CR-16-2018 (DR-1)

PRINCE GEORGE'S COUNTY & the CITY OF LAUREL

Hazard Mitigation Plan Update

THIS PLAN IS AVAILABLE FOR REVIEW IN THE OFFICE OF THE CLERK OF THE COUNCIL AND ONLINE AT https://princegeorgescountymd.legistar.com/

PRINCE GEORGE'S COUNTY
OEM
OFFICE OF EMERGENCY MANAGEMENT
Creating Resilient Communities

PRINCE GEORGE'S COUNTY MARYLAND

August 2018

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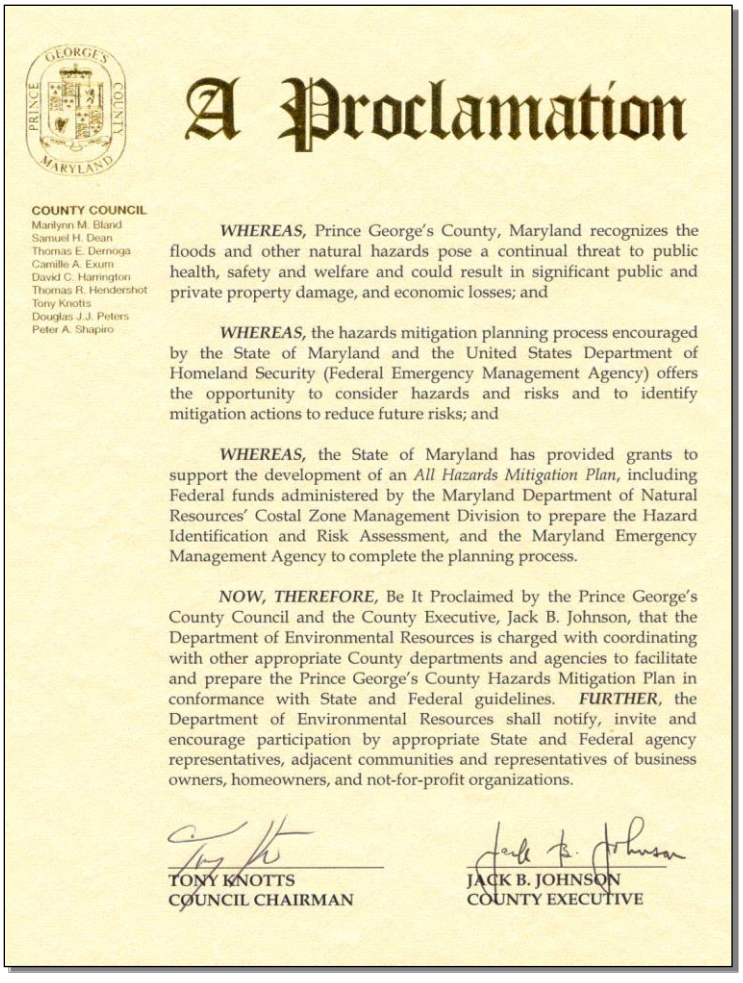
1 Executive Summary

During 2003, the State of Maryland encouraged its counties and cities to lead the development of local hazard mitigation plans. These plans, required by the Disaster Mitigation Act of 2000 (DMA2K) for hazard mitigation assistance (HMA) grant program eligibility, help local governments determine risks and vulnerabilities and identify projects to reduce these risks. *The Prince George's County – City of Laurel Multi-Jurisdictional Hazard Mitigation Plan 2017 Update* is an update to the 2005 and 2010 plans approved by the Maryland Emergency Management Agency and the Department of Homeland Security Federal Emergency Management Agency, Region III and adopted by the Prince George's County Council and the City of Laurel City Council. *The Prince George's County and City of Laurel Hazard Mitigation Plan 2010 Update* was approved by FEMA Region III on February 8, 2012.

Prince George's County and the City of Laurel convened a joint Mitigation Advisory Committee (MAC) to lead plan development. The Committee met twice during the planning process and worked closely with Dewberry Consulting, LLC to develop the multi-jurisdictional plan update. Public input was sought throughout the process in accordance with DMA2K requirements.

1.1 Authority

By proclamation in 2005, the County Council and the County Executive charged the Department of Environmental Resources (DER) with coordinating with other appropriate departments and agencies to facilitate the development of the Plan in conformance with state and federal guidelines.



A Proclamation

COUNTY COUNCIL
Marilynn M. Bland
Samuel H. Dean
Thomas E. Dernoga
Camille A. Exum
David C. Harrington
Thomas R. Hendershot
Tony Knotts
Douglas J.J. Peters
Peter A. Shapiro

WHEREAS, Prince George's County, Maryland recognizes the floods and other natural hazards pose a continual threat to public health, safety and welfare and could result in significant public and private property damage, and economic losses; and

WHEREAS, the hazards mitigation planning process encouraged by the State of Maryland and the United States Department of Homeland Security (Federal Emergency Management Agency) offers the opportunity to consider hazards and risks and to identify mitigation actions to reduce future risks; and

WHEREAS, the State of Maryland has provided grants to support the development of an *All Hazards Mitigation Plan*, including Federal funds administered by the Maryland Department of Natural Resources' Costal Zone Management Division to prepare the Hazard Identification and Risk Assessment, and the Maryland Emergency Management Agency to complete the planning process.

NOW, THEREFORE, Be It Proclaimed by the Prince George's County Council and the County Executive, Jack B. Johnson, that the Department of Environmental Resources is charged with coordinating with other appropriate County departments and agencies to facilitate and prepare the Prince George's County Hazards Mitigation Plan in conformance with State and Federal guidelines. ***FURTHER,*** the Department of Environmental Resources shall notify, invite and encourage participation by appropriate State and Federal agency representatives, adjacent communities and representatives of business owners, homeowners, and not-for-profit organizations.

TONY KNOTTS
COUNCIL CHAIRMAN

JACK B. JOHNSON
COUNTY EXECUTIVE

The Plan was prepared pursuant to the federal Hazard Mitigation and Pre-Disaster Mitigation Programs (44 CFR Parts 201 and 206), the Flood Mitigation Assistance Program (44 CFR 78.6), and the process outlined in materials prepared by the Federal Emergency Management Agency for the Community

Rating System of the National Flood Insurance Program. In addition, it is intended to satisfy planning requirements associated with the Maryland Comprehensive Flood Management Grant program (Environment Title 5, Subtitle 9).

1.2 Planning Area

Prince George's County and the City of Laurel are part of the greater Washington-Baltimore metropolitan area (Figure 1-1). The County is bounded on the west by the District of Columbia and Fairfax County, Virginia. To the north are Montgomery and Howard Counties; on the east are Anne Arundel and Calvert Counties, and Charles County is to the south. The City is located midway between Baltimore and Washington, DC.

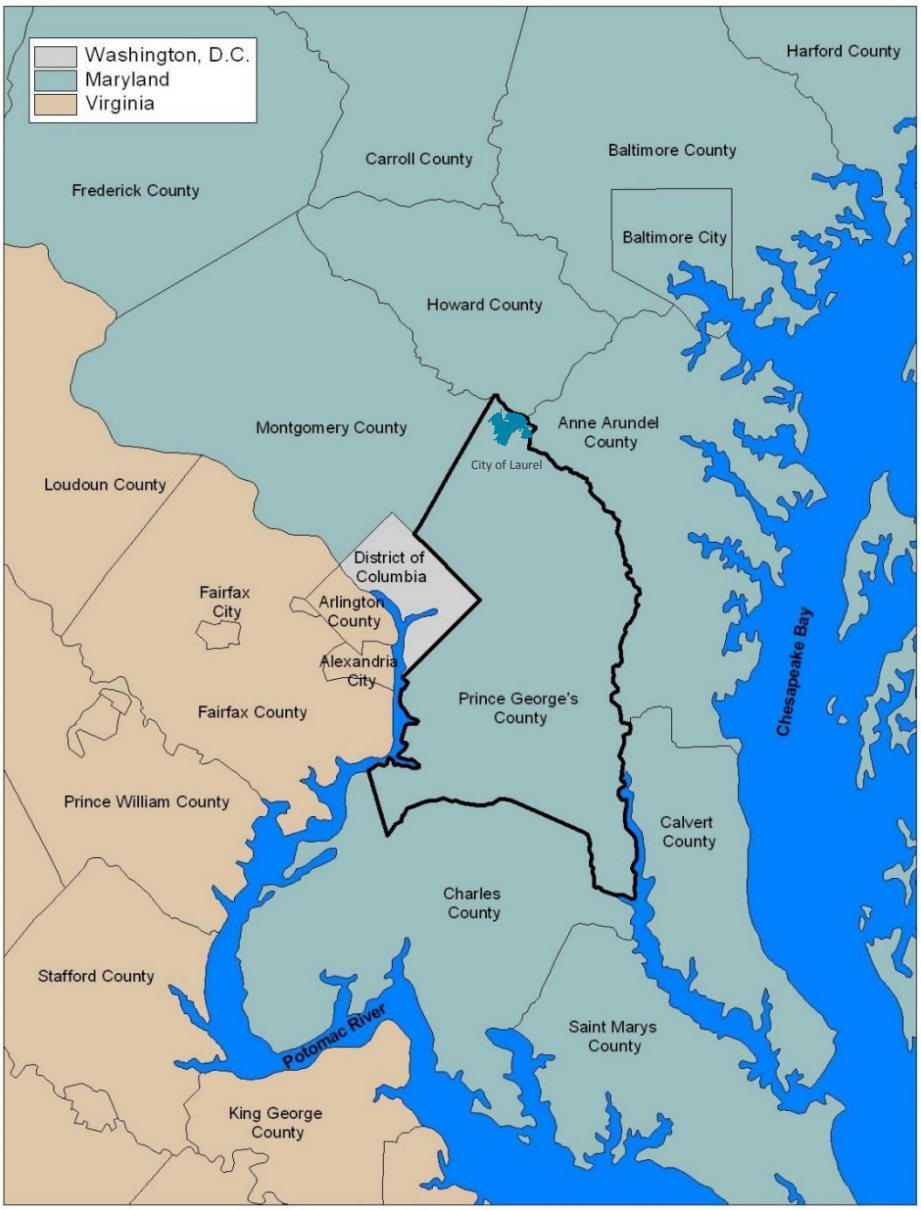


Figure 1-1. Vicinity map of Washington, DC, area.

Although there are 27 separate incorporated municipalities within the boundaries of Prince George's County, only the Cities of Laurel and Bowie retain some degree of land use authority. Only the City of Laurel is recognized separately by FEMA and administers its own floodplain management ordinance, thus the City of Laurel participation has been incorporated into the plan as a separate entity in the planning process with specific community profile information detailed in Section 8.0.

For the purposes of planning, Prince George's County is divided into its 37 planning areas which were used during the 2010 plan update planning process.) These planning areas are geographically defined by natural or manmade boundaries and represent the smallest geographical area for which a master plan is prepared.

Per the Mitigation Advisory Committee, the 2017 Hazard Mitigation Plan Update was organized where appropriate into areas consistent with the nine County Council Districts and the City of Laurel as shown in Figure 1-2.

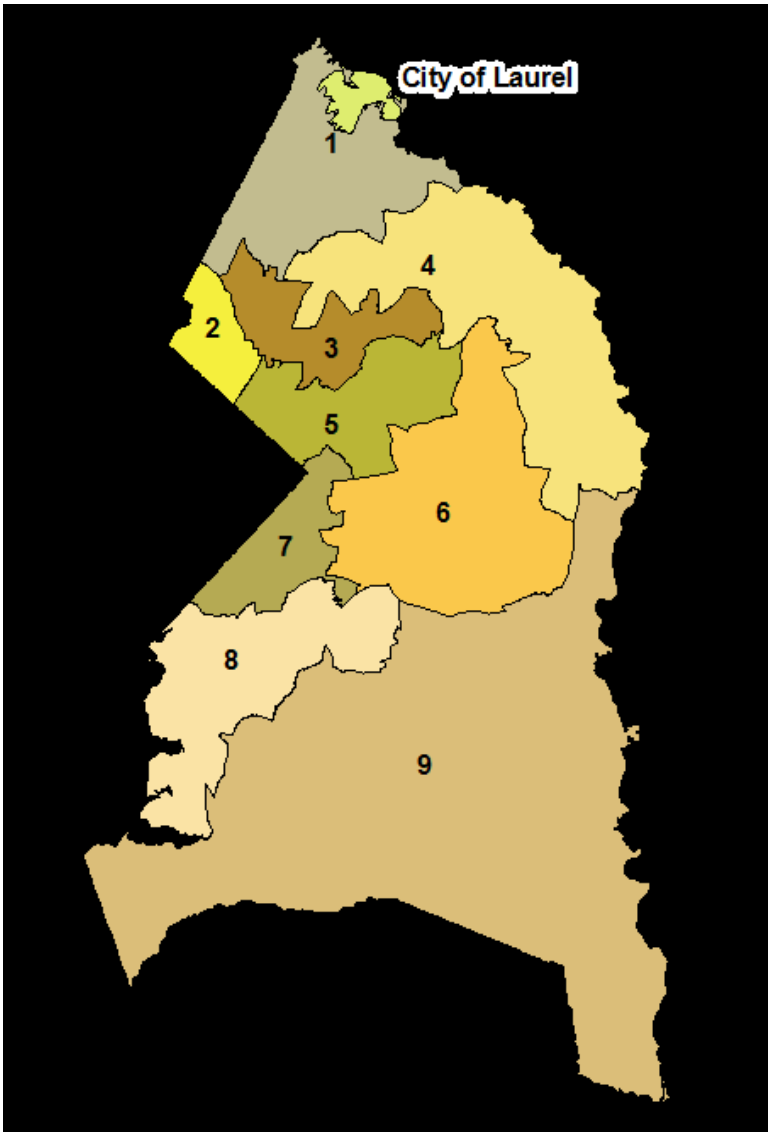


Figure 1-2. Prince George's County Council District Map.

1.3 Planning Committee Membership

The following agencies are designated members of the Mitigation Advisory Committee:

- Environment (Dawn Hawkins-Nixon, Chris Akinboloa and Catherine Escarpeta)
- Office of Homeland Security Office of Emergency Management (Ronald Gill, Courtney Mariette, James Carter and Eddie Waters)
- Police (Joe Perez, Charles Hamby, William Alexander, Kirk McLean and Dan Shefield)
- Fire/EMS (Rudolph Thomas and Craig Black)
- Public Works and Transportation (Gwen Clerkley and Vernon Stinnett)
- Information Technology (Todd Addis)
- Family Services (Cathy Stasny)
- Maryland-National Capital Park & Planning – Planning (Debbie Tyner and Caroline Connelly)
- City of Laurel (Bill Goddard, Jack Brock, and Martin who left the city after the Kick-off Meeting
- City of Laurel (Stephen Allen and Christian Pulley)

The following were notified when the planning process was initiated and were asked to review and comment on the Plan before it was finalized:

- The 25 incorporated municipalities located in Prince George's County that do not have separate land use authority and the City of Bowie, which retains some land use authority.
- Interested parties on Planning Board's public notification list of e-mails that is maintained by M-NCPPC (civic associations, neighborhood associations, etc.)
- Adjacent counties (Montgomery, Howard, Charles, Calvert, Anne Arundel)
- American Red Cross (Prince George's Chapter)
- Maryland Emergency Management Agency
- Maryland Department of the Environment
- Natural Resources Conservation Service, Prince George's District Conservationist

The Mitigation Advisory Committee (MAC) participated in the planning process (outlined in Section 2.2) through attendance at a series of meetings, review of materials, comments on draft documents, consideration of hazards and existing programs and policies, and identification of actions that will further reduce the impacts of hazards in Prince George's County and the City of Laurel.

1.4 Hazard Identification and Risk Assessment

A solid fact base is a key component of any plan. The Hazard Identification and Risk Assessment (HIRA) serves as the fact base for the hazard mitigation plan. The HIRA consists of three parts. Its purpose is to:

1. Identify which hazards could affect Prince George's County and the City of Laurel,
2. Profile hazard events and determine what areas and community assets are the most vulnerable to damage from these hazards, and
3. Estimate losses and prioritize the potential risks to the community.

For this plan update, certain hazards were not addressed due to the infrequency of occurrence and/or limited impact, several were combined and several added. Table 1-1 summarizes the results of the hazard identification, which are explained fully in Section 4.0, Hazard Identification and Risk Assessment. For Prince George's County and the City of Laurel, the hazards discussed were ranked on a scale from High (5), Medium-High (4), Medium (3), Medium-Low (2), and Low (1) based on a number of factors. These factors were then summed and an overall ranking of high to low was given. This high to low comparison only ranks these hazards comparatively for the County. That does not mean that a low or medium-low hazard will not occur or does not have some impact on the community.

Table 1-1. Planning Consideration Levels by Hazard Type for 2017 Update.

Hazard	State Ranking	Population Vulnerability	Total Damages	Geographic Extent	Deaths and Injuries	Warning Time	Number of Events	Overall Ranking
Riverine Flooding	5	5	5	5	5	4	5	High
Coastal Flooding	4	3	3	2	3	3	1	Medium-Low
Severe Storms (Flood-Related)	5	5	4	5	4	4	4	High
Flood Risk - Dam Failures	5	3	3	2	3	5	1	Medium
Flood Risk - Levee Failures	5	3	3	2	3	5	1	Medium
Tornadoes	5	3	5	3	5	5	5	High
Severe Storms (Wind-Related)	5	4	3	5	4	3	5	Medium - High
High Winds	5	4	3	5	3	3	4	Medium - High
Hurricanes/Tropical Storms (Wind-Related)	4	4	4	4	3	4	4	Medium-High
Winter Storms/Blizzards	5	4	3	5	5	3	4	Medium - High
Wildfire	4	3	1	2	1	2	1	Low
Drought	4	3	3	5	1	1	2	Medium-Low
Earthquakes	0	5	3	5	3	5	3	Medium
Land Movement/ Landslides	0	1	3	2	1	5	5	Medium-Low
Sinkholes	0	1	2	1	1	3	1	Low
Extreme Heat	0	5	1	5	5	1	3	Medium
Extreme Cold	0	5	1	5	3	1	2	Medium-Low

The HIRA described each of the hazards in varying levels of detail consistent with each planning consideration level. In general, the Mitigation Advisory Committee through

qualitative and quantitative analysis presented in Section 4.0 found that riverine flooding, severe flood-related storms and tornados were the most significant hazards. Wind-related severe storms, high winds, tropical storms and winter storms were all ranked "Medium-High."

Floods occur primarily within several key watersheds as well as throughout transportation networks with inadequate drainage measures to handle stormwater during short-duration, heavy precipitation events. More recently localized flooding occurred along Upper Branch in Upper Marlboro during Tropical Depression Irene in 2011, and subsequent heavy storms during spring 2015 and December 2016, A new method to assess flooding risk was used – FEMA's Total Exposure in Floodplains version 2.0 or TEIF 2.0 which analyzes flood risk using building footprints apportioned within regulated flood hazard areas. The TEIF 2.0 methodology uses building footprints from local jurisdictions to apportion total replacement values of buildings at the census block-level (1000 square feet units). The TEIF methodology divides building replacement values by proportionate methods (area of each respective building footprint). For example if a census block is known to have $1M of value associated with all buildings and there are a total of ten (10) buildings in the census block - each building having the same exact size – a proportional distribution would dictate that each building has a value of $100,000. After Hazus values are dispersed to the building footprints, the buildings within the Special Flood Hazard Area were identified and the portions (or percent area) of buildings within the floodplain was calculated. Ultimately, the dispersed replacement values were tallied for the dollar value associated with each respective building that is entirely or partially in the floodplain. These values are then generalized into 1000 ft^2 blocks to comply with regulations and not target individual structures or building owners.

Severe wind events, such as hurricanes and tornadoes, have historically affected the area. Generally, hurricanes tend to bring flooding rather than high winds brought by severe storms create localized havoc from downed trees blocking transportation networks, creating localized power outages from downed power lines and damaging building structures, particularly residential roofs and property. Central Virginia the opposite is often true with high wind impacting areas with tree cover causing roof damage and power outages due to downed power lines. Flooding from tropical and sub-tropical storm events and severe thunderstorms tends to be localized and in many cases due to a high proportion of paved or impervious pavement in densely populated watersheds which cannot absorb high volumes of runoff during intense storms. Tornadoes recorded in the region have typically been F0 (40–72 mph; light damage) or F1 (73–112 mph; moderate damage) in intensity but a rare tornado did result in fatalities in College Park several decades ago.

1.5 Mitigation Goal and Strategies

The Mitigation Advisory Committee (MAC) reviewed the previous plan's goal and revised it to better reflect resiliency which has emerged as a main societal concern. The 2017 to 2022 plan goal is:

It is the goal of Prince George's County and the City of Laurel, Maryland, to protect and improve the public health, safety, and welfare of its communities, and to expand the resiliency of livable communities by:

1. Increasing public awareness of natural hazards and risk reduction measures; and
2. Mitigating risks due to natural hazards.

Mitigation strategy status on the 2012 Hazard Mitigation strategies, actions and projects may be found in Appendix C. Some strategies were completed and have outlived their relevancy while others are ongoing programmatic activities which are included in the new strategies outlined in Section 5.0 and listed in more detail in Appendix D.

The new, 2017 to 2022 mitigation strategy, action and project types were re-organized into six categories shown on Table 1-2 that better correspond to County and City government department organization, programs and *the Plan 2035 Prince George's Approved General Plan approved May 6, 2014.*

Table 1-2. Mitigation Categories and Project Types.

Category	Project Type
Prevention	• Planning and zoning • Building codes • Open space preservation • Floodplain regulations • Stormwater management regulations • Drainage system maintenance • Capital improvements programming • Shoreline/riverine setbacks
Property Protection	• Acquisition/Demolition/Relocation • Building elevation • Critical facilities protection • Retrofitting (i.e., wind-proofing, floodproofing, seismic design) • Safe rooms, shutters, shatter-resistant glass • Insurance
Natural Resource Protection	• Land acquisition • Floodplain protection • Watershed management • Beach and dune preservation • Riparian buffers • Forest and vegetation management (i.e., fire resistant landscaping, fuel breaks) • Erosion and sediment control • Wetland preservation and restoration • Habitat preservation • Slope stabilization • Historic properties and archaeological site preservation
Structural Projects	• Reservoirs • Dams/levees/dikes/floodwalls/seawalls • Diversions/detention/retention • Channel modification • Beach nourishment • Storm sewers
Emergency Services	• Warning systems • Evacuation planning and management • Emergency response training and exercises • Sandbagging for flood protection • Installing temporary shutters for wind protection
Education & Awareness	• Outreach projects • Speaker series/demonstration events • Hazard mapping • Real estate disclosure • Library materials • School children educational programs • Hazard expositions

In addition, MAC members and their staff identified and prioritized mitigation strategies for their organizations and programs who were engaged by email or phone conversations. Priorities were developed from data collected on past damages, existing exposure to risk, community goals, and needs based on local knowledge of County and City needs.

1.6 Capability Assessment, Implementation and Maintenance

The capability assessment evaluates the current capacity of Prince George's County and the City of Laurel to mitigate the effects of the natural hazards identified in the HIRA. By providing a summary of each jurisdiction's existing programs and policies, the capability assessment serves as the foundation for designing an effective hazard mitigation strategy.

The plan outlines a procedure for implementation, maintenance, and plan updates. The Prince George's County Office of Homeland Security's Office of Emergency Management (OEM) in partnership with the City of Laurel Emergency Manager and the Mitigation Advisory Committee will be responsible for monitoring this plan. The OEM will request an annual progress update from the MAC participants and others designated as "Lead Agencies" for 2017 – 2022 Mitigation Strategies Alliance January 31 annually. Information will be consolidated and provided in a report to MEMA and FEMA Region III. These annual progress reports will begin in 2018 and will include corrective action plans if needed, based on evaluation criteria set by the MAC. In accordance with Federal Emergency Management Agency (FEMA) regulations, a written update will be submitted to Maryland Emergency Management Agency and FEMA Region III every five years from the original date of the plan, unless circumstances (e.g., Presidential disaster declaration, changing regulations) require a formal update earlier. The public will be continually informed of changes to the plan as they occur.

1.7 Acknowledgments

The 2017 Plan update was supported by a Hazard Mitigation Assistance Pre-Disaster Mitigation grant program planning grant administered by the Maryland Emergency Management Agency with funding from the Federal Emergency Management Agency. The project was facilitated by Dewberry Engineers, Inc..

1.8 Conclusion

The *Prince George's County and City of Laurel Hazard Mitigation Plan 2017 Update* embodies the continued commitment and dedication of the local governments and community members of the region to enhance the safety of residents and businesses by taking actions before a disaster strikes. While nothing can be done to prevent natural hazard events from occurring, the region is poised to minimize the disruption and devastation that so often accompanies these disasters.

2 Introduction

2.1 Mitigation

Mitigation is commonly defined as sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects. A mitigation plan states the aspirations and specific courses of action that a community intends to follow to reduce vulnerability and exposure to future hazard events. These plans are formulated through a systematic process centered on the participation of citizens, businesses, public officials, and other community stakeholders.

A local mitigation plan is the physical representation of a jurisdiction's commitment to reduce risks from natural hazards. Local officials can refer to the plan in their day-to-day activities and in decisions regarding regulations and ordinances, granting permits, and funding of capital improvements and other community initiatives. Additionally, these local plans will serve as the basis for states to prioritize future grant funding as it becomes available.

The Prince George's County and the City of Laurel Hazard Mitigation Plan will continue to be a useful tool for all community stakeholders by increasing public awareness about local hazards and risks, and providing information about options and resources available to reduce those risks. Educating the public about potential hazards will help each jurisdiction protect itself against the effects of future hazards, and will enable informed decision-making regarding where to live, purchase property, or locate business.

The area covered by this plan includes:

City of Laurel

Prince George's County

2.2 The Local Mitigation Planning Impetus

On October 30, 2000, President Clinton signed into law the Disaster Mitigation Act of 2000 (DMA2K), which required state and local mitigation plans that would help to reduce loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters.

The new law amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act and added a new section to the law, Section 322, Mitigation Planning. Section 322 requires local governments to prepare and adopt jurisdiction-wide hazard mitigation plans for disasters declared after November 1, 2004, as a condition of receiving Hazard Mitigation Grant Program (HMGP) project grants and other non-disaster related mitigation grant assistance programs. Local governments must review and, if necessary, update their mitigation plans every five years

from the original date of the plans in order to continue Hazard Mitigation Assistance (HMA) program eligibility.

The requirements for local mitigation plans are found in Section 44 Code of Federal Regulations Part 201.6. FEMA's "Local Multi-Hazard Mitigation Planning Guidance" issued on October 1, 2011 provides updated FEMA interpretation and explanation of local plan mitigation regulations and FEMA's expectations for mitigation plan updates. In addition, FEMA now uses the 2013 Local Mitigation Plan Review Tool to ensure that a plan meets FEMA's regulatory requirements as well as hazard

2.3 The Prince George's County and City of Laurel Local Hazard Mitigation Plan 2017 Update Sections

Section 1.0 – Executive Summary provides the plan update context of communities, the Prince George's County and City of Laurel Mitigation Advisory Committee (MAC), the planning area, the revised mitigation plan goal and a brief summary of the planning process.

Section 2.0 – Introduction summarizes the nearly two-decade planning determined by the Disaster Mitigation Act of 2000, its regulatory requirements and the plan document organization.

Section 3.0 – Planning Process and Community Profile defines the processes followed throughout the update of this plan including a description of stakeholder involvement and outreach. This section also provides a physical and demographic profile of Prince George's County and the City of Laurel, examining characteristics such as geography, hydrography, development, people, and land uses.

Section 4.0 – Hazard Identification and Risk Assessment evaluates the natural hazards likely to affect Prince George's County and the City of Laurel, and quantifies whom, what, where, and how the region might be affected by natural hazards. Critical facility information has been redacted and is located in Appendix G, available upon request from the Prince George's County Office of Emergency Management.

Section 5.0 – Multiple Hazard Mitigation Strategy addresses the Prince George's County and City of Laurel hazard-related issues and concerns for by establishing a revised framework goal for mitigation activities and policies. The strategy includes a revised goal and a range of updated mitigation strategies, actions and projects to support achievement of this goal to reduce hazard exposure to area citizens and to increase community resiliency. Status on the 2010 mitigation strategies may be found in Appendix C and new 2017 – 2022 strategies, organized by six major mitigation project types, may be found in Appendix D.

Section 6.0 – Community Capability Assessment, Implementation and Plan Maintenance Procedures described available programs and resources which can support plan implementation. How the plan will be monitored, evaluated, and updated, including a process for continuing stakeholder involvement after the plan is completed, is also described in this section.

Section 7.0 – Additional State Requirements contain all other state requirements that need to be met.

Section 8.0 – City of Laurel Plan provides a physical and demographic profile of the City of Laurel, looking at characteristics such as geography, hydrography, development, people, and land uses.

Section 9.0 – References includes a list of the reports and data used to develop this plan.

Section 10.0 –Appendices are included at the end of the plan, and contain supplemental reference materials and more detailed calculations and methodologies used in the planning process. The complete meeting and outreach support materials, history of federal disaster declarations in the region, additional HIRA data, and 2010 mitigation strategy status updates may all be found in the Appendices along with a detailed summary of updated information in the 2017 plan.

Appendix A – Committee meeting materials and outreach

Appendix B – Hazard Identification and Risk Assessment supplemental materials

Appendix C – 20101 Mitigation Strategies Status

Appendix D – 2017 – 2022 Detailed Strategy Update

Appendix E – Record of Change

Appendix F – Sample Adoption Resolutions

Appendix G – Redacted Materials

Appendix H – List of Abbreviated Terms

3 Planning Process and Community Profile

3.1 Planning Process

The Prince George's County Department of the Environment and the Office of Homeland Security Office of Emergency Management in partnership with the City of Laurel's Office of Emergency Services led the development of their first regional hazard mitigation plan for the jurisdictions during 2005.

For the required 2010 update, the County and City continued a joint planning process during 2010, resulting in the *Prince George's County and City of Laurel Maryland Hazard Mitigation Plan 2010 Update* approved by FEMA on February 8, 2012 then consequently adopted by the Prince George's County Council. That plan update will be referred to as the "2010 plan update" throughout this document to reflect that plan's title page as posted on Prince George's County and the City of Laurel websites. This combined effort leveraged the advantage of shared resources, and built on the success of similar multi-jurisdiction partnering agreements. This approach has been continued for the 2017 plan update with technical assistance and support provided by Dewberry.

The Mitigation Advisory Committee (MAC) worked with the consultants throughout the planning process to ensure that potential stakeholders participated in the planning process including reviewing the draft and final versions of the plan. Prince George's County received a Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance (HMA) grant to support the 2017 plan update and contracted with Dewberry Consultants, LLC, on behalf of the County and the City of Laurel.

The plan update followed a traditional mitigation plan update process initiated with then a Mitigation Advisory Committee Hazard Mitigation Plan Update kick-off meeting December 2, 2016. The Hazard Identification Risk Assessment (HIRA – see section 4.0) was completely reformatted using updated data sources during the winter and early spring of 2017 since the 2010 HIRA only featured updated demographic and disaster declaration information. The hazard identification, risk assessment and vulnerability analysis was presented to the MAC at a meeting on March 10, 2017 where the Plan's goal was reviewed and edited. The Community Profile, 2010 Mitigation Action Status and Maintenance sections were updated during late spring and early summer, 2017 along with new 2017 to 2022 mitigation strategies.

The County leveraged community outreach events during May through July, 2017 to seek comments on the draft HIRA and stakeholders perceptions of hazard exposure and disaster preparedness. Some of these events centered on the kick-off of Hurricane Season and corresponding outreach opportunities during June, 2017. A variety of media outlets were employed including social media. A sampling of outreach materials and messaging may be found in Appendix A.

3.1.1 The Hazard Mitigation Technical Advisory Committee

Prince George's County convened a Mitigation Advisory Committee (MAC) comprised of representatives from departments within Prince George's County and the City of Laurel. The MAC worked with the Dewberry team and provided input at each key stage of the planning process, including reviewing the format and content of the previous plan and making decisions on what information to carry forward into the 2017 plan update. MAC members responded to queries detailing plan implementation and mitigation capabilities; updated their 2011 plan actions; participated in MAC and HIRA/Goal Setting meetings; organized and participated in email correspondence, phone discussions or in-person meetings to create a comprehensive menu of 2017 – 2022 mitigation actions which respond to identified priority hazard risks, reviewed document drafts and supported outreach efforts. Appendix E contains the record of changes that documents how each section in the 2010 plan was updated in the 2017 plan. Efforts to involve county and city departments and community organizations that might have a role in implementation of the mitigation actions or policies included invitations to attend meetings and serve on the MAC, access to draft updated plan sections, e-mail updates, mitigation action development discussion, numerous outreach events and opportunities for input and comment on all draft deliverables. Table 3-1 lists contributing HMTAC members.

Table 3-1. 2017 Mitigation Advisory Committee.

Name	Jurisdiction/Organization	Department	Title
Ronald Gill	Prince George's County	Office of Homeland Security/Office of Emergency Management	Deputy Director
Courtney Mariette	Prince George's County	Office of Homeland Security/Office of Emergency Management	Regional Planner
James Carter	Prince George's County	Office of Homeland Security/Office of Emergency Management	
Eddie Walters	Prince George's County	Office of Homeland Security/Office of Emergency Management	
Dawn Hawkins-Nixon	Prince George's County	Department of the Environment	Associate Director
Chris Akinbobola	Prince George's County	Department of the Environment	Special Assistant

Table 3-1. 2017 Mitigation Advisory Committee.

Name	Jurisdiction/Organization	Department	Title
Catherine Escarpeta	Prince George's County	Department of the Environment	GIS Analyst
Joe Perez	Prince George's County	Police Department	Captain
Charles Hamby	Prince George's County	Police Department	Major
William Alexander	Prince George's County	Police Department	Major
Kirk McLean	Prince George's County	Police Department	Lieutenant
Dan Schefield	Prince George's County	Police Department	
Gwen Clerkley	Prince George's County	Department of Public Works and Transportation	Associate Director
Vernon L. Stinnett	Prince George's County	Department of Public Works and Transportation	Division Chief
Todd Addis	Prince George's County	Office of Information Technology	Security Manager
Debbie Tyner	MNCPPC	Department of Parks and Recreation	Deputy Director
Laura Connelly	MNCPPC	Department of Parks and Recreation	Planner Coordinator
Cathy Stasny	Prince George's County Department of Family Services	Area Agency on Aging	
Bill Goddard	City of Laurel	Administration	Deputy City Administrator
Jack Brock (left city service)	City of Laurel	Planning	Planning Director
Christian Pulley	City of Laurel	Economic and Community Development	ECD Director
Stephen Allen, Sr.	City of Laurel	Department of Emergency Services	Emergency Manager
Theresa Martin (left city service)	City of Laurel	Department of Information Technology	GIS Analysis

Table 3-1. 2017 Mitigation Advisory Committee.

Name	Jurisdiction/Organization	Department	Title
Melissa Roeswer	City of Laurel		GIS Analysis

During December, 2016 through March, 2017 the MAC held two meetings and supervised work on the County and City's mitigation plan update. Extensive coordination through weekly calls occurred between Prince George's County OEM and the contractor. Additionally, several calls were conducted with the City of Laurel Office of Emergency Services staff to incorporate appropriate dam infrastructure hazard and risk information into the redacted critical facilities analysis. The MAC members coordinated and consulted with other entities and stakeholders to identify and delineate natural hazards within the local jurisdictions and to assess the risks and vulnerability of public and private buildings, facilities, utilities, communications, transportation systems, and other vulnerable infrastructure. In addition, the individual MAC members worked with OEM and the consultant to review program capabilities, 2011 mitigation action status and to identify/update 2017 jurisdictional mitigation actions.

In developing the mitigation plan update, a majority of necessary communications occurred through telephone calls and e-mails. The MAC and Dewberry mutually chose this communications avenue, rather than meetings, to best accommodate budgets and schedules. Table 3-2 documents meeting dates and their purposes. Meeting presentations, related materials and attendance sign-in sheet scans may be found in Appendix A. Participation in various plan development activities is summarized in Table 3-3.

Table 3-2. Hazard Mitigation Technical Advisory Committee Meetings.

Date	Summary of Discussions
December 1, 2016	Prince George's County Department of Environment and Office of Emergency Management and Dewberry Consultants, LLC project administrative kick-off meeting. At this meeting the project schedule, deliverables and coordination with the Maryland Emergency Management Agency (MEMA) and Region III, Federal Emergency Management Agency (FEMA) was discussed.
December 2, 2016	**Hazard Mitigation Plan Update Project Kick-off Meeting:** During the Mitigation Advisory Committee Plan Update Kick-off Meeting, the planning process and schedule was presented. Committee members committed to the project and schedule. The list of hazards and rankings from the 2011 previous plan update were validated through a prioritization exercise. The previous plan structure and content was discussed; a decision was made to retain structure and general level of content. The update process and role of HMTAC members, project schedule and desired plan outcomes were discussed.
March 10, 2017	**HIRA Results and Goals Update Meeting:** The Hazard Identification, Risk Assessment and Vulnerability Analysis results were presented with maps posted in the meeting space as well as provided in a power point presentation. The 2011 plan goal was reviewed and slightly modified. Public outreach needs were discussed.
May 17, 2017	Conference call between Prince George's County MD Department of Environment and Office of Emergency Management and Dewberry to outline plan draft progress and incorporation of Community Rating System program review into the project. Plans were made for the contractor to visit with some staff personally in June to gain clarity on some County programs as well as to complete 2017 – 2022 new Mitigation Strategies.
June 30, 2017	**Final Project Meeting:** A **c**ombined Prince George's County and City of Laurel meeting outlined adoption procedures for the local plan adoption process and implementation schedule based on MEMA-FEMA conditional plan approval.

Table 3-3. Mitigation Advisory Committee Meeting Summary and Attendance.

