (Limited, Moderate, or High) based upon best available information and the responses provided in Sections 1-5 of this survey.

AREA	DEGREE OF CAPABILITY		
	LIMITED	MODERATE	HIGH
Planning and Regulatory Capability			X
Administrative and Technical Capability			X
Fiscal Capability		X	
Community Political Capability			X
Community Resiliency Capability			X

This Hazard Mitigation Capability Assessment Survey is needed to conduct an assessment of Montgomery County's existing capabilities to implement hazard mitigation activities and is being requested as part of the Montgomery County 2012 Hazard Mitigation Plan update. The information provided in response to this survey will help provide a broad overview of how local programs are currently being used to lessen the impacts of potential hazards. In order to accurately assess your jurisdiction's capability, it is critical that representatives who are familiar with existing local government programs help complete this survey.

A capability assessment has two components: an inventory of a jurisdiction's existing planning and regulatory tools and an analysis of its capacity to carry them out. The assessment process will help identify existing gaps, conflicts, and/or weaknesses that may need to be addressed through future mitigation planning goals and actions. It will also highlight the measures in place or already being performed that should continue to be supported and enhanced through future mitigation efforts. Finally, the capability assessment will help to ensure that proposed mitigation actions are deemed practical, considering the local ability to implement them.

PLEASE PROVIDE THE FOLLOWING CONTACT INFORMATION:

JURSIDICTION	Town of Kensington
NAME / TITLE	Sanford W. Daily, Town Manager
PHONE	301-949-2424
E-MAIL	swdaily@tok.md.gov

1. **PLANNING AND REGULATORY CAPABILITY —** Please indicate whether the following planning or regulatory tools (plans, ordinances, codes, or programs) are currently in place or under development for your jurisdiction by placing an "X" in the appropriate box, followed by the date of adoption/update. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Support, Neutral, or Hinder) with the appropriate symbol, and also indicate if there has been a change in the ability of the tool/program to result in loss reduction. Finally, please provide additional comments or explanations in the space provided.

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
EXAMPLE: Hazard Mitigation Plan	*X*	*1/1/2006*		*Hazard County EMA*	+	+	*Interim update in 2008 revised mitigation strategy; completed one action.*
Hazard Mitigation Plan							
Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	X	3-20-2012		**MNCPPC & Planning Board**			**County Council adopted the Kensington Town Sector Plan**
Floodplain Management Plan							
Open Space Management Plan (or Parks/Rec or Greenways Plan)							
Stormwater Management Plan/Ordinance	X	1-6-2003					Town Council adopted Ordinance allow County Law Chapter 19 to apply in Kensington
Natural Resource Protection Plan							
Flood Response Plan							
Emergency Operations Plan							

Continuity of Operations Plan							

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Evacuation Plan							
Disaster Recovery Plan							
Capital Improvement Plan	X	**5/11/2010**					**Town Council adopted CR-3-2010 to establish a non-lapsing CIP Budget**.
Economic Development Plan							
Historic Preservation Plan	X	1986					Article 28 of State Code, MNCPPC has jurisdicition
Floodplain Regulations							
Zoning Regulations							Article 28 of State Code, MNCPPC has jurisdicition
Subdivision Regulations							Article 28 of State Code, MNCPPC has jurisdicition
Unified Development Ordinance							
Post-Disaster Redevelopment/ Reconstruction Ordinance							
Building Code	X						Town Council adopted Ordinance allow County Law Chapter 8 to apply in Kensington. Town also issues Town Building Permit to assure yard requirements.
Fire Code	X						Town Council adopted Ordinance allow County Law Chapter 22 to apply in Kensington
National Flood Insurance Program							

National Flood Insurance Program – CRS							
Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Firewise							
Storm Ready							
Farmland Preservation							
Other:							
Other:							
Other:							
Other:							

2. **ADMINISTRATIVE AND TECHNICAL CAPABILITY —** Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "X" in the appropriate box. Then, if "yes," please identify the department or agency they work under and provide any other comments you may have in the space provided or with attachments.

Staff/Personnel Resources	Yes	No	Department/Agency	Comments
Planners with knowledge of land development/management practices				
Engineers or professionals trained in construction practices related to buildings and/or infrastructure (includes building inspectors)	X		**Town Building Inspector, Part-time**	
Planners or engineers with an understanding of natural and/or human-caused hazards				
Emergency manager				
Floodplain manager				
Land surveyors				
Scientist familiar with the hazards of the community				
Staff with the education or expertise to assess the community's vulnerability to hazards				
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program				
Resource development staff or grant writers				
Fiscal staff to handle large/complex grants				
Other:				

3. FISCAL CAPABILITY — Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources ***for hazard mitigation purposes*** (including match funds for state or federal mitigation grant funds). Then, identify the primary department or agency responsible for its administration or allocation and provide any other comments you may have in the space provided or with attachments.