MAC Member	Organization	Jurisdiction	Kick-off Meeting	Capability Survey/2011 Action Status	Data Provided	HIRA & Goal Review Meeting	Mitigation Actions Discussion	Outreach Activities	Final Adoption Call TBD
Ronald Gill	OHS/OEM	PG County	X			X	X		
Courtney Mariette	OHS/OEM	PG County	X	X	X	X	X	X	
James Carter	OHS/OEM	PG County	X		X		X		
Eddie Walters	OHS/OEM	PG County				X			
Dawn Hawkins-Nixon	Dept. of the Environment	PG County	X	X	X	X			
Chris Akinbobola	Dept. of the Environment	PG County	X	X		X			
Catherine Escarpeta	Dept. of the Environment	PG County	X	X	X				
Joe Perez	Police Dept.	PG County		X	X		X		

Table 3-3. Mitigation Advisory Committee Meeting Summary and Attendance.

MAC Member	Organization	Jurisdiction	Kick-off Meeting	Capability Survey/2011 Action Status	Data Provided	HIRA & Goal Review Meeting	Mitigation Actions Discussion	Outreach Activities	Final Adoption Call TBD
Charles Hamby	Police Dept.	PG County		X	X	X			
William Alexander	Police Dept.	PG County		X	X	X			
Kirk McLean	Police Dept.	PG County	X	X	X				
Dan Schefield	Police Dept.	PG County				X			
Gwen Clerkley	Dept. of Public Works and Transportation	PG County	X	X	X		X		
Vernon L. Stinnett	Dept. of Public Works and Transportation	PG County	X	X		X			

Table 3-3. Mitigation Advisory Committee Meeting Summary and Attendance.

MAC Member	Organization	Jurisdiction	Kick-off Meeting	Capability Survey/2011 Action Status	Data Provided	HIRA & Goal Review Meeting	Mitigation Actions Discussion	Outreach Activities	Final Adoption Call TBD
Todd Addis	Office of Information Technology	PG County	X	X	X				
Debbie Tyner	Department of Parks and Recreation	MNCPPC	X	X	X	X	X		
Laura Connelly	Department of Parks and Recreation	MNCPPC		X	X		X		
Cathy Stasny	Agency on Aging	PG County					X		
Bill Goddard	Administration	Laurel	X						
Jack Brock	Planning	Laurel	X						
Stephen Allen, Sr.	Emergency Management	Laurel	X	X	X		X		

Table 3-3. Mitigation Advisory Committee Meeting Summary and Attendance.

MAC Member	Organization	Jurisdiction	Kick-off Meeting	Capability Survey/2011 Action Status	Data Provided	HIRA & Goal Review Meeting	Mitigation Actions Discussion	Outreach Activities	Final Adoption Call TBD
Theresa Martin	GIS/IT	Laurel	X						
Christian Pulley	Economic and Community Development	City of Laurel					X		
Melissa Roeswer	GIS	City of Laurel							

3.1.2 Public Participation and Stakeholder Input

Internal stakeholder engagement began in November, 2016 when the Prince George's County and City of Laurel Mitigation Advisory Committee was notified that the plan would be updated and the committee would be revitalized to reconvene at a project kick-off meeting on December 2, 2016.

External public participation was initiated in May, 2017 by the Prince George's County Office of Homeland Security – Office of Emergency Management supplemented by efforts of the Prince George's County Department of the Environment during May, June and July, 2017.

Prince George's County has promoted the plan update process internally at meeting such as the Public Works Roundtable Workshop on May 23, 2017 where OEM Planner Courtney Mariette promoted the plan during an afternoon update on Emergency Management Activities. The program agenda and sign-in sheet may be found in Appendix A.

The Prince George's County Local Emergency Planning Committee (LEPC) Meeting was conducted on July 11. 2017. The purpose of the LEPC is to enhance Prince George's County's preparedness to hazardous materials incidents by involving the government, private business, nonprofit organizations, and citizens. Conducted at the Prince George's County Public Safety Complex - Training Room at the Landover Office of Homeland Security Office of Emergency Management facility. This meeting presented an opportunity to tie the plan's updated Hazard Identification and Risk Assessment to areas in the county identified as vulnerable to natural hazards which may also be vulnerable to hazardous materials incidents. It also provided an opportunity for networking on mutual program objectives. The LEPC roster may be found in Appendix A.

The City of Laurel has encouraged public participation through the Mayor's "City Hall in the Park" and the various committees and commissions within the City of Laurel Government.

Examples of community outreach and engagement include incorporation of hazard awareness into community events like Capital Heights Day on June 10, 2017 where the Office of Emergency Management provided all-hazard information from the 2017 Plan Update Hazard Identification Risk Assessment to the more than 50 people who came up to the OEM table.

Prince George's County citizens were notified of the plan revisions and asked to participate through posts on Facebook, Twitter, and on the Emergency Management section of the county website. Citizens were encouraged to contact Courtney Mariette with any comments or questions they might have; her contact information was posted to the county website. This method of soliciting public participation in the plan will be utilized during the next 5 years.

Engagement of community stakeholders in the review of the Prince George's County and the City of Laurel Hazard Mitigation Plan (HMP) update has been an ongoing effort. In addition to posting a digital version of the HMP on the Prince George's County website (at

https://www.princegeorgescountymd.gov/2769/Hazard-Mitigation-Plan---Draft), Prince George's County Office of Emergency Management (PGC OEM) staff solicited feedback from the community partners through:

- Onsite meetings, where PGC OEM staff discussed Prince County hazards, HMP findings, ongoing mitigation efforts and solicited feedback from constituents one-on-one or in a classroom setting.
- Local Emergency Planning Committee Meeting (7/11/2017) – meeting minutes included in Appendix A;
- Prince George's County Fair (9/7/2017 - 9/10/2017);
- Public Safety Night for the City of Mt. Rainier (9/29/2017) – photo included in Appendix A; and
- Prince George's County Floodplain Mitigation Meeting (10/4/2017) - agenda in Appendix A.

Feedback from surrounding communities was solicited through the following mechanisms:

- Monthly and quarterly meetings with Metropolitan Washington Council of Governments (MWCOG): Emergency Management Planners and Office of Emergency Management Neighboring Jurisdictions Trainings. During these meetings, PGC OEM staff verbally solicited feedback and discussed Prince George's County hazards, HMP findings, mitigation strategies, and community outreach efforts.
- The MWCOG meeting includes: the City of Manassas, the City of Manassas Park, Arlington County, Fairfax County, Loudoun County, Montgomery County, Prince George's County, Prince William County, the District of Columbia, State of Maryland, Commonwealth of Virginia, WMATA, MWAA, and other Federal partners.
- The Office of Emergency Management Neighboring Jurisdictions trainings include: Prince George's County, Anne Arundel County, Howard County, Montgomery County, the City of Laurel, the City of Bowie, colleges and universities.
    - During the trainings, to include interagency and municipality leadership, PGC OEM staff verbally solicited feedback and discussed Prince George's County HMP, findings, successes, challenges, and mitigation strategies.

PGC OEM staff continue to use an open floor (or unarranged times) during meetings and trainings to solicit feedback and discuss the PGC and the City of Laurel Hazard Mitigation Plan update with community stakeholders.

June is Prince George's County Flood Awareness Month which was used to introduce the Hazard Mitigation Plan update project and flood awareness through several intensive activities. The month kicks off with A Proclamation shown to the right by the County Council and County Executive followed by leveraged press and media contacts using traditional news, radio and television along with Social Media. Each owner of flood prone property depicted on the County's Flood Insurance Rate Maps as being within the Special Flood Hazard Area is sent a letter encouraging the purchase of flood insurance even if not lender required, mitigation options and sources of more information through the County's web-based Floodplain Lookup Tool and other programs.

A Proclamation

COUNTY COUNCIL
Derrick Leon Davis
Mel Franklin
Dannielle M. Glaros
Andrea C. Harrison
Mary A. Lehman
Obie Patterson
Dani Tavoras
Karen R. Toles
Todd M. Turner

WHEREAS, the month of June signals the advent of hurricanes, tropical storms, tornadoes and other related severe weather occurrences including the likelihood for flooding; and

WHEREAS, the Prince George's County Department of the Environment conducted floodplan studies identifying at least 4,300 floodprone structures Countywide; and

WHEREAS, the Department of Environment is taking measures to inform local residents about the hazards of flooding; and

WHEREAS, it is important to renew public awareness of floods and flood disasters, and that local residents become aware of the potential for flooding and how to reduce the impact of a major flood.

NOW, THEREFORE, Be It Proclaimed by the Prince George's County Council and County Executive, Rushern L. Baker, III, that the month of June 2017, is declared **"Flood Awareness Month"** in Prince George's County. **FURTHER,** all citizens are encouraged to become aware of the programs and services the County offers through the Department of the Environment, the Offices of Emergency Management, and the Police and Fire/EMS Departments, which protect the community from floods and flood disasters.

DERRICK LEON DAVIS
COUNCIL CHAIRMAN

RUSHERN L. BAKER, III
COUNTY EXECUTIVE

The City of Laurel Emergency Manager apprised internal City staff of plan update status at weekly department director meetings. In addition, citizens have been briefed at each Mayor's Community Gathering since inception of the project in December, 2016. City of Laurel homeowner's association have been briefed and linked to the draft plan are on the city's website encouraging citizen comment.

A summary of Prince George's County and City of Laurel outreach efforts, scanned materials and screen captures of messaging will be placed in Appendix A.

3.1.3 Incorporation of Existing Plans and Studies

The *2017 Prince George's County and City of Laurel MD Hazard Mitigation Plan* update incorporates information from a number of other plans, studies, and reports. These documents include:

- 2016 State of Maryland State Hazard Mitigation Plan, MEMA.
- Plan Prince George's 2035 – Guiding Today and Tomorrow; Prince George's County General Plan
- City of Laurel Master Plan: Goals, Objectives and Policies
- NOAA and US Army Corps of Engineers climate reports
- Maryland National Capital Park and Planning Commission Data and GIS datasets
- Prince George's County Data and GIS datasets
- Maryland Forest Service wildfire data and reports
- Landslide Incidence and Susceptibility in the Conterminous United States, U.S. Geological Survey (USGS).
- FEMA Risk Mapping, Assessment, and Planning FIRMS and FIS, Prince George's County and City of Laurel, MD
- FEMA TEIF 2.0 Analysis 2017 methodology for flood risk analysis
- Draft Prince George's County Emergency Operations Plan
- USDA Census of Agriculture
- 2010 US Census Bureau population data
- 2010 – 2014 American Community Survey population estimates

Information about how these plans and studies were incorporated into in Sections 3.0., 4.0, and 5.0 is specifically mentioned in those sections where relevant and more specific data sources and information is cited with relevant tables and figures. Full reference information is provided in Section 9 References.

3.2 Community Profile

Prince George's County is part of the greater Washington-Baltimore metropolitan area. The county is approximately 499 square miles ($mi^{2)}$, 483 mi^2 comprised of land and 16 mi^2 of water. Prince George's County is surrounded by Anne Arundel County and the Patuxent River to the east, Calvert County to the southeast, Charles County to the south, Howard County to the north, and Montgomery County to the northwest in Maryland. Washington, D.C. and the Potomac River lie to the west. The county border with Fairfax County and Alexandria, Virginia is the Potomac River shoreline along the Virginia coast.

Although there are 27 separate incorporated municipalities within the boundaries of Prince George's County, only the Cities of Laurel and Bowie retain some degree of land use authority. Only the City of Laurel is recognized separately by FEMA and administers its own floodplain management ordinance, thus the City of Laurel participation has been incorporated into the plan as a separate entity in the planning process with specific community profile information detailed in Section 8.0.

3.2.1 Physiography

Prince George's County lies in the Atlantic Coastal Plain, and its landscape is characterized by gently rolling hills and valleys, but can be locally quite rugged where short, high-gradient streams have incised steep ravine systems. Along its western border with Montgomery County, Adelphi, Calverton and West Laurel rise into the Piedmont, exceeding 300 feet mean sea level (MSL) in elevation. The Piedmont is characterized by deeply weathered, poorly exposed bedrock and a rolling topography. The Fall Line, which delineates the division between Coastal Plain and Piedmont, is the easternmost extent of rock-filled river rapids, the point at which east-flowing rivers cross from the hard, igneous, and metamorphic rocks of the Piedmont to the relatively soft, unconsolidated strata of the flat Coastal Plain. Figure 3-1 shows the States of Maryland and Delaware divided into their respective physiographic provinces.

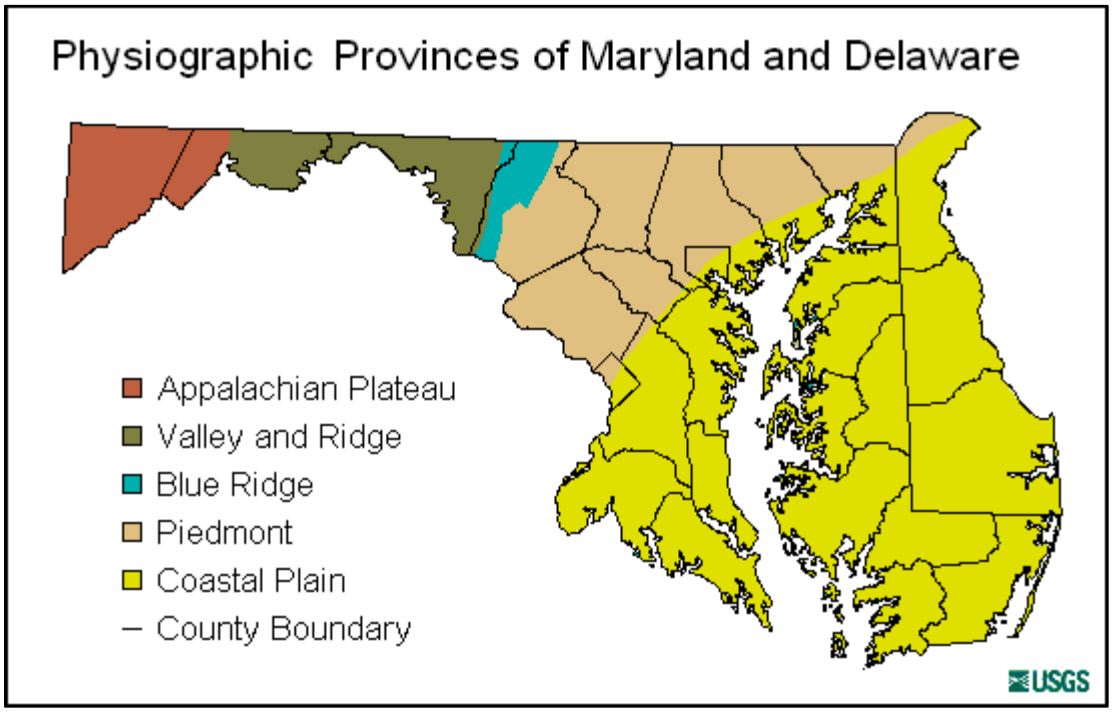


Figure 3-1. Physiographic Provinces of Maryland and Delaware.

3.2.2 Hydrology

Prince George's County lies within two watersheds: the Patuxent River and the Potomac River, both of which are a part of the greater Chesapeake Bay Watershed.

The Potomac River Watershed covers 14,670 square miles: Virginia (5,723 $mi^{2)}$ Maryland (3,818 $mi^{2)}$), West Virginia (3,490 $mi^{2)}$), Pennsylvania (1,570 mi^{2}), and the District of Columbia (69 $mi^{2)}$). Based on information from the 2011 National Land Cover Database (NLCD) which is the most current land use database, the majority of the basin's land area is covered by forests (54.6% of the land area). Developed land makes up 14.1% of the basin's land area, while agriculture

covers 26.0%. Water and wetlands make up 5.9 percent of the basin's land area. The Potomac's major tributaries include: the Anacostia River, Antietam Creek, the Cacapon River, Catoctin Creek, Conocoheague Creek, the Monocacy River, the North Branch, the South Branch, the Occoquan River, the Savage River, the Seneca Creek, and the Shenandoah River. The Potomac River watershed is mainly fed by the Anacostia River, Oxon Creek, Piscataway Creek, Mattawoman Creek, Zekiah Swamp, and the Potomac River in Prince George's County.

The Patuxent River Watershed is fed mainly by the Patuxent River, Rocky Gorge Reservoir, and Western Branch in Prince George's County. It covers 957 mi^2that is mostly forested (42.3%) with only 10.7% of its acreage developed. The Patuxent River is the largest and longest river entirely within Maryland, and its watershed is the largest completely within the state.

Significant water bodies in Prince George's County include, but are not limited to:

- Bald Hill Branch
- Base Lake
- Bear Branch
- Beaverdam Creek
- Black Swamp Creek
- Carey Branch
- Cash Creek Lake
- Charles Branch
- Chews Lake
- Collington Lake
- Crow Branch
- Greenbelt Lake
- Henson Creek
- Horsepen Branch
- Indian Creek
- Lake Artemesia
- Lake Deborah
- Laurel Lake
- Northampton Lake
- Paint Branch
- Redington Lake
- Sligo Creek
- Walker Branch

3.2.3 Climate

The eastern half of Maryland lies on the Atlantic Coastal Plain, with flat topography and sandy or muddy soil. This region has a humid subtropical climate, with hot, humid summers and a short, mild to cool winter. This humid subtropical climate is strongly influenced by the Chesapeake Bay and the Atlantic Ocean, both of which moderate the weather but do not prevent ice formation almost every winter on the bay's northern tributaries; summer calms can produce high temperatures of up to 107°F, with nearly 100% relative humidity. Average temperatures in eastern Maryland are 75°F in July and 35°F in January.

The Piedmont region has average seasonal snowfall totals generally exceeding 20 inches; temperatures below 10°F are less rare than in the Atlantic Coastal Plain. Land use and development trends in Prince George's County is characterized by highly urbanized areas, high growth areas, and outlying more rural areas in the southern area of the county. Between 2002

and 2010, the County experienced a 7.7% increase in developed land and a 6.3% decrease in natural resource areas—agricultural, forest, and wetlands.

3.2.4 Land-use and Development Trends

While the majority of residential growth between 1980 and 2010—measured by the number of issued building permits—occurred in County communities outside of the Capital Beltway (Route 95/495) more isolated from transit stations, approximately 60% of nonresidential growth occurred outside of the Capital Beltway during this period as well. These trends are problematic because suburban development during the past three decades has not been compact and has, as a result, consumed a disproportionate amount of land and required an extensive new infrastructure investment. Between 2002 and 2011, suburban development outside of the Capital Beltway accounted for 73% of all growth and 59% of all consumed land, while more densely urban areas inside the Capital Beltway accounted for 25% of all growth and only 5% of all consumed land. This is because areas inside of the Capital Beltway have been largely "built out" for several decades. Thus the areas inside the Beltway are more prone to re-development.

Land use and development trends are documented by the United States Census Bureau and that agency's American Community Survey. In addition, a George Mason University study also characterized county demographics. Section 3.2 relies most strongly on Census Bureau data supplemented by the Plan 2035 Prince George's Approved General Plan, May 6, 2014.

As of May, 2014, the highest percentage of the county (282,589 acres) is devoted to single-family dwelling units (27%). Land dedicated to agricultural and natural resource activities accounts for 16.7% of the county, while parks and open space, institutional uses, and vacant property consumes approximately 20% of land area. Only 37 acres, or 0.013%, of county land is classified as mixed use. It is anticipated that mix use development will increase with new and re-development projects in the future. Table 3-4 provides a comprehensive list and description for each of these land use categories as of May 2014.

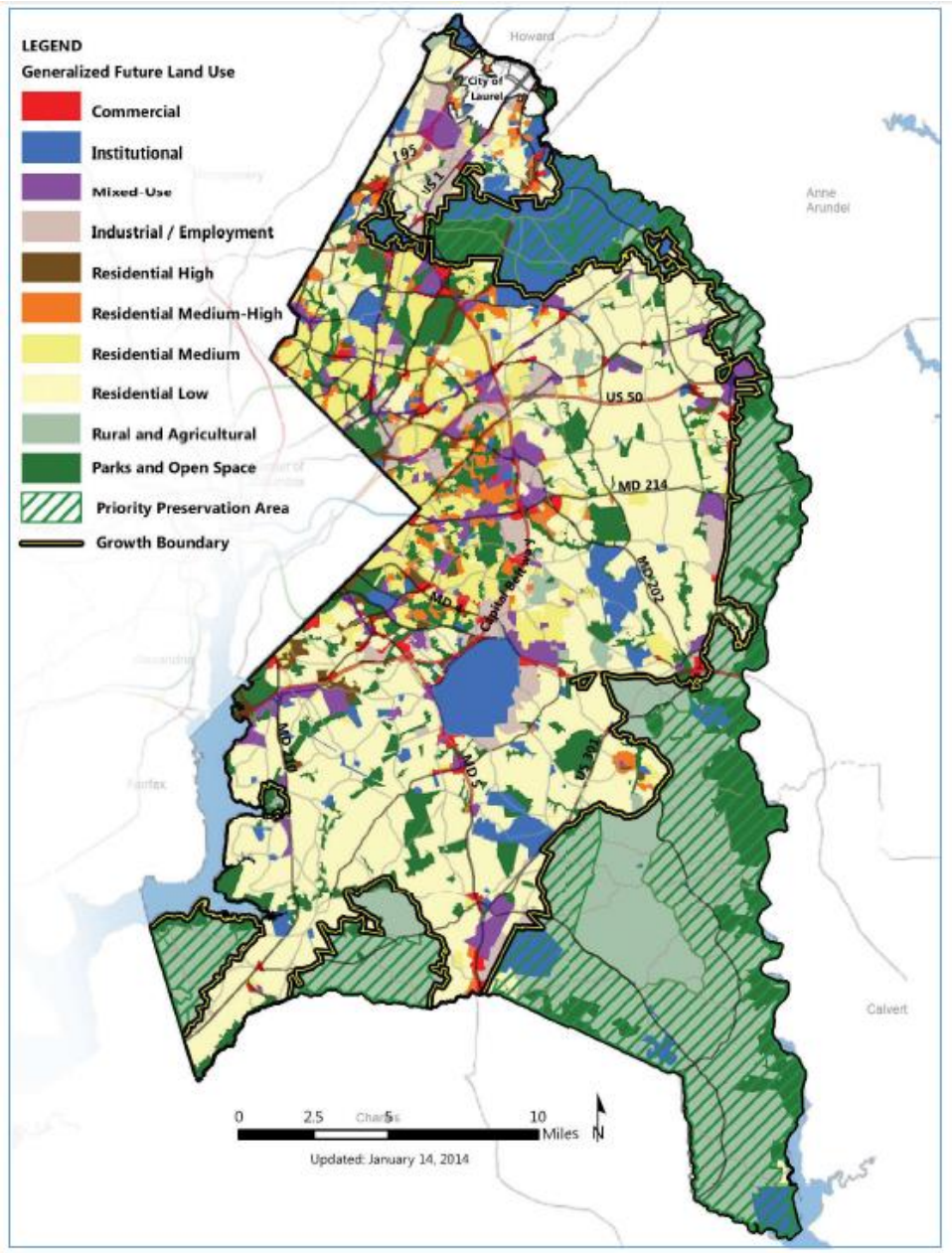
Table 3-4. Existing Land Use for Prince Georges County, 2014.

Land Use	Acres	% Land Area	Description
Agricultural–Natural Resources	47,134	16.68%	Agricultural or natural resources activities.
Residential–Single-Family	76,412	27.04%	Single-family detached units.
Residential–Attached	1,190	0.42%	Single-family attached units e.g. duplexes or triplexes.
Residential–Townhouse	4,878	1.73%	Single-family townhouse units.
Residential–Multifamily	5,431	1.92%	Multifamily units e.g. apartments or condos.
Commercial	5,832	2.06%	Commercial e.g. shopping, service, trade, or restaurants.
Office	3,446	1.22%	Offices.
Industrial	8,150	2.88%	Industrial, manufacturing, and storage.
Institutional	32,662	11.56%	Social, institutional, or public facilities.
Transportation and Utilities	7,186	2.54%	Transportation and utility-related.
Parks and Open Space	34,475	12.20%	Parks and open space.
Vacant	55,756	19.73%	Undeveloped land.
Mixed Use	37	0.01%	Single lot Mixed-use, typically housing office above retail or retail.
Total	282,589	100.00%	All land area in Prince George's County

Source: Prince George's County Approved General Plan, 2014

Future Prince George's County land use decisions are guided by *Plan 2035* which prioritizes which affect the county as a whole, specifically where future growth and development should be concentrated. Land use areas which are characterized by three "tiers." Plan 2035 delineates Priority Preservation Areas and is committed to maximizing g development in its mixed-use Regional Transit Districts, many centered proximate to the county's 15 Metro Stations. A 2011 study by the George Mason University Center for Regional Analysis (GMU) concluded that robust economic growth in the region cannot be guaranteed unless the housing preferences of the workforce have been met. The study recommended that a majority of new housing be located in compact developments with convenient access to jobs and transportation options to meet growing demand for mixed-use, walkable, transit accessible communities. The density of the Regional Transit Districts is often noticeably greater within a quarter mile of Metro and light rail stations. The County's greatest opportunity to build a strong commercial tax base and

generate the type and scale of economic development opportunities that will enhance its competitiveness within the region will rest on creating and enhancing these Districts shown in approved sector and master plans. A challenge the County faces is reconciling approved residential unit development (at least 10,000 by 2011) to the land use vision outlined in *Plan 2035.* The County Department of Planning and the Maryland-National Capital Parks and Planning Commission continue to modify community plans and zoning to meet *Plan 2035's* vision.



Source: M-NCPPC, 2014

Figure 3-2. Generalized Future Land Use Map for Prince George's County.

Source: Maryland-National Capital Park and Planning Commission, 2014

Plan 2035 notes that 90% of approved by unbuilt development is located outside of the Capital Beltway. Land use is characterized by three tiers:

Table 3-5. Prince George's County Growth and Consumption by Tier.

Tier	Growth Rate	Total Land Consumption
Developed Tier	25%	5%
Developing Tier	73%	59%
Rural Tier	2%	36%

Source: Plan 2035 Prince George's Approved General Plan, May 6, 2014.

3.2.5 Population

The Prince George's County population is estimated to be 909,535 as of the 2015 US Census Bureau population estimates. This is a 5.3% increase since the 2010 population census. Table 3-6 shows the population projections for Prince George's County. Veteran population has soared, increasing by 59,015 people between 2011 and 2015. As Middle East and Afghanistan deployments are reduced, veterans return or settle in the County for proximity to national capital region employment.

Table 3-6. Population Projections for Prince George's County.

Year	Population	Percent Change from 2015
2010 (Census)	863,519	
2015 (estimated)	909,535	5.30%
2020 (projected)	914,500	0.6%
2025 (projected)	929,650	2.2%
2030 (projected)	944,550	3.8%
2035 (projected)	957,650	5.3%
2040 (projected)	967,850	6.4%

Source: U.S. Census Bureau QuickFacts and the Maryland Department of Planning, July, 2014

Race and Sex

According to 2015 US Census Bureau data, the majority of the population in Prince George's County was reported to be of a single race (97.4%). Of the total population reporting one race, 64.6% were Black or African American, 26.9% were White, and 4.70% were Asian. The Hispanic or Latino origin population was reported as 17.2%. Table 3-7 shows County demographics.

Table 3-7. Race Demographics for Prince George's County.

Prince George's County Self-reported Race	Percent	Approximate Number of Persons
White alone, 2015	26.90%	244,665
Black or African American alone, 2015	64.60%	587,560
American Indian and Alaska Native percent, 2015	1.00%	9,095
Asian alone, 2015	4.70%	42,748
Native Hawaiian and Other Pacific Islander alone, 2015	0.20%	1,819
Two or More Races,2015	2.60%	23,648
Hispanic or Latino, 2015	17.20%	156,440
White alone, not Hispanic or Latino, 2015	13.90%	126,425

Source: U.S. Census Bureau QuickFacts

In Prince George's County, there are more females than males. Females represent 51.8% of the population, or 471,139 people. Male persons make up the remaining 48.2% of the population, or 438,396 people. Table 3-8 shows the gender distribution for Prince George's County.

Table 3-8. Gender Distribution of Prince George's County.

Prince George's County Self-reported Gender	Percent	Approximate Number of Persons
Female persons, 2015	51.80%	471,139
Male persons, 2015	48.20%	438,396

Source: U.S. Census Bureau QuickFacts

Language

About 21.2% of Prince George's County residents were foreign-born according to the 2015 U.S. Census bureau data. In addition, 22.5% of persons age five or older do not speak English at home. These statistics indicate there may be a significant portion of the community that may require special consideration when developing hazard reduction and outreach strategies for the community. Table 3-9 shows the language statistics for Prince George's County.

Table 3-9. Language Demographics for Prince George's County.

Foreign Born and At-home Language Demographics	Percent	Approximate Number of Persons
Foreign born persons, 2011-2015	21.20%	192,821
Language other than English spoken at home, persons age 5 years+, 2011-2015	22.50%	204,645

Source: U.S. Census Bureau QuickFacts

Age

Age can characterize another special needs group is characterized by age. The 2015 TIGER U.S. Census Bureau data shows that about 6.6% of the population in Prince George's County is under the age of five while approximately 22.5% is under the age of 18. Additionally, approximately 11.7% of the population is age 65 and above. These figures are similar to the Maryland state averages, with the exception of the 65 and over population, being 2.4% below the state average (14.1%). Table 3-10 shows the age statistics for Prince George's County.

Table 3-10. Age Demographics for Prince George's County.

Statistics	Prince George's County	Approximate Number of Persons
Persons under 5 years, 2015	6.60%	60,029
Persons under 18 years, 2015	22.50%	204,645
Persons between 18 and 65 years,2015	40.80%	371,091
Persons 65 years and over, 2015	11.70%	106,416

Source: U.S. Census Bureau QuickFacts

Education

Data from the 2015 TIGER census estimates shows that about 85.6% of residents in the region graduated from high school and 31.1% received a bachelor's degree or higher. These statistics, coupled with the population characteristics described in the previous paragraphs, are important to inform public outreach programs. The content and delivery of public outreach programs should be consistent with the audiences' needs and ability to understand complex information. Table 3-11 summarizes education levels of Prince George's County.

Table 3-11. Education Levels for Prince George's County.

Education Level	Percent	Approximate Number of Persons
High school graduate or higher, persons age 25 years+, 2011-2015	85.60%	778,562
Bachelor's degree or higher, persons age 25 years+, 2011-2015	31.10%	282,865

Source: U.S. Census Bureau QuickFacts

Education levels are lower than the Maryland State percentages of 89.4% of persons graduated from high school and 37.9% hold bachelor's degrees or higher.

3.2.6 Income

As of 2015, the average median household income in Prince George's County was approximately $74,260, less than half a percent of the state average according to the 2015 TIGER U.S. Census. About 9.5% of residents within Prince George's County live below the poverty line. This rate is significantly lower than that of the national rate of 14.8% in 2015 and the state rate of 9.7%. The income levels indicate that some residents in housing at risk may not have the resources available to them to undertake mitigation projects that require self-funding. Table 3-12 shows the income data for Prince George's County and the State of Maryland.

Table 3-12. Income Statistics for Prince George's County and the State of Maryland.

County Income	Prince George's County	State of Maryland
Median household income (in 2015 dollars), 2011-2015	$74,260	$74,551
Per capita income in past 12 months (in 2015 dollars), 2011-2015	$32,639	$36,897
Persons in poverty	9.5%	9.7%

Source: U.S. Census Bureau QuickFacts

3.2.7 Housing

As of 2015, there were 331,325 housing units in Prince George's County according to the TIGER U.S. Census. When considering mitigation options, special attention should be given to the difference in capabilities between owners and renters. Housing mitigation projects, with the exception of acquisition/demolition or elevation of buildings in extremely high hazard landslide and flood areas. Table 3-13 shows the housing statistics for Prince George's County.

Table 3-13. Housing Demographics for Prince George's County.

Housing Demographics	Prince George's County
Housing units, 2015	331,325
Owner-occupied housing unit rate, 2011-2015	62.00%
Median value of owner-occupied housing units, 2011-2015	$254,700
Median selected monthly owner costs -with a mortgage, 2011-2015	$1,998
Median selected monthly owner costs -without a mortgage, 2011-2015	$631
Median gross rent, 2011-2015	$1,294
Building permits, 2015	1,757
Households, 2015	305,610
Persons per household, 2011-2015	2.86

Source: U.S. Census Bureau QuickFacts

3.2.8 Business and Labor

The sectors with the most employees in Prince George's County are:

- Educational services
- Federal government
- Transportation and warehousing
- Retail trade
- Information
- Health care
- Accommodation and food services
- Finance and insurance
- Professional services

Table 3-14 lists the establishments with the highest number of employees in Prince George's County.

Table 3-14. The Ten Largest Employers in Prince George's County, MD, 2015.

Company	Product / Service	Number Employed
University of Maryland System	Higher education	18,726

Company	Product / Service	Number Employed
Joint Base Andrews Naval Air Facility Washington	Military installation	17,500
U.S. Internal Revenue Service	Revenue collection & data processing	5,539
U.S. Census Bureau	Demographic research & analysis	4,414
United Parcel Service (UPS)	Mail & package delivery services	4,220
NASA - Goddard Space Flight Center	Space research	3,397
Giant Food	Groceries	3,000
Prince George's Community College	Higher education	2,785
Verizon	Telecommunications	2,738
Dimensions Healthcare System	Medical services	2,500

Source: Maryland Department of Commerce Brief Economic Facts for Prince George's County

The highest paid professions in the county during 2015 average between $75,000 and $90,000 annually:

- Medical
- Architecture and Engineering
- Computer and Mathematical
- Legal
- Management
- Life, Physical, and Social Science

As of 2014, there were a total of 14,459 employer establishments and 77,204 firms in Prince George's County, according to the TIGER U.S. Census. Table 3-15 shows business and labor statistics for Prince George's County. As of December 2016, the unemployment rate for Prince George's County was 3.9%, lower than the Maryland State average of 4.2%

Table 3-15. Business and Labor Statistics for Prince George's County.

Employment	Prince George's County
Total employer establishments, 2014	14,459
Total employment, 2014	250,855
Total annual payroll, 2014 ($1,000)	11,619,629
Total employment, percent change, 2013-2014	+3.10%
Total non-employer establishments, 2014	73,755
All firms, 2012	77,204
Men-owned firms, 2012	37,899
Women-owned firms, 2012	34,395
Minority-owned firms, 2012	59,172
Nonminority-owned firms, 2012	16,219
Veteran-owned firms, 2012	7,644
Nonveteran-owned firms, 2012	67,290
Source: U.S. Census Bureau QuickFacts	

Residential and Employment Growth

Of the many priority policies presented in *Plan 2035*, one compelling strategy is "Policy 1: Direct a majority of projected new residential and employment growth to the Regional Transit District in accordance with the Growth Policy Map and the County's Growth Policy Goals." Table 3-16 aligns Growth Policy Map Areas with projected new dwelling units and new jobs from 2014 through the *Plan 2035* planning horizon of 2035.

Table 3-16. Plan 2035 Growth Management Goals.

Growth Policy Map Areas	Percentage of New Dwelling Units	Projected Dwelling Units	Percentage of New Jobs	Projected New Jobs
Regional Transit District	50%	31,500	50%	57,000
Local Centers	25%	15,750	20%	22,800
Local Transit, Neighborhood & Campus Centers	15%	9,450	15%	17,100
Town Centers	10%	6,300	5%	5,700
Employment Areas	4%	2,520	20%	22,800
Established Communities	20%	12,600	9%	10,260
Future Water & Sewer Service Areas	0%	0	0%	0
Rural and Agricultural Areas	1%	630	1%	1,140
Total County Projected Growth	100%	63,000	100%	114,000

Source: Maryland-National Capital Parks and Planning Commission 8.1 Projections, 2012

3.2.9 Transportation

The County contains a large portion of the Capital Beltway (I-95/I-495). After a decades-long debate, construction began in late 2007 on an east-west toll freeway, the Intercounty Connector (ICC), which extends I-370 in Montgomery County to connect I-270 with I-95 and U.S. 1 in Laurel. The ICC was completed in 2012. Other interstates that service the county include I-95 and I-295. Interstate 95 is a north-south route, being the primary route along the East Coast extending from Maine to Florida. I-295 is an eight mile spur route connecting I-95/I-495 and Maryland Route 210 near the Potomac River to Interstate 695 and Washington D.C. Route 295 in the Anacostia neighborhood of Washington, DC. A number of large U.S. highways also service the region. They include: US 1, US 1 Alternate, US 50, and US 301. There are a total of 38 Maryland state roads that run through Prince George's County.

Fourteen Washington Metro subway system stations are located in Prince George's County; four of them are line terminus stations: Greenbelt, New Carrollton, Largo Town Center and Branch Avenue. There has been much debate on the construction of the Purple Line, which will link highly developed areas of both Montgomery and Prince George's Counties. In 2016, the MTA selected the Purple Line Transit Partners, a consortium led by Fluor Enterprises, to design and build the Purple Line and to operate and maintain it for 36 years. Construction had been anticipated for late 2016, with service projected to begin in 2022, though a legal challenge has stalled work on the new line. Also worth noting is the potential expansion of the Green Line northward to the City of Laurel and beyond.

The MARC Train (Maryland Area Rail Commuter) train service has two lines that traverse Prince George's County. The Camden Line runs between Baltimore Camden Station and Washington Union Station and has six Prince George's County stops: Riverdale Park, College Park, Greenbelt, Muirkirk, Laurel, and Laurel Racetrack. The Penn Line runs on the AMTRAK route between Baltimore Penn Station and Washington Union Station. It has three stops in the county: Bowie State, Seabrook, and New Carrollton.

The Washington Metropolitan Area Transit Authority operates Metrobus fixed-route bus service and Metrorail heavy-rail passenger service in and out of the County as well as the regional MetroAccess paratransit system for the handicapped. The Prince George's County Department of Public Works and Transportation also operates TheBus, a County-wide fixed-route bus system, and the Call-A-Bus service for passengers who do not have access to or have difficulty using fixed-route bus service. Call-A-Bus is a demand-response service which generally requires 14-days advance reservations. The County also offers a subsidized taxicab service for elderly and disabled residents called Call-A-Cab in which eligible customers who sign up for the service purchase coupons giving them a 50 percent discount with participating taxicab companies in Prince George's and Montgomery Counties.

The College Park Airport (est. 1909) is the world's oldest continuously operated airport and is home to the adjacent College Park Aviation Museum. Residents also use Ronald Reagan

Washington National Airport in Arlington County, Virginia, Baltimore–Washington International Thurgood Marshall Airport near Baltimore, and Dulles International Airport in Dulles, Virginia.

The Central Maryland Regional Transit (CMART) bus system served the greater Laurel Maryland area and parts of neighboring Ann Arundel, Howard and Prince George's County. It was funded as the Corridor Transportation Corporation in May, 1987 by the Baltimore-Washington Corridor Chamber and began its transit operation as "Connect-a-Ride" two years later with nine buses serving five routes. The non-profit organization changed its status and name and rebranded its service in early 2013. During 2014, Howard County initiated its own Regional Transportation Agency of Central Maryland recruiting Anne Arundel County to join. Service through this system will serve citizen in the City of Laurel.

3.2.10 Infrastructure

The Public Service Commission of Maryland regulates gas, electric, telephone, water, sewage disposal companies, and telecommunications companies. Infrastructure services are robust in the densely populated areas of the county and within the City of Laurel. Services like solid waste pick up are more limited in the more rural, southern areas of the county.

Electric
Prince George's County is served by five electricity providers: First Energy, Spark Energy, Baltimore Gas and Electric, PEPCO, and SMECO.

Natural Gas
Natural gas is provided to the County by Washington Gas and Baltimore Gas and Electric.

Telephone
Local telephone service is provided throughout Prince George's County by Verizon Communications Inc. and AT&T.

Public Water and Wastewater
In the County, public water and wastewater treatment is provided by the Washington Suburban Sanitary Commission (WSSC).

Television
Cable television service is provided within Prince George's County by Verizon FIOS, Comcast, and Xfinity along with satellite and internet providers.

Internet
Internet is provided within Prince George's County by Verizon FIOS, Comcast, and Xfinity.

4 Hazard Identification, Risk Assessment and Vulnerability Analysis

4.1 Introduction

The purpose of the hazard identification, risk assessment and vulnerability analysis is to provide a County-wide overview of how various hazards impact Prince George's County and the City of Laurel in Maryland. The Hazard Identification and Risk Assessment (HIRA) uses an all-hazards identification, classification, and vulnerability indexing process to ensure that the hazard analysis is comprehensive. The purpose of a HIRA is to characterize hazards which threaten the County and City's vulnerable people, property and critical infrastructure and thus enable the Mitigation Advisory Committee to develop a comprehensive slate of mitigation strategies, projects and actions designed to reduce risk exposure to identified hazards. While new hazards are unlikely to emerge, evaluation tools and processes will evolve and hazard priorities will likely change in subsequent HIRA revisions.

A natural hazard is defined as an event or physical condition with the potential to cause harm to people, property and infrastructure damage, agricultural loss, damage to natural resources, interruption of business, or other types of harm or loss. In addition, a manmade hazard includes any disastrous event caused directly and principally by one or more identifiable deliberate or negligent human actions. Technological hazards, a hazard originating from technological or industrial conditions, including accidents, dangerous procedures, or failures are also considered a type of manmade hazard. Other than consideration of dam-related hazards, this plan is only addressing natural hazards.

Prince George's County and the City of Laurel are not immune to any type of hazard and can experience damage to property and crops, injuries and sometimes loss of life. Hazards have been categorized as Flood, Wind, Fire, Geologic, and Extreme Temperatures hazards, consistent with the organization of the *State of Maryland 2016 Hazard Mitigation Plan Update.*

Identifying the hazard risk and vulnerability for a community is critical when determining how to allocate finite resources to carry out feasible and appropriate mitigation actions. The hazard analysis involves identifying each hazard that potentially threatens Prince George's County and the City of Laurel, and then analyzing them collectively in main hazard categories to determine the degree of threat. Addressing risk and vulnerability through hazard mitigation measures will reduce societal, economic, and environmental exposure to hazard impacts.

4.2 Summary of Changes

The 2017 plan update consolidates, updates, and streamlines content from the 2010 hazard identification and risk assessment. As part of the update, the following changes were made to the hazard identification and risk assessment section:

- Five grouped hazard categories are presented: Flood, Wind, Fire, Geologic and Extreme Temperatures for consistency with the *State of Maryland 2016 Hazard Mitigation Plan Update*. This categorization is slightly different than what was included in the 2010 update and resulted in new hazards being profiled as individual hazards (e.g., sinkholes);
- Geographic analysis and mapping depicts hazard extent, where appropriate, by the nine County Council Districts. The 2010 plan used a system of very small geographic planning units not necessarily relevant to hazard analysis;
- Pre-2010 hazard event summaries were moved to Appendix B;
- Total Exposure in Floodplain (TEIF) analysis was performed for analyzing flood risk instead of using the Hazus Flood module for more precise analysis of potential risk exposure based on actual building footprints and assessed building values within the 1% and 0.2% floodplain; and
- Redacted information and maps depicting County critical facilities may be found in Redacted Appendix G.

In addition, each section of Section 4.0 was reformatted to improve clarity, and new maps and imagery were included. The *State of Maryland 2016 Hazard Mitigation Plan*, effective August 26, 2016, was reviewed during the update process, and where applicable, information from the Plan has been cited.

4.3 Hazard Identification

4.3.1 Types of Hazards

Prince George's County and the City of Laurel are exposed to a wide array of natural hazards that can impact people and property. This section includes a general description and definition of each of the following hazard categories analyzed: Flood, Wind, Fire, Geologic, and Extreme Temperatures. The impact of each natural hazard will be discussed in their respective hazard sections later. The level of analysis performed is also described.

Table 4-1 shows how the available data was split into the Flood, Wind and Fire hazard-related categories, the identified hazards ranked in this HIRA section, and the applicable hazard(s) from the National Centers for Environmental Information (NCEI) database. Note that some hazards, such as severe storms and tropical storms, may be listed in more than one hazard related category since they include flood- and wind-related hazard elements. Table 4-2 shows

how the available data was split into the Geologic and Extreme Temperature hazard-related categories and applicable hazards from the NCEI database.

Table 4-1. National Centers for Environmental Information (NCEI) Hazard(s) related to Flood, Wind and Fire Hazard-Related Categories and Identified Hazard.

Hazard Related Category	Identified Hazard	Applicable NCEI Database Hazard(s)*
Flood	Riverine Flood	Flood
	Coastal Flood	Coastal Flood
		Tropical Storm
	Severe Storms (Flood-Related)	Flash Flood
		Heavy Rain
	Flood Risk - Dam Failures	None
	Flood Risk - Levee Failures	None
Wind	Tornadoes	Tornado
	Severe Storms (Wind-Related)	Thunderstorm Wind
		Lightning
		Hail
	High Winds	High Wind
		Strong Wind
	Hurricanes/Tropical Storms (Wind-Related)	Hurricane
		Tropical Storm
	Winter Storms/Blizzards	Blizzard
		Heavy Snow
		Winter Storm
		Winter Weather
		Ice Storm
Fire	Wildfire	Wildfire
	Drought	Drought

* Definitions for the NCEI hazard categories: https://www.ncdc.noaa.gov/stormevents/pd01016005curr.pdf

Table 4-2. NCEI Hazards related to Geologic and Extreme Temperature Hazard-Related Categories and Identified Hazards.

Hazard Related Category	Identified Hazard	Applicable NCEI Database Hazard(s)
Geologic	Earthquake	None
	Land Movement/Landslides	None
	Sinkholes	None
Extreme Temperature	Extreme Heat	Heat
		Excessive Heat

Hazard Related Category	Identified Hazard	Applicable NCEI Database Hazard(s)
	Extreme Cold	Cold/Wind Chill
		Extreme Cold/Wind Chill

4.3.2 Hazard Data

There were several sources for data used in this hazard analysis. As mentioned in the previous section, NCEI data was used for identifying hazards affecting Prince George's County and the City of Laurel. NCEI data was also used for annualizing hazard events, damage figures, and as a historical record, as well as injury count and death toll. While NCEI data was used by almost all of the hazards in one way or another, there was other data that was used to help quantify and visualize hazards.

For flood-related hazards a variety of sources were used. Digital Flood Insurance Rate Map data, from the 2016 updated flood maps, was used to map all of the Special Flood Hazard Areas and for the levee mapping and analysis. GIS data was obtained from Maryland's Department of Information Technology for large and several small dams. Coast Smart Flood Hazard Analysis of the Potomac and Patuxent Rivers data was used for mapping potential sea level rise and in the coastal flooding analysis. Wind related events primarily used NCEI data, but data for hurricane and tropical storm tracks is from the NOAA National Hurricane Center's Atlantic Hurricane database (HURDAT2), updated in April 2017 to include the 2016 hurricane season data. Wildfire location data and the Community Wildfire Protection Plan (CWPP) Area was provided by the Forest Service Research Data Archive and the CWPP, respectively. Drought used NCEI data. Geologic data was acquired through the United States Geological Survey (USGS) for earthquakes, Maryland Geological Survey for sinkholes, and Prince George's County for land movement. Extreme temperature data was acquired from the National Weather Service.

4.3.3 Probability

Probability in the following sections is defined as the likelihood that a hazard event will occur. The higher the probability of an event, the more likely it is that the event will occur. When determining the probability for a hazard event to occur, annualized hazard values were used to determine this likelihood. Low probability was defined by less than 1.25 annualized events per year, while high probability was defined by greater than 4.5 annualized events per year. Medium probability is between low and high probability.

4.4 Vulnerability Assessment Overview

4.4.1 Critical Facilities

Critical Facilities data has been redacted into Appendix G due to the sensitive nature of secure data within both localities.

4.4.2 Building Data

Building footprints were provided by the County. Building values were extrapolated from the 2016 Hazus TIGER census values and assigned by area weight. Hazus (Hazards-US) is a FEMA computer modeling tool which enables the use of Census data to determine risk exposure from floods, coastal wind events and earthquakes. The Hazus data set does not take into account actual building value, height, occupancy, or elevation. Approximated values were used to determine all analyses of damage due to hazard exposure, rounded to three significant figures. Vulnerability analysis is meant to approximate exposure or damages, which in the case of a real event, may be more or less than what is calculated in Section 4.0.

4.4.3 Presidential Disaster Declarations

The Federal Emergency Management Agency (FEMA) maintains the National Disaster Declarations Summary dataset[1]. The first disaster declared in the dataset was in 1953, and is updated on a regular basis. Events are categorized as "major disaster," "emergency," and "fire management" assistance declarations per the Robert T. Stafford Disaster Recovery Act and related Department of Homeland Security regulations. For an event to be declared a disaster by FEMA, the Governor of Maryland must first declare a state of emergency and then formally request from the President that Federal government respond to the disaster because the impacted local governments and the State lacks the full resources to respond and recover. Table 4-3 shows the FEMA Disaster Declarations Summary for events declared for Prince George's County, Maryland from 1953 to January, 2017. Eleven Major Disaster Declarations were issued since 1971 and five Emergency Declarations were issued since 1993, totaling 16 declarations. The City of Laurel is included in these declarations. The Individual and Households Program (IAHP) provides assistance to individuals who experienced property loss or damage due to the disaster, the Public Assistance Program (PA) supports repair or replacement to damaged public infrastructure and the Hazard Mitigation Grant Program (HM) is available for eligible mitigation projects after the disaster.

Table 4-3. FEMA Declared Disasters for Prince George's County, Maryland (1953-2017).

Disaster Number	Disaster Type	Incident Type (Named Storm)	Incident Begin Date	Programs Declared			
				IH	IA	PA	HM
309	Major Disaster	Flood	17-Aug-1971	-	◎	◎	◎
341	Major Disaster	Flood (Agnes)	23-Jun-1972	-	◎	◎	◎
489	Major Disaster	Flood	4-Oct-1975	-	◎	◎	◎

[1] FEMA Disaster Declarations Summary – Open Government Dataset. https://www.fema.gov/media-library/assets/documents/28318

Disaster Number	Disaster Type	Incident Type (Named Storm)	Incident Begin Date	Programs Declared			
				IH	IA	PA	HM
3100	Emergency	Snow	13-Mar-1993	-	-	◎	◎
1016	Major Disaster	Snow	8-Feb-1994	-	-	◎	◎
1081	Major Disaster	Snow/Blizzard	6-Jan-1996	-	-	◎	◎
1324	Major Disaster	Severe/Winter Storm(s)	25-Jan-2000	-	-	◎	◎
3179	Emergency	Severe/Winter Storm(s)	14-Feb-2003	-	-	◎	-
1492	Major Disaster	Hurricane/Flood (Isabel)	18-Sep-2003	◎	◎	◎	◎
3251	Emergency	Hurricane/Flood (Katrina)*	29-Aug-2005	-	-	◎	-
1910	Major Disaster	Snow/Blizzard	5-Feb-2010	-	-	◎	◎
3335	Emergency	Hurricane/Flood (Lee)	26-Aug-2011	-	-	◎	-
4038	Major Disaster	Flood (Lee)	6-Sep-2011	-	-	◎	◎
4091	Major Disaster	Hurricane/Flood (Sandy)	26-Oct-2012	◎	-	◎	◎
3349	Emergency	Hurricane/Flood (Sandy)	26-Oct-2012	-	-	◎	-
4261	Major Disaster	Snow/Blizzard	22-Jan-2016	-	-	◎	◎

*Note Emergency Declaration 3251 was intended to assist Hurricane Katrina evacuees.

◎ = program declaration made

4.5 Flood-Related Hazards

4.5.1 Flooding

Description

Flooding is the most frequent and costly natural hazard in the United States, causing more than 10,000 deaths since 1900. Nearly 90 percent of Presidential Disaster Declarations result from natural events where flooding was a major component. Floods generally result from excessive precipitation, and are classified in two categories: general floods due to precipitation within a watershed for an extended time period which includes storm-induced wave or tidal action; and flash floods, the product of heavy precipitation in short duration impacting a localized area. The severity of a flood event is typically determined by a combination of several major factors, to include: stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing and impervious surface.

A flood, as defined by the National Flood Insurance Program (NFIP)[2] is: "a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from: inland or tidal waters; unusual and rapid accumulation or runoff of surface waters from any source; or mudflow." Riverine flooding occurs when a river channel or stream receives more water than it can hold and excess water overflows the channel banks results in flooding of the surrounding area.

Coastal flooding[3] is typically a result of storm surge, wind-driven waves and heavy rainfall produced by hurricanes, tropical storms and other large coastal storms. Urban flooding occurs where manmade development has obstructed the natural flow of water and decreased the ability of natural groundcover to absorb and retain surface water runoff. Urban areas are extremely impervious due to pavement and rooftops which do not allow absorption of rainwater. This is common in the more densely populated areas in Prince George's County and the City of Laurel.

Most flash flooding is caused by slow-moving thunderstorms in a local area or by heavy rains associated with hurricanes and tropical storms[4]. However, flash flooding events may also occur from a dam or levee failure[5] within minutes or hours of heavy amounts of rainfall, or from a sudden release of water held by a retention basin or other storm water control facility. Flash flooding occurs most in urbanized areas where much of the ground is covered by impervious

[2]FEMA. https://www.fema.gov/national-flood-insurance-program/definitions#F

[3] Coastal flooding is more thoroughly addressed under the "Coastal Flooding" section.

[4] Flash flooding is more thoroughly addressed under the "Severe Storms" section.

[5] Dam and levee failures is more thoroughly addressed under the "Dam/Levee Failure" section.

surfaces. Damages from flash flooding are common due to inadequate stormwater management or facilities which are not properly maintained.

Periodic flooding of lands adjacent to rivers, streams and shorelines (floodplains) is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

Floodplains are designated by the frequency of the flood that is large enough to cover them. For example, the 10-year floodplain will be impacted by a flood with a 10% probability of occurring at any time; the 100-year floodplain represents the area inundated by a 1% probability flood. Flood frequencies such as the 1% probability (100-year) flood are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur. Flood frequencies are used to characterize flood modeling by the Federal Emergency Management Agency (FEMA) and its floodplain management regulations, stormwater management design requirements, and local floodplain management building standards.

Impact and Vulnerability

Flooding impacts a community to the degree that it affects the lives of its citizens and overall community functions. Therefore, the most vulnerable areas of a community will be those most affected by floodwaters in terms of potential loss of life, damages to homes and businesses, and disruption of community services and utilities. For example, an area with a highly developed floodplain is significantly more vulnerable to the impacts of flooding than a rural or undeveloped floodplain where potential floodwaters would have less impact on the community.

A number of factors contribute to the relative vulnerabilities of certain areas in the floodplain. Development, or the presence of people and property in the hazardous areas, is a critical factor in determining vulnerability to flooding. Additional factors that contribute to flood vulnerability range from specific characteristics of the floodplain to characteristics of the structures located within the floodplain. The following is a brief discussion of some of these factors and how they may relate to the area.

Flood depth: The greater the depth of flooding, the higher the potential for significant damages.

Flood duration: The longer duration of time that floodwaters are in contact with building components, such as structural members, interior finishes, and mechanical equipment, the greater the potential for damage. Floodwaters may linger because of the low relief of the area, but the degree varies.

Velocity: Flowing water exerts force on the structural members of a building, increasing the likelihood of significant damage. A one-foot depth of water, flowing at a velocity of five feet

per second or greater, can knock an adult over and cause significant scour around structures and roadways.

Elevation: The lowest possible point where floodwaters may enter a structure is the most significant factor contributing to its vulnerability to damage due to flooding.

Construction type: Certain types of construction are more resistant to the effects of floodwaters than others. Masonry buildings, constructed of brick or concrete blocks, are typically the most resistant to flood damages simply because masonry materials can be in contact with limited depths of water without sustaining significant damage. Wood frame structures are more susceptible to flood damage because the construction materials used are easily damaged when inundated with water.

Location and Extent

Prince George's County is bordered by the Patuxent River to the east and the Potomac River to the west. The City of Laurel is located in the northeast section of the County and borders the Patuxent River. The majority of tributaries, branches, and creeks in the area flow into either of these two rivers. The effective FEMA Flood Insurance Rate Maps (FIRM) for the County were updated September 16, 2016. They show one-percent annual chance floodplains associated with the rivers and streams in the Potomac and Patuxent watersheds. The FIRM identifies high flood hazard risk areas as part of the one-percent annual chance (100 year) floodplain, moderate risk areas as part of the 0.2-percent annual chance (500 year) floodplain, or minimal risk areas outside the 500 year floodplain. Figure 4-1 shows the 100 and 500 year floodplains within Prince George's County and Figure 4-2 similarly shows the 100 and 500 year floodplains in the City of Laurel. About 10.7 percent of the County area (including the City of Laurel) is considered at risk for the 100 year flood with an additional 0.6 percent considered at risk for the 500 year flood or levee failure.

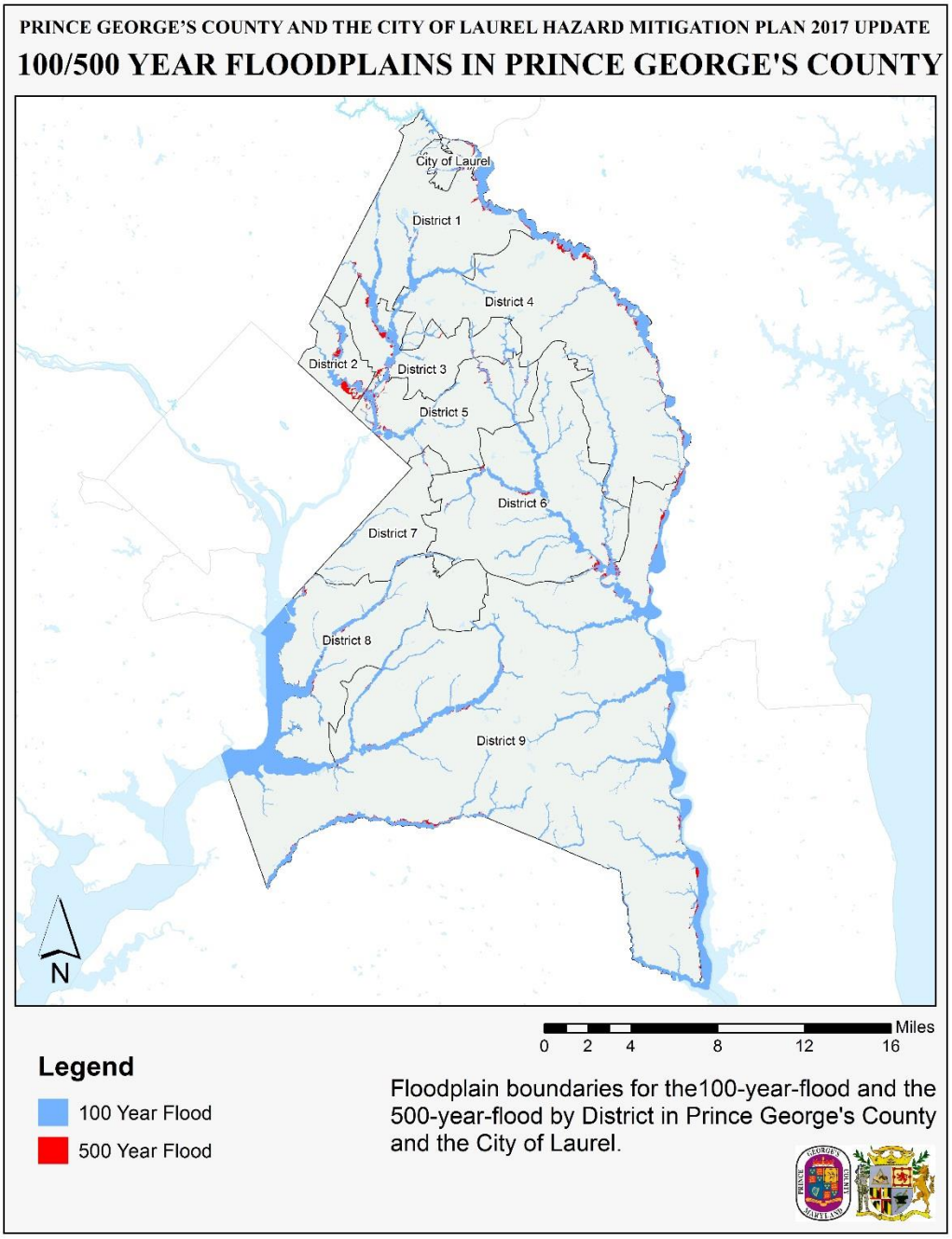


Figure 4-1. 100- and 500-Year Floodplains; Prince George's County, Maryland.

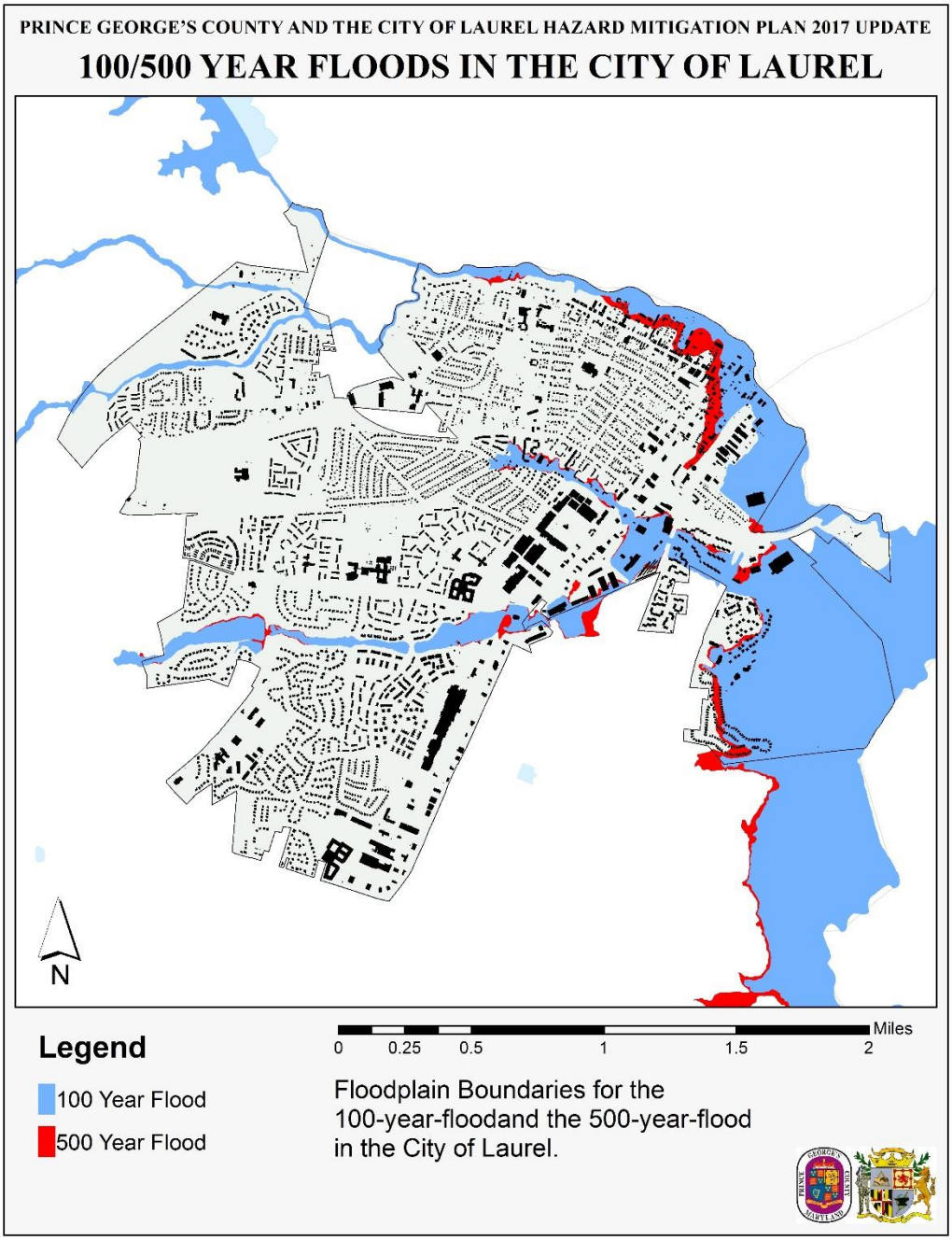


Figure 4-2. 100- and 500-Year Floodplains, City of Laurel, Maryland.

Previous Occurrences

Prince George's County and the City of Laurel have experienced many flood events that have caused damage since the 2010 mitigation plan update. Table 4-4 summarizes several notable

flood events that have occurred.[6] Many of these flood instances are related to remnants of tropical storms and hurricanes that have also affected many other areas of the United States.

Table 4-4. Notable Flood Hazard History – Prince George's County & City of Laurel.

Event Date	Description
September 2010	Remnants of Tropical Storm Nicole produced massive amounts of rain throughout Maryland.
August 2011	Hurricane Irene did not make direct landfall, but due to the large size, hurricane conditions were felt inland. FEMA issued an Emergency declaration (FEMA-EM-3335-MD) for the incident beginning August 26, 2011.
September 2011	The remnants of Tropical Storm Lee moved across Maryland, causing widespread flooding.[7] Prince Georges County experienced around 24 inches of rainfall from this storm. FEMA issued a Major Disaster declaration (FEMA-DR-4038-MD) for the incident beginning September 6, 2011. Additionally, the NOAA NCEI Storm Events Database reported two flood events – one in Upper Marlboro and one in Brown.
October 2012	Hurricane Sandy makes landfall north of the state. However, due to the tremendous size of the storm, its effects were felt all over Maryland. Over a foot of rain fell in some spots along with very gusty winds. FEMA issued Emergency (FEMA-EM-3349-MD) and Major Disaster (FEMA-DR-4091-MD) declarations for Sandy beginning October 26, 2012. Additionally, the NOAA NCEI Storm Events Database indicates one flood event was reported in Wells Corner.
April through June, 2014	There were at least eleven flash floods reported in the region during this month due to heavy rainfall.
August 2014	There were several flash floods and riverine flooding occurred due to heavy rainfall. The NOAA NCEI Storm Events Database indicates three flood events were reported – two in Piscataway and one in Upper Marlboro.
September 2015	A couple of flash floods and riverine flooding occurred due to heavy rainfall
October 2016	While Hurricane Matthew did not make landfall in the state, the storm still brought rain and gusty winds to Prince George's County and the City of Laurel due to its large size.

According to the NOAA NCEI Storm Events Database, there have been 33 reported flood events in Prince George's County since 1996, with seven of these events incorporated into Table 4-4 (not counting the cluster of events during spring, 2014). According to the data shown in Table 4-5 there was an average of $14,225 in annual damages (all property damage with no reported agricultural damage), and no deaths or injuries reported to the database during this period. Note that the annualized damages in Table 4-5 and the other NCEI events addressed in the HIRA have been inflated to 2017 values using the Engineering News Record (ENR) inflation

[6] For events before December 2009, they can be found at: http://www.princegeorgescountymd.gov/375/Local-Flood-Hazards-Mapping-History-of-F

[7] https://en.wikipedia.org/wiki/List_of_Maryland_hurricanes_(1950%E2%80%93present)

index; which is used in FEMA's benefit-cost analysis tool because it is more applicable for construction and repair costs than the Consumer Price Index (CPI).

Table 4-5. NCEI Historic Flood Event Data.

HIRA Hazards	Number of Events	Period of Record	Current Total Annual Damages	Annualized Deaths	Annualized Injuries	Annualized Events
River/Stream Flooding	33	1996-2016	$14,225	0	0	1.65

Historic Summary of Insured Flood Losses (RP/SRL)

The National Flood Insurance Program (NFIP) enables property owners in participating communities to purchase Federally-backed insurance for flood losses. For a community to participate in the NFIP they must adopt floodplain management regulations that reduce future flood damages, adopt the FEMA Flood Insurance Rate Maps and Flood Insurance Study for the jurisdiction and manage a floodplain management program which enforces Federal, State and local floodplain regulations affecting development in the designated Special Flood Hazard Area (SFHA) (1% floodplains depicted on the FIRMs). Flood insurance backed by the Federal government is designed to provide an alternative to disaster assistance so that the high costs associated with repairing damage to buildings and their contents caused by floods is reduced. Flood insurance is available to property owners and contents coverage is available to renters in communities in good standing with FEMA in terms of their local floodplain management ordinance.

In addition to providing flood insurance and reducing flood damages through floodplain management regulations, the NFIP identifies and maps the nation's floodplains. Mapping flood hazards creates broad-based awareness of the flood hazards and provides the data needed for insurers to actuarially rate structures for flood insurance coverage.

Communities that participate in the NFIP are required to adopt and enforce local floodplain management regulations that meet or exceed the minimum Federal NFIP floodplain management regulations. These regulations apply to all types of floodplain development and ensure that development activities will not cause an increase in future flood damages. Buildings are required to be reasonably safe from flooding which usually requires the finished floor elevation to be elevated at or above the corresponding Base Flood Elevation (BFE). The BFE is determined based on modeling and mapping identified within a community's Flood Insurance Study (FIS). The FIS and its corresponding Flood Insurance Rate Maps (FIRMs) provide information on areas of flood risk per the NFIP standards. The maps identify areas that have a 1 percent-annual chance of flooding as well as those areas with a 0.2 percent-annual chance of flooding. Some communities have additional flood frequencies that are modeled as part of their

flood studies are within their local watershed mapping programs. When new structures are built, they are required to adhere to regulations and flood risk information provided by the NFIP. If a structure is within the regulated floodplain (SFHA) backed by a federally insured mortgage, flood insurance coverage is mandatory. The requirement for high risk structures to be insured through the National Flood Insurance Program or another flood hazard specific insurance policy is how the government minimizes flood recovery costs to the public.

Prince George's County and the City of Laurel participate in the NFIP, and the County participates in the Community Rating System and the City of Laurel is planning to participate in late 2017 or early 2018. Their participation in the NFIP is shown in Table 4-6, which includes the dates the Flood Hazard Boundary Maps (FHBM) were issued, when the first Flood Insurance Rate Maps became effective, the date of the current FIRMs used for insurance purposes, and the date the community entered into the NFIP. Table 4-7 shows that the City of Laurel and Prince George's County have a combined total of 3,576 policies and their associated insurance value as of April 30, 2017.

Table 4-8 summarizes the NFIP policy and claim statistics for the County and City with Maryland totals for comparison. Claims values (losses) include any flood damage where water crossed a property line. It should be emphasized that these values include only those losses to structures that were insured through the NFIP policies, and for losses where insurance claims were filed and received. It is likely that many additional instances of flood losses in Prince George's County and the City of Laurel were either uninsured, denied claims payment, or not reported.

Table 4-6. FEMA NFIP Participation Dates. [8]

Jurisdiction	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date
City of Laurel	9 Aug 1974	1 Nov 1978	16 Sep 2016
Prince Georges County	N/A	4 Aug 1972	16 Sep 2016

Table 4-7. NFIP Policies in Force. [9]

Jurisdiction	Policies in Force	Insurance In-Force Whole	Written Premium In-Force
City of Laurel	175	42,481,800	196,005
Prince Georges County	3,401	799,602,800	2,188,592

[8] FEMA. Community Status Book Report. Maryland. https://www.fema.gov/cis/MD.html

[9] FEMA. Policy Statistics as of 04/30/2017. http://bsa.nfipstat.fema.gov/reports/1011.htm

Table 4-8. NFIP Claims as of 31 December 2016. [10]

Jurisdiction	Total Losses	Closed Losses	Open Losses	CWOP Losses	Total Payments
City of Laurel	17	5	0	12	$99,870.88
Prince Georges County	680	384	2	294	$4,168,895.77
Maryland Totals	18,145	13,223	49	4,873	$289,719,855.21

NFIP Repetitive Loss Properties

A repetitive loss (RL) property is a property that is insured under the NFIP and has filed two or more claims in excess of $1,000 each, within a 10-year period. Nationwide, RL properties constitute 2% of all NFIP insured properties, but are responsible for 40% of all NFIP claims. Mitigation for RL properties is a high priority for FEMA, and the areas in which these properties are located typically represent the most flood prone areas of a community.

The identification of RL properties is an important element to conducting a local flood risk assessment, as the inherent characteristics of properties with multiple flood losses strongly suggest that they will be threatened by continual losses. RL properties are also important to the NFIP, since structures that flood frequently put a strain on NFIP funds. Under the NFIP, FEMA defines an RL property as "any NFIP-insured property that, since 1978 and regardless of any change(s) of ownership during that period, has experienced: a) four or more paid flood losses; or b) two paid flood losses within a 10-year period that equal or exceed the current value of the insured property; or c) three or more paid losses that equal or exceed the current value of the insured property." A primary goal of FEMA is to reduce the numbers of structures that meet these criteria, whether through elevation, acquisition, relocation, or a flood control project that lessens the potential for continual losses.

According to FEMA, there are currently 42 RL properties that have not been mitigated within Prince George's County accounting for 92 losses. The majority of these RL properties are residential. The specific addresses of the properties are maintained by FEMA, MEMA, and the Prince George's County Department of Environment, and are deliberately not included in this plan as required by the Privacy Act. Figure 4-3 maps the general location of these properties in Prince George's County and their proximity to the 500 year floodplain. Due to map scale limitations, some points on the map actually represent clusters of repetitive loss properties located in close proximity, for example in the same neighborhood.

[10] FEMA. Loss Statistics Country Wide as of 12/31/2016. http://bsa.nfipstat.fema.gov/reports/1040.htm

More than $2 million has been paid in claims for 92 losses with an average claim of $21,800. Only one RL property was identified in the 2010 Plan. Table 4-9 shows the total number of properties, total number of losses experienced, and losses paid for all of the communities within Prince George's County. The City of Laurel does not presently have any Repetitive Loss listed by FEMA.

A severe repetitive loss (SRL) property has: a) at least four NFIP claims payments of more than $5,000 each, with the cumulative amount of such claims payments exceeding $20,000; or b) at least two separate claims payments with the cumulative amount exceeding the market value of the building. There are no SRL properties within Prince George's County or in the City of Laurel.

Table 4-9. NFIP Repetitive Loss Property Information.