Financial Resources	Yes	No	Department/Agency	Comments
Capital improvement programming	X		Town Manager	
Community Development Block Grants (CDBGs)	X		Town Manager	
Special purpose taxes				
Gas/electric utility fees				
Water/sewer fees				
Stormwater utility fees				
Development impact fees				
General obligation, revenue, and/or special tax bonds				
Partnering arrangements or intergovernmental agreements	X		Town Manager	
Other:				
Other:				

4. COMMUNITY POLITICAL CAPABILITY — Political capability in this instance is being measured by the degree to which local political leadership (including appointed boards) *is willing* to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (e.g., building codes, floodplain management, etc.). Rate the jurisdiction's political capability to enact policies and programs that reduce hazard vulnerabilities on a scale from 0 to 5: generally, the higher the score, the higher degree of community political capability.

5-Very Willing **3-Moderately Willing** **0-Unwilling to Adopt Policies/Programs** **SCORE: __________**

5. COMMUNITY RESILIENCY CAPABILITY AFTER AN EVENT (CONSEQUENCE ANALYSIS) — Community capability to recover after an event can be measured by considering consequences of an event on several community systems. The question below uses an impact score to describe how the particular community system would be impacted after a large hazard event. Please use a scale of 0 to 5 for the impact score as described below. Then, provide a general description of potential consequences that would occur for each system element. Generally, the lower the impact scores are, the higher degree of community resiliency capability there will be.

5-Significantly Impacted **3-Moderately Impacted** **0-No Impacts to System**

Impacted System	Impact Score	Potential Consequences If Significant Event Occurs
Public		
Responders		
Continuity of operations of local government, including continued delivery of services		
Property, facilities, and infrastructure		
Environment		
Economic condition of the jurisdiction		

Public confidence in the jurisdiction's governance		

6. SELF-ASSESSMENT OF CAPABILITY — Please provide an approximate measure of your jurisdiction's capability to effectively implement hazard mitigation strategies to reduce hazard vulnerabilities. Using the following table, please place an "X" in the box marking the most appropriate degree of capability (Limited, Moderate, or High) based upon best available information and the responses provided in Sections 1-5 of this survey.

AREA	DEGREE OF CAPABILITY		
	LIMITED	MODERATE	HIGH
Planning and Regulatory Capability			
Administrative and Technical Capability			
Fiscal Capability			
Community Political Capability			
Community Resiliency Capability			

This Hazard Mitigation Capability Assessment Survey is needed to conduct an assessment of Montgomery County's existing capabilities to implement hazard mitigation activities and is being requested as part of the Montgomery County 2012 Hazard Mitigation Plan update. The information provided in response to this survey will help provide a broad overview of how local programs are currently being used to lessen the impacts of potential hazards. In order to accurately assess your jurisdiction's capability, it is critical that representatives who are familiar with existing local government programs help complete this survey.

A capability assessment has two components: an inventory of a jurisdiction's existing planning and regulatory tools and an analysis of its capacity to carry them out. The assessment process will help identify existing gaps, conflicts, and/or weaknesses that may need to be addressed through future mitigation planning goals and actions. It will also highlight the measures in place or already being performed that should continue to be supported and enhanced through future mitigation efforts. Finally, the capability assessment will help to ensure that proposed mitigation actions are deemed practical, considering the local ability to implement them.

PLEASE PROVIDE THE FOLLOWING CONTACT INFORMATION:

JURSIDICTION	Somerset
NAME / TITLE	Rich Charnovich, Manager
PHONE	
E-MAIL	manager@townofsomerset.com

1. **PLANNING AND REGULATORY CAPABILITY —** Please indicate whether the following planning or regulatory tools (plans, ordinances, codes, or programs) are currently in place or under development for your jurisdiction by placing an "X" in the appropriate box, followed by the date of adoption/update. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Support, Neutral, or Hinder) with the appropriate symbol, and also indicate if there has been a change in the ability of the tool/program to result in loss reduction. Finally, please provide additional comments or explanations in the space provided.

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
EXAMPLE: Hazard Mitigation Plan	*X*	*1/1/2006*		*Hazard County EMA*	*+*	*+*	*Interim update in 2008 revised mitigation strategy; completed one action.*
Hazard Mitigation Plan	X	2007	2012	County EMA	O		
Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	X				O		County's Plan
Floodplain Management Plan							Do not have one
Open Space Management Plan (or Parks/Rec or Greenways Plan)							Do not have one
Stormwater Management Plan/Ordinance			X				Town does not have one but we are beginning to establish one through Environmental Committee. Mainly relies on County's review. At beginning stages of development. Approximately 2 years to implement
Natural Resource Protection Plan							Do not have one
Flood Response Plan							Do not have one
Emergency Operations Plan							Fall under the county's plan

Continuity of Operations Plan							Under County plan

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Evacuation Plan							County
Disaster Recovery Plan							County
Capital Improvement Plan	X	March 15, 2012		Mayor and Manager			5-year plan that includes capital improvements
Economic Development Plan							Do not have
Historic Preservation Plan							Have historic districts throughout the town and multiple homes – use County's historic preservation.
Floodplain Regulations							Follow county's and FEMA, State of MD
Zoning Regulations							Do not have - Follow the county
Subdivision Regulations							Internally review town's code – already built out so we don't have subdivision reg. Contained within your building code
Unified Development Ordinance							Do not have
Post-Disaster Redevelopment/ Reconstruction Ordinance							Do not have
Building Code	X						Check
Fire Code							Falls under the county

National Flood Insurance Program	X						
National Flood Insurance Program – CRS							Do not participate
Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Firewise							No
Storm Ready							No
Farmland Preservation							No
Other:							
Other:							
Other:							
Other:							

2. **ADMINISTRATIVE AND TECHNICAL CAPABILITY —** Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "X" in the appropriate box. Then, if "yes," please identify the department or agency they work under and provide any other comments you may have in the space provided or with attachments.