Building Type	RL Buildings	RL Losses	Property Value	Total Payments
2-4 Family	3	9	$568,934	$76,752
Nonresidential	4	9	$5,516,973	$974,619
Single Family	35	74	$9,872,195	$954,503
Grand Total	**42**	**92**	**$15,958,102**	**$2,005,875**

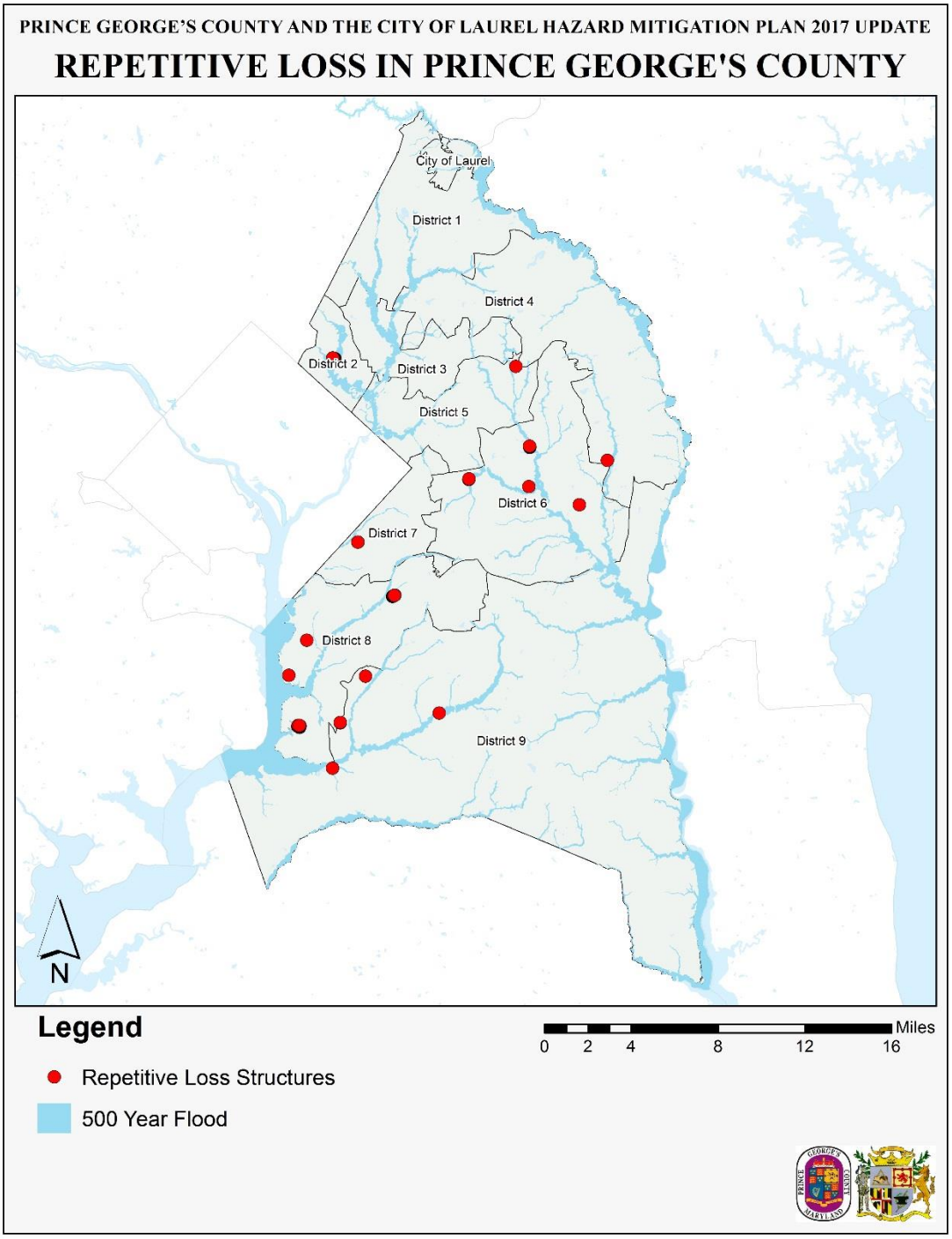


Figure 4-3. Repetitive Loss Structures in Prince George's County.

Community Rating System

The NFIP Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risks. There are ten CRS classes: Class 1 requires the most credit points and gives the

largest flood insurance premium reduction; Class 10 does not receive a premium reduction. These discounts are applied per each CRS community and apply to all flood insurance policyholders. For CRS participating communities, flood insurance premium rates are discounted in increments of 5%; i.e., a Class 1 community receives a 45% premium discount, while a Class 9 community receives a 5% discount.[11]

Prince George's County currently participates in the CRS program.[12] Prince George's first entered the CRS on October 1, 1991 and the current effective date for the program is October 1, 2001. Participation in this program allows residents within the SFHA to receive a discount on their flood insurance premiums for policies purchased under the NFIP. Residents within the non-SFHA also receive a discount on their policies. Their current class is ranked as 5, which give a 25% premium discount to properties in the SFHA, or regulated floodplain, and 10% premium discount for non-SFHA properties. Note that the City of Laurel does not currently participate in the CRS, but is currently working to enroll in the CRS program.

Probability of Future Events

Flood events will occur frequently in Prince George's County and the City of Laurel, with a high probability of future occurrences. The probability of future flood events based on the magnitude and according to best available data is illustrated by floodplains shown in Figure 4-1 and Figure 4-2. Further, it is highly likely that Southern Prince George's County may be subject to coastal flooding associated with possible sea-level rise.[13]

It is estimated that about 10.7% of the 498 square miles within Prince George's County and the City of Laurel is located in the 100-year floodplain[14]. Figure 4-4 illustrates the location and extent of the currently mapped flood zones in Prince George's County and the City of Laurel based on the effective FEMA Flood Insurance Rate Maps (FIRM) dated September 16, 2016.

[11] FEMA Community Rating System https://www.fema.gov/national-flood-insurance-program-community-rating-system

[12] FEMA Community Rating System. PDF. https://www.fema.gov/media-library-data/1476294162726-4795edc7fe5cde0c997bc4389d1265bd/CRS_List_of_Communites_10_01_2016.pdf

[13] This topic is addressed in the "Coastal Flooding" section.

[14] Area calculated from the NFHL DFIRM data provided by FEMA. http://msc.fema.gov/portal/advanceSearch

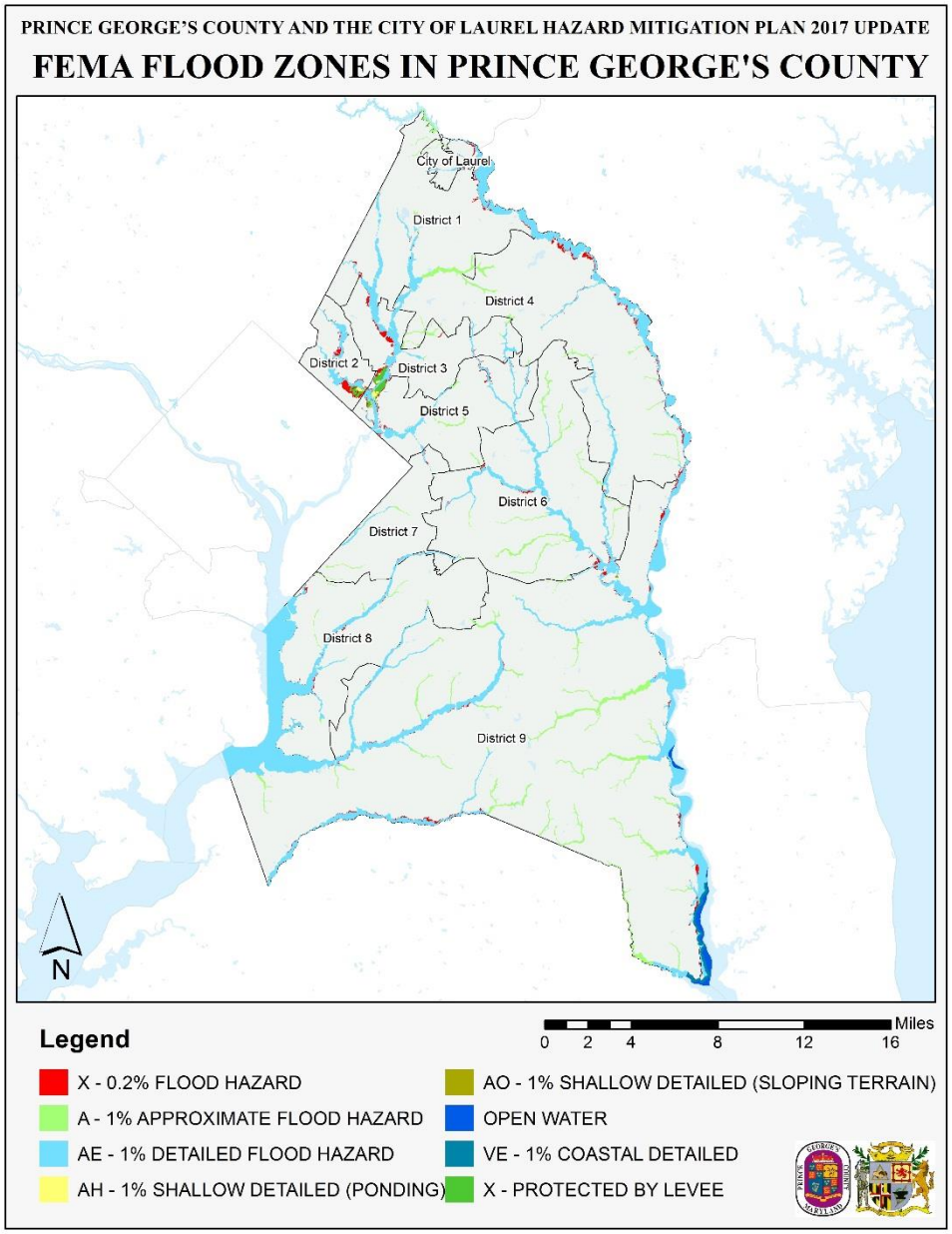


Figure 4-4. FEMA Flood Zones in Prince George's County and the City of Laurel effective September 16, 2016.

Vulnerability and Risk Assessment

From the *State of Maryland 2016 Hazard Mitigation Plan*, the County was ranked on a number of different factors for flooding, including a statewide Hazus analysis. These scores and ranks are shown in Table 4-10, where the State ranked the flood vulnerability for Prince George's County (including the City of Laurel) as high.

Table 4-10. 2016 State of Maryland Vulnerability Analysis Flood Hazard Ranking.

Risk Factors Weighted	Rank
Population Vulnerability	4
Population Density	3
Injuries	2
Deaths	1
Property Damage	3
Crop Damage	1
Geographic Extent	2
Events	4
Local Plan Ranking	5
Overall Rating	25
Overall Ranking	High

Flood losses to properties can be caused by storm tides from hurricanes, tropical storms, or from storm water flooding caused by stream/canal overflow or sheet flow. Historic flood damages from tropical/sub-tropical storms and hurricanes include foundation and wall damage to structures, contents damage, loss of utilities, infrastructure damage to roads, and beach erosion. Damages from storm water runoff events also include wall damage due to "wicking", mildew damage, damages to contents, minor foundation damage, damage to water distribution systems, and potable water contamination. Public related costs include debris clearance; equipment, material and labor expenses related to emergency response and recovery; and building or facility repair or replacement (County parks, utilities, communications, buildings, vehicles, etc.).

The NCEI Storm Events data was annualized by taking the total number of damaging flood events and dividing by the length of record. The annualized values should only be used as an estimate of what can be expected in any specific year. Refer back to Table 4-5 for an overview of historic data.

In support of the Federal Emergency Management Agency's (FEMA) RiskMAP Program, FEMA endeavored to produce national-level flood risk analyses to estimate the potential losses from flooding across the Lower 48 states. This effort occurred during 2009 to 2010 and produced a product known as the 2010 Average Annualized Flood Loss (AAL) Study Results. The 2010 AAL Study and its associated results were intended to be a mechanism for FEMA - as well as local stakeholders - to assist in the prioritization of flood mitigation activities across the lower 48 states. Further information on the 2010 AAL Results and its use in RiskMAP Risk Assessments can be viewed in Guidance for Flood Risk Analysis and Mapping (May 2014). Notably, there were some problem areas in which the Hazus software FEMA used for the study was unable to produce valid results for the 2010 AAL Study in certain coastal areas. Lack of

estimated flood damages limited the ability to assess potential damage across the entirety of the regional geography. An analysis was performed to estimate the Total Exposure in the Floodplain of the building stock in Prince George's County and the City of Laurel. The subsequent sections describe the methodology and vulnerability assessment as part of this analysis.

Total Exposure in Floodplain (TEIF) Methodology: TEIF uses 2010 Census' Topologically Integrated Geographic Encoding and Referencing (TIGER) tract level data to assume the total property value for each census tract within the County and the City of Laurel. The analysis proportionally divides the total census tract property value by the number of buildings in the tract, based on the area of each of the building footprints[15]. For example, if the total value of one census tract is $1,000,000 and there are 10 equally sized 1,000 square foot buildings within the tract, each building would be assigned a value of $100,000. If the buildings were not equal in size, they would receive value proportionate to the size of the other buildings within that tract.

The building footprints are then intersected with the FEMA effective 100-year and 500-year floodplain data. The proportion of how much each building is within each floodplain is then used to calculate the value of the building's exposure to the floodplain. Due to the low resolution of the property values from the tract data, the high resolution of the buildings, and the assumption of total exposure within the floodplain, the exposed values are extrapolated to 1,000 foot square grids. This resolution best summarizes the results of the TEIF analysis at a County-wide scale, identifies areas that may be more affected by a flood, and represents the uncertainty within this method.

TEIF Vulnerability Analysis and Assessment: The results of the analysis identified many areas within Prince George's County and the City of Laurel that may be at risk to flood. Districts 1, 2, and 3 account for the most property value exposed to the floodplain accounting for 19.9%, 15.7%, and 18.5% of the total damage within all political areas. The City of Laurel accounted for 12.7% of the calculated exposure. The estimated total exposure for all political areas is shown in Table 4-11. Figure 4-5 and Figure 4-6 show the 1,000 square foot grids that identify different areas, ranked from low to high. Also, Figure 4-7 and Figure 4-8 show the TEIF grids associated with the City of Laurel. These figures help to identify areas that were ranked on a scale from low to high. There are three areas with especially high concentrations of high value properties that lie within the floodplain. These areas are generally located in the City of Laurel and between the borders of Districts 2, 3, and 5, and on the border of Districts 6 and 9.

[15] Building footprints shape file provided by Prince George's County.

Table 4-11. TEIF Property Values by Political Areas.

Political Area	TEIF 100 Yr.	TEIF 500 Yr.
City of Laurel	$14,300,000	$250,000,000
District 1	$22,500,000	$348,000,000
District 2	$17,700,000	$542,000,000
District 3	$20,900,000	$316,000,000
District 4	$2,560,000	$29,800,000
District 5	$14,800,000	$224,000,000
District 6	$3,050,000	$109,000,000
District 7	$2,410,000	$35,100,000
District 8	$7,400,000	$91,100,000
District 9	$7,670,000	$169,000,000
Total	$113,000,000	$2,110,000,000

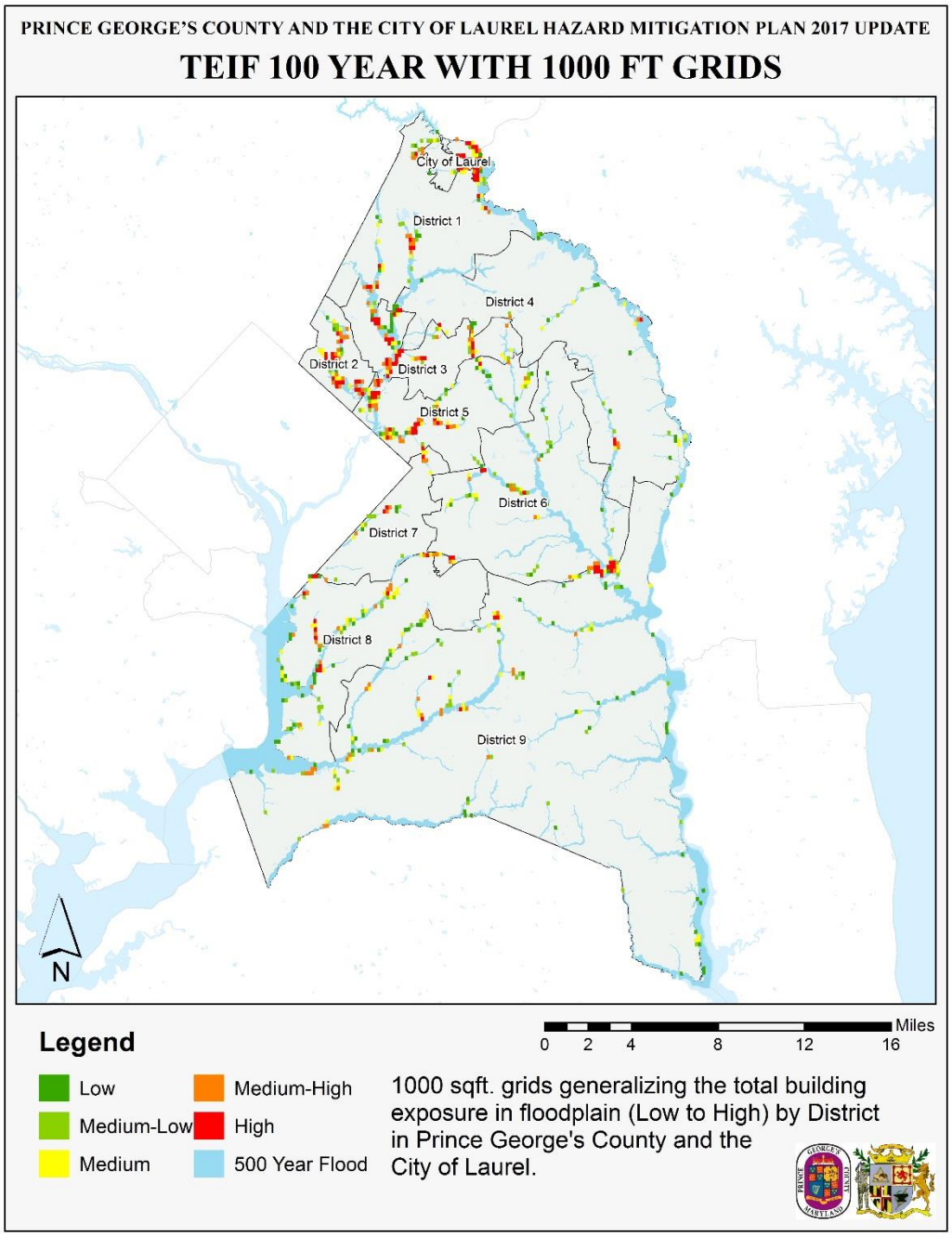


Figure 4-5. 100 Year Flood Exposure per TEIF Analysis, Prince George's County.

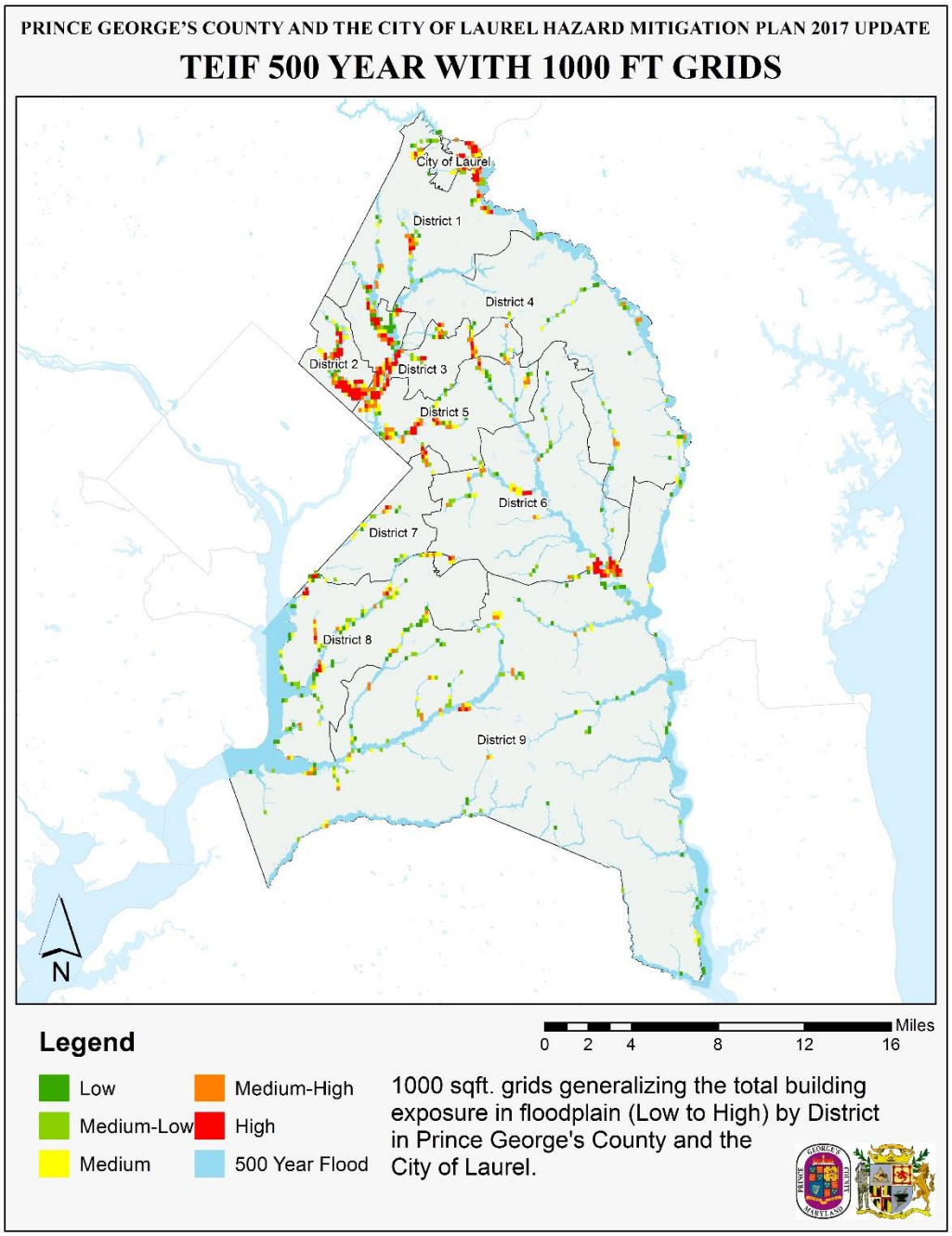


Figure 4-6. 500 Year Flood Exposure per TEIF Analysis, Prince George's County.

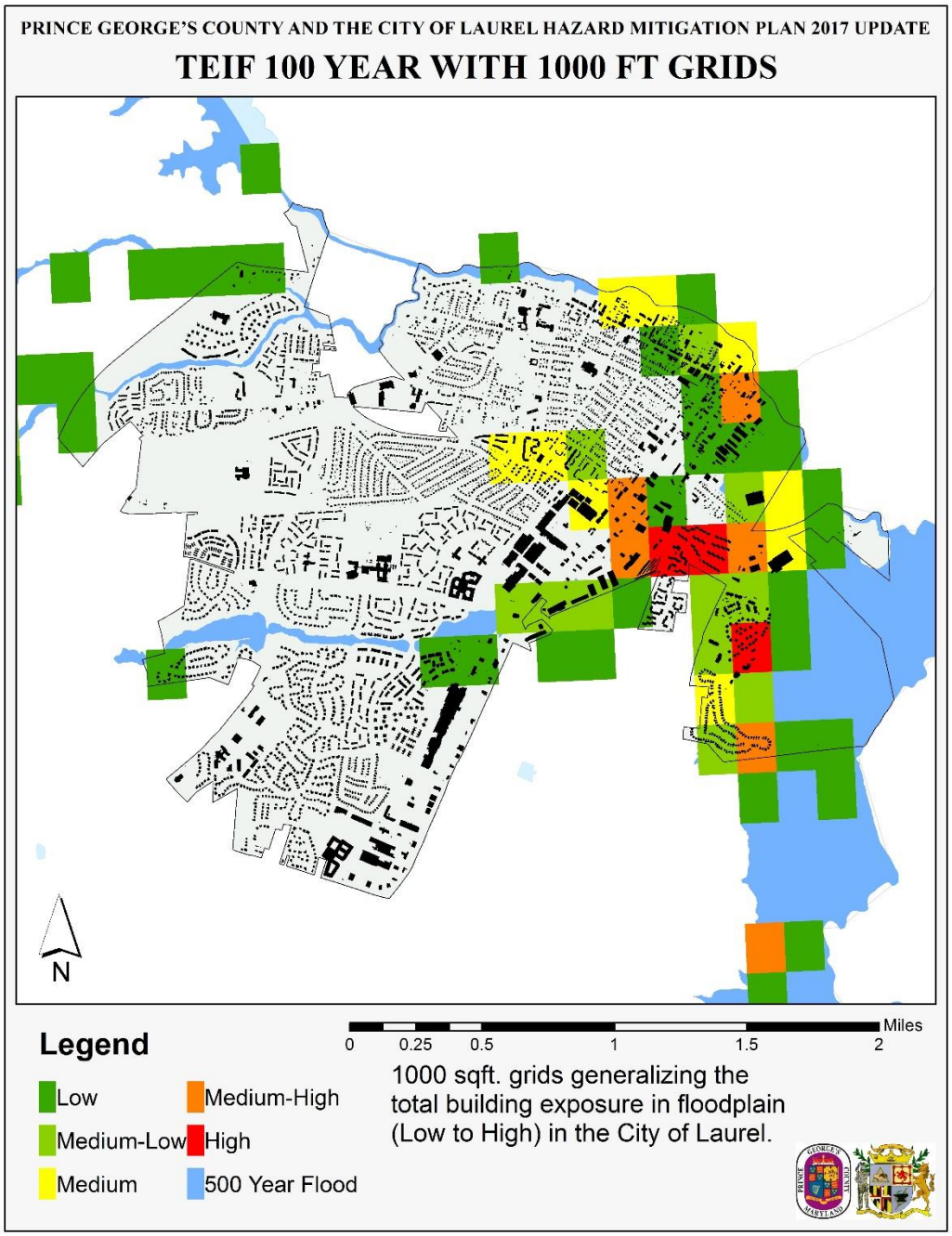


Figure 4-7. 100 Year Flood Risk per TEIF Analysis, City of Laurel.

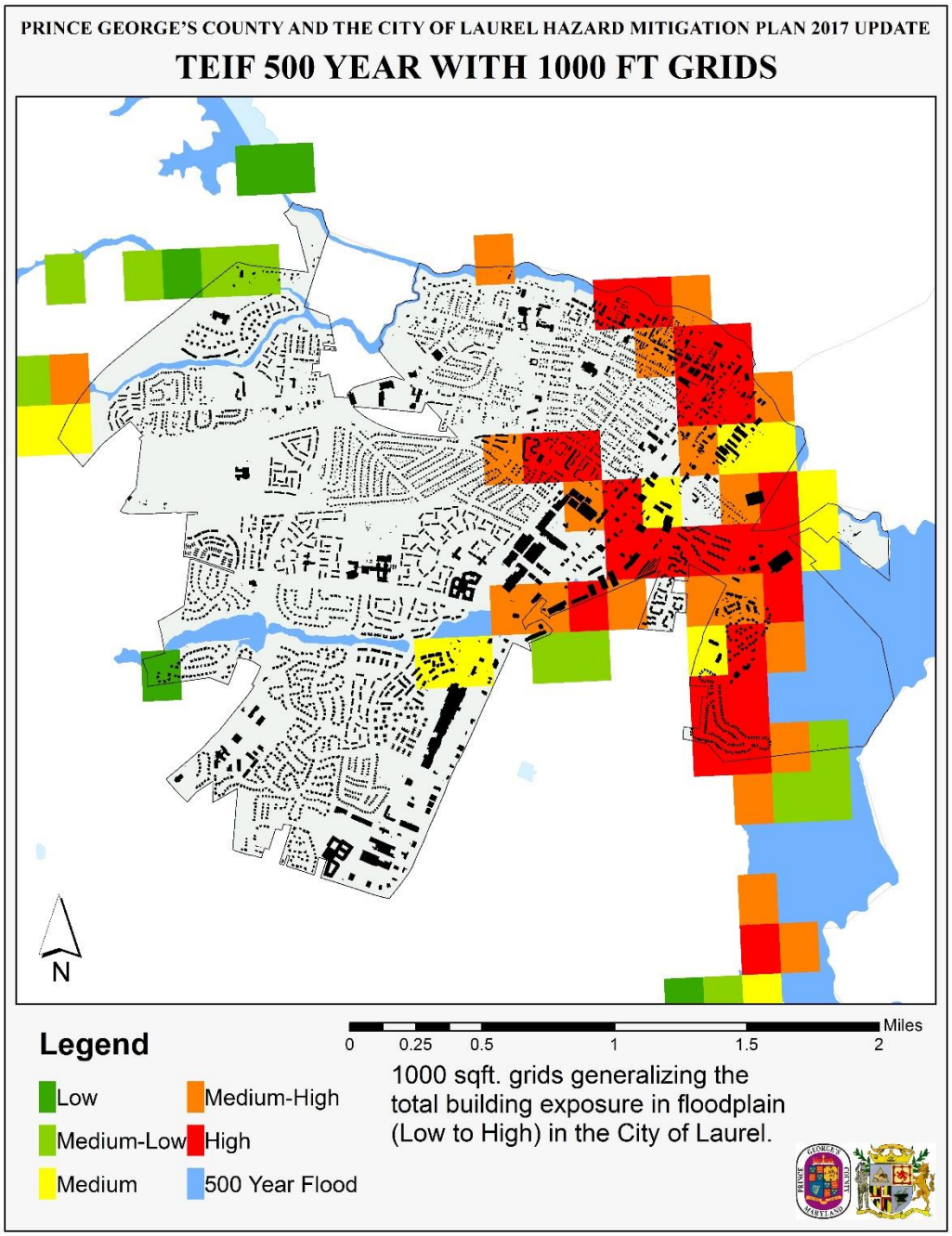


Figure 4-8. 500 Year Flood Risk per TEIF TIEF Analysis, City of Laurel.

4.5.2 Coastal Flooding

Description

Coastal erosion is the landward displacement of the shoreline caused by the forces of waves and currents. The Bureau of Beaches and Coastal Systems defines a critically eroded area as:

> *A segment of the shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects.*

It is important to note that for an erosion problem area to be labeled "critical" there must exist a threat to or loss of one of four specific interests – upland development, recreation, wildlife habitat, or important cultural resources. Many areas have significant historic or contemporary erosion conditions, yet the erosion processes do not currently threaten public or private interests. These areas are therefore designated as noncritical eroded areas and require close monitoring in case conditions become critical.

Impact and Vulnerability

Flooding impacts a community to the degree that it affects the lives of its citizens and overall community functions. Therefore, the most vulnerable areas of a community will be those most affected by floodwaters in terms of potential loss of life, damages to homes and businesses, and disruption of community services and utilities. For example, an area with a highly developed floodplain is significantly more vulnerable to the impacts of flooding than a rural or undeveloped floodplain where potential floodwaters would have less impact on the community.

A number of factors contribute to the relative vulnerabilities of certain areas in the floodplain. Development, or the presence of people and property in the hazardous areas, is a critical factor in determining vulnerability to flooding. Additional factors that contribute to flood vulnerability range from specific characteristics of the floodplain to characteristics of the structures located within the floodplain. The following is a brief discussion of some of these factors and how they may relate to the area.

Flood depth: The greater the depth of flooding, the higher the potential for significant damages.

Flood duration: The longer duration of time that floodwaters are in contact with building components, such as structural members, interior finishes, and mechanical equipment, the greater the potential for damage. Floodwaters may linger because of the low relief of the area, but the degree varies.

Velocity: Flowing water exerts force on the structural members of a building, increasing the likelihood of significant damage. A one-foot depth of water, flowing at a velocity of five feet per second or greater, can knock an adult over and cause significant scour around structures and roadways.

Elevation: The lowest possible point where floodwaters may enter a structure is the most significant factor contributing to its vulnerability to damage due to flooding.

Construction type: Certain types of construction are more resistant to the effects of floodwaters than others. Masonry buildings, constructed of brick or concrete blocks, are typically the most resistant to flood damages simply because masonry materials can be in contact with limited depths of water without sustaining significant damage. Wood frame structures are more susceptible to flood damage because the construction materials used are easily damaged when inundated with water.

Location and Extent

Storm surge causes widespread coastal flooding and is exclusively associated with nor'easters, tropical cyclones and is considered one of the most dangerous aspects of these kinds of storms. Storm surge occurs when the winds and forward motion associated with a storm piles water up in front as it moves toward shore. This advancing surge combines with the normal tides to create the hurricane storm tide that can increase the mean water level by 15 feet or greater. Wind-generated storms can even cause flooding, coastal erosion, and structural damage upstream of typical coastal regions. Areas that are not typically susceptible to storm surge can experience damage to structures or infrastructure.

The VE zone, or the coastal high hazard zone, includes areas where there are primary frontal dunes and areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. BFEs derived from detailed hydraulic coastal analyses are shown within these zones. Mandatory flood insurance purchase requirements apply. According to the National Flood Hazard Layer (NFHL), in Prince George's County there are only four VE zone areas which total 0.734 square miles (0.148% of the County area).

Coastal flooding may be caused by hurricanes, tropical storms, Nor'easters, and when long-duration on-shore winds coincide with high tides. In Prince George's County, storm surges produced by hurricanes and tropical/sub-tropical storms depend on storm intensity, forward speed, and timing (relative to high tide and lunar cycles). The southern part of the County may be at risk for increased storm surge impacts within the Potomac and Patuxent River floodplains as shown through predictive sea level rise modeling that considers the increasing storm impacts due to climate change.

Vulnerability and Risk Assessment

The State of Maryland did an analysis on the possible effects on sea level rise, producing data called Coast Smart.[16] From a memo that was provided to the County with the data, the following methodology and differences are described as to what this data represents.

Methodology

Flood extent mapping for the present day scenario in Prince George's County used the effective countywide mapping from the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS). This mapping went into effective on September 16th, 2016 and includes coastal, riverine, and combined coastal and riverine flooding. The coastal areas of the study include both 1%-annual-chance Stillwater Elevation Level (1% SWEL) and wave hazard mapping, where applicable (wave hazards are confined mainly to the lower Patuxent River coastline). Along the Potomac River, the coastal mapping for the FEMA FIS only displays approximate Zone A flood hazard areas. These approximate zones do not include any Base Flood Elevation (BFE) information.

Mapping of the Coastal Overlay Zone for the future year leveraged the 1%-annual-chance Stillwater Elevation Levels (1% SWELs) from the 2016 FEMA FIS. Sea level rise values were added to the 1% SWELs to produce each future year map. Riverine flooding impacts and wave hazard mapping were not in the scope of the Coast Smart project and therefore the future year maps only show the coastal flooding hazards from the 1% SWELs with sea level rise.

Differences

FEMA floodplain mapping was used as the base mapping for this study because it is the most accurate and comprehensive current mapping for Prince George's County and the City of Laurel. The FEMA study had a more detailed scope than the Coast Smart project and included flooding hazards that could not be captured in the future year mapping; including riverine flooding, combined riverine and coastal flooding, and wave hazards. Since these additional hazards are shown in the present day maps but not the future year maps, the present day maps may have a larger flooding extent than the future year maps, even though the future year maps include the impacts of sea level rise. The future year maps only display the Coastal Overlay Zone 1% SWELs flooding for Prince George's County and do not include any riverine impacts to flooding or wave hazards."[17]

Vulnerability Analysis

The Coastal Smart data was used to estimate how much property would be affected by Sea Level Rise. The different Sea Level Rise (SLR) Scenarios were intersected with the Building Footprints used in the TEIF analysis from the Riverine Flooding section to estimate the potential

[16] Data was provided by Prince George's County.

[17] Memo provided by Prince George's County

property damage that could occur for each scenario. Considering the No SLR scenario to be from the 2016 FEMA FIS, the scenarios for two feet through seven feet of sea level rise consider increasing amounts of SLR.

A summary of the average Base Flood Elevation (BFE), number of buildings affected and their associated value is shown in Table 4-12. The BFE calculated for the table is based on the size of the area in respect to the total area affected by the SLR. The Coast Smart SLR scenarios for two feet through seven feet along the Potomac and Patuxent Rivers are shown in Figure 4-9 and Figure 4-10.

Table 4-12. Coast Smart Coastal Flooding Exposure Summary.

Sea Level Rise Scenario	Weighted Average Base Flood Elevation	Number of Buildings Affected	Approximate Value of Affected Buildings
2′	6.34′	105	$12,700,000
3′	6.53′	107	$13,000,000
4′	7.90′	167	$21,600,000
5′	9.00′	205	$25,700,000
6′	10.4′	238	$31,400,000
7′	12.8′	382	$56,400,000

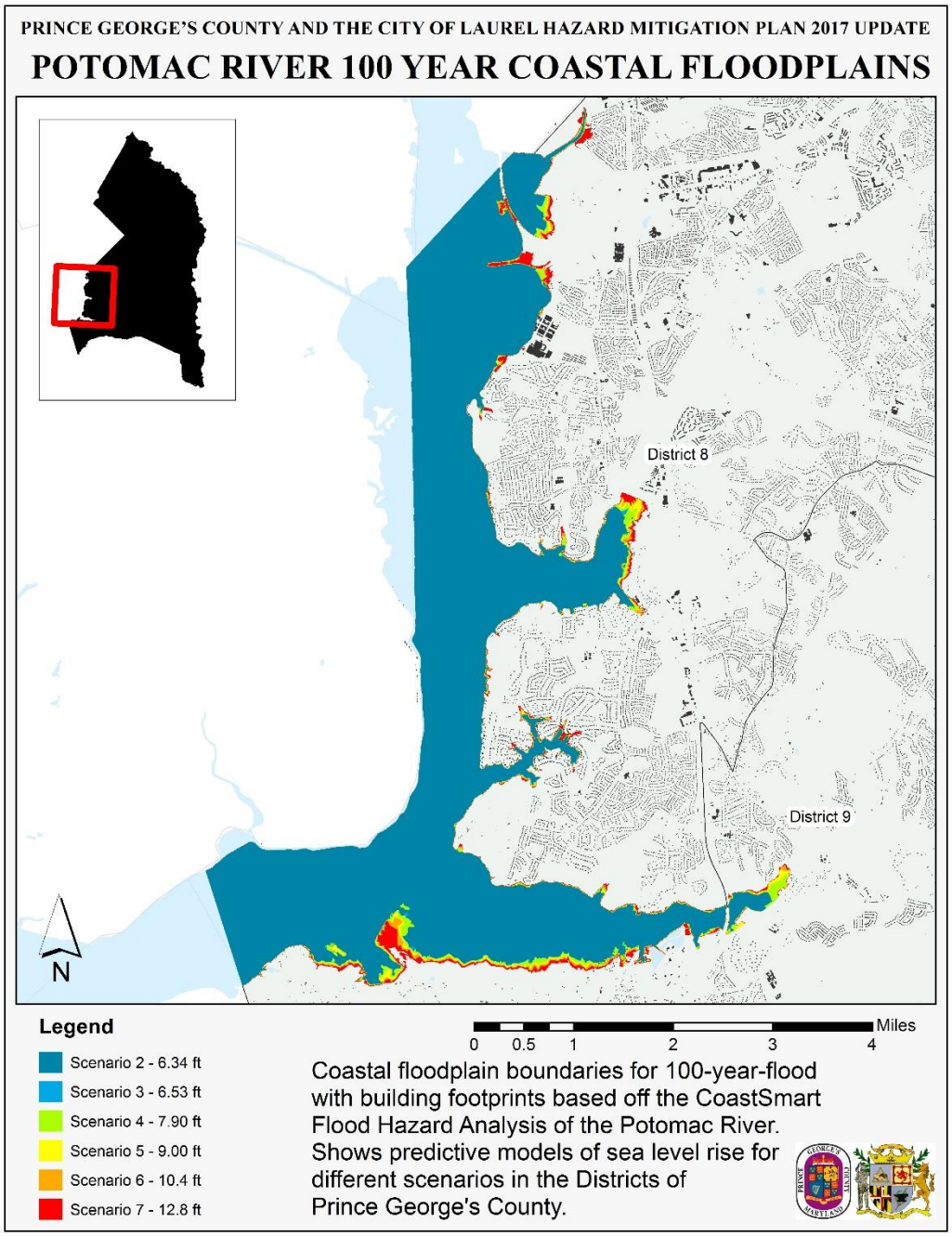


Figure 4-9. Coast Smart Coastal Modeled Flood Impacts on Potomac River in Prince George's County.

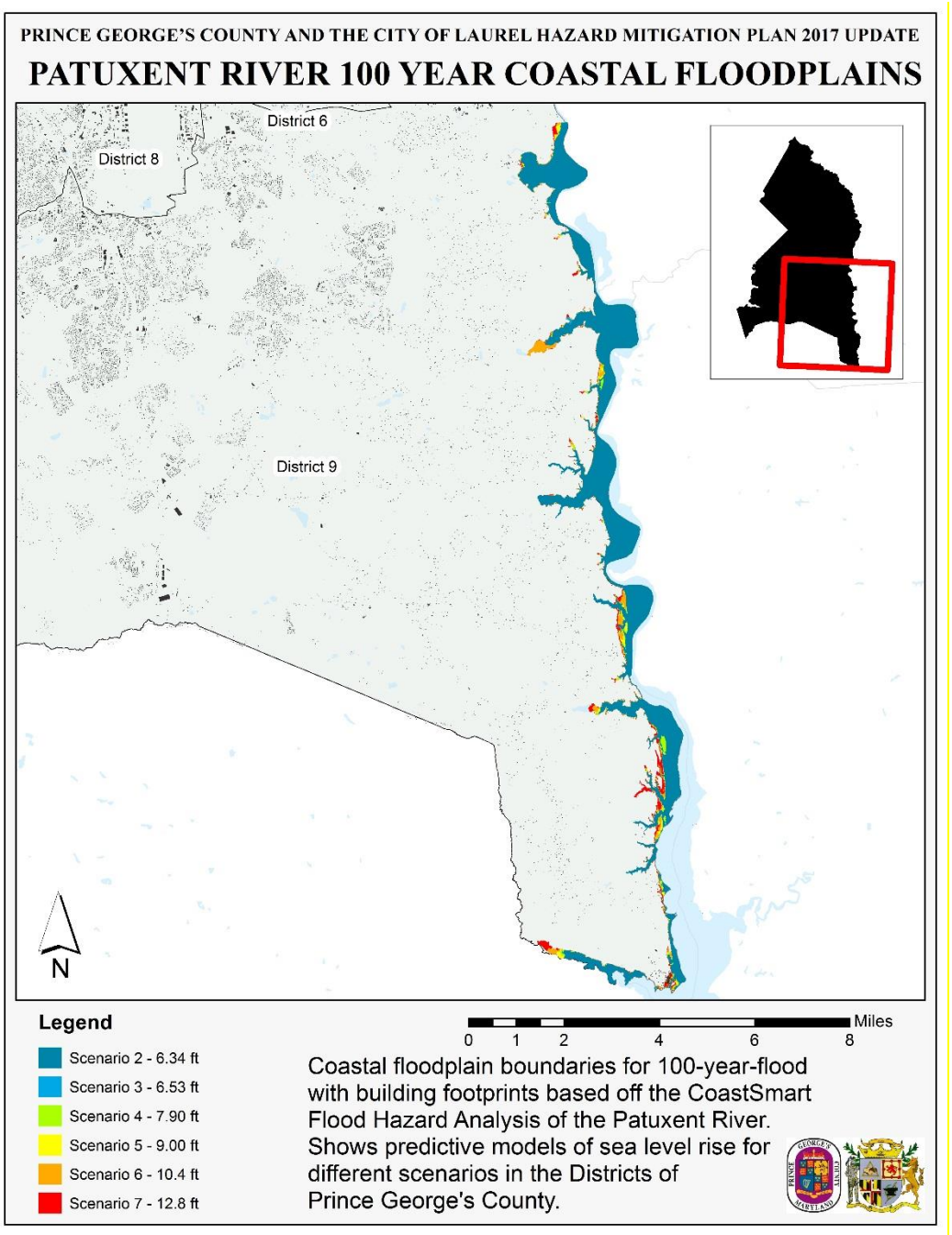


Figure 4-10. Coast Smart Coastal Modeled Flood Impacts on Patuxent River in Prince George's County.

4.5.3 Severe Storms (Flood-Related)

Description

Severe Storms can be the result of warm, moist air that is pushed upwards into the atmosphere where it cools and forms into cumulonimbus clouds. As the air continues to cool, it starts to form water droplets or ice. As these droplets or ice start to fall, they may collide and combine many times into larger forms before reaching the Earth's surface. Severe Storms such as this can form in any geographic region, and are sometimes the cause of other natural phenomena. In particular, flash floods can be the product of heavy localized precipitation in a short time period.

Previous Occurrences

According to the NCEI, there have been 75 flash flood events and 102 heavy rain events recorded in the database. These records range from 1996 to present. Some events were associated with massive tropical weather systems, but most were associated with storms occurring from April through August. Additionally, it should be noted that some NCEI heavy rain events occurred on the same day or within a few days of NCEI flash flood events. The NCEI database showed that for flash flood and heavy rain occurrences, there were a total of $250,602 in annual damages (all property damage), and approximately 8.85 of these events annually since 1996. Table 4-13 summarizes these results by hazard event type.

Table 4-13. NCEI Historic Flash Flood and Heavy Rain Event Data.

Event Type	Number of Events	Period of Record	Current Total Annual Damages	Annualized Deaths	Annualized Injuries	Annualized Events
Flash Flood	75	1996-2016	$250,332	0	0.20	3.75
Heavy Rain	102	1996-2016	$270	0	0	5.10

Probability of Future Events

The probability of future occurrences of severe storm events impacting Prince George's County and the City of Laurel is high. It is extremely difficult to determine probability of future occurrence in a specific area with any degree of accuracy. All areas within Prince George's County are at risk to heavy rain and flash floods, especially the heavily urbanized and highly impervious areas in the northern part of the County, Upper Marlboro and in the City of Laurel. Based on past occurrences, Prince George's County and the City of Laurel has a high probability of future severe storm occurrence averaging 8.85 events annually.

Vulnerability and Risk Assessment

Severe storm events have a high correlation with riverine flooding, as previously discussed. Vulnerability is similar to what was presented in the Riverine Flooding discussion.

4.5.4 Flood Risk – Dam Failures

Description

In addition to natural flooding, there are several dams within and around Prince George's County that could damage property within the County and the City of Laurel. Dam breaks could result for several reasons including excessive flooding, aging of the dam, inadequate maintenance or an act of terrorism. Due to this risk, it was important to evaluate dam inundation zones and calculate possible flood hazard exposure in dam inundation zones.

Location and Extent

There are two large dams on the Patuxent River, the Brighton and Duckett Dams, which if breached would have a significant impact on the northeast section of the County and specifically in the City of Laurel. Inundation mapping has also been completed for eight smaller dams: Laurel Lakes 1, Laurel Lakes 2, Rocky Gorge, Indian Creek 2, Indian Creek 3, Lake Arbor, Heritage Glen, and Largo Town Center Dams. For each dam, the downstream inundation zones were analyzed and mapped to show potential flood exposure due to dam failure or breach.

Vulnerability and Risk Assessment

Large Dams – Duckett

Based on GIS data obtained from the Maryland's Department of Information Technology, two inundation zones were obtained for the Brighton and Duckett Dams. These two scenarios represent the lowest and highest risk scenarios possible if flooding were to occur. The first scenarios represents a sunny day scenario, where the Duckett Dam fails, the reservoir is full, and there is no inclement weather to add additional water to the event. The second scenario assumes the worst case flooding scenario where inclement weather is occurring and the Brighton Dam breaks first which in turn causes the Duckett Dam to break. The inundation areas from these two cases were intersected with the building footprints map layer to determine the exposure during each scenario. Table 2 in Appendix G shows the results of the sunny day (lowest risk) scenario, while Table 3 in Appendix G shows the results of the flood (worst case) scenario. Figures showing both scenarios from Prince George's County and the City of Laurel's perspectives can be found in Appendix G.

Based on these analysis, the Sunny Day Scenario yielded a total exposure of $921 million while the High Risk Flood Scenario showed an exposure estimated at $2.22 billion. There is a $1.30 billion difference between each scenario. Regardless, a breach of either dam would cause extensive damage to any property within the inundation zone and create a risk for people and infrastructure.

Small Dams

Each of the small dams were analyzed for their possible property exposure. Table 4 in Appendix G shows a summary of each of the 5 small Dam inundation zones and their potential exposure to the zone. The values were intersected with the centroids of each building to determine the risk. Both Laurel Lake dams had the greatest value exposed to the dam inundation area, with Laurel Lake 2 totaling $142.6 million and Laurel Lake 1 totaling $88.9 million. District 6 has the most accumulative exposure totaling around $114.2 million and 180 buildings affected. The City of Laurel has $107.4 million with 75 buildings, and District 1 has $88.2 million and 134 building affected. Maps detailing the inundation zones for these small dams can be found in Appendix G.

4.5.5 Flood Risk – Levee Failures

Description

The levees along the Anacostia River were designed by the U.S. Army Corps of Engineers (referred to in this document as the Corps), which started construction in 1954. In 1959, the levees were turned over to the Washington Suburban Sanitary Commission for maintenance. Subsequently, the maintenance responsibilities were assumed by Prince George's County. The Prince Georges County Department of Public Works and Transportation (DPW&T) partners with the Corps to conduct annual inspections. Routine maintenance includes cutting, mowing, trimming and repair annually.

During the mid-1990s, the Prince George's County Department of Environmental Resources prepared a watershed study that examined anticipated flood discharges and flood levels. Due to decades of upland development that changed rainfall-runoff patterns, the 100-year flood was determined to be larger than the design flood used by the Corps to design the levees. Therefore, the County expressed concern that the levees no longer provided the intended level of protection. A study determined that in some places, levee height is lower than required by current standards. Three areas could be affected by levee overtopping which puts more than 2,100 structures at risk to flooding.

In 2009, the Corps and the County held discussions regarding a plan to remove trees that had not previously been identified as problematic and to address vegetation and high grass that obstruct identification of potential erosion and burrowing animals that may weaken the levees.

Vulnerability and Risk Assessment

The building values were approximated for this analysis using the same building values that were attributed to the TEIF analysis performed in the riverine flooding analysis. Total building exposure was evaluated by determining the "at risk" flood zone using the center point of each building. Table 4-14 summarizes the total building exposure in Prince George's County to potential levee failure within 100-year flood zones (zones AE and AH), the 500-year flood zone

(zone X), and the areas with reduced flood risk due to levees. The total exposure for the County is approximately $412 million, while the value of structures protected by the levees totals nearly $365 million. Figure 4-11 shows levee systems within Prince George's County in County Commission Districts 2 and 3.

Table 4-14. Summary of Individual Levee Risk Exposure.

Levee System	County Commission District	Flood Zone	Flood Zone Subtype	Building Count	Building Exposure
Allison Levee System	District 2	AE		11	$3,370,000
		AH		131	$19,000,000
		X	0.2 %Annual Chance	724	$265,000,000
		X	Reduced Flood Risk Due To Levee	580	$161,000,000
Colmar Manor North and South Levee	District 5	AH		24	$3,360,000
		X	0.2 % Annual Chance	50	$10,400,000
		X	Reduced Flood Risk Due To Levee	257	$52,800,000
Bladensburg Levee	District 5	AE		13	$4,410,000
		AH		48	$43,700,000
		X	0.2 % Annual Chance	44	$19,200,000
		X	Reduced Flood Risk Due To Levee	376	$74,900,000
Northwest Branch Anacostia River Levee (Left Bank)	District 2	AH		1	$61,000
		X	0.2 % Annual Chance	6	$2,390,000
		X	Reduced Flood Risk Due To Levee	7	$940,000
Riverdale Hyattsville Levee	District 3	X	0.2 % Annual Chance	166	$23,400,000
		X	Reduced Flood Risk Due To Levee	274	$41,900,000
	District 5	AE		4	$666,000
		AH		69	$7,510,000
		X	0.2 % Annual Chance	14	$9,990,000
		X	Reduced Flood Risk Due To Levee	212	$33,400,000

Table 4-15. Comparison of Total Building Stock Exposure in Areas protected by Levees to other Flood Zones in Prince George's County.

Flood Zone	Building Count	Building Exposure
AE, AH	301	$82,077,000
0.2 % Annual Chance Flood Hazard	1004	$330,380,000
Reduced Flood Risk Due To Levee	1706	$364,940,000

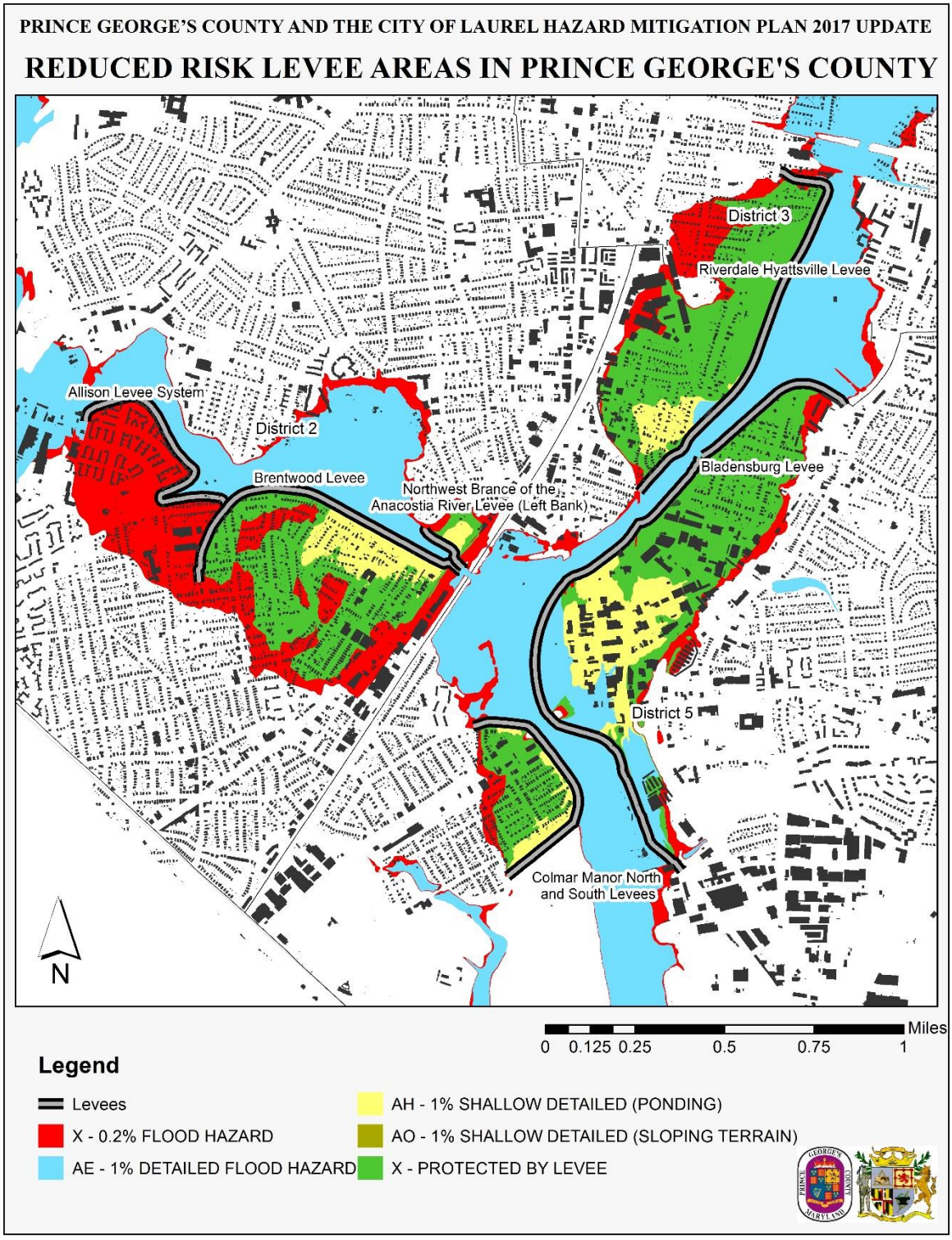


Figure 4-11. Levee Systems within Prince George's County.

4.6 Wind Related Hazards

4.6.1 Tornadoes

Description

According to the National Oceanic and Atmospheric Administration (NOAA), a tornado is described as a violently rotating column of air extending from a thunderstorm to the ground. Data from the NOAA website indicates the path of a tornado is generally less than half of a mile wide, but the path length can vary from a few hundred yards to dozens of miles. A tornado moves at speeds from 30 to 125 mph, but can generate winds exceeding 300 mph.

Tornado season typically occurs from March through August; however, tornadoes can happen in any month. In the United States, tornadoes have been classified on the Fujita Scale, assigning numeric scores from zero to five (or higher) based on the severity of observed damages. The traditional Fujita (F) scale, introduced in 1971, was used to rate the intensity of tornadoes thereafter, and was also applied to previously documented tornadoes. Starting in February of 2007, an "enhanced" Fujita (EF) scale was implemented, with somewhat lower wind speeds at the higher F-numbers, and more thoroughly-refined structural damage indicator definitions. Table 4-16 shows the differences between the old and new tornado intensity scales, wind speeds, typical damages, and relative frequency.

Tornadoes are one of nature's most violent storms. In an average year, about 1,000 tornadoes are reported across the United States, resulting in 80 deaths and more than 1,500 injuries. Tornadoes have the potential of creating total destruction of homes, especially mobile homes, businesses, and cars, causing many deaths; extensive tree damage along roadways, which may inhibit or block access; extensive damage to electric and telephone lines; utility line breaks; damaged or destroyed radio and television towers. Tornadoes are hazard events that threaten everyone in Prince George's County and the City of Laurel.

Table 4-16. Tornado Damage Scale (Source: NOAA Storm Prediction Center).

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

Location and Extent

Prince George's County has experienced tornadoes ranging from EF0 (minimum severity) to EF3. A tornado with a classification of EF1 or above could at least cause moderate damage, overturning automobiles and uprooting trees. Figure 4-12 summarizes tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles. Prince George's County and the City of Laurel are in a zone where they may experience one to five tornados every 1,000 square miles per year.

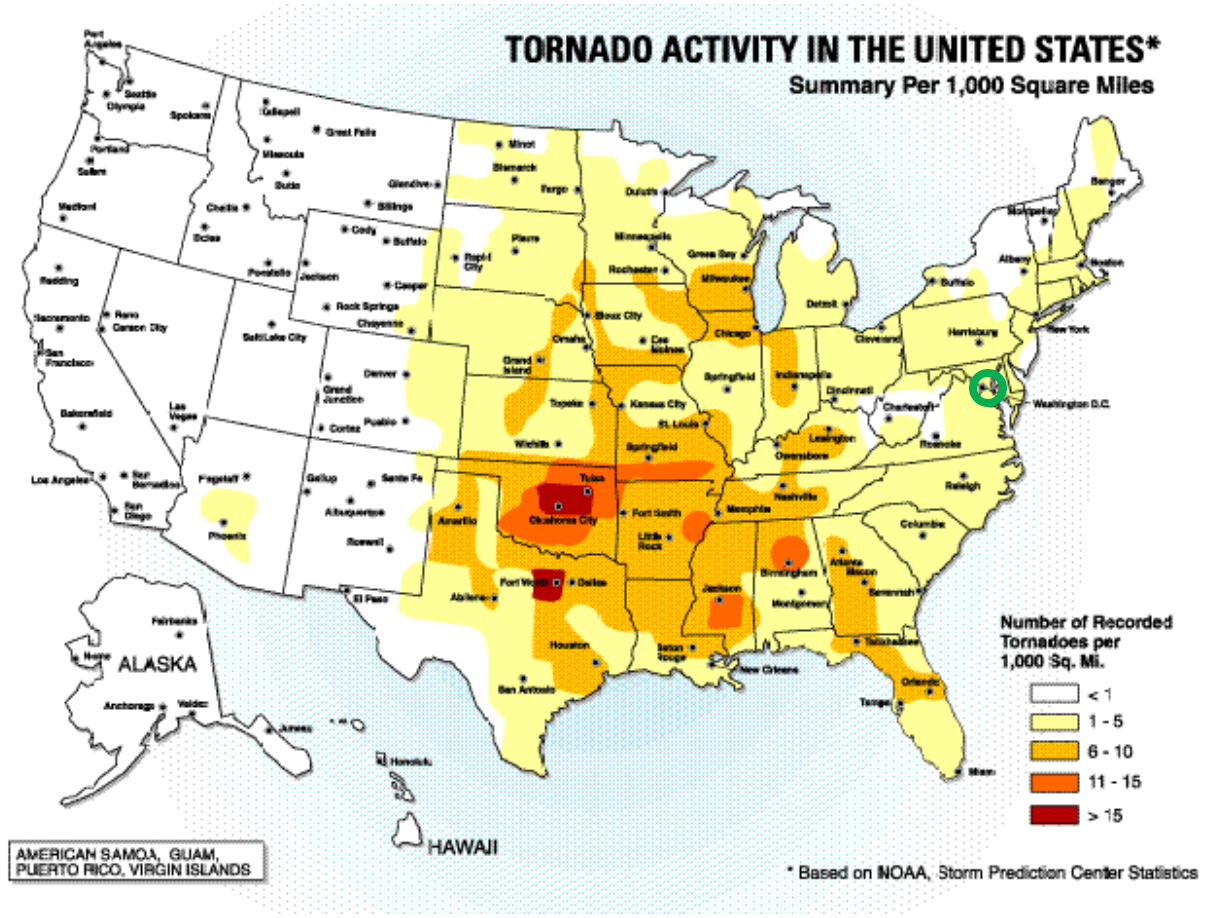


Figure 4-12. Tornado Activity in the United States.

Source: American Society of Civil Engineers

Buildings must be designed to withstand both external and internal wind pressures on the structural framing and exterior elements. The level to which these structures are designed, as expected, directly correlates with the building's ability to resist damages due to high winds. The community's building code dictates the design wind speed to which a structure must be designed; both Prince George's County and the City of Laurel have adopted the 2015 International Building Code[18]. For some building types, the structures constructed subsequent to the adoption of the building code are the most likely to be the most resistant to damages from wind.

Tornado damages to a given structure depend on several factors, including the condition of the exposed structures, its design and construction, and the quality of the building materials and connections. The current 2015 International Building Code references American Society of Civil

[18] 2015 International Building Code and Subtitle 4 Prince George's County Building Code. http://www.princegeorgescountymd.gov/1436/Building-Codes-Bulletins

Engineers (ASCE) Standard 7-10; which requires most residential structures to constructed to withstand a design wind speed of 115 mph (three second peak gust). However, most structures within the County were built prior to the adoption of the current building code and current standards. As such older buildings, certain construction materials and techniques, manufactured housing, and poorly designed buildings are more vulnerable to tornadoes. If homes are destroyed by tornadoes, then residents would be impacted by requirement to rebuild to current standards at a higher cost. Destruction of commercial buildings and infrastructure could cause employers to move their facilities and operations elsewhere, resulting in employees relocating to other areas outside of the County.

Vulnerability to tornadoes is dependent on the geographic extent and magnitude of the event. Damages from lower intensity tornadoes (EF0) can range from chimney damage to uprooted shallow trees. A significant tornado (EF2) would cause considerable damage to the roofs of frame houses, complete destruction of mobile homes and large trees and utility lines snapping. A devastating tornado (EF4) would result in well-constructed houses being leveled, weak foundations blown down, and cars thrown.

Previous Occurrences

Since 1950, there have been 25 recorded tornadoes in the area, ranging in intensity from EF0 to F3.

Table 4-17 shows the community affected, intensity rating, and 2016 inflated damages for tornadoes since 2010 from the NCEI Storm Events Database, but the complete NCEI record extends back to 1950. The recent events shown in

Table 4-17 demonstrate recorded tornado incidents in the County and City since the last plan update. Previous occurrences, including the September 24, 2001 College Park tornado which killed two people, may be found in Appendix B. Most tornadoes occur in the spring, and sometimes tornado outbreaks can occur where several can happen on the same day. Table 4-18 summarizes the annualized NCEI historic data from the last plan update (2010 to present). From the NCEI database, there were only two deaths over the period from 1950 to 2016 associated with one F3 tornado on September 24, 2001, which explains the very low annualized deaths for this event type. There were also 55 injuries associated with the 2001 F3 tornado, while there were five other injuries back in 1995 from two other tornadoes. These were the only deaths and injuries that were reported to the database. The annual occurrence of tornadoes shows that they occur on average once every two years

Table 4-17. NCEI Recent Tornado Hazard History 2010 – 2016.

Fujita Scale	Date	Community Affected	Deaths	Injuries	2016 Property Damages	2016 Total Damages
EF0	29 Sep 2015	Laurel	0	0	$0	$0
EF0	01 Jul 2013	Crestview Manor	0	0	$513	$117,000
EF0	19 Apr 2013	Westphalia	0	0	$25,600	$1,200,000
EF0	01 Jun 2012	Buena Vista	0	0	$2,080	$2,080
EF0	27 Apr 2011	Andrews Manor, near Camp Springs	0	0	$5,310	$5,310
EF0	27 Apr 2011	Friendly	0	0	$106,000	$106,000
EF0	27 Apr 2011	Westchester Estates, Clinton	0	0	$106,000	$106,000
EF0	05 Apr 2011	Collington	0	0	$2,120	$2,120

Table 4-18. NCEI Historic Tornado Event Data (1950-2016).

HIRA Hazards	Number of Events	Period of Record	Current Total Annual Damages	Annualized Deaths	Annualized Injuries	Annualized Events
Tornado	25	1950-2016	$2,843,724	0.030	0.909	0.379

Probability of Future Events

The NWS advises that tornadoes strike randomly, so all areas within Prince George's County and the City of Laurel are equally at risk. Tornado and high-wind events could occur at any time of the year, but are more frequent in the springtime. Based on the NCEI historic records of tornado activity in Prince George's County, it is estimated that the County will experience about one tornado event every 2.6 years.

On the basis of 40 years of tornado history and more than 100 years of hurricane history, the United States has been divided into four zones that geographically reflect the number and strength of extreme windstorms. Zone IV includes high-hazard mid-west and prairie states like Oklahoma, Kansas and Texas where the most frequent and strongest tornado activity with wind speeds up to 250 mph occurs. Zone III has experienced significant tornado activity with winds speeds up to 200 mph, and Zone II has experienced some amount of tornado activity with wind speeds up to 160 mph. There are also areas labeled as being susceptible to hurricane weather. Prince George's County and the City of Laurel are included in Zone II which is also in the zone susceptible to hurricanes.

Vulnerability and Risk Assessment

A tornado manifests as high-impact, low-probability hazards whose effect is dependent on its intensity and the type of development in its path. Tornado vulnerability is based on building construction and standards, the availability of shelters or safe rooms, and advanced warning capabilities. Even well-constructed buildings are vulnerable to the effects of a stronger (generally EF2 or higher) tornado. Identifying assets at risk for tornado damage is virtually impossible since tornadoes are so unpredictable. It can be assumed that every structure has an equal chance of exposure to a tornado event. Therefore, all of the assets of Prince George's County and the City of Laurel should be included.

Buildings must be designed to withstand both external and internal wind pressures on the structural framing and exterior elements. The level to which these structures are designed, as expected, directly correlates with its ability to resist damages due to high winds. The community's building code dictates the design wind speed to which a structure must be designed. For some building types, the structures constructed subsequent to the adoption of the building code are the most likely to be the most resistant to damages from wind.

The damages resulting from tornadoes are affected by the condition of the exposed structures, their design and construction, and the quality of the building materials. Older structures, certain construction materials, mobile homes, and poorly designed buildings are very vulnerable to tornadoes. If homes are destroyed by tornadoes, residents are impacted by building codes requiring reconstruction to current building code standards or relocation. Destruction of commercial buildings and infrastructure results in loss of business income, employee wages and potential services dependent on infrastructure. Major damage to an employer could force temporary or permanent relocation outside of Prince George's County or the City of Laurel negatively impacting employees and tax revenues.

A generalized loss estimate for the County was derived from NCEI Storm Events data. The data was annualized by taking the total number of damaging tornado events and dividing by the length of record. The annualized values should only be utilized as an estimate of what can be expected in a given year. From Table 4-18, the NCEI data showed that on average approximately $2.843 million could be lost in annual damages (nearly all of it property damage).

As evidenced in loss figures, tornadoes have the potential to be very destructive. The NCEI estimates are believed to be an underrepresentation of the actual losses experienced, as numerous losses from events are not reported or are difficult to quantify so the NCEI database is incomplete.

4.6.2 Severe Storms (Wind-Related)

Description

Thunderstorms are caused when air masses of varying temperatures and moisture content meet. More severe storms are associated with the presence of strong winds, thunder, and lightning. It is also possible to experience storms without precipitation which can increase wildfire risk during periods of dry weather or draught. Thunderstorms can form in any geographic region, and are sometimes the cause of other natural phenomena such as downburst winds, heavy rain, flash floods, large hailstones, tornadoes, and waterspouts.

A severe thunderstorm includes damaging winds of 58 mph (50 knots) or greater and hail one inch or larger in diameter. High winds have been further broken down into three categories by the NWS Storm Events database:

- High Wind: Sustained non-convective winds of 35 knots (40 mph) or greater lasting for one hour or longer or winds (sustained or gusts) of 50 knots (58 mph) for any duration (or otherwise locally/regionally defined), on a widespread or localized basis. In some mountainous areas, the above numerical values are 43 knots (50 mph) and 65 knots (75 mph), respectively.[19]
- Strong Wind: Non-convective winds gusting less than 50 knots (58 mph), or sustained winds less than 35 knots (40 mph) resulting in a fatality, injury, or damage.[20]
- Thunderstorm Wind: Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 50 knots (58 mph), or winds of any speed (non-severe thunderstorm winds below 50 knots) producing a fatality, injury, or damage. Events with maximum sustained winds or wind gusts less than 50 knots (58 mph) should be entered as a Storm Data event only if they result in fatalities, injuries, or serious property damage.

Hail is precipitation in the form of ice that occurs in thunderstorms between currents of rising air (updrafts) and currents of descending air (downdrafts). These storms typically occur in late spring through early summer. One criteria for severe thunderstorms, as defined by the NWS, is hail that is 1 inch in diameter (quarter-size) or larger. Figure 4-13 diagrams how hail is formed in the atmosphere.

[19] High Winds are addressed under the "High Winds" section

[20] Strong Winds are addressed under the "High Winds" section

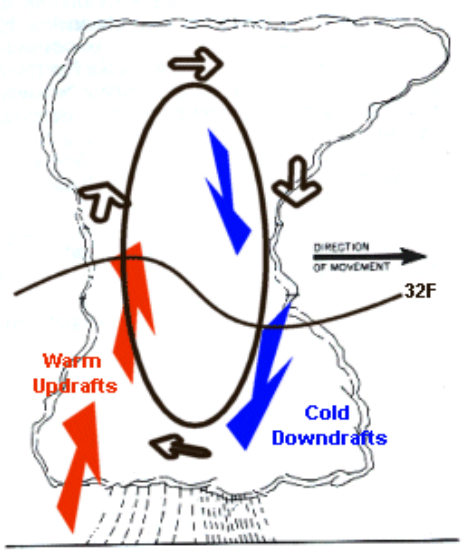


Figure 4-13. Formation of Hail (Source: NOAA).

Lightning is generated by the buildup of charged ions in a thundercloud. When this buildup intersects with the best conducting object or surface on the ground, the result is a discharge of a lightning bolt. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes, but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes thunder.

Location and Extent

All of Prince George's County and the City of Laurel could potentially be impacted by a thunderstorm event that causes high wind, lightening, and hail. All structures and assets in Prince George's County and the City of Laurel should be considered vulnerable to these hazards.

Using the NWS definition for a severe thunderstorm, dime-sized hail is considered a minimum hazard and quarter-sized hail is considered a major hazard. Quarter-sized hail can cause significant damage to property such as automobiles, aircraft, and roofs as well as agricultural crops and livestock. Damage to shingled roofs may go undetected until leaks and cracks start forming. Damage to metal roofs is more noticeable due to dents and damages to exterior finishes. Automobiles may be dented or have their windshields and windows shattered. Although rare, large hailstones may even cause injury or death. The amount of cover available during a hail storm can greatly reduce the risk to human health during these events.

While there is no established index for lightning, a lightning strike is considered to be of minimum severity when it has limited impacts on infrastructure (ex. tree limbs) and major severity when it causes extensive damage (e.g. loss of life, fire, structural damage). The potential damages resulting from lightning strikes are primarily loss of life, business interruption, fire and minor structural damage. A false sense of security often leads people to believe that they

are safe from a lightning strike because it may not appear to be near their location. However, lightning can strike 10 miles away from a rain column, which puts people at risk outside of the storm cloud.

Using the NWS high wind categories listed above, sustained non-convective winds of 40 mph or greater lasting for one hour or longer or winds (sustained or gusts) of 58 mph for any duration, on a widespread or localized basis are considered a minimum severity event. A major severity event would be wind events of greater than 58 mph or wind events resulting in death, injury or significant damage.

Previous Occurrences

When using the combined NCEI thunderstorm wind, lightning, and hail events, there are a total of 461 events that have been recorded in Prince George's County. There have been 358 thunderstorm wind events recorded since 1955, 90 hail events since 1955, and 13 lightning strikes recorded since 1996 in the database. Adjusted for inflation, the annualized deaths, injuries, damages and number of events are summarized in Table 4-19.

Table 4-19. NCEI Historic Hail, Lightning, and Thunderstorm Wind Event Data.

Event Type	Number of Events	Period of Record	Current Total Annual Damages	Annualized Deaths	Annualized Injuries	Annualized Events
Thunderstorm Wind	358	1955 - 2016	$117,359	0	0.115	5.869
Lightning	13	1996 - 2016	$57,556	0.05	0.25	0.650
Hail	90	1955 - 2016	$369	0	0	1.475

Probability of Future Events

Based on the NCEI database, Prince George's County and the City of Laurel have a high probability to experience these types of hazards. Severe thunderstorm wind events occur five to six times annually (5.87 annual occurrences), hail events occur once or twice each year (1.48 annual occurrences), and a damaging lightning strike happens once every one to two years (0.65 annual occurrences).

Vulnerability and Risk Assessment

The primary hazard caused by thunderstorm winds is the transport of debris, which can cause casualties and property loss or even the dislodging of mobile homes from their foundation. High winds may also cause damage to poles and lines carrying electric, telephone, and cable television service. Older structures built before 1940 are often more susceptible to wind damage. Lightning strikes can injure or kill people as well as damage buildings not properly grounded.

Older critical facilities are vulnerable to wind damage due to the age of construction and poor condition due to age and lack of maintenance, especially in the more rural and isolated areas of

the County. It is important to identify specific critical facilities and assets that are most vulnerable to severe weather. Evaluation criteria include the age of the building (and what building codes may have been in effect at the time of construction), type of construction, and condition of the structure (i.e., how well the structure has been maintained).

4.6.3 High Winds

Description

High wind events occur when there is a large difference in air pressure between two locations. The NCEI dataset defines high wind events as:

> *Sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer or winds (sustained or gusts) of 50 knots (58 mph) for any duration (or otherwise locally/regionally defined), on a widespread or localized basis. In some mountainous areas, the above numerical values are 43 knots (50 mph) and 65 knots (75 mph), respectively.*

In addition to high winds, the NCEI dataset includes strong wind events as defined below:

> *Non-convective winds gusting less than 50 knots (58 mph), or sustained winds less than 35 knots (40 mph) resulting in a fatality, injury, or damage*

This sub-set of wind type does not include wind during severe storm events, winter storms and blizzards, or tropical/sub-tropical cyclones. Those wind effects are described in sections addressing those specific hazards.

Location and Extent

High wind events can occur throughout the County and City. Sometimes these high wind events originate from microbursts. Microbursts (also known as downbursts) are powerful downdrafts associated with heavy precipitation events such as thunderstorms, rain showers, and particularly hail storms. In some cases, dry microbursts can be triggered by virga (rain that evaporates before it reaches the ground). According to the National Oceanic and Atmospheric Administration (NOAA), microbursts occur when the weight of heavy precipitation or hail accelerates downward winds to very high velocities as it falls from the upper levels of the atmosphere. Approximately five percent of all thunderstorms are estimated to produce a microburst. These microbursts can result in significant wind damage similar to a weak tornado. Although microbursts are more common in the western United States, they also occur in the eastern United States, including Maryland.

Downdrafts associated with microbursts are typically only a few hundred to a few thousand feet across. When the downdraft reaches the ground, it spreads out horizontally and may form one or more horizontal vortex rings around the downdraft. Microburst events typically last 15 to 20 minutes.