Staff/Personnel Resources	Yes	No	Department/Agency	Comments
Planners with knowledge of land development/management practices		X		
Engineers or professionals trained in construction practices related to buildings and/or infrastructure (includes building inspectors)	X			Somerset has someone under contract for this
Planners or engineers with an understanding of natural and/or human-caused hazards		X		
Emergency manager	X		Town Manager	
Floodplain manager	X		Town Manager	
Land surveyors		X		
Scientist familiar with the hazards of the community	X			Arborist, Enforcement officer
Staff with the education or expertise to assess the community's vulnerability to hazards		X		
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program		X		
Resource development staff or grant writers	X		Town Manager	
Fiscal staff to handle large/complex grants	X		Town Manager	
Other:				

3. FISCAL CAPABILITY — Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources ***for hazard mitigation purposes*** (including match funds for state or federal mitigation grant funds). Then, identify the primary department or agency responsible for its administration or allocation and provide any other comments you may have in the space provided or with attachments.

Financial Resources	Yes	No	Department/Agency	Comments
Capital improvement programming		X		
Community Development Block Grants (CDBGs)		X		
Special purpose taxes		X		
Gas/electric utility fees		X		
Water/sewer fees		X		
Stormwater utility fees		X		
Development impact fees		X		
General obligation, revenue, and/or special tax bonds		X		
Partnering arrangements or intergovernmental agreements		X		
Other:				
Other:				

4. COMMUNITY POLITICAL CAPABILITY — Political capability in this instance is being measured by the degree to which local political leadership (including appointed boards) *is willing* to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (e.g., building codes, floodplain management, etc.). Rate the jurisdiction's political capability to enact policies and programs that reduce hazard vulnerabilities on a scale from 0 to 5: generally, the higher the score, the higher degree of community political capability.

5-Very Willing **3-Moderately Willing** **0-Unwilling to Adopt Policies/Programs** **SCORE: ______4____**

5. COMMUNITY RESILIENCY CAPABILITY AFTER AN EVENT (CONSEQUENCE ANALYSIS) — Community capability to recover after an event can be measured by considering consequences of an event on several community systems. The question below uses an impact score to describe how the particular community system would be impacted after a large hazard event. Please use a scale of 0 to 5 for the impact score as described below. Then, provide a general description of potential consequences that would occur for each system element. Generally, the lower the impact scores are, the higher degree of community resiliency capability there will be.

5-Significantly Impacted **3-Moderately Impacted** **0-No Impacts to System**

Impacted System	Impact Score	Potential Consequences If Significant Event Occurs
Public		Through the county no EMS, use neighboring law enforcement
Responders		Through the county no EMS, use neighboring law enforcement
Continuity of operations of local government, including continued delivery of services		Power outage offer assistance. Building has emergency generator
Property, facilities, and infrastructure		
Environment		
Economic condition of the jurisdiction	1	

Public confidence in the jurisdiction's governance	0	

6. SELF-ASSESSMENT OF CAPABILITY — Please provide an approximate measure of your jurisdiction's capability to effectively implement hazard mitigation strategies to reduce hazard vulnerabilities. Using the following table, please place an "X" in the box marking the most appropriate degree of capability (Limited, Moderate, or High) based upon best available information and the responses provided in Sections 1-5 of this survey.

AREA	DEGREE OF CAPABILITY		
	LIMITED	MODERATE	HIGH
Planning and Regulatory Capability		X	
Administrative and Technical Capability		X	
Fiscal Capability	X		
Community Political Capability		X	
~~Community Resiliency Capability~~			

This Hazard Mitigation Capability Assessment Survey is needed to conduct an assessment of Montgomery County's existing capabilities to implement hazard mitigation activities and is being requested as part of the Montgomery County 2012 Hazard Mitigation Plan update. The information provided in response to this survey will help provide a broad overview of how local programs are currently being used to lessen the impacts of potential hazards. In order to accurately assess your jurisdiction's capability, it is critical that representatives who are familiar with existing local government programs help complete this survey.

A capability assessment has two components: an inventory of a jurisdiction's existing planning and regulatory tools and an analysis of its capacity to carry them out. The assessment process will help identify existing gaps, conflicts, and/or weaknesses that may need to be addressed through future mitigation planning goals and actions. It will also highlight the measures in place or already being performed that should continue to be supported and enhanced through future mitigation efforts. Finally, the capability assessment will help to ensure that proposed mitigation actions are deemed practical, considering the local ability to implement them.

PLEASE PROVIDE THE FOLLOWING CONTACT INFORMATION:

JURSIDICTION	City of Takoma Park
NAME / TITLE	Captain Edward Coursey, Emergency Management Coord.
PHONE	301-891-7105
E-MAIL	edwardc@takomagov.org

1. **PLANNING AND REGULATORY CAPABILITY —** Please indicate whether the following planning or regulatory tools (plans, ordinances, codes, or programs) are currently in place or under development for your jurisdiction by placing an "X" in the appropriate box, followed by the date of adoption/update. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Support, Neutral, or Hinder) with the appropriate symbol, and also indicate if there has been a change in the ability of the tool/program to result in loss reduction. Finally, please provide additional comments or explanations in the space provided.

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
EXAMPLE: Hazard Mitigation Plan	*X*	*1/1/2006*		*Hazard County EMA*	*+*	*+*	*Interim update in 2008 revised mitigation strategy; completed one action.*
Hazard Mitigation Plan							Adopted the County Plan in 2007
Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	XXX			M-NCPPC / Montgomery County MD			
Floodplain Management Plan	X	May 2009		City Public Works Dept.			Flood Hazard Mitigation Plan – first version for the City
Open Space Management Plan (or Parks/Rec or Greenways Plan)	XXX			M-NCPPC / Montgomery County MD			
Stormwater Management Plan/Ordinance	XXX	On-going		Public Works			City inspects 1/3 of its stormwater system each year, corrective projects would be included in City CIP budget.
Natural Resource Protection Plan							
Flood Response Plan							
Emergency Operations Plan	X	11/2010		City of Takoma Park	+	+	
Continuity of Operations Plan	X	2/2010		City of Takoma Park	+	+	

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Evacuation Plan							
Disaster Recovery Plan							
Capital Improvement Plan	XXX			City of Takoma Park			Overseen by City Administration
Economic Development Plan	XXX			City of Takoma Park			Various plans, reports and policies
Historic Preservation Plan	XXX			Montgomery County MD			Montgomery County Code Chapter 24A - Historic Preservation
Floodplain Regulations							
Zoning Regulations	XXX			Montgomery County MD			Montgomery County Code Chapter 59 - Zoning
Subdivision Regulations	XXX			Montgomery County MD			Montgomery County Code Chapter 59 - Zoning
Unified Development Ordinance	XXX			Montgomery County MD			Montgomery County Code Chapter 59 - Zoning
Post-Disaster Redevelopment/ Reconstruction Ordinance							
Building Code	XXX			Montgomery County MD			Montgomery County Code Chapter 8 - Buildings
Fire Code	XXX			Montgomery County MD			Montgomery County Code Chapter 22 - Fire Safety Code
National Flood Insurance Program							
National Flood Insurance Program – CRS							

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Firewise							
Storm Ready							
Farmland Preservation	XXX			Montgomery County MD			Montgomery County Code Chapter 2B Agricultural Land Preservation
Other:							
Other:							
Other:							
Other:							

2. **ADMINISTRATIVE AND TECHNICAL CAPABILITY —** Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "X" in the appropriate box. Then, if "yes," please identify the department or agency they work under and provide any other comments you may have in the space provided or with attachments.

Staff/Personnel Resources	Yes	No	Department/Agency	Comments
Planners with knowledge of land development/management practices	XXX		Housing and Community Development Department	
Engineers or professionals trained in construction practices related to buildings and/or infrastructure (includes building inspectors)	X		Public Works	City Engineer
Planners or engineers with an understanding of natural and/or human-caused hazards				
Emergency manager			Police Department	Emergency Management Coordinator
Floodplain manager				
Land surveyors				
Scientist familiar with the hazards of the community				
Staff with the education or expertise to assess the community's vulnerability to hazards				
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program	XXX		Housing and Community Development Department	GIS Expertise
Resource development staff or grant writers	XXX		Housing and Community Development Department	Expertise varies / dependent on nature of grant
Fiscal staff to handle large/complex grants				
Other:				

3. FISCAL CAPABILITY — Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources ***for hazard mitigation purposes*** (including match funds for state or federal mitigation grant funds). Then, identify the primary department or agency responsible for its administration or allocation and provide any other comments you may have in the space provided or with attachments.

Financial Resources	Yes	No	Department/Agency	Comments
Capital improvement programming	XXX		Administration Department	
Community Development Block Grants (CDBGs)	XXX		Housing and Community Development Department	
Special purpose taxes	XXX		Administration Department	
Gas/electric utility fees		XXX	PEPCO	
Water/sewer fees		XXX	WSSC	
Stormwater utility fees	XXX		Public Works Department	
Development impact fees		XXX	Montgomery County MD	
General obligation, revenue, and/or special tax bonds	XXX		Administration Department	
Partnering arrangements or intergovernmental agreements	XXX		Administration Department	
Other:				
Other:				

4. COMMUNITY POLITICAL CAPABILITY — Political capability in this instance is being measured by the degree to which local political leadership (including appointed boards) *is willing* to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (e.g., building codes, floodplain management, etc.). Rate the jurisdiction's political capability to enact policies and programs that reduce hazard vulnerabilities on a scale from 0 to 5: generally, the higher the score, the higher degree of community political capability.