Previous Occurrences

Since 1996, there have been 11 high wind events and 23 strong wind events recorded by the NCEI database in Prince George's County. Table 4-20 shows the combined annualized NCEI data that was recorded from these 34 wind events. The most damaging high wind event occurred on October 29, 2012 when Hurricane Sandy moved up the Atlantic coast and then made landfall in New Jersey, Northeast of the area. Estimated wind gusts of 60 mph caused damage to seventeen residences, totaling $3.53 million in damages. The most damaging strong wind event occurred on November 13, 2003, causing $112,297 in damages (all property damage) and had one direct death recorded with it. A record of all 34 events and their subsequent damages, deaths, and injuries can be found in Appendix B.

Table 4-20. NCEI Historic High Wind and Strong Wind Event Data.

Event Type	Number of Events	Period of Record	Annual Total Damages	Annualized Deaths	Annualized Injuries	Annualized Events
High Wind	11	1996-2016	$189,426	0	0.250	0.550
Strong Wind	23	1996-2016	$12,009	0.050	0	1.150

Probability of Future Events

High wind events are considered medium probability and random events that can occur at any time of year, so all areas within Prince George's County and the City of Laurel are equally at risk.

Vulnerability and Risk Assessment

The impact of high winds can be measured in financial terms, as well as fatalities and injuries. The NCEI Storm Events data was annualized by taking the total number of damaging thunderstorm events and dividing by the length of record, as see in Table 4-20. The annualized values should only be used as an estimate of what can be expected in any year. Using historic records, it can be estimated that Prince George's County and/or the City of Laurel will experience at least one event every one to two years. Damages from these events can be approximated at $201,434 for property and minimal crop damages annually.

4.6.4 Hurricanes/Tropical Storms (Wind-Related)

Description

The *2016 State of Maryland Hazard Mitigation Plan* defines wind as: "the motion of air past a given point caused by a difference in pressure from one place to another." There are several effects from intense events including interruptions in elevated communications and power lines or the picked up debris which can damage property.

Location and Extent

Nor'easters are large-scale cyclones that cause hurricane force winds. They are an offshore air mass that blows wind from the northeast to the southwest. The name Nor'easter is usually associated with sub-tropical or tropical storms that impact the Mid-Atlantic and New England region. They thrive when cold polar air converges with warmer air over the water, and can be very severe when they occur in the winter season. These storms typically occur between September and April. Many tropical depressions and hurricanes degrade in the Mid-Atlantic and manifest as Nor'easters over Prince George's County and the City of Laurel causing extensive damage from high winds and excessive precipitation.

Previous Occurrences

In the NCEI database, there are three tropical storm and hurricane events with recorded dates and damages that occurred from the Nor'easter's hurricane force winds. Each of these events caused significant damages affecting property. Hurricane Isabel in 2003 storm featured reported crop damages as well. Table 4-21 summarizes these events and their total damages in current dollars (nearly all property damages) while Table 4-22 shows the combined annualized NCEI data that was recorded from those three events. There were no deaths or injuries reported directly in this database.

Table 4-21. NCEI Tropical Storm Event Damages.

Date	Name	Current Total Damages
16 Sep 1999	Hurricane Floyd	$173,290
18 Sep 2003	Hurricane Isabel	$3,999,420
27 Aug 2011	Hurricane Irene	$1,984,750

Table 4-22. NCEI Tropical Storm Event Damages.

Event Type	Number of Events	Period of Record	Annual Total Damages	Annualized Deaths	Annualized Injuries	Annualized Events
Tropical/Sub-Tropical Storms	3	1996-2016	$498,000	0	0	0.15

Probability of Future Events

Based on the NCEI database, Prince George's County and the City of Laurel have a low probability to experience these destructive types of hazards. Hurricanes and tropical storms destructively affect Prince George's County and the City of Laurel about once a decade (0.15 annual occurrences), even though the Atlantic hurricane season occurs every year between June and November.

Vulnerability and Risk Assessment

The State of Maryland 2016 Hazard Mitigation Plan ranked the County on a number of different factors for flooding, including a statewide Hazus analysis. These scores and ranks are shown in Table 4-23 where the state ranked Prince George's County (including the City of Laurel) as High.

Table 4-23. 2016 State of Maryland HMP Ranking for Wind Hazards.

Risk Factors Weighted	Rank
Population Vulnerability	4
Population Density	3
Injuries	2
Deaths	4
Property Damage	2
Crop Damage	1
Geographic Extent	1
Events	4
Local Plan Ranking	4
Overall Rating	24
Overall Ranking	High

Prince George's County (along with the rest of Maryland) has an extensive history of exposure and damage from Nor'easters and hurricanes. Figure 4-14 shows the named tropical storm and hurricane tracks that have passed within 200 miles of Maryland since 1970.[21] Many were categorized as tropical storms when they passed by. However, there were a few that passed by that were either a hurricane category 1 or 2. Note that some of the larger hurricanes that have affected Prince George's County may not be shown on this map for the sake of clarity, as the extent of their influence was larger than 200 miles wide.

[21] NCAR UCAR. Climate Data Guide. https://climatedataguide.ucar.edu/climate-data/ibtracs-tropical-cyclone-best-track-data

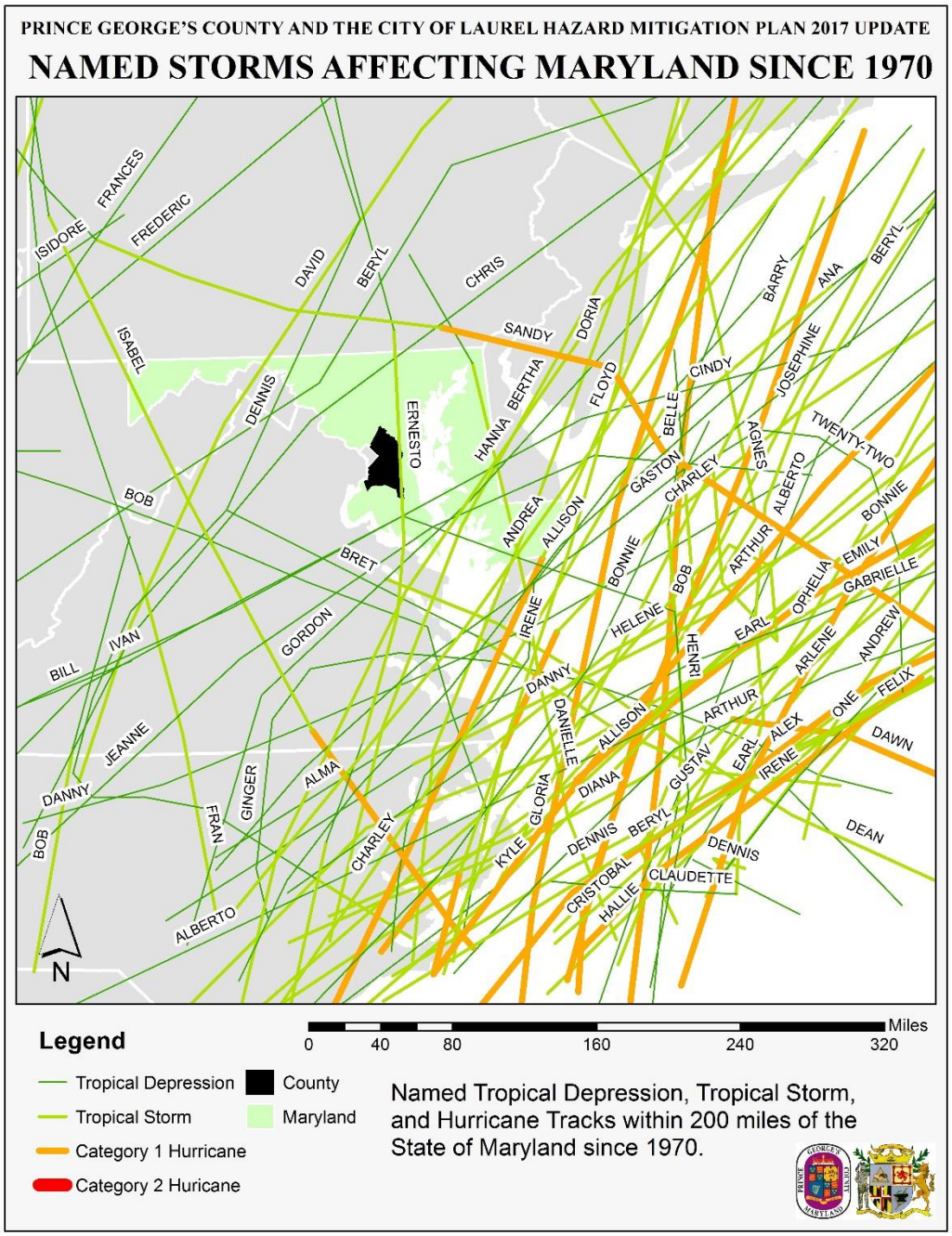


Figure 4-14. Named Tropical Depression, Tropical Storm, and Hurricane Tracks.

4.6.5 Winter Storms/Blizzards

Description

For this section the following NCEI database event types were used to generalize the winter storms section: blizzard, heavy snow, winter storm, winter weather, and ice storm. Winter storms come in many forms and can include heavy snow, freezing rain, and/or high winds. Snow typically maintains its crystalline structure from the clouds where it forms until it reaches the ground surface. Freezing rain, may have started in the clouds as either rain or snow, but reaches the surface as liquid that freezes on contact with power lines, tree limbs, vehicles, buildings and the ground when temperatures are below freezing. Freezing rain can accumulate on these surfaces resulting in an ice coating. Sleet reaches the surface in the form of clear pellets of ice that bounce upon contact. Winter winds can produce extremely low temperatures and create snow drifts which can impact mobility in the region.

Location and Extent

The impacts of winter storms are usually minimal in terms of property damage and long-term effects. The most notable impact from winter storms is damage to power distribution networks and utilities and the impacts on transportation, debris removal and utility restoration. Severe winter storms have the potential to inhibit normal community services. Government costs for these events include overtime personnel wages and equipment, or contractors for road clearing. Private-sector losses are attributed to time lost when employees are unable to travel. Homes and businesses suffer damage when electric service is interrupted for long periods of time. After several severe winter storms during the plan update period the Potomac Electric Power Company (PEPCO) reorganized its response structure to improve power restoration after severe events.

Health threats can become severe when frozen precipitation makes roadways and walkways very slippery, when prolonged power outages occur, and when fuel supplies are jeopardized. Occasionally, buildings may be damaged when snow loads exceed the design capacity of their roofs or when trees fall due to excessive ice accumulation on branches. The water content of snow can vary significantly from one storm to another and can drastically impact the degree to which damage might occur. In snow events that occur at temperatures at or even above freezing, the water content of the snowfall is generally higher. Higher water content translates into a heavier, “wet” snowfall that more readily adheres to power lines and trees, increasing the risk of their failure. Roof collapse is also more of a concern with wetter, heavier snowfall.

Clearing of roadways and sidewalks is usually easier with a drier, more powdery snow which is also less likely to accumulate on power lines and trees. This type of snow generally occurs in temperatures below freezing, as water content decreases with temperature. The primary impact of excessive cold is increased risk for frostbite, and potentially death as a result of over-exposure to extreme cold. Secondary effects of extreme/excessive cold include frozen water pipes in homes and businesses.

Previous Occurrences

The NCEI database has recorded a total of 105 events that involve blizzard, heavy snow, winter storm, winter weather, and ice storm in Prince George's County. There have been three blizzard events, ten heavy snow events, 28 winter storm events, 65 winter weather events, and three ice storms, all of which the database started recording in 1996. These events include five of the seven FEMA declared winter storm/blizzard events listed earlier in Table 4-3, but exclude two earlier snow-related events - an emergency declaration in January 1993 and a major disaster declaration in February 1994. Adjusted for inflation, the annualized damages, deaths, injuries, and number of events are summarized in Table 4-24.

Table 4-24. NCEI Historic Blizzard, Heavy Snow, Winter Storm, Winter Weather, and Ice Storm Event Data.

Event Type	Number of Events	Period of Record	Current Total Annual Damages	Annualized Deaths	Annualized Injuries	Annualized Events
Blizzard	3	1996 - 2016	$2,802	0.05	0	0.150
Heavy Snow	10	1996 - 2016	$1,868	0	0	0.500
Winter Storm	28	1996 -2016	$78,718	0	0.45	1.400
Winter Weather	65	1996 -2016	$0	0	0	3.250
Ice Storm	3	1996 - 2016	$3,033	0	0	0.150

Probability of Future Events

Based on the NCEI database, Prince George's County and the City of Laurel have a high probability to experience all types of winter weather events. NCEI winter weather events occur about three times annually (3.25 annual occurrences), winter storm events occur once or twice each year (1.4 annual occurrences), heavy snow events occur once every two years (0.5 annual occurrences, and blizzards and ice storms happen about once every five to seven years (0.15 annual occurrence).

Based on data from the Maryland Hazard Analysis (January 2000), the total average annual snowfall within Prince George's County varies between 16.3 and 20.2 inches annually. However, as shown during the blizzard of 1996 and other events, winter storms producing higher snowfall amounts are possible. Over the past three decades, areas of Prince George's County have recorded 24-hour snowfall totals as high as 22 inches.

Vulnerability and Risk Assessment

Winter storm vulnerability can be expressed by impacts to people, property, and societal function. For example, exposure of individuals to extreme cold, falls on ice-covered walkways, carbon monoxide poisoning from generators and automobile accidents are heightened during winter weather events.

4.7 Fire Related Hazards

4.7.1 Wildfire

Description

A wildfire is an undesirable fire occurring in a forest, brush land or wooded development and is a serious and growing hazard over much of the United States. Fires within forested areas that are ignited by natural causes such as lightning or as part of a controlled burn process are part of the natural fire cycle and an important contributor to forest health.

Wildfires pose a great threat to life and property, particularly when they move from forest or brushy areas into more developed or habited areas. An average of five million acres burn annually in the U.S. as a result of wildfires, causing millions of dollars in damage. Each year more than 100,000 wildfires occur in the U.S., almost 90% of which are started by humans; the rest are caused by lightning. Weather is one of the most significant factors in determining the severity of wildfires.

Wildfires can be classified as uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures for areas greater than one acre. Wildfires may create additional environmental concerns well after they are extinguished such as increased erosion and water quality concerns in storm water runoff. Three main factors influence wildfire behavior – topography, fuel, and weather. Other hazards can contribute to the potential for wildfires or can influence wildfire behavior. High winds can down power lines; earthquakes can rupture gas lines; lightning can spark fires. Lightning is a major cause of structural fires and wildfires. People improperly disposing of cigarettes and matches also causes wildfires, especially along roadways.

Drought conditions increase wildfire potential by decreasing fuel moisture. Warm winters, hot, dry summers, severe drought, insect and disease infestations, years of fire suppression, and growth in the wildland-urban interface (WUI) continue to increase wildfire risk and the potential for catastrophic wildland fires. Forest insect epidemics and forest parasites contribute to wildfire potential by increasing fuel loading. Protecting the WUI is the nation's fastest-growing firefighting expense. Suppressing wildfires in the WUI continues to account for 85% of firefighting costs in the United States, according to the USDA Forest Service. Protecting life and property in these areas is costly because fire managers must take an aggressive stand on the ground and from the air.

Location and Extent

Forested lands and any surrounding urban areas (WUI - wildland-urban interface) are most at risk to fires. Potential risks include destruction of land, property, and structures as well as injuries and loss of life. Although rare, deaths and injuries usually occur at the beginning stages of wildfires when sudden flare-ups occur from high wind conditions. In most situations, however, people have the opportunity to evacuate the area and injury. Financial losses related

to wildfires include destroyed or damaged houses, barns, private facilities, vehicles and equipment, loss of commercial timber supplies, and local and State costs for response and recovery.

Previous Occurrences

Prince George's County has had many wildfires over the last few years. From 1992 to 2013, there were 85 wildfires of various sizes[22]. Sizes can range from less than a quarter of an acre (Class A) to larger than 5,000 acres (Class G). Table 4-25 summarizes the number of wildfires that occurred by Class in each District. Figure 4-15 shows wildfire extent within the County, as well as a specific areas of the community that participate in a Community Wildfire Protection Plan (CWPP) to fight against the wildfire danger.

Table 4-25. Number of Wildfires[23] from 1992 to 2013 in Prince George's County.

Political Area	Fire Size Code	Fire Description	Total Fires
City of Laurel	--	--	--
District 1	A	0.25 Acres or less	1
	B	0.26 to 9.9 Acres	3
	C	10.0 to 99.9 Acres	1
District 2	B	0.26 to 9.9 Acres	1
District 3	A	0.25 Acres or less	1
	B	0.26 to 9.9 Acres	5
District 4	A	0.25 Acres or less	4
	B	0.26 to 9.9 Acres	11
District 5	B	0.26 to 9.9 Acres	2
District 6	A	0.25 Acres or less	1
	B	0.26 to 9.9 Acres	1
District 7	A	0.25 Acres or less	1
	B	0.26 to 9.9 Acres	2
District 8	B	0.26 to 9.9 Acres	2
	C	10.0 to 99.9 Acres	1
District 9	A	0.25 Acres or less	18
	B	0.26 to 9.9 Acres	26
	C	10.0 to 99.9 Acres	2
	E	300 to 999 Acres	2
Total			85

[22] Short, Karen C. 2015. *Spatial wildfire occurrence data for the United States, 1992-2013 [FPA_FOD_20150323]. 3rd Edition*. Fort Collins, CO: Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2013-0009.3

[23] Ibid.

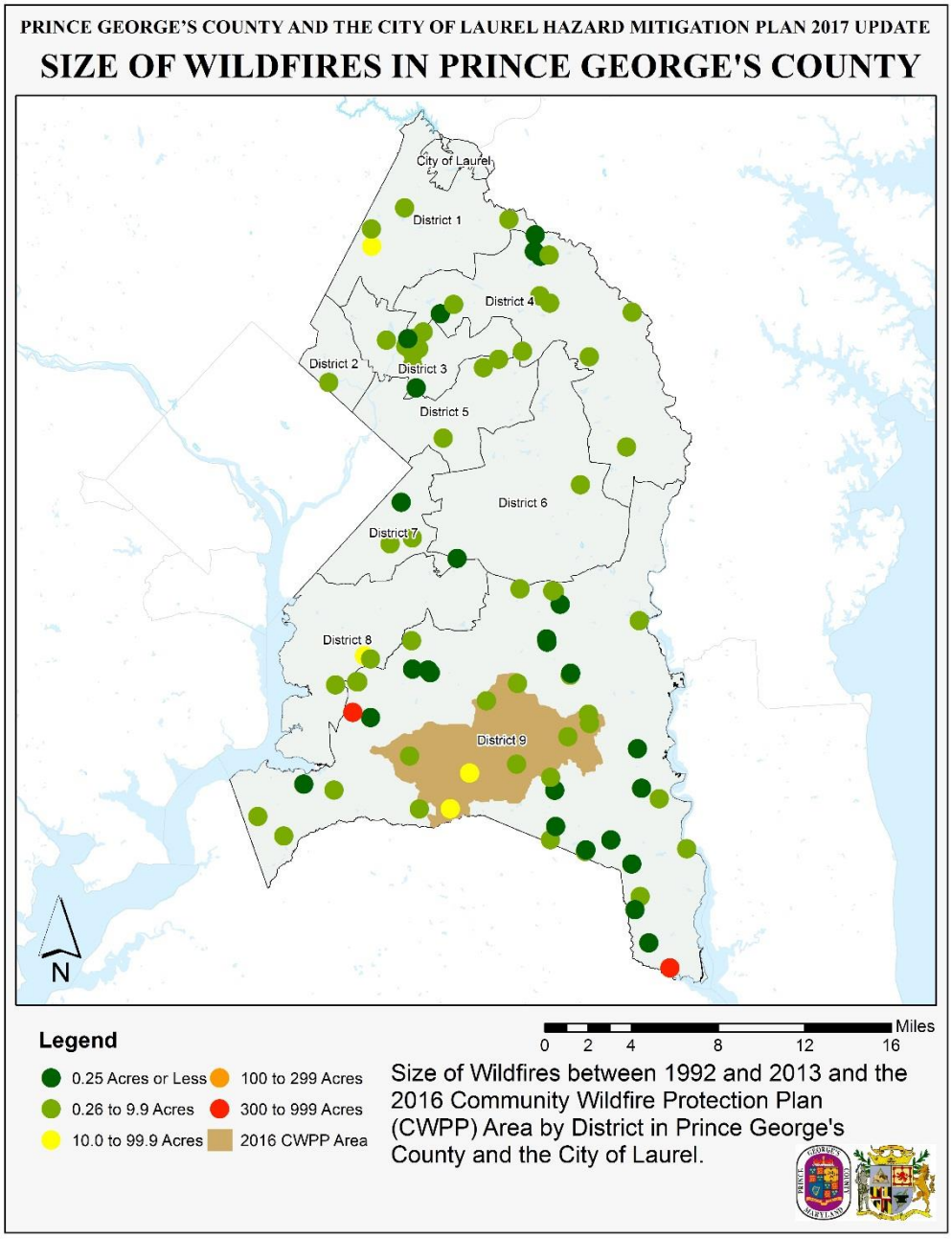


Figure 4-15. 1992 to 2013 Wildfires and CWPP Occurrence in Prince George's County.

Vulnerability and Risk Assessment

The most danger to property in the County is where residential developments meet or intermingle with wildland vegetation, also known as the wildland-urban interface zone. This is where wildfire poses the biggest risk to human lives and structures. Buildings without fire suppression systems (e.g. sprinkler systems) or proximity to hydrants are more vulnerable to building fires.

Wildfires can have disastrous consequences causing damage to residences, commercial buildings, and to timber, grasslands and natural resources. Economic consequences include the cost of suppression, reduced property values, lost sales and business revenues, reduced tourism, and increased water treatment costs. Resources threatened include communities, homes, gas transmission lines, electrical facilities and lines, timber, watershed and recreation areas, and wildlife.

Timber loss and environmental damage frequently result from wildfires. Wildfire poses a significant threat to nearby buildings and populations. Forest damage from thunderstorms may block interior access roads and fire breaks, pull down overhead power lines, or damage pavement and underground utilities, thereby creating heavy fire load and making suppression and response more difficult.

Maryland's Firewise program is trying to mitigate the wildland – urban fire interface risk.[24] By helping property owners to know how to best maintain their properties, they can reduce their risk to wildfires in their area. A portion of District 9 participates in the program. That area was digitized and an estimated building value was determined to evaluate the extent of the County actively working on wildfire prevention. This district's estimated value is summarized in Table 4-26. This area was shown previously in Figure 4-15 above.

Table 4-26. Community Wildfire Protection Plan Building Counts and Values within Prince George's County.

Political Area	Approximate Building Count	Approximate Building Value
District 9	8,206	$1,360,000,000

4.7.2 Drought

Description

A drought can be characterized in several different ways depending on its impact. The most common form of drought is agricultural. Agricultural droughts are characterized by unusually dry conditions during the growing season. Meteorological drought is an extended period of time (six or more months) with precipitation of less than 75% of normal precipitation. Severity of droughts often depends on the community's reliance on a specific water source. The probability of a drought is difficult to predict because of the variables involved with draught.

Location and Extent

Many problems can arise at the onset of a drought, some of which include diminished water supply and water quality, undernourishment of livestock and wildlife, crop damage, and

[24] http://dnr.maryland.gov/forests/Pages/fire/firewise.aspx

increased wildfire risk. Secondary impacts from droughts pose problems to farmers with reduction in income, while food prices and lumber prices can increase.

High summer temperatures can exacerbate the severity of a drought. When soils are wet, a significant portion of the sun's energy goes toward evaporation of the ground moisture. However, when drought conditions eliminate soil moisture, the sun's energy heats the ground surface and temperatures can soar, further drying the soil.[25] Table 4-27 summarizes the drought severity and their possible impacts on a community or region.[26]

Table 4-27. Drought Severity Classification and Possible Impacts.

Category	Description	Possible Impacts
D0	Abnormally dry	Going into a drought: short-term dryness slows planting, growth of crops or pastures; fire risk above average. Coming out of a drought: some lingering water deficits; pastures or crops not fully recovered.
D1	Moderate drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low; some water shortages develop or are imminent; voluntary water use restrictions requested.
D2	Severe drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.
D3	Extreme drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions.

For excessive heat, the NWS uses heat index thresholds as criteria for the issuance of heat advisories and excessive heat warnings. NWS heat advisory bulletins inform citizens of forecasted extreme heat conditions. The bulletins are based on projected or observed heat index values and include:

- Excessive Heat Outlook when there is a potential for an excessive heat event within three to seven days.
- Excessive Heat Watch when conditions are favorable for an excessive heat event within 12 to 48 hours but some uncertainty exists regarding occurrence and timing.
- Excessive Heat Warning/Advisory when an excessive heat event is expected within 36 hours.

These products are usually issued when confidence is high that the event will occur. A warning implies that conditions could pose a threat to life or property, while an advisory is issued for

[25] The impact of extreme heat is more thoroughly addressed under the "Extreme Heat" section

[26] U.S. Drought Monitor.

less serious conditions that may cause discomfort or inconvenience, but could still lead to threat to life and property if caution is not taken.

Previous Occurrences

According to the NCEI database, there have been 11 recorded events of drought since 1996. These NCEI drought events are recorded monthly at the beginning of each month, even if the drought persists for a lengthy time period. When droughts are combined in this way, there have been several recent droughts, where one in 1998 lasted for three months and another during 1999 lasted five months. A summary of the annualized damages, death, injuries, and events in shown in Table 4-28. Only one event was reported to have losses: recorded crop losses that occurred during the 1998 drought.

Table 4-28. NCEI Historic Drought Event Data.

HIRA Hazards	Number of Events	Period of Record	Annual Total Damages	Annualized Deaths	Annualized Injuries	Annualized Events
Drought	11	1996 - 2016	$148,096	0	0	0.55

Vulnerability and Risk Assessment

Vulnerability and Impact to People and Property

If a significant drought event were to occur, it could bring economic, social, and environmental impacts to the study area. Commonly, one of the most significant economic effects to a community is agricultural impact. Other economic effects could be felt by businesses that rely on adequate water levels for their day-to-day business, such as carwashes and laundromats. The elderly, small children, the chronically ill, livestock and pets are most vulnerable to extreme heat.

Droughts can also create conditions that enable the occurrence of other natural hazard events such as wildfires or wind erosion. The likelihood of flash flooding is increased if a period of severe drought is followed by a period of extreme precipitation. Low-flow conditions also decrease the quantity and pressure of water available to fight fires, while the dry conditions increase the likelihood that fires will occur.

Environmental drought impacts include those on both human and animal habitats and hydrologic units. During periods of drought, the amount of available water decreases in lakes, streams, aquifers, soil, wetlands, springs, and other surface and subsurface water sources. This decrease in water availability can affect water quality such as oxygen levels, bacteria, turbidity, temperature increase, and pH changes. Changes in any of these levels can have a significant effect on the aquatic habitat of numerous plants and animals found throughout the study area.

Low water flow can result in decreased sewage flows and subsequent increases in contaminants in the water supply. Decrease in the availability of water also decreases drinking water supply

and the food supply as food sources become scarcer. This disruption can work its way up the food chain within a habitat. Loss of biodiversity and increases in mortality can lead to increases in disease and endangered species.

4.8 Geologic Hazards

4.8.1 Earthquakes

Description

The earth's surface is covered by solid rock that is approximately 50 miles thick, referred to as the lithosphere. The lithosphere is made up of the Earth's crust, which ranges in size from about 22 miles thick for continents to about five miles thick for the oceans, and the upper mantle which is composed of solidified magma. This lithosphere "floats" above a thick layer of molten rock known as the lower mantle. The lithosphere is divided into large and small sections that geologists call plates. Earthquakes occur when those geologic plates slide against or move under each other, resulting from the sudden release of energy that creates seismic waves. Most movements between plates are extremely small, generating tiny earthquakes that cannot be sensed by people. Other, less frequent movements between plates can be quite large, generating powerful earthquakes that can shake the ground surface and cause widespread damage. Earthquakes can be violent enough to toss people around and destroy whole cities.

In its most general sense, the term "earthquake" is used to describe any seismic event — whether natural or caused by humans — that generates seismic waves. Earthquakes are caused mostly by rupture of geological faults, but also by other events such as volcanic activity, landslides, mine blasts, "fracking" supporting the oil and natural gas industries and nuclear tests. An earthquake's point of initial rupture is called its focus or hypocenter. The epicenter is the point at ground level directly above the hypocenter.

Most earthquakes occur at weak points in the earth's crust along surfaces where two or more geologic plates meet, called faults. Large faults within the Earth's crust result from the action of plate tectonic forces, with the largest forming the boundaries between the plates. The location of faults can provide an indication of where future earthquakes are likely to occur. Some of the more active earthquake faults in the United States include the San Andreas Fault in California and the New Madrid Fault in the Midwest.

The potential effects of an earthquake are dependent on the magnitude of the event, the distance from the epicenter, and the local geology. At the Earth's surface, earthquakes manifest themselves by shaking and sometimes displacement of the ground. Typical impacts of a major earthquake include damages to buildings, transportation networks, and utility systems due to earthquake ground shaking and displacements. Intensities are generally greater on soft soils such as Marlboro Clays than solid rock. Seismic shaking of some poorly compacted alluvial soil can lead to liquefaction; which occurs when soil is shaken to the point where it can no longer support the weight of any object that is located on it. Other geologic impacts of strong earthquakes may include landslides, fissuring and slumping at the ground surface. When the epicenter of a large earthquake is located offshore near a subduction zone (where one geologic plate moves under another), the seabed may be displaced sufficiently to cause a tsunami.

Tsunami waves can travel across the ocean at very high speeds, depending on the location and source of the seismic event.

Location and Extent

Since 1900, there are no recorded earthquakes with their epicenter located in Prince George's County. This is not surprising as the State of Maryland does not have the geologic conditions and shoreline conditions that are conducive to earthquakes or tsunamis. For this reason, there is little historic data available for major earthquakes or tsunamis affecting in Prince George's County or other counties in Maryland. None of the recorded Maryland earthquakes appear to have exceeded a Richter magnitude of 3.6 or caused any damages. According to a report prepared by the National Geophysical Data center, a tsunami wave may have occurred along the Maryland shoreline in 1821; however, the report was unable to thoroughly document the validity of this event.

Earthquakes in the United States occur most frequently along the West Coast, where several geologic plate boundaries converge. Earthquakes also occur along the East Coast of the United States, but the mechanisms causing these earthquakes are not well understood, as these earthquakes occur within the plate rather than at plate boundaries (USGS, 2003).

Earthquakes are most commonly measured by magnitude, intensity, and peak ground acceleration:

- **Magnitude** is a measure of the strength of an earthquake or energy released by it. Magnitude is measured by a device known as a seismograph. The scale used to measure earthquake magnitude was originally defined by Charles Richter in the 1930s, and is commonly referred to as the Richter Scale, which assigns a magnitude number to quantify the strength of an earthquake. Since January 2002, the Moment Magnitude Scale (MMS) has been used by seismologists in the USGS to calculate and report magnitudes for all modern large earthquakes. The MMS was developed in the 1970s and measures the size of earthquakes in terms of its energy released.
- **Intensity** is a measure of the effects of an earthquake at a particular place on people, structures, or the land itself. Earthquake intensity is most commonly measured in the United States using the Modified Mercalli Intensity (MMI) scale. The intensity at a point depends not only upon the strength of the earthquake, but also upon the distance from the earthquake to the point and the local geology at that point.
- **Peak Ground Acceleration (PGA)** is another common measure of earthquake shaking along the earth's surface. PGA expresses acceleration along the earth's surface as a percentage of g, the acceleration due to gravity (32.2 ft. /s^2).

The most common form of scale is the Modified Mercalli Intensity Scale. This scale is summarized in Table 4-29.

Table 4-29. Modified Mercalli Intensity Scale for Earthquakes.

Scale	Intensity	Earthquake Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs	
II	Feeble	Some people feel it	<4.2
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	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	<6.9
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
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	>8.1

Probability of Future Events

Earthquakes and tsunamis are not considered as significant hazards in Prince George's County, and the probability of such events occurring within Prince George's County appears to be extremely low. However, they could be indirectly affected by earthquakes occurring outside the County such as the August 23, 2011 earthquake that occurred in Louisa County, Virginia.

Vulnerability and Risk Assessment

There have been 175 Earthquakes of various sizes that have affected Prince George's County and the City of Laurel since 1900. Although no earthquakes have occurred in the County area, earthquakes can travel very far depending on their size. Many of the earthquakes have

originated from the Virginia Seismic Zone.[27] Earthquakes, origin points, and magnitudes are shown in Figure 4-16.

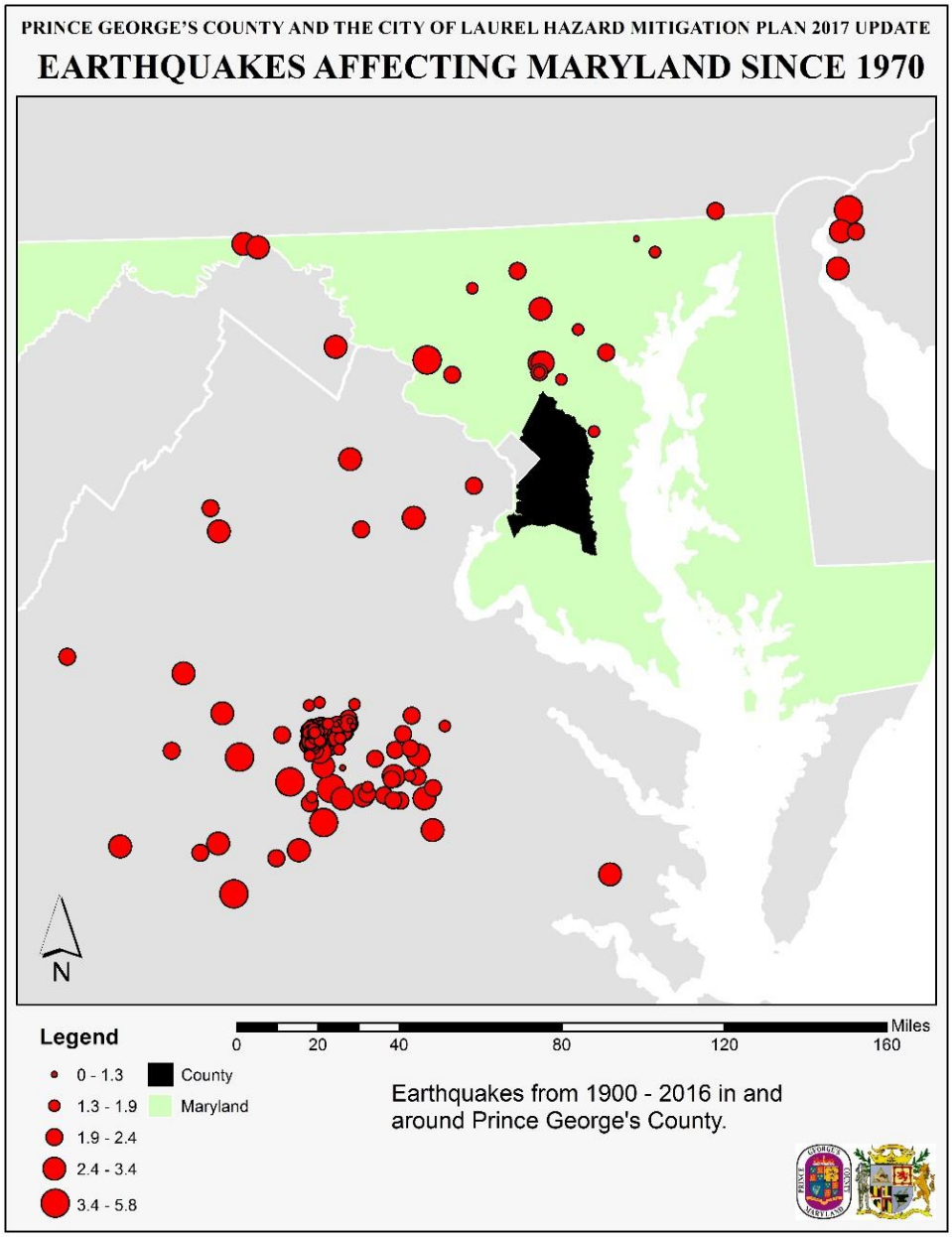


Figure 4-16. Locations and Magnitudes of Earthquakes.

[27] https://en.wikipedia.org/wiki/Virginia_Seismic_Zone

4.8.2 Land Movement (including landslides)

Description

Land movement is a powerful destructive force which can erode steep slopes, topple or destroy buildings, and damage roadways along with other infrastructure. In Prince George's County and the City of Laurel, land movement is a pervasive hazard that occurs as either land subsidence or landslide.

According to the National Research Council, the primary causes of land subsidence are related to resource development and land use practices including underground mining of coal or other minerals, withdrawal of petroleum or groundwater, and drainage of expansive soils. This is because these resources are partially responsible for holding the ground up. When they are removed, the rock collapses on itself. However, this is not immediately noticeable as it tends to occur over wider areas like a valley or an agricultural area as opposed to a sinkhole which is in one spot. Karst topography, which features erosive limestone soils, are particularly vulnerable to land subsidence and sinkholes[28].

Expansive soils are soils that undergo large volume changes when moisture is added or removed. Expansive soils typically include organic soils and highly plastic clays. In some instances, land subsidence may be triggered by an earthquake. Pockets of potentially expansive soil formations – Marlboro Clays – are known to cause problems for building foundations and roadbeds. Marlboro Clay formations have low permeability and may have high shrink-swell potential, meaning they are capable of large volume changes when water is added or removed. When Marlboro Clays are altered or cut into, the characteristics of these soils can cause construction problems for foundations and roadways, and may increase the risk of potential land subsidence or even landslides. Land subsidence from expansive soils generally occur over a period of time, and most commonly occur in regions where expansive soils in humid climates are exposed to a loss of moisture from a severe drought. In such situations, expansive soils may decrease in volume and lose their bearing strength, leading to differential settlement of building foundations, potholes in roadway surfaces, and damage to underground utility lines.