5-Very Willing **3-Moderately Willing** **0-Unwilling to Adopt Policies/Programs** **SCORE: __________**

5. COMMUNITY RESILIENCY CAPABILITY AFTER AN EVENT (CONSEQUENCE ANALYSIS) — Community capability to recover after an event can be measured by considering consequences of an event on several community systems. The question below uses an impact score to describe how the particular community system would be impacted after a large hazard event. Please use a scale of 0 to 5 for the impact score as described below. Then, provide a general description of potential consequences that would occur for each system element. Generally, the lower the impact scores are, the higher degree of community resiliency capability there will be.

5-Significantly Impacted **3-Moderately Impacted** **0-No Impacts to System**

Impacted System	Impact Score	Potential Consequences If Significant Event Occurs
Public	2	
Responders	2	

Continuity of operations of local government, including continued delivery of services	3	
Property, facilities, and infrastructure	3	
Environment	2	
Economic condition of the jurisdiction	2	
Public confidence in the jurisdiction's governance	2	

6. SELF-ASSESSMENT OF CAPABILITY — Please provide an approximate measure of your jurisdiction's capability to effectively implement hazard mitigation strategies to reduce hazard vulnerabilities. Using the following table, please place an "X" in the box marking the most appropriate degree of capability (Limited, Moderate, or High) based upon best available information and the responses provided in Sections 1-5 of this survey.

AREA	DEGREE OF CAPABILITY		
	LIMITED	MODERATE	HIGH
Planning and Regulatory Capability	XXX		
Administrative and Technical Capability	XXX		
Fiscal Capability	XXX		
Community Political Capability	XXX		

Community Resiliency Capability		XXX	

This Hazard Mitigation Capability Assessment Survey is needed to conduct an assessment of Montgomery County's existing capabilities to implement hazard mitigation activities and is being requested as part of the Montgomery County 2012 Hazard Mitigation Plan update. The information provided in response to this survey will help provide a broad overview of how local programs are currently being used to lessen the impacts of potential hazards. In order to accurately assess your jurisdiction's capability, it is critical that representatives who are familiar with existing local government programs help complete this survey.

A capability assessment has two components: an inventory of a jurisdiction's existing planning and regulatory tools and an analysis of its capacity to carry them out. The assessment process will help identify existing gaps, conflicts, and/or weaknesses that may need to be addressed through future mitigation planning goals and actions. It will also highlight the measures in place or already being performed that should continue to be supported and enhanced through future mitigation efforts. Finally, the capability assessment will help to ensure that proposed mitigation actions are deemed practical, considering the local ability to implement them.

PLEASE PROVIDE THE FOLLOWING CONTACT INFORMATION:

JURSIDICTION	Town of Glen Echo
NAME / TITLE	Nicole Fraser/ Clerk-Treasurer
PHONE	301-320-4041
E-MAIL	townhall@glenecho.org

1. **PLANNING AND REGULATORY CAPABILITY —** Please indicate whether the following planning or regulatory tools (plans, ordinances, codes, or programs) are currently in place or under development for your jurisdiction by placing an "X" in the appropriate box, followed by the date of adoption/update. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Support, Neutral, or Hinder) with the appropriate symbol, and also indicate if there has been a change in the ability of the tool/program to result in loss reduction. Finally, please provide additional comments or explanations in the space provided.

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
EXAMPLE: Hazard Mitigation Plan	*X*	*1/1/2006*		*Hazard County EMA*	*+*	*+*	*Interim update in 2008 revised mitigation strategy; completed one action.*
Hazard Mitigation Plan	x	2007		Montgomery County OEM	o	+	We are a small municipality of 300 people, we rely on Montgomery County for most services.
Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	x	2007		Montgomery County OEM	o	+	
Floodplain Management Plan	x	2007		Montgomery County OEM	o	+	
Open Space Management Plan (or Parks/Rec or Greenways Plan)	x	2007		Montgomery County OEM	+	+	
Stormwater Management Plan/Ordinance	x	2007		Montgomery County OEM	o	+	
Natural Resource Protection Plan	x	2007		Montgomery County OEM	o	+	
Flood Response Plan	x	2007		Montgomery County OEM	o	+	
Emergency Operations Plan	x	2007		Montgomery County OEM	o	+	
Continuity of Operations Plan	x	2007		Montgomery County OEM	o	+	

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Evacuation Plan	x	2007		Montgomery County OEM	o	+	
Disaster Recovery Plan	x	2007		Montgomery County OEM	+	+	
Capital Improvement Plan	x	2007		Montgomery County	o	+	
Economic Development Plan	x	2007		Montgomery County	o	+	
Historic Preservation Plan	x	2007		Montgomery County	o	+	
Floodplain Regulations	x	2007		Montgomery County	o	+	Not applicable, no floodplain in Glen Echo
Zoning Regulations	x	2007		Montgomery County DPS	+	+	
Subdivision Regulations	x	2007		Montgomery County OEM	o	+	
Unified Development Ordinance	x	2007		Montgomery County	o	+	
Post-Disaster Redevelopment/ Reconstruction Ordinance	x	2007		Montgomery County OEM	o	+	
Building Code	x	2007		Montgomery County DPS	+	+	
Fire Code	x	2007		Montgomery County OEM	o	+	
National Flood Insurance Program	X	2007		FEMA	o	+	
National Flood Insurance Program – CRS	X	2007		FEMA	o	+	