Landslides, also known as mass movements, are defined as the downward and outward movement of slope-forming materials under the force of gravity (FEMA, 1997). Landslides consist of bedrock and soils materials, and may be classified by the type of movement (slides, flows, lateral spreads, and falls and topples). Landslides generally occur in areas of steep or unstable soil or rock. Landslide events may be triggered by various processes such as excess groundwater buildup and seepage, flood-induced erosion along the sides of slopes, or even seismic events. However, many landslides are triggered by man-made activities such as removal of vegetation from slopes or hillside construction of buildings, roadways, and other

[28] Karst topography is more thoroughly addressed under the "Sinkholes" section.

infrastructure. Landslides can cause significant damage and destruction of roadways, buildings, utility lines and other infrastructure. Although landslide damages are usually confined to a small area, the secondary impacts of a landslide can sever key roads or utility lines and may be felt over a much wider area.

Location and Extent

Prince George's County lies primarily within the Atlantic Coastal Plain physiographic region, which ranges from nearly level to gently rolling topography. Most of the County's topography is relatively flat; less than 5 percent of the total land area has steep slopes (between 15 and 25%) and only 1 percent has severe slopes (greater than 25%). According to the Maryland Greenways Commission, a small section of the County is considered part of the Piedmont Plateau and is somewhat hillier.

Previous Occurrences

Currently, land subsidence is not known to be a significant problem in Prince George's County but there have been localized problems. The County does not have a history of mining or other man-made activities that contribute to land subsidence; so it is unlikely that land subsidence will become a significant hazard in the near future.

The State of Maryland does not have the geologic conditions or the types of topography that are conducive to large-scale landslides. Therefore landslides and slope failures are limited to small, isolated areas mostly in the western and southeastern parts of the County. For this reason, there is little historic data available for major landslides in Prince George's County or other counties in Maryland. However, a review of landslide data and news articles for this report referenced two landslide events related to Marlboro Clay soils that occurred in 1975 and 2014. According to these sources, the 1975 landslide damaged or destroyed 25 homes and caused approximately $500,000 worth of damage. In May 2014, heavy rains triggered a major landslide in the Piscataway Hills community of Fort Washington. The landslide impacted 28 homes, damaged local roads and water lines supported by Marlboro clay soils, and required approximately $15 million in hillside restoration and infrastructure repairs. The May 2014 landslide remains the costliest natural disaster in Prince George's County history. In addition to these events, several localized landslides have damaged or threatened homes in Prince George's County which are currently being acquired through a FEMA Hazard Mitigation Grant Program project.

Vulnerability and Risk Assessment

Only a few areas have soil types that are largely influenced by expansive clays. These areas may be more susceptible to land movement and landslides when intense precipitation occurs. Figure 4-17 shows the location of the Marlboro Clays in Prince George's County.

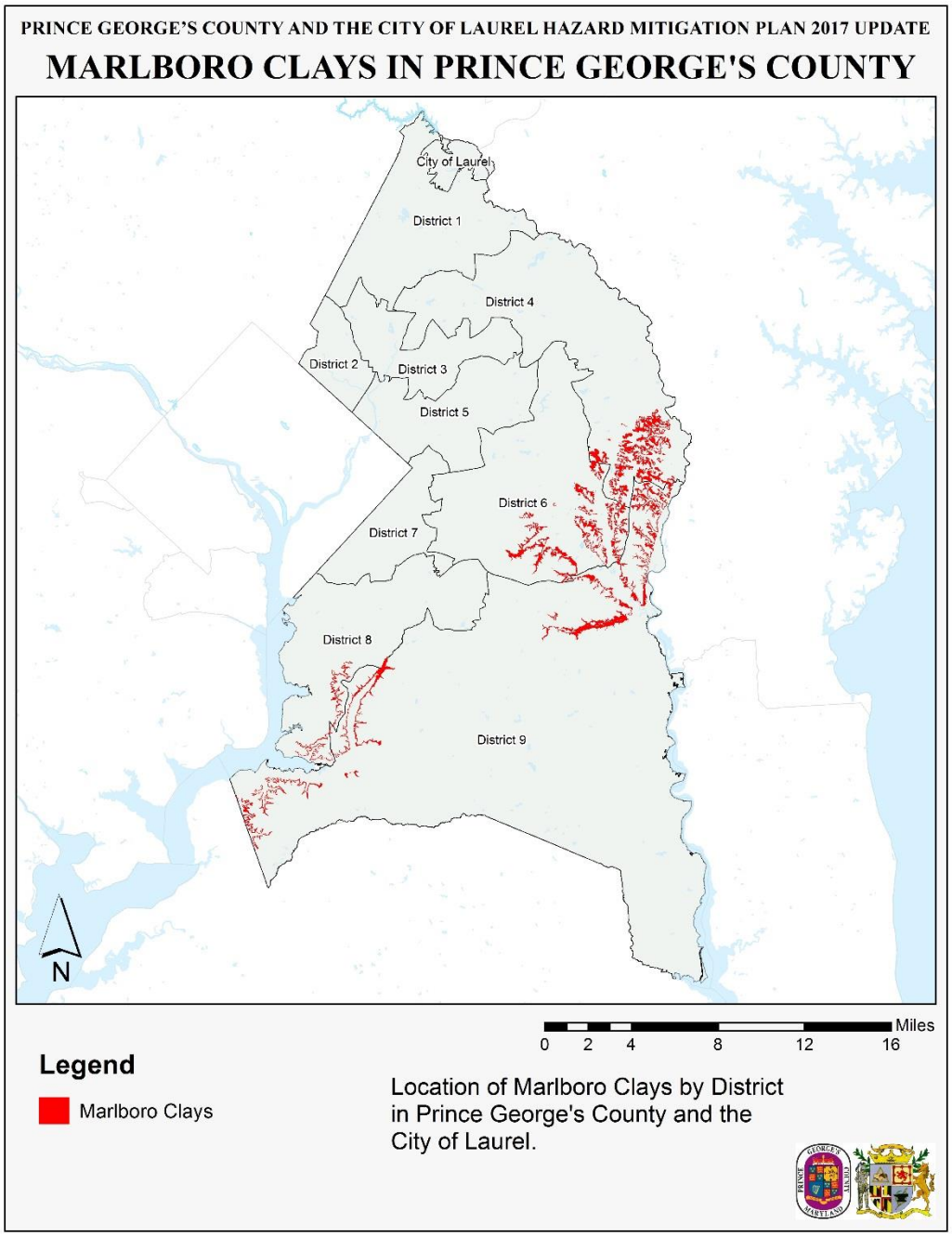


Figure 4-17. Marlboro Clay Areas within Prince George's County.

4.8.3 Sinkholes

Description

A sinkhole is a circular depression, typically funnel-shaped, that has no natural external surface drainage—when it rains, all of the water stays inside the sinkhole and typically drains into the subsurface—and typically forms in karst areas. Karst is a type of topography formed on carbonate rock such as limestone or dolomite, and is characterized by sinkholes, caves, and open-channel groundwater flow. Sinkholes are common where the rock below the land surface is limestone, carbonate rock, salt beds, or rocks that can naturally be dissolved by groundwater circulating through them. As the rock dissolves, spaces and caverns develop underground. Sinkholes are dramatic because the land usually stays intact for a time until the underground spaces just get too big. If there is not enough support for the land above the spaces then a sudden collapse of the land surface can occur. These collapses can be small, or they can be huge and can occur where a house or road is located. Typically, sinkholes form so slowly that little change is noticeable, but they can form suddenly when a collapse occurs. Such a collapse can have a dramatic effect if it occurs in an urban setting.

Sinkholes can vary from a few feet to hundreds of acres and from less than 1 to more than 100 feet deep. Some are shaped like shallow bowls or saucers whereas others have vertical walls; some hold water and form natural ponds. The most damage from sinkholes tends to occur in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania.

In Maryland, karst areas occur in Baltimore, Carroll, Washington, and Frederick Counties, with less extensive areas in Allegany County. Depressions that form on karst areas may be sinkholes, however, every depression or hole in the ground isn't necessarily a sinkhole. Depressions in the land may also be a result of rotted tree stumps, collapsed underground structures such as old septic tanks, storm water runoff, and leaking underground pipes. True sinkholes do not form in areas underlain by hard, crystalline rock present in central and western Maryland nor in the unconsolidated sediments of Maryland's Coastal Plain (areas approximately east of I-95).

Location and Extent

Sinkholes are not a likely hazard within Prince George's County and the City of Laurel. The areas in Maryland that are most associated with collapse sinkholes are the Hagerstown Valley, the Frederick Valley, and the Wakefield Valley. To a lesser degree, sinkholes are found in Green Spring Valley, Worthington Valley, and Long Green Valley. None of these valleys are located in Prince George's County and there are no karst areas in the County either.

Previous Occurrences

A significant subsidence incident occurred on May 11-12, 2008 after 12 hours of continuous and relatively uniformly distributed rainfall, averaging about 0.25 inch rain per hour. The area behind five homes on the south side of Yorkville Road was affected, resulting in the formation of a sinkhole approximately 500 feet long, 100 feet wide and 10 feet deep. In 2009, the

Department of Environmental Resources obtained HMGP funds to acquire the properties, demolish the homes, stabilize the site, and retain the land in open space.

Probability of Future Events

Since only one record for sinkholes occurring within Prince George's County could be found, it is posited that sinkholes are unlikely to occur within Prince George's County or City of Laurel. Figure **4-18** shows the geology of Maryland. Prince George's County is mainly composed of the Quaternary, Tertiary, and Cretaceous sediments of sand, silt, gravel, and clay. There are no karst areas within the County, making the probability of a sinkhole forming inside its bounds extremely low.

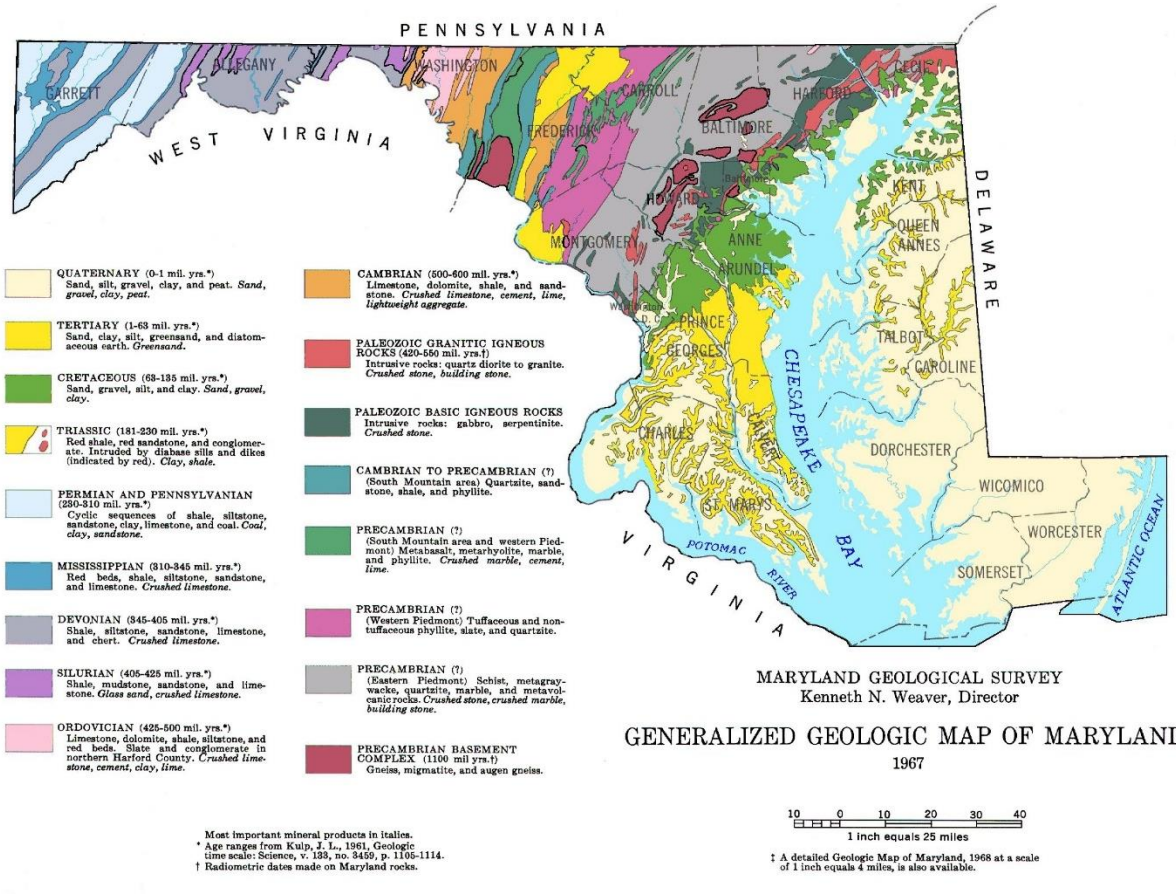


Figure 4-18**. Generalized Geologic Map of Maryland (Source: Maryland Geologic Survey, 1967).**

Vulnerability and Risk Assessment

Because sinkholes are not a significant risk in the region, a full calculation of probability was not performed for this analysis. Sinkholes are high-impact, low-probability events. With the few historic incidents throughout the region and limited data, the probability is low.

4.9 Extreme Temperature Hazards

4.9.1 Extreme Heat

Description

Prolonged periods of unusually high temperatures, generally accompanied by high humidity, characterize the hazard of extreme heat in the Mid-Atlantic region. The "heat index" is a measure of the combined effects of temperature and relative humidity to produce the temperature that is perceived. For example, a temperature of 100°F "feels like" 109°F when the relative humidity is 40%. A copy of the National Weather Service heat index chart is shown in Figure 4-19, and indicates the potential for heat-related disorders under prolonged exposure and/or strenuous physical activity.

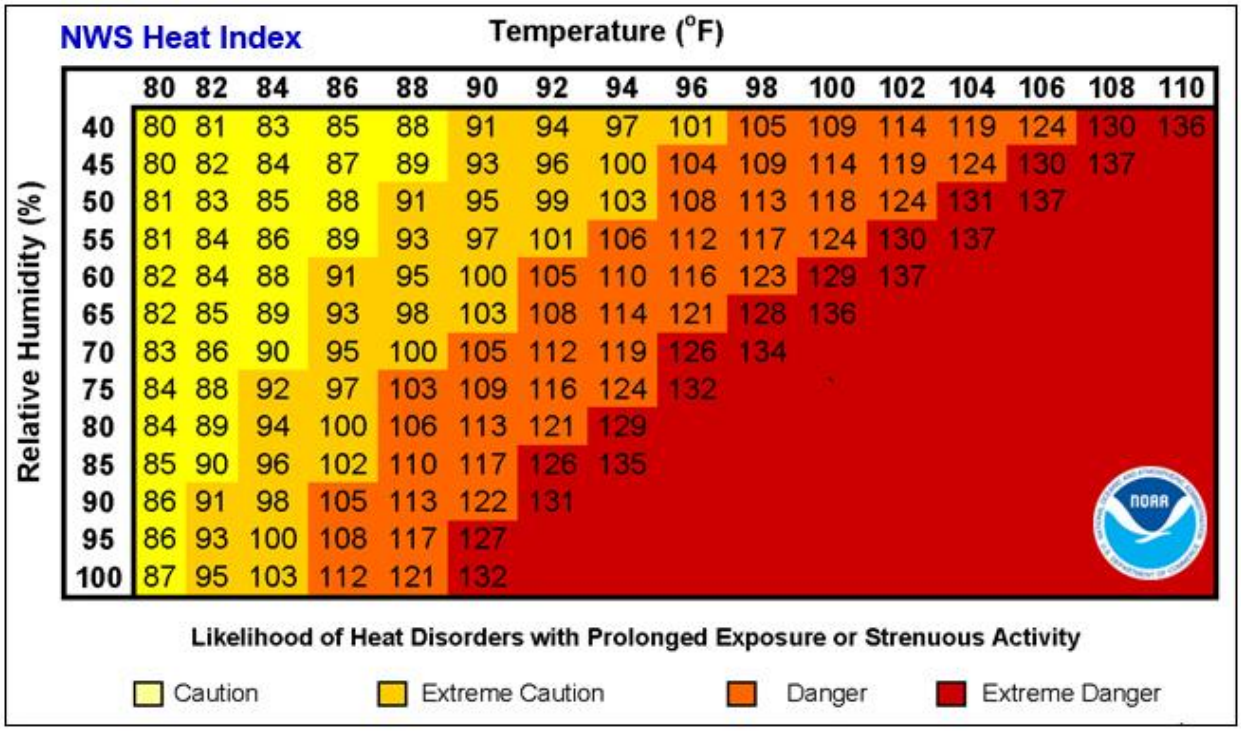


Figure 4-19. National Weather Service Heat Index Chart.

Location and Extent

Although heat is County-wide, the impact of extreme heat is most prevalent in urban areas, where urban heat-island effects prevent densely developed areas from releasing heat built up during daylight hours. Secondary impacts of extreme heat are severe strain on the electrical power system and potential brownouts or blackouts.

Extreme heat combined with high relative humidity slows evaporation, limiting the body's ability to efficiently cool itself. Overexposure may result in heat exhaustion or stroke, which

could lead to death. The Centers for Disease Control and Prevention state that excessive heat exposure caused 8,015 deaths in the United States between 1979 and 1999.[29]

Previous Occurrences

According to the NCEI heat and excessive heat events, there are a total of 50 extreme heat events that have been recorded in Prince George's County since 1996, including 45 heat events and five excessive heat events. Adjusted for inflation, the total annualized damages, deaths, injuries, and number of events are summarized in Table 4-30.

Table 4-30. NCEI Historic Heat and Excessive Heat Event Data.

Event Type	Number of Events	Period of Record	Total Annual Damage	Annualized Deaths	Annualized Injuries	Annualized Events
Heat	45	1996 - 2016	$0	0.35	2	2.25
Excessive Heat	5	1996 - 2016	$0	0.1	0	0.25

A closer review of the NCEI data National Climatic Data Center's reveals two notable periods of extreme heat within the last ten years:

- A strong ridge of high pressure set up across the eastern United States for several days in early- to mid-June in 2008. High temperatures combined with dew points in the lower 70s allowed heat index values to reach near 105 degrees in lower southern Maryland. The County opened cooling stations, and one heat-related death was reported.
- A hot and humid air mass seeped into the Mid-Atlantic region on July 17 and July 18, 2006, driving the heat index value to around 105 degrees. Emergency response officials reported three deaths as well as widespread incidents of heat-related illness, such as shortness of breath and heat exhaustion around the Washington/Baltimore Metropolitan region. Between August 1-3, 2006, afternoon heat index values rose to as high as 115 degrees. Several deaths in Central Maryland were attributed to the heat, but fortunately no deaths or injuries were reported in Prince George's County or the City of Laurel.

Probability of Future Events

Based on the NCEI historic records of heat-related events in Prince George's County, it is estimated that that county will experience between two and three extreme heat events annually.

Vulnerability and Risk Assessment

Extreme heat has social, economic and environmental impacts. People, especially senior citizens, outdoor laborers, children, and individuals in poor physical health, are vulnerable to

[29] National Center for Environmental Health, Centers for Disease Control. *About Extreme Heat*. Retrieved from http://www.cdc.gov/nceh/hsb/extremeheat/

heat-related illnesses (heat exhaustion) and death (heat stroke). The most at-risk districts which contain the largest population of senior citizens are Districts 1, 3, 4, and 6. These districts therefore have a greater vulnerability to heat as well; this can be seen in Figure 4-20. Prolonged periods of extreme heat would lead to agricultural/horticultural losses (see Drought section for details). The National Climatic Data Center's online data indicate 9 deaths and 40 injuries attributed to extreme heat between 1997 and 2016.

Although all citizens over 65 are equally at-risk, relative vulnerability of different planning areas may be derived by combining a measure of population of seniors with estimated agricultural losses. The results indicate the following planning areas have relatively higher vulnerability to extreme heat: Langley Park; Greenbelt; Bladensburg- New Carrolton; Bowie; Landover; Largo-Lottsford; Suitland-District Heights; The Heights; and Henson Creek. Some physical damage to roads and railroads can occur during heat waves, when asphalt surfaces soften or rails deform.

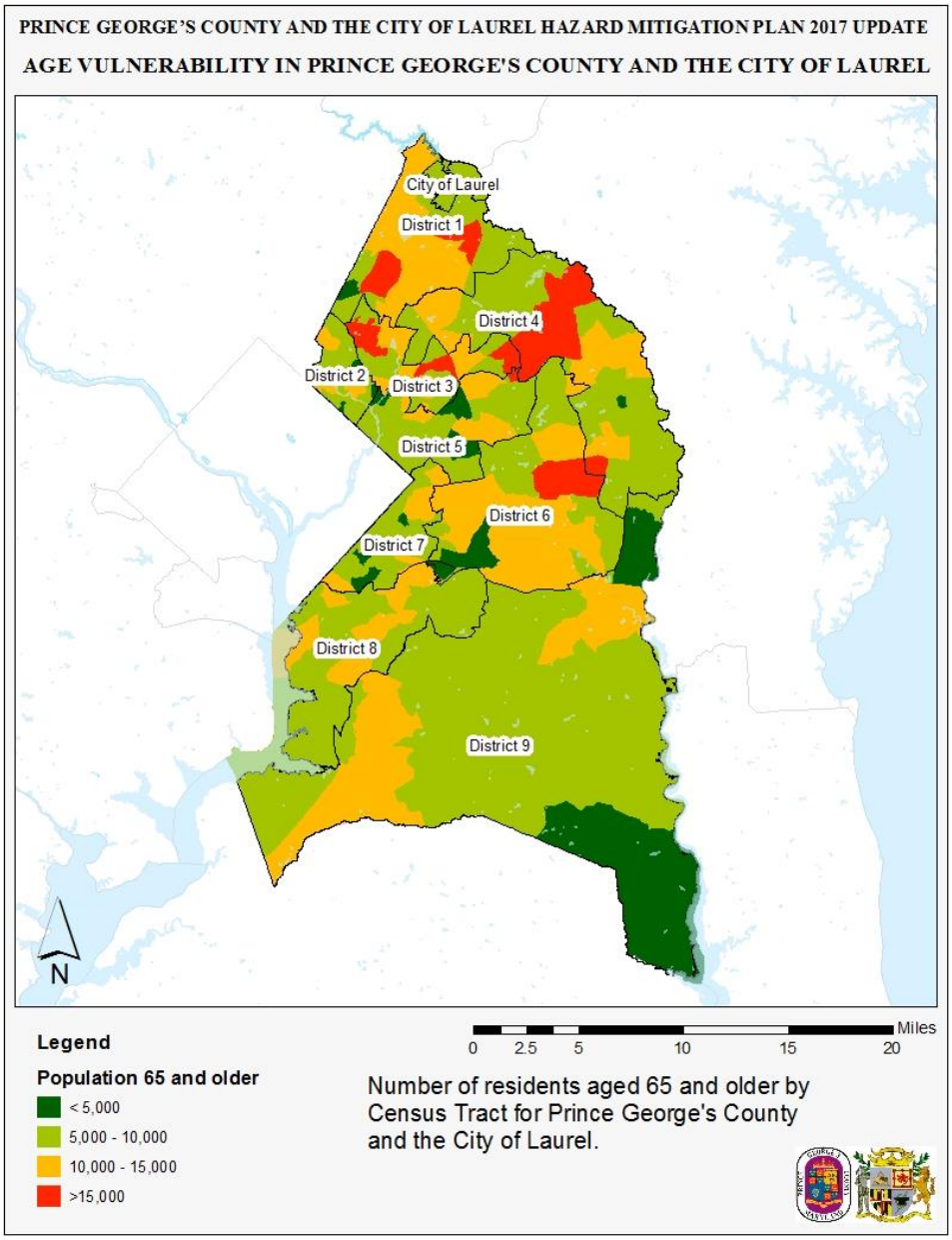


Figure 4-20. Age Vulnerability in Prince George's County and the City of Laurel.

4.9.2 Extreme Cold

Description

While not as prevalent as extreme heat events, extreme cold events - prolonged periods of unusually low temperatures, generally accompanied by high winds – can and do occur in the Mid-Atlantic region. The "wind chill" is a measure of the combined effects of air temperature and wind speed to produce the temperature that is perceived. For example, a temperature of 20°F "feels like" 4°F when the wind speed is 20 mph. A copy of the National Weather Service

wind chill chart is shown in Figure 4-21, and indicates the length of time for frostbite to develop on exposed skin.

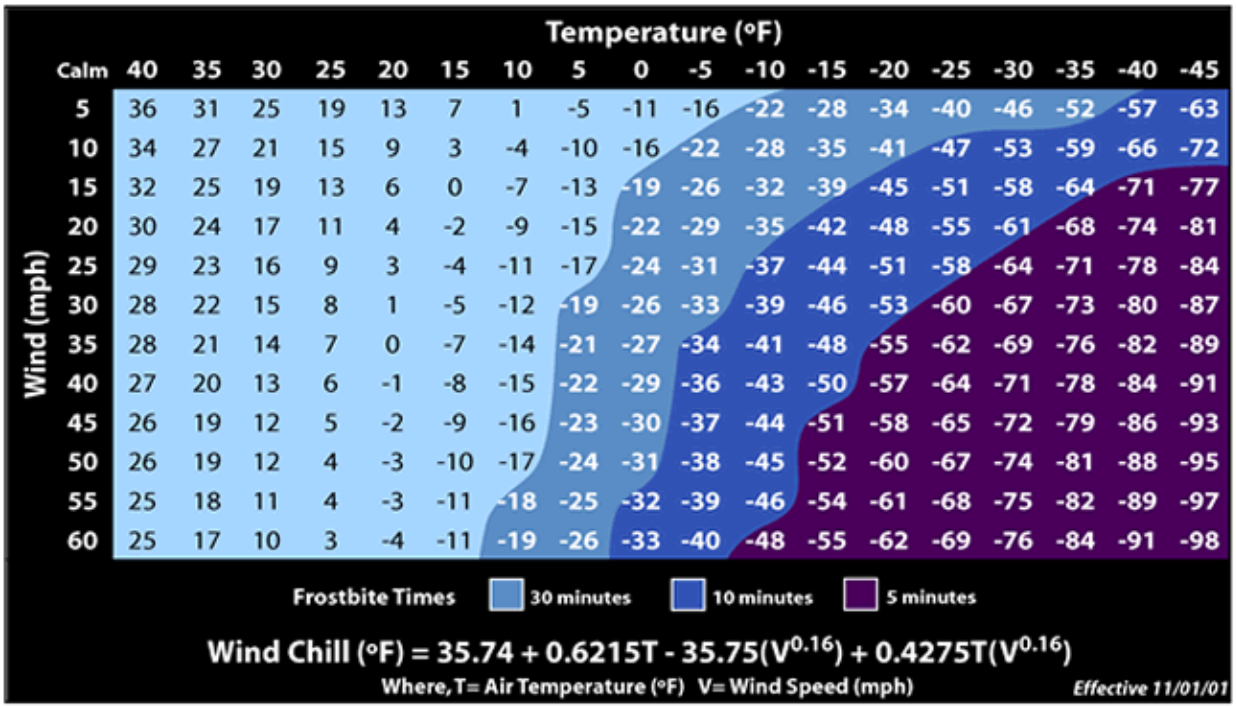


Figure 4-21. National Weather Service Wind Chill Chart.

Location and Extent

As with heat, cold is County-wide, but the impact of extreme cold is most prevalent in urban areas, where residents tend to be less accustomed to extreme cold and there is usually a larger proportion of vulnerable populations. Secondary impacts of extreme cold may include freezing and bursting of frozen pipes, and severe strain on electrical and fuel systems with potential electrical or fuel service interruptions.

Extreme cold combined limits the body's ability to efficiently warm itself. Overexposure may result in frostbite and hypothermia, which could lead to death. The Centers for Disease Control and Prevention state that excessive cold exposure caused 16,911 deaths in the United States between 1999 and 2011.[30]

Previous Occurrences

According to the NCEI cold/wind chill and extreme cold/wind chill events, there are a total of nine extreme cold events that have been recorded in Prince George's County since 1996, including four cold/wind chill events and five extreme cold/wind chill events. Adjusted for

[30] Centers for Disease Control and Prevention. *QuickStats: Number of Hypothermia-Related Deaths, by Sex – National Vital Statistics System, United States, 1999-2011*. Retrieved from https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6151a6.htm

inflation, the current total annualized damages, deaths, injuries, and number of events are summarized in Table 4-31. Note that only one event had $4,434 in adjusted crop damages, with no other damages, deaths and injuries provided in the NCEI data.

Table 4-31. NCEI Historic Cold/Wind Chill and Extreme Cold/Wind Chill Event Data.

Event Type	Number of Events	Period of Record	Current Total Annual Damage	Annualized Deaths	Annualized Injuries	Annualized Events
Cold/Wind Chill	4	1996 - 2016	$222	0	0	0.200
Extreme Cold/ Wind Chill	5	1996 - 2016	$0	0	0	0.250

A closer review of the NCEI data National Climatic Data Center's does not reveal any notable periods of extreme cold or wind chill within the last ten years.

Probability of Future Events

Based on the NCEI historic records of extreme temperature-related events in Prince George's County, it is estimated that that county will experience extreme cold events about once every two years.

Vulnerability and Risk Assessment

Extreme cold has social, economic and environmental impacts. People, especially senior citizens, outdoor laborers, children, and individuals that are homeless or in poor physical health, are vulnerable to cold-related illnesses (frostbite) and death (extreme hypothermia). Periods of extreme cold, especially in the early spring or fall months, can lead to agricultural/ horticultural losses. Although the National Climatic Data Center's online data does not indicate any deaths or injuries attributed to extreme cold between 1996 and 2016, a review of recent online media reports indicates that the State of Maryland has experienced an average of about 20 hypothermia-related deaths per year over the past five years. Although most of the hypothermia-related deaths occurred in Baltimore and northern areas of the State, a few of these deaths were reported in Prince George's County. The most at-risk districts which contain the largest population of senior citizens are Districts 1, 3, 4, and 6. This population group has a greater vulnerability to extreme cold; Figure 4-20 illustrates where these populations are concentrated.

4.10 Summary/Conclusions on Vulnerability Assessment

4.10.1 Hazard Rankings

For Prince George's County and the City of Laurel, the hazards discussed in this chapter were ranked on a scale from High (5), Medium-High (4), Medium (3), Medium-Low (2), and Low (1) based on a number of factors. These factors were then summed and an overall ranking of high to low was given. This high to low comparison only ranks these hazards comparatively for the County. That does not mean that a low or medium-low hazard will not occur or does not have some impact on the community. It does provide an overview of what hazards may pose the greatest risk to Prince George's County. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions. A summary of these rankings are found in Table 4-32. The ranking factors used were based on the following criteria:

- ***State Ranking:*** Based on the 2016 State of Maryland Hazard Mitigation Plan, the County was ranked and compared with other counties. The score from high to low represents the overall ranking for each County. A score of 0 was given if no analysis was provided from this plan for that hazard. Some hazards have also been sectioned out, so those sections will share the same score.
- ***Population Vulnerability:*** Based on the location and extent of each hazard, a score from high to low was given based on the population that could be affected by a single event from that hazard.
- ***Total Damages:*** Mostly based on the NCEI damages, scores from high to low were given based on the annual damages provided and their possible future damages.
- ***Geographic Extent:*** A score was given from high to low based on the percent of area that could be affected by an affected both by a single event, and where that event would be likely to occur. For example, tornadoes are equally likely to occur everywhere even though it only would damage a narrow piece of land, so it would be ranked as high. In comparison, coastal would also only affect the southern parts of the counties near the two rivers, but only those areas were at risk so this hazard was ranked as medium-low.
- ***Deaths and Injuries:*** Mostly based on the NCEI direct deaths and injuries, scores from high to low were given based on the annual deaths and injuries provided and their possible future occurrences.
- ***Warning Time:*** Based on how much perceived warning time would be given for a particular event. If the event could have 3 days or more, then it would be ranked as low. If the event would happen instantaneously with very little warning, it would be ranked as high.
- ***Number of Events:*** Mostly based on the NCEI annualized events, scores from high to low were given based on the likelihood of their occurrence. Events that were also somewhat periodic in nature but high in their damage intensity where also ranked as high.

The three hazards ranked as high were Riverine Flooding, Severe Storms (Flood-Related), and Tornadoes. The four ranked as medium-high were Severe Storms (Wind-Related), High Winds, Hurricanes/Tropical Storms (Wind-Related), and Winter Storms/Blizzards. The four ranked as medium included Dam Failures, Levee Failures, Earthquakes, and Extreme Heat. The four ranked as medium-low were Coastal Flooding, Drought, Land Movement/Landslides, and Extreme Cold. The two lowest ranked categories were Wildfire and Sinkholes.

Table 4-32. Hazards Ranking Analysis.

Hazard	State Ranking	Population Vulnerability	Total Damages	Geographic Extent	Deaths and Injuries	Warning Time	Number of Events	Overall Ranking
Riverine Flooding	5	5	5	5	5	4	5	High
Coastal Flooding	4	3	3	2	3	3	1	Medium-Low
Severe Storms (Flood-Related)	5	5	4	5	4	4	4	High
Flood Risk - Dam Failures	5	3	3	2	3	5	1	Medium
Flood Risk - Levee Failures	5	3	3	2	3	5	1	Medium
Tornadoes	5	3	5	3	5	5	5	High
Severe Storms (Wind-Related)	5	4	3	5	4	3	5	Medium - High
High Winds	5	4	3	5	3	3	4	Medium - High
Hurricanes/Tropical Storms (Wind-Related)	4	4	4	4	3	4	4	Medium-High
Winter Storms/Blizzards	5	4	3	5	5	3	4	Medium - High
Wildfire	4	3	1	2	1	2	1	Low
Drought	4	3	3	5	1	1	2	Medium-Low
Earthquakes	0	5	3	5	3	5	3	Medium
Land Movement/ Landslides	0	1	3	2	1	5	5	Medium-Low
Sinkholes	0	1	2	1	1	3	1	Low
Extreme Heat	0	5	1	5	5	1	3	Medium
Extreme Cold	0	5	1	5	3	1	2	Medium-Low

5 Hazard Mitigation Goals and Strategies

5.1 Introduction

During May, 2014, Prince George's County approved the *Plan 2035, Prince George's County General Plan* which outlines county goals and strategies to guide future land use, growth and development, while providing for environmental protection and preservation of important lands. The City of Laurel's General Plan was approved September 26, 2016 but does not include growth and development projections. Both plans lay out a vision for the future of their communities. The Prince George's County general plan has a 20-year window to 2035, the City of Laurel General Plan has an unspecified time frame but many references to updating as necessary. The vision statements of the general plans are consistent with community well-being and sustainability, which enables cross-cutting interfaces with the Hazard Mitigation Plan update revised goal and new 2017 – 2022 strategies presented in this section and Appendix D. Hazard Mitigation sets the stage for long-term disaster resistance through identification of actions that will, over time, reduce the exposure of people and property to hazards. In addition, the Plan enables continued eligibility for certain mitigation grant funds.

The hazard mitigation planning process used a typical problem-solving methodology:

- Describe the problem through the updated Hazard Identification;
- Estimate what is at risk through updating population, land-use, critical facilities, etc. in the Risk Assessment;
- Determine the most vulnerable populations, property and critical infrastructure to multiple natural hazards in the new Vulnerability Analysis;
- Assess what safeguards exist that might already or could potentially lessen those impacts (Capability Assessment); and
- Using this information, determine what, if anything, can be done, and select priority, appropriate mitigation strategies, actions and projects which can make Prince George's County and the City of Laurel more resilient in an updated Mitigation Strategy.

Section 5.0 of the hazard mitigation plan describes the most challenging part of any such planning effort – the development of a mitigation strategy. It is a process of:

- Evaluating and revising the 2010 plan goal; selecting mitigation strategies, actions, and projects; and
- Developing a mitigation action plan.

5.2 Existing Authorities, Policies, Programs, and Resources for Mitigation

Relevant authorities, policies, programs and resources available to support Prince George's County and the City of Laurel hazard mitigation activities are outlined in Section 6.0 Capabilities, Implementation and Maintenance with specific City of Laurel governmental program capabilities are detailed in Section 8.0 City of Laurel Plan. Both jurisdictions have long-established, experienced program administrators and staff who can work with the Mitigation Advisory Committee to advance not only the 2017 to 2022 mitigation strategies herein but can also further facilitate a holistic, integrated program to reduce risk exposure and increase resiliency of the County and City's growing and diverse populations as described in Section 3.0 Community Profile for Prince George's County and Section 8.0 City of Laurel Community Profile.

5.3 Setting Mitigation Goals

When a community decides that certain risks are unacceptable and that certain mitigation actions may be achievable, the development of goals and actions takes place. Goals are long-term and general statements. Actions are detailed and specific methods to meet the goals.

The HMTAC reviewed the 2010 Prince George's County Hazard Mitigation Plan at a meeting on March 10, 2017. The committee discussed whether to modify or add a resiliency. The revised goal is broad and is applicable to the areas served by Prince George's County and the City of Laurel:

- It is the goal of Prince George's County and the City of Laurel, Maryland, to protect and improve the public health, safety, and welfare of its communities, and to expand the resiliency of livable communities by:
    - Increasing public awareness of natural hazards and risk reduction measures; and
    - Mitigating risks due to natural hazards.