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Firewise	x	2007		Montgomery County OEM	o	+	
Storm Ready	x	2007		Montgomery County OEM	+	+	
Farmland Preservation	x	2007		Montgomery County	o	+	Not applicable
Other: Snow Emergency Program	X	1996			+	+	This is a town run program that provides access for Emergency Vehicles during snowstorms
Other:							
Other:							
Other:							

2. **ADMINISTRATIVE AND TECHNICAL CAPABILITY —** Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "X" in the appropriate box. Then, if "yes," please identify the department or agency they work under and provide any other comments you may have in the space provided or with attachments.

Staff/Personnel Resources	Yes	No	Department/Agency	Comments
Planners with knowledge of land development/management practices		x	Montgomery County	We are a small municipality of 300 people, we rely on Montgomery County for most services.
Engineers or professionals trained in construction practices related to buildings and/or infrastructure (includes building inspectors)		x	Montgomery County Or subcontract	
Planners or engineers with an understanding of natural and/or human-caused hazards		x	Montgomery County Or subcontract	
Emergency manager		x	Montgomery County Or subcontract	
Floodplain manager		x	Montgomery County Or subcontract	
Land surveyors		x	Montgomery County Or subcontract	
Scientist familiar with the hazards of the community		x	Montgomery County Or subcontract	
Staff with the education or expertise to assess the community's vulnerability to hazards		x	Montgomery County Or subcontract	
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program		x	Montgomery County Or subcontract	
Resource development staff or grant writers		x	Montgomery County Or subcontract	
Fiscal staff to handle large/complex grants		x	Montgomery County Or subcontract	
Other: Town Clerk-Treasurer	X		Montgomery County Or subcontract	This is a quarter-time position and the only paid employee of the town.

3. FISCAL CAPABILITY — Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources ***for hazard mitigation purposes*** (including match funds for state or federal mitigation grant funds). Then, identify the primary department or agency responsible for its administration or allocation and provide any other comments you may have in the space provided or with attachments.

Financial Resources	Yes	No	Department/Agency	Comments
Capital improvement programming		x	Montgomery County	Since we are a small municipality we rely on the county for most of these fiscal supports.
Community Development Block Grants (CDBGs)		x	Montgomery County	
Special purpose taxes		x	Montgomery County	
Gas/electric utility fees		x	Montgomery County	
Water/sewer fees		x	Montgomery County	
Stormwater utility fees		x	Montgomery County	
Development impact fees		x	Montgomery County	
General obligation, revenue, and/or special tax bonds		x	Montgomery County	
Partnering arrangements or intergovernmental agreements	x			
Other:				
Other:				

4. COMMUNITY POLITICAL CAPABILITY — Political capability in this instance is being measured by the degree to which local political leadership (including appointed boards) *is willing* to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (e.g., building codes, floodplain management, etc.). Rate the jurisdiction's political capability to enact policies and programs that reduce hazard vulnerabilities on a scale from 0 to 5: generally, the higher the score, the higher degree of community political capability.

5-Very Willing **3-Moderately Willing** **0-Unwilling to Adopt Policies/Programs** **SCORE: ____4______**

5. COMMUNITY RESILIENCY CAPABILITY AFTER AN EVENT (CONSEQUENCE ANALYSIS) — Community capability to recover after an event can be measured by considering consequences of an event on several community systems. The question below uses an impact score to describe how the particular community system would be impacted after a large hazard event. Please use a scale of 0 to 5 for the impact score as described below. Then, provide a general description of potential consequences that would occur for each system element. Generally, the lower the impact scores are, the higher degree of community resiliency capability there will be.

5-Significantly Impacted **3-Moderately Impacted** **0-No Impacts to System**

Impacted System	Impact Score	Potential Consequences If Significant Event Occurs
Public	4	In the 2010 snow storms, the public was impacted due to a loss of power (no gas lines in town, so all electrical heat) for four days. Also, snowplows were not able to come to clear the streets for two days making it difficult for public to leave their homes.
Responders	3	Responders were able to access most homes as a result of the snow emergency plan.
Continuity of operations of local government, including continued delivery of services	3	Town Hall was still open but without power unable to answer e-mails. The post office was closed.
Property, facilities, and infrastructure	4	There was some damage to property.
Environment	4	There was damage to several trees and other landscaping.
Economic condition of the jurisdiction	3	Other than the extra costs of snow removal the economic condition of the Town remained in a good state.

Public confidence in the jurisdiction's governance	3	It took a hit but most understood that it was out of the Mayor and Council's hands.

6. SELF-ASSESSMENT OF CAPABILITY — Please provide an approximate measure of your jurisdiction's capability to effectively implement hazard mitigation strategies to reduce hazard vulnerabilities. Using the following table, please place an "X" in the box marking the most appropriate degree of capability (Limited, Moderate, or High) based upon best available information and the responses provided in Sections 1-5 of this survey.

AREA	DEGREE OF CAPABILITY		
	LIMITED	MODERATE	HIGH
Planning and Regulatory Capability	X		
Administrative and Technical Capability	X		
Fiscal Capability	X		
Community Political Capability		X	
Community Resiliency Capability		X	

This Hazard Mitigation Capability Assessment Survey is needed to conduct an assessment of Montgomery County's existing capabilities to implement hazard mitigation activities and is being requested as part of the Montgomery County 2012 Hazard Mitigation Plan update. The information provided in response to this survey will help provide a broad overview of how local programs are currently being used to lessen the impacts of potential hazards. In order to accurately assess your jurisdiction's capability, it is critical that representatives who are familiar with existing local government programs help complete this survey.

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PLEASE PROVIDE THE FOLLOWING CONTACT INFORMATION:

JURSIDICTION	Town of Washington Grove
NAME / TITLE	Mary M. Challstrom, Treasurer
PHONE	301-926-4498
E-MAIL	Spinner5@comcast.net

1. **PLANNING AND REGULATORY CAPABILITY —** Please indicate whether the following planning or regulatory tools (plans, ordinances, codes, or programs) are currently in place or under development for your jurisdiction by placing an "X" in the appropriate box, followed by the date of adoption/update. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Support, Neutral, or Hinder) with the appropriate symbol, and also indicate if there has been a change in the ability of the tool/program to result in loss reduction. Finally, please provide additional comments or explanations in the space provided.

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
EXAMPLE: Hazard Mitigation Plan	*X*	*1/1/2006*		*Hazard County EMA*	+	+	*Interim update in 2008 revised mitigation strategy; completed one action.*
Hazard Mitigation Plan							Montgomery County
Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	X	2/25/09		Wash Grove Planning Commission	0	+	
Floodplain Management Plan							Non-floodprone community
Open Space Management Plan (or Parks/Rec or Greenways Plan)	X	2/25/09		Wash Grove Planning Commission	0	+	
Stormwater Management Plan/Ordinance	X						Chapter 19, Montgomery County Code
Natural Resource Protection Plan							
Flood Response Plan							
Emergency Operations Plan	X						Montgomery County
Continuity of Operations Plan							

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Evacuation Plan							
Disaster Recovery Plan							
Capital Improvement Plan	X	5/14/11		Town Council			annual update with budget
Economic Development Plan							
Historic Preservation Plan	X	2/25/09		Town HPC			Historic Preservation Commission
Floodplain Regulations							Chapter 19, Montgomery County Code
Zoning Regulations	X	6/9/11		Wash Grove Plan Comm			
Subdivision Regulations	X	10/12/05		Wash Grove Plan Comm			
Unified Development Ordinance							
Post-Disaster Redevelopment/ Reconstruction Ordinance							
Building Code	X			Montgomery County			Chapter 8, Montgomery County Code
Fire Code	X			Montgomery County			Chapter 22, Montgomery County Code
National Flood Insurance Program	X	3/8/11		FEMA			
National Flood Insurance Program – CRS							

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Firewise							
Storm Ready							
Farmland Preservation							
Other:							
Other:							
Other:							
Other:							

2. **ADMINISTRATIVE AND TECHNICAL CAPABILITY —** Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "X" in the appropriate box. Then, if "yes," please identify the department or agency they work under and provide any other comments you may have in the space provided or with attachments.

Staff/Personnel Resources	Yes	No	Department/Agency	Comments
Planners with knowledge of land development/management practices	X		Washington Grove Planning Commission	
Engineers or professionals trained in construction practices related to buildings and/or infrastructure (includes building inspectors)		X		
Planners or engineers with an understanding of natural and/or human-caused hazards		X		
Emergency manager		X		
Floodplain manager		X		
Land surveyors		X		
Scientist familiar with the hazards of the community		X		
Staff with the education or expertise to assess the community's vulnerability to hazards		X		
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program		X		
Resource development staff or grant writers		X		
Fiscal staff to handle large/complex grants		X		
Other:				

3. FISCAL CAPABILITY — Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources ***for hazard mitigation purposes*** (including match funds for state or federal mitigation grant funds). Then, identify the primary department or agency responsible for its administration or allocation and provide any other comments you may have in the space provided or with attachments.

Financial Resources	Yes	No	Department/Agency	Comments
Capital improvement programming	X		Town Treasurer	
Community Development Block Grants (CDBGs)	X		Town Council	
Special purpose taxes	X		Town Meeting	
Gas/electric utility fees		X		
Water/sewer fees		X		
Stormwater utility fees		X		
Development impact fees		X		
General obligation, revenue, and/or special tax bonds	X		Town Meeting	
Partnering arrangements or intergovernmental agreements	X		Town Council	
Other:				
Other:				

4. COMMUNITY POLITICAL CAPABILITY — Political capability in this instance is being measured by the degree to which local political leadership (including appointed boards) *is willing* to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (e.g., building codes, floodplain management, etc.). Rate the jurisdiction's political capability to enact policies and programs that reduce hazard vulnerabilities on a scale from 0 to 5: generally, the higher the score, the higher degree of community political capability.

5-Very Willing **3-Moderately Willing** **0-Unwilling to Adopt Policies/Programs** **SCORE: ____3_____**

5. COMMUNITY RESILIENCY CAPABILITY AFTER AN EVENT (CONSEQUENCE ANALYSIS) — Community capability to recover after an event can be measured by considering consequences of an event on several community systems. The question below uses an impact score to describe how the particular community system would be impacted after a large hazard event. Please use a scale of 0 to 5 for the impact score as described below. Then, provide a general description of potential consequences that would occur for each system element. Generally, the lower the impact scores are, the higher degree of community resiliency capability there will be.

5-Significantly Impacted **3-Moderately Impacted** **0-No Impacts to System**

Impacted System	Impact Score	Potential Consequences If Significant Event Occurs
Public	1	Almost 100% residential
Responders	3	Efforts to improve premise address identification ongoing
Continuity of operations of local government, including continued delivery of services	3	Government reasonably spread out. Most services contracted. Storing data in more than one location.
Property, facilities, and infrastructure	3	Large number of trees could impact residences, public facilities, power lines and roads. Working with PEPCO to reduce potential impact. Future planting plans take infrastructure impact into account.
Environment	5	Heavily wooded, tornado could inflict major damage
Economic condition of the jurisdiction	1	Good condition

Public confidence in the jurisdiction's governance	0	High confidence. Community cohesion in event of hazard would be advantage.

6. SELF-ASSESSMENT OF CAPABILITY — Please provide an approximate measure of your jurisdiction's capability to effectively implement hazard mitigation strategies to reduce hazard vulnerabilities. Using the following table, please place an "X" in the box marking the most appropriate degree of capability (Limited, Moderate, or High) based upon best available information and the responses provided in Sections 1-5 of this survey.

AREA	DEGREE OF CAPABILITY		
	LIMITED	MODERATE	HIGH
Planning and Regulatory Capability		X	
Administrative and Technical Capability	X		
Fiscal Capability		X	
Community Political Capability		X	
Community Resiliency Capability			X

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This Hazard Mitigation Capability Assessment Survey is needed to conduct an assessment of Montgomery County's existing capabilities to implement hazard mitigation activities and is being requested as part of the Montgomery County 2012 Hazard Mitigation Plan update. The information provided in response to this survey will help provide a broad overview of how local programs are currently being used to lessen the impacts of potential hazards. In order to accurately assess your jurisdiction's capability, it is critical that representatives who are familiar with existing local government programs help complete this survey.

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PLEASE PROVIDE THE FOLLOWING CONTACT INFORMATION:

JURSIDICTION	Rockville City
NAME / TITLE	Mayor Tom Marsh
PHONE	240-314-8960
E-MAIL	tmarsh@rockvillemd.gov

1. **PLANNING AND REGULATORY CAPABILITY** — Please indicate whether the following planning or regulatory tools (plans, ordinances, codes, or programs) are currently in place or under development for your jurisdiction by placing an "X" in the appropriate box, followed by the date of adoption/update. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Support, Neutral, or Hinder) with the appropriate symbol, and also indicate if there has been a change in the ability of the tool/program to result in loss reduction. Finally, please provide additional comments or explanations in the space provided.

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
EXAMPLE: Hazard Mitigation Plan	*X*	*1/1/2006*		*Hazard County EMA*	+	+	*Interim update in 2008 revised mitigation strategy; completed one action.*
Hazard Mitigation Plan	X	04-2005		Police			
Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	X			CPDS			
Floodplain Management Plan	X			P Works			
Open Space Management Plan (or Parks/Rec or Greenways Plan)	X			Dept of Parks			
Stormwater Management Plan/Ordinance	X			P. Works			
Natural Resource Protection Plan	X			Dept of Parks			
Flood Response Plan	X			P. Works			
Emergency Operations Plan	X	01-2010		Police			

Continuity of Operations Plan	X	01-2010					

Tool/Program	Status			Dept. / Agency Responsible	Effect on Loss Reduction: + Support O Neutral -- Hinder	Change Since Last Plan: + Positive -- Negative	Comments:
	In Place	Date Adopted or Updated	Under Develop-ment				
Evacuation Plan							
Disaster Recovery Plan	X			Purce			
Capital Improvement Plan	X	July 2012		Fmace			
Economic Development Plan	X			CPDS			
Historic Preservation Plan	X						
Floodplain Regulations	X			P. Works CPDS			
Zoning Regulations	X			CPDS			
Subdivision Regulations	X			CPDS			
Unified Development Ordinance	X			CPDS			
Post-Disaster Redevelopment/ Reconstruction Ordinance							
Building Code	X			CPDS			
Fire Code	X			CPDS			
National Flood Insurance Program							