5.4 Selecting and Prioritizing Mitigation Actions

Mitigation *Strategies, Actions and Projects* are detailed in Appendix D with priorities, and specific methods to meet the goals. The actions from the 2011 plan formed a basis for discussion about mitigation actions for the 2017 plan. The 2011 actions were described and discussed during the March 10, 2017 MAC meeting after presentation of the HIRA results and the goal revision discussion. The conversation centered upon the relevance of the actions, successes, program evolution and lessons learned. Staff from designated lead agencies updated the status of each

action and determined which should be continued as well as if continuation required modification. The status of the actions from the previous plan is documented in Appendix C.

In addition, a range of new strategies, actions and projects were identified by Prince George's County and the City of Laurel through phone and email correspondence and during a meeting on June 30, 2017 with each jurisdiction at the Prince George's County OEM facility. The 2017 – 2022 strategies, actions and projects are presented in Appendix D. Generally, each community's representatives evaluated the actions for inclusion in the plan with the following criteria:

- Time – Can the strategy be implemented quickly?
- Ease to implement – How easy is the strategy to implement? Will it require many financial or staff resources?
- Effectiveness – Will the strategy be highly effective in reducing risk?
- Lifespan – How long will the effects of the strategy be in place?
- Hazards – Does the strategy address a high-priority hazard or does it address multiple hazards?

After the 2017 actions were selected, the STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) criteria (Table 5-1) were used to inform prioritization the most appropriate actions for Prince George's County. This methodology requires that social, technical, administrative, political, legal, economic, and environmental considerations be taken into account when reviewing potential actions for the area's jurisdictions to undertake. This process was used to help ensure that the most equitable and feasible actions would be undertaken based on the county's capabilities.

Table 5-1. STAPLEE Project Evaluation Criteria.

Social
• Is the proposed action socially acceptable to the community(s)? • Are there equity issues involved that would mean that one segment of a community is treated unfairly? • Will the action cause social disruption?
Technical
• Will the proposed action work? • Will it create more problems than it solves? • Does it solve a problem or only a symptom? • Is it the most useful action in light of other community(s) goals?

Table 5-1. STAPLEE Project Evaluation Criteria.

Administrative
• Can the community(s) implement the action? • Is there someone to coordinate and lead the effort? • Is there sufficient funding, staff, and technical support available? • Are there ongoing administrative requirements that need to be met?
Political
• Is the action politically acceptable? • Is there public support both to implement and to maintain the project?
Legal
• Is the community(s) authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity? • Are there legal side effects? Could the activity be construed as a taking? • Is the proposed action allowed by a comprehensive plan, or must a comprehensive plan be amended to allow the proposed action? • Will the community(s) be liable for action or lack of action? • Will the activity be challenged?
Economic
• What are the costs and benefits of this action? • Do the benefits exceed the costs? • Are initial, maintenance, and administrative costs taken into account? • Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private)? • How will this action affect the fiscal capability of the community(s)? • What burden will this action place on the tax base or local economy? • What are the budget and revenue effects of this activity? • Does the action contribute to other community goals, such as capital improvements or economic development? • What benefits will the action provide?

Table 5-1. STAPLEE Project Evaluation Criteria.

Environmental
• How will the action affect the environment? • Will the action need environmental regulatory approvals? • Will it meet local and state regulatory requirements? • Are endangered or threatened species likely to be affected?

Although a detailed analysis was not conducted during the mitigation action development process, each factor was of primary concern when selecting measures. For those measures, such as education and outreach, that do not result in a quantifiable reduction of damages, the relationship of the probable future benefits and the cost of each measure was considered when developing the mitigation actions.

5.5 Developing and Integrating Mitigation Strategies

Mitigation action plans were developed for each identified strategy, action or project. The table in Appendix D serves as the "action plan" and includes:

- the type of mitigation action,
- the hazard(s) it is designed to mitigate,
- the agency assigned responsibility for carrying out the strategy,
- general resources needed,
- a timeframe for completion, and
- Priority level for its implementation (high, medium, or low).

5.5.1 Identifying Priority Actions

Throughout the planning process, the Mitigation Advisory Committee considered hazards, the number of people and types of property that are exposed, and the development review process. For the 2017 Update, the Committee reviewed and discussed the status of the 2010 mitigation actions and whether to modify or retain the actions (see Appendix C for the status report on the actions identified in the 2010 Plan). The actions considered by the Committee were intentionally broad and comprehensive in scope.

As outlined in Sections 6.0 and 8.0, the County and the City incorporate recognition of natural hazards in their private development review processes and regulations pertinent to privately-

installed infrastructure. The public agencies responsible for public infrastructure deliberately design to minimize damage due to natural hazards, much of this is required by local code compliance which is described in Sections 6.0 and 8.0. Therefore, it was determined unnecessary to identify new actions that are specific to new private development and new public infrastructure.

Based on a review of the revised Section 4.0 Hazard Identification and Risk Assessment, and the Committee's understanding of local hazards, vulnerabilities and needs, potential strategies, actions and projects were identified, circulated, reviewed, and prioritized. Factors that influenced prioritizing included the Community's review of available information on flood hazards, other hazards, past hazard events, the number of people and types of property exposed to those hazards, and relevant elements of the land development approval process.

2010 Mitigation Plan actions were reviewed and it was determined whether each strategy and related sub-activity was completed, or should be dis-continued or continued as a 2017 – 2022 strategy. The 2010 strategy status can be found in Appendix C for both Prince George's County and the City of Laurel. Per the request of lead MAC members, the strategies, actions and projects were re-configured into single actions organized by the six major types of mitigation:

- Prevention
- Property protection
- Natural resource protection
- Structural
- Emergency services
- Education & awareness

High priority was placed on those actions that are considered consistent with current County and City policies, those that are technically feasible, that are likely to have high political and social acceptance, and those that can be achieved using existing authorities, budget levels, and staff. Projects for which Federal mitigation grant funds are sought must be eligible activities and potentially have a positive cost-to-benefit ratio.

The City of Laurel's Emergency Manager coordinated setting priorities for the City's mitigation actions. High priority was placed on those actions that are considered consistent with current County policies, those that are technically feasible, that are likely to have high political and social acceptance, and those that can be achieved using existing authorities, budget levels, and staff. Projects for which Federal mitigation grant funds are sought must be eligible activities and have a cost-to-benefit ratio of 1.0 or higher.

The actions which follow do not consider a wide range of measures for site-specific flood mitigation projects because each jurisdiction manages an ongoing and mature floodplain management program (see Sections 6.0 and 8.0.). The 2007 *Countywide Comprehensive Flood*

Management Plan set four criteria: severity of flooding; number of structures that can be handled by a solution; economic considerations (benefit: cost ratio); and community impacts. A point system establishes ranges of points for each criterion. For example, buildings that are affected by flooding from the 10-year flood receive more points than those that are flooded by less frequent events. The criteria may be modified if necessary to conform to the requirements of external grant funding.

Types of mitigation strategies, actions, and projects were categorized as depicted in Table 5-2.

Table 5-2. Mitigation Project Types.

Mitigation Types	Project Types
Prevention	Planning and zoning Building codes Open space preservation Floodplain regulations Stormwater management regulations Drainage system maintenance Capital improvements programming Shoreline/riverine setbacks
Property Protections	Acquisition/Demolition/Relocation Building elevation Critical facilities protection Retrofitting (i.e., wind-proofing, floodproofing, seismic design) Safe rooms, shutters, shatter-resistant glass Insurance
Natural Resource Protection	Land acquisition Floodplain protection Watershed management Riparian buffers Forest and vegetation management Erosion and sediment control Wetland preservation and restoration Habitat preservation Slope stabilization Historic property
Structural Projects	Reservoirs Dams/levees/dikes/floodwalls/seawalls Diversions/detention/retention Channel modification Beach nourishment Storm sewers
Emergency Services	Warning systems Evacuation planning and management Emergency response training and exercises Sandbagging for flood protection

Table 5-2. Mitigation Project Types.

Mitigation Types	Project Types
	Installing temporary shutters for wind protection
Education & Awareness	Outreach projects Speak series/demonstration events Hazard mapping Real estate disclosure Library materials School children educational programs Hazard expositions

Table 5-3. Mitigation Strategy Implementation Time Frames.

Timeframe	Definition
Short-term	Less than three years
Long-term	More than three years
As funding becomes available	Project timeline is dependent on funding
Ongoing	Project is continuous with no designated end date

The 2017 to 2022 Strategies, Actions, and Projects for Prince George's County are shown in Table 5-4, with additional specific details located in Appendix D. Similarly, Table 5-5 contains the 2017 to 2022 mitigation strategies, actions, and projects for the City of Laurel.

Table 5-4. 2017 to 2022 Mitigation Strategies, Actions and Projects.

Primary Mitigation Project Type	Action Number	Action Strategy	Lead Office	Priority
Prevention	County - 1	Continue to partner with FEMA/MDE to promote use of Updated Flood Hazard Maps. Updated Mapping will continue to inform Risk Reduction and mitigation of at-Risk Buildings such as repetitive loss structures.	Department of Environment Support: Maryland-National Capital Park & Planning	High
Prevention	County - 2	Partner with FEMA/MDE to Update Flood Hazard Mapping; Use Updated Mapping for Risk Reduction. Private Nonprofit Buildings. Search the updated list of flood-prone properties to determine if any are owned by private nonprofit organizations.	Department of Environment Support: Maryland-National Capital Park & Planning	Medium

Table 5-4. 2017 to 2022 Mitigation Strategies, Actions and Projects.

Primary Mitigation Project Type	Action Number	Action Strategy	Lead Office	Priority
Prevention	County - 3	Using the revised Flood Maps, check locations of HazMat sites, NPDES sites, and other land uses; if found to be in flood hazard areas, communicate with owner/handler of hazardous materials and known pollutants regarding risk and appropriate response and protection measures.	Fire/EMS Department of Environment Maryland Department of the Environment	High
Prevention	County - 4	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive plans and capital improvement plans.	Office of Homeland Security - Office of Emergency Management; Department of Environment	Medium
Prevention	County - 5	Collect flood depth information to support a grant to provide elevation certificates in areas newly included in Special flood hazard areas to assist residents in obtaining elevation certificates to support LOMAs or reduced risk NFIP premiums.	Department of Emergency Management	High
Property Protection	County - 6	Continue to coordinate the Building Code & Floodplain Ordinance whenever either is updated.	Department of Environment Department of Public Works & Transportation	High
Property Protection	County - 7	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to: 1. acquisition of flood-prone property 2. Elevation of flood-prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities	Office of Homeland Security - Office of Emergency Management; Department of Environment, DPWT	High

Table 5-4. 2017 to 2022 Mitigation Strategies, Actions and Projects.

Primary Mitigation Project Type	Action Number	Action Strategy	Lead Office	Priority
		and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. wastewater and water supply system hardening and mitigation		
Property Protection	County - 8	Promote appropriate mitigation measures for hazard-vulnerable priority critical facilities	Office of Emergency Management; Dept. of Environment	High
Property Protection	County - 9	Update Upper Marlboro Emergency Response Plan to address flooding, including evacuation, emergency response, mitigation, etc.	Department of Emergency Management	Medium
Property Protection	County - 10	Continue annual flood risk awareness and mitigation mailing to all owners of high-risk properties in the SFHA, including RL structures.	Department of Emergency Management	High
Natural Resource Protection	County - 11	Continue implementation of Best Management Practices and Low Impact Development practices to meet NPDES water pollution requirements. The County has EPA-listed Total Daily Maximum Load (TMDL) stream segments due to high levels of Nitrogen, Phosphorous, Sediment and Trash which it continues to mitigate.	Department of Emergency Management	High

Table 5-4. 2017 to 2022 Mitigation Strategies, Actions and Projects.

Primary Mitigation Project Type	Action Number	Action Strategy	Lead Office	Priority
Natural Resource Protection	County - 12	Use the M-NCPPC 2016 water quality biological stream assessment studies to prioritize stabilization projects, especially if funding from outside resources is available for mitigation of environmental impacts.	Department of Environmental Resources The Maryland-National Capital Park & Planning Commission - Debbie Tyner	Medium
Structural	County - 13	**Anacostia Levee Improvements.** Work with the Corps of Engineers to pursue funding to implement the levee improvement work. Four of five levee systems have been FEMA-accredited. Complete accreditation of Arundel Street Levee System. Maintain accreditation through O & M Plan implementation as prescribed by USACE.	Department of Environment Department of Public Works & Transportation	High
Emergency Services	County - 14	Update the flood warning system notification lists used in the Everbrite system with the list of flood-prone properties based on revised flood maps. Distribute general warnings to all County citizens using traditional and social media platforms such as the ORM website, Twitter and Facebook.	Department of Environment Office of Emergency Management	High
Emergency Services	County - 15	Complete disaster recovery plan, family reunification plan.	Office of Emergency Management	High
Emergency Services	County - 16	The Department of Family Services Agency on Aging will continue its outreach to seniors about health and safety during periods of extreme heat and extreme cold. Information will be added to the Family Service's web page and frozen meal distribution with supplement provision of hot meals during	Department of Family Services	High

Table 5-4. 2017 to 2022 Mitigation Strategies, Actions and Projects.

Primary Mitigation Project Type	Action Number	Action Strategy	Lead Office	Priority
		severe weather periods from January through March.		
Emergency Services	County - 17	Continue to Support Regional Drought Response and Planning. Continue the County's commitment and participation with the MWCOG and WSSC when drought awareness responses are activated.	Department of Environmental Resources Washington Suburban Sanitary Commission	Medium
Education & Outreach	County - 18	Continue participation in community and neighborhood events to promote hazard awareness and mitigation options.	Office of Emergency Management; Dept. of Environment	High
Education & Outreach	County - 19	Expand use of Social Media for natural hazard awareness and hazard mitigation messaging.	Office of Emergency Management	High
Education & Outreach	County - 20	Work with County municipalities to provide hazard awareness messaging and information on storm preparedness and mitigation for promotion using local newspapers, municipal websites, etc.	Office of Emergency Management	High
Education & Outreach	County - 21	Distribute Citizens' Preparedness Guide and Business Preparedness Guides at community events. Upon updating, incorporate new HMP Hazard information …	Office of Emergency Management	Medium

Table 5-5. City of Laurel 2017 – 2022 Mitigation Actions.

Primary Mitigation Project Type	Action Number	Action Strategy	Lead Office	Priority
Prevention	Laurel - 1	Continue to partner with FEMA/MDE to promote use of Updated Flood Hazard Maps. Updated Mapping will continue to inform Risk Reduction and mitigation of at-Risk Buildings such as repetitive loss structures.	Emergency Manager; Department of Economic & Community Development	Medium - High
Prevention	Laurel - 2	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive plans and capital improvement plans.	Emergency Manager; Department of Economic & Community Development	Medium - High

Table 5-5. City of Laurel 2017 – 2022 Mitigation Actions.

Primary Mitigation Project Type	Action Number	Action Strategy	Lead Office	Priority
Property Protection	Laurel - 3	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to: 1. acquisition of flood-prone property 2. Elevation of flood-prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. wastewater and water supply system hardening and mitigation	Emergency Manager; Department of Economic & Community Development	Medium - High

Table 5-5. City of Laurel 2017 – 2022 Mitigation Actions.

Primary Mitigation Project Type	Action Number	Action Strategy	Lead Office	Priority
Property Protection	Laurel - 4	Seek mitigations solutions for city facilities including: the flood-prone municipal swimming pool; Department of Public Works flood-prone buildings and the City of Laurel Police Department Building. Determine pro-active preventive mitigation actions and seek grant funds for permanent solutions.	Emergency Manager; Department of Economic & Community Development; Department of Public Works, Laurel Police Department, Department of Recreation.	High
Property Protection	Laurel - 5	After flood events, the City of Laurel will evaluate whether to pursue funding to implement flood mitigation projects.	Prince George's County Department of Environment	Medium - High
Property Protection	Laurel - 6	Pursue participation in the FEMA Community Rating System to reduce the cost of National Flood Insurance Policy premiums.	Emergency Manager	High
Emergency Services	Laurel - 7	Continue to support regional drought response and Planning.	Prince George's County Department of Environment	Medium

Table 5-5. City of Laurel 2017 – 2022 Mitigation Actions.

Primary Mitigation Project Type	Action Number	Action Strategy	Lead Office	Priority
			Washington Suburban Sanitary Commission Emergency Manager	
Emergency Services	Laurel - 8	Continue to support regional drought response and planning by continuing the City's commitment and participation with MWCOG and WSSC when drought awareness responses are activated. Examine appropriate water conservation measures for City office buildings.	Prince George's County Department of Environment Washington Suburban Sanitary Commission Emergency Manager	High
Emergency Services	Laurel - 9	The new notification procedures must be tested and exercised within the City of Laurel and Prince George's County to identify any shortfalls or procedures that need to be amended. Expanded floodplain areas must be addressed in relationship to areas effected by a release of water from the dams.	Emergency Manager	High
Education & Awareness	Laurel - 10	Continue outreach efforts to promote recently completed bi-lingual Citizens Emergency Preparedness Guide	Emergency Manager, CERT volunteers	High

Table 5-5. City of Laurel 2017 – 2022 Mitigation Actions.

Primary Mitigation Project Type	Action Number	Action Strategy	Lead Office	Priority
Education & Awareness	Laurel - 11	Work with City closed circuit television network to produce seasonal hazard awareness and topical mitigation programming.	Emergency Manager , Department of Communications	Medium

5.6 Implementation of Ongoing Actions

Both Prince George's County and the City of Laurel have programs and activities that reduce the impacts of hazards and emergencies. Section 6.0 describes the general County and City capabilities and ongoing activities that reduce the impacts of hazards, maintenance and implementation. More specific capabilities for Prince George's County are included in Section 6.0 and specific City of Laurel capabilities are in Section 8.0.

6 Prince George's County Capabilities, Plan Implementation and Maintenance

6.1 County Government Structure and Capabilities

Prince George's County is one of eight charter counties in Maryland. Since 1970, it has had an elected executive and an elected council. A charter county has been granted express powers rule by the Maryland General Assembly. According to the Maryland Association of Counties (www.mdcounties.org), charter counties provide services and facilities for its citizens that are grouped by the general nature of those services and facilities:

- General Government – includes executive and legislative control, judicial support, election supervision, financial administration (budgeting and accounting), legal (counsel and prosecution), personnel administration, planning and zoning, general services, and alcoholic beverage control.
- Public Safety – includes law enforcement, fire protection, corrections, building inspection, animal control, homeland security, emergency management and traffic engineering.
- Public Works – includes road construction and maintenance, sewer, water, storm drains, and solid waste collection and disposal (in Prince George's County, sewer and water services are provided by the Washington Suburban Sanitary Commission).
- Health – includes support of the state required and regulated county health department.
- Education (Kindergarten through 12th grade) – includes support of the state required county board of education that operates under state law.
- Community Colleges – includes support of the county or regional board of trustees of a community college that operates under state law.
- Libraries – includes support of the county board of library trustees that operates under state law.
- Recreation and Parks – includes recreation activities and facilities, and park and open space maintenance and development (The Maryland-National Capital Park and Planning Commission has responsibility for parks and recreation in Prince George's County).
- Development – includes such things as urban and rural development and redevelopment, housing, economic development, and economic opportunity programs.
- Debt Service – includes the annual principal and interest payments on debt issued for the development of public capital facilities (i.e., roads, schools, libraries, parks, etc.).

Prince George's County administers its services and facilities through numerous departments and agencies. The primary agencies that have direct or indirect roles related to mitigation of natural hazards and which are summarized briefly in this section include:

- Office of Homeland Security – Office of Emergency Management

- Department of Environment
- Department of Public Works & Transportation;
- Department of Housing & Community Development;
- Office of Central Services;
- Permitting, Inspections and Enforcement;
- Prince George's County Public Schools;
- Fire/Emergency Medical Services; and
- Department of Family Services.

Two other organizations that have roles related to mitigation of natural hazards are summarized briefly in this section: The Maryland-National Capital Park & Planning Commission and the Washington Suburban Sanitary Commission.

6.1.1 Planning & Development Processes

Prince George's County is characterized by highly urbanized areas, high growth areas, and outlying rural areas. The comprehensive and long-term planning, zoning, and development review and approval processes are complex and involve several agencies, notably the Department of the Environment and The Maryland-National Capital Park & Planning Commission. Site-specific characteristics are considered, including the presence of mapped flood hazards, wetlands, unstable soils, and steep slopes during development review. This section presents brief overviews of key documents and highlights how natural hazards are addressed in the overall process. More detail is available online: http://www.princegeorgescountymd.gov/2236/Portal

The 27 municipalities in Prince George's County participate in planning and regulating development. As shown in Table 6-1, the County and The Maryland-National Capital Park & Planning Commission perform these functions for the cities, with the exception of the City of Laurel.

Table 6-1. Development Authorities in Municipalities.

Municipality	NFIP ID#	Planning	Zoning	Building Code	Floodplain Ordinance	Schools	Fire, EMS, Police
Laurel	240053	Yes	Yes	Yes	Yes	✓	Yes
Bowie	✓	✓	✓	Yes (also requires County permit)	✓	✓	✓
Berwyn Heights, Bladensburg, Brentwood, Capital Heights, Cheverly, College Park, Colmar Manor, Cottage City, District Heights, Eagle Harbor, Edmondston, Fairmount Heights, Forest Heights, Glenarden, Greenbelt, Hyattsville, Landover Hills, Morningside, Mount Rainier, New Carrollton, North Brentwood, Riverdale Park, Seat Pleasant, University Park, Upper Marlboro	✓	✓	✓	✓	✓	✓	✓

✓ Means the function is included in the County's process, the municipality thus does not have separate authority, ordinances, or services.

6.1.2 Approved General Plan

Plan 2035, Prince George's County Approved General Plan (May 6, 2014) makes comprehensive recommendations for guiding future development. The plan's vision emphasizes Accessibility, Sustainability, Prosperity and Livability. It redefines policies and objectives by re-characterizing the 2022 General Plan Policy Areas. The Developed Tier and Developing Tier were re-characterized into new 2035 Policy Areas: Established Communities, Future Water and Sewer Service Areas and Employment Areas. The 2002 General Rural Tier Policy Area was converted to 2035 Agricultural/Rural Areas and the Growth Boundary Area. The goals of the *Approved General Plan* are consistent with the goal revised for the 2017 established for the Hazard Mitigation Plan update.

Undeveloped flood hazard areas are included among environmentally sensitive areas. The plan emphasized protection of sensitive areas through methods such as property acquisitions, conservation programs, and development of enhanced or additional regulations and policies. Prince George's County is widely recognized for its progressive approach to guiding development away from flood-prone areas.

The *Approved General Plan* does not explicitly address the other natural hazards that are identified in the *Hazard Identification and Risk Assessment* as having a hazard risk level of medium-high: wind; severe storm; drought; and wildland fire. The effects of wind and severe storm, which are not dependent on location, are appropriately addressed by the building code. Because water supplies are provided by the Washington Suburban Sanitary Commission and drought planning is conducted on a regional basis, drought is not a factor that influences individual development decisions.

6.1.3 Zoning & Planning

The primary elements of the zoning and planning processes are highlighted here. Extensive materials, both printed matter and webpages, are issued by Department of Environment and The Maryland-National Capital Parks and Planning Commission (M-NCPPC) to explain and guide citizens and developers through the processes.

The Zoning Ordinance. The ordinance establishes a number of zones which permit residential, commercial, industrial or agricultural uses, or a mixture of those uses. Each zone has specific requirements and limitations. The Chesapeake Bay Critical Area Overlay Zones, required by the State, apply to tidal waters, tidal wetlands, and all land within 1,000 feet of the mean high tide line. Woodland conservation requirements are addressed through the review and approval of tree conservation plans (TCPs), as detailed in the Woodland Conservation Technical Manual. Landscape provisions are also included in the Zoning Ordinance and details and requirements can be found in the Landscape Manual. Variances may be sought to obtain relief from the strict application of the Zoning Ordinance, such as to allow variances to setback or building height limitations. The ordinance was revised since the 2010 hazard mitigation plan update and the floodplain management ordinance was revised and adopted following provision of new FEMA Flood Insurance Rate Maps (September 16, 2016).

The Zoning Ordinance contains two specific provisions related to floodplains:

- Sec. 27-124.01 one hundred year floodplain. This section defines the floodplain as that which is delineated by the County's watershed management studies (or the FEMA map, at a minimum). Where no studies are available or where DPW&T has determined existing studies to be inapplicable, new studies shall be required and performed to the satisfaction of DWP&T, taking into consideration future land use based on zoning. Watercourses having less than 50 acres of upstream watershed may be excluded.
- Sec. 32-204 Floodplains. This section addresses nonconforming buildings and structures, and certified nonconforming uses that are located within a one hundred (100) year floodplain. It provides that such buildings and uses may be modified to incorporate flood-proofing measures provided that: (1) the measures do not raise the level of the one hundred (100) year floodplain; and (2) the measures are in conformance with Division 2 of Subtitle 4, "Building," of this Code, entitled "Construction or Changes in Floodplain Areas."

The Planning Process. Through several types of plans the County provides guidance for future physical development. The responsibility for the *General Plan* and other plans rests with The M-NCPPC Area master plans address the adequacy of public facilities and development proposals are analyzed for impacts on schools, police, fire, rescue, libraries, health, parks and trails. They also are used as the basis for decisions on zoning changes, special exceptions and subdivision applications.

Subdivision Review. Subdivision Regulations control subdivision of land for the purposes of sale or development. Each subdivision proposal is supported by a preliminary plan that depicts such features as lot lines, streets, drainage patterns, stormwater management facilities, topography, building restriction lines, easements and environmental features such as floodplains, wetlands, woodlands, steep slopes and unstable soils. After receiving preliminary plan approval most plans are recorded in the County land records office. This legally recorded document, known as a record plat, depicts lot lines, easements, building setbacks, public right-of-ways and any other encumbrances that restrict the physical development of the land. The M-NCPPC administers the review process.

Additional Plans and Reviews. Environmental features and constraints are among many aspects that are reviewed and considered. Detailed site plans show additional detail, including location of buildings, open spaces, landscaping, grading and other physical features. Detailed plans are required for stormwater management, tree conservation, sediment and erosion control, and utilities.

Floodplain Ordinance. The Prince George's County Floodplain Ordinance (Division 4 of Subtitle 32, Water Resources Protection in the County Code, meets and exceeds the minimum requirements of the National Flood Insurance Program.

Building Permit, Use and Occupancy. The Prince George's County Building Code enforces provisions supporting protection from potential impacts from natural hazards. Building permits are required for new construction and certain work on existing buildings and a robust inspection program enforces the code.

6.1.4 Subdivision Regulations

The Prince George's County regulations pertaining to the subdivision of land are found in Subtitle 27. The broad purposes are to provide for the public health, safety, and general welfare, including wise use and management of natural resources and provision of open space. A stated objective is that "Significant natural features which are impossible or difficult to reproduce, such as waterways, streams, hills, wooded lands, and specimen trees, should be preserved to the degree practicable." Some highlights pertaining to natural hazards:

- Stormwater management must be addressed in all subdivision proposals (minor subdivisions are four or fewer single-family residential lots; major subdivisions are all others).

- Preliminary plans for subdivision must show flood hazard areas, forest stands, perennial streams, non-tidal wetlands, and soil types (including highly erodible soils).
- Minimum lot areas are specified, generally exclusive of any land within the 100-year floodplain.
- For residential subdivisions, a 25-foot setback from the floodplain shall be established as a building restriction line.
- Proposals for most residential subdivisions are required to plat and convey to the County or a municipality suitable and adequate land for active or passive recreation; land shown for preservation as part of a stream valley park on an official master plan may be substituted under certain conditions.
- Developers are encouraged to dedicate floodplain areas for public purpose, otherwise such areas are subject to a floodplain easement.
- The area in the floodplain easement may be used for utility lines and /or storm drainage facilities, open-type fencing, or passive recreation, provided that no structures are built that would interfere with the flood conveyance capacity.
- A 50-foot perennial stream buffer is required.
- The minimum 50-foot perennial stream buffer may be extended to include the floodplain, adjacent slopes of 25% or greater, and highly erodible soils on slopes of 15% or greater and additional area deemed necessary to protect the stream or floodplain.
- The subdivision of land found to be unsafe for development, which may be due to natural conditions such as, but not confined to, flooding, erosive stream action, high water table, unstable soils or severe slopes, or to man-made conditions such as unstable fills or slopes may be restricted or prohibited.

6.1.5 Stormwater & Wetlands Requirements

The Prince George's County regulations pertaining to stormwater management are found in Division 3, Stormwater Management (Subtitle 32, Water Resources). The purpose of the requirements is to protect, maintain, and enhance the public health, safety, and general welfare by establishing minimum requirements and procedures to control the adverse results of increased stormwater runoff associated with land development. Proper management of stormwater runoff minimizes damage to public and private property, reduces the effects of development on land and stream channel erosion, assists attainment and maintenance of water quality standards, reduces local flooding, and maintains, as nearly as possible, predevelopment runoff characteristics of the area.

The County emphasizes the use of non-structural stormwater best management practices when a development is proposed. Stormwater best practices used and promoted in the County emphasis "No Adverse Impact" structures such as bio-retention facilities, underground infiltration, on-site ponds, and off-site regional facilities. Protection of existing wetlands and replacement of impacted wetlands are controlled through permitting related to grading and

construction activities. County stormwater management regulations include a number of provisions for the safe conveyance of excess stormwater and floodwaters and to increase groundwater recharge.

Development proposals that include wetland impacts are subject to the requirements of the Maryland Department of the Environment and the U.S. Army Corps of Engineers.

6.1.6 Floodplain Ordinance

The revised Floodplain Ordinance (Division 4 of Subtitle 32 Water Resources Protection and Grading Code) was adopted September 16, 2016 to protect life and health and to minimize public and private property damage. .

Due to the County's restrictive approach to floodplain development, proposals for new development in the regulated floodplain are not common. Substantial improvements and additions to existing buildings are subject to ordinance provisions. The following highlights the areas in which the ordinance exceeds minimum requirements:

New development of substantial improvement is required to be 2 feet above the Base Flood Elevation.

- The 1%-annual chance floodplain is based upon ultimate conditions hydrology or full build out of the watershed based upon current zoning or land use proposed in an approved Master Plan.
- The lowest floor of any new building or substantial improvement/additions to existing buildings are to be elevated one or more feet above the elevation of the 1%-annual chance floodplain.
- Activities proposed for the mapped floodplain must be evaluated using engineering methodologies to determine the impact on flood elevations; compensatory storage that offsets any impacts is required.
- For any new buildings or substantially improved buildings or additions, enclosures below the lowest floor are not allowed.

6.1.7 County Building Code

Prince George's County stays current with the Maryland Building Performance Standards (which are based on the current Editions of the *International Building Code*, the *International Mechanical Code*, the *International Energy Code*, the *International Existing Building Code,* and the *International Residential Code*). By amendment, the County embodies in the building code, certain additional regulations for grading, drainage, surface structures, erosion control, and stormwater management. The codes apply to new construction and work on existing structures. The current County Building Code is Subtitle 4, Building, Division 1 Building Code.

Prince George's County has adopted some amendments to the Building Code that are specific to wind damage, damage due to heavy winter storms, and geologic hazards and drainage:

- Sec. 4-187. Structural Design; Snow Loads; Section 1608.1, General. References ASCE 7 for design snow loads; but design roof load shall not be less than that determined by Sec. 1607 of the Code, and in no case less than thirty (30) pounds per square foot snow load, plus the drift.
- Sec. 4-188. Structural Design; Wind Loads; Section 1609.3, Basic Wind Speed. References ASCE 7 for determination of wind loads; basic wind speeds shall be in accordance with ASCE 7, but in no case less than 90 miles per hour.
- Sec. 4-191. Damp roofing and Waterproofing; among other provisions, modified Section 1807.4, Site Grading, to require ground immediately adjacent to foundations to be sloped away at not less than one unit vertical in 12 units horizontal (1:12) or an alternate method for diverting water may be used if approved.
- Sec. 4-279. Denial of Permit (c) Geological Hazard. "If, in the opinion of the Director or Permitting, Inspections and Enforcement, the land area for which grading is proposed is subject to geological hazard to the extent that no reasonable amount of corrective work can eliminate or sufficiently reduce settlement, slope instability, or any other hazard to persons or property, the grading permit shall be denied."
- Sec. 4-308. On-site Drainage (a) (6) ". . . Drainage discharging into natural watercourses may require that such natural ground be protected from erosion by an adequate amount of riprap or by other measures. Flows exceeding five (5) cubic feet per second will not be permitted in open facilities such as swales and ditches, but shall be piped in enclosed systems."
- Sec. 4-308. On-Site Drainage (a)(7) "Overflows [of drainage] from the one hundred (100) year storm shall be traced through the site and intervening area to their locations of discharge into a natural stream and, at critical locations, their hydraulic gradient determined to ascertain that the proposed construction does not flood or damage existing and proposed buildings or structures along the trace."

The residential building code applicable to one and two-family dwellings identifies the wind speed, flood loads, and snow load for prescriptive designs. It also addresses unstable soils, giving the building code office the authority to require additional measures. The County adopted modifications to the residential code that are comparable to the adopted modifications to the building code.

6.1.8 Department of Environment

The mission of the Department of Environment is to protect and enhance the natural and built environments of Prince George's County by enforcing Federal, State and County laws to create a healthy, safe and aesthetically pleasing environment for all residents and businesses of the County. Its programs, which are some of the most progressive in the Nation, work hand in hand with the County Executive's Livable Communities Initiative to provide healthy, safe, and clean communities for the citizens and residents of Prince George's County. Descriptions of the

department's functional groups and initiatives that address natural hazards in some form are briefly described below.

Environmental Services Group. The Environmental Services Group is responsible for environmental stewardship of the County and administers programs for stormwater management, floodplain management and damage assessment, allocation of water and sewer service, reforestation of designated areas, capital projects construction, and the restoration of degraded streams and ponds. Prince George's County is recognized as a national model for ecosystem management and restoration. Special programs focus on the quality of streams, others on industrial and residential pollution prevention, the revitalization of older communities, the restoration of the Anacostia River and its tributaries, the preservation and replacement of trees, and the protection of the Chesapeake Bay.

The Group is involved with a number of programs associated with land development and revitalization, working closely with the Office of Engineering in the Department of Public Works and Transportation to ensure development projects will meet environmental concerns and the required codes, but at the same time, making sure this process is fairly and practically applied.

The Environmental Services Group is charged with monitoring the County's activities that are related to its continued compliance with and participation in the National Flood Insurance Program (NFIP) and the NFIP's Community Rating System (CRS).

The NFIP Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risks. There are ten CRS classes: Class 1 requires the most credit points and gives the largest flood insurance premium reduction; Class 10 does not receive a premium reduction. These discounts are applied per each CRS community and apply to all flood insurance policyholders. For CRS participating communities, flood insurance premium rates are discounted in increments of 5%; i.e., a Class 1 community receives a 45% premium discount, while a Class 9 community receives a 5% discount.[31]

Prince George's County currently participates in the CRS program.[32] Prince George's first entered the CRS on October 1, 1991 and the current effective date for the program is October 1, 2001. Participation in this program allows residents within the SFHA to receive a discount on their flood insurance premiums for policies purchased under the NFIP. Residents within the non-SFHA also receive a discount on their policies. Their current class is ranked as 5, which

[31] FEMA Community Rating System https://www.fema.gov/national-flood-insurance-program-community-rating-system

[32] FEMA Community Rating System. PDF. https://www.fema.gov/media-library-data/1476294162726-4795edc7fe5cde0c997bc4389d1265bd/CRS_List_of_Communites_10_01_2016.pdf

give a 25% premium discount to properties in the SFHA, or regulated floodplain, and 10% premium discount for non-SFHA properties.

Permits and Review Group. The Permits and Review Group provides technical support to review and approve plans for construction, including fire and life safety. The County code requires that an owner or authorized agent obtain a permit to erect, construct, enlarge, alter, move, improve, connect, demolish, use and/or occupy, or raze any building. Other types of projects which require permits include grading, stormwater, installation or construction of chimneys, billboards, carports, chairlifts, escalators, swimming pools, wood burning stoves, certain fences, antennas, and installation or renovation of certain electrical devices and wiring.

Licenses and Inspection Group. The Licenses and Inspections Group (LIG) provides regulation of construction, development, and grading activity in the County and incorporated municipalities (except the City of Laurel), through inspection and enforcement. Codes enforced include building, electrical, fire, mechanical, energy, accessibility, grading, stormwater management, zoning, and other applicable State and County codes for construction and development projects. Except for work of a minor nature, commercial projects are required to be certified by third party inspection agents under the Third Party Inspection Program (TPIP). The Group's Commercial Construction/Life Safety Team oversees the TPIP.

Permit and Inspection Activity and Staff Qualifications. The Office of Engineering (DPW&T) and the Licenses and Inspection Group are staffed by professionals who meet or exceed State requirements for certification in their trade/specialty, either through the model code organization or the Maryland Department of Housing & Community Development. Most staff members maintain multiple certifications. To maintain qualifications, staff members attend training offered by the International Code Council, the Maryland Department of Housing & Community Development, and commercial providers.

Countywide Flood Reduction Program

Prince George's County has a strong record of dealing with flooding since 1972's Tropical Storm Agnes brought the potential for significant impacts to the attention of elected officials and policymakers. The County joined the National Flood Insurance Program (NFIP) that year, and soon thereafter established a task force to analyze the risks and data on flood control projects, to review flood emergency procedures, and to recommend actions to address flooding. A comprehensive watershed-based stormwater management plan approach has evolved during the past 45 years which is nationally recognized as an innovative and practical way to meet regulatory requirements, enhance clean water and protect riverine and wetland systems in a highly urban and suburban environment.

One of the responsibilities of the Sustainability Services Division (SSD) is to respond to citizen complaints regarding drainage problems. Drainage complaints range in nature from property flooding to home flooding and include such concerns as erosion and problems associated with sump pump discharges. Groundwater-associated problems are investigated with remedial actions suggested for homeowners, along with the provision of a residential drainage manual (Figure 6-1).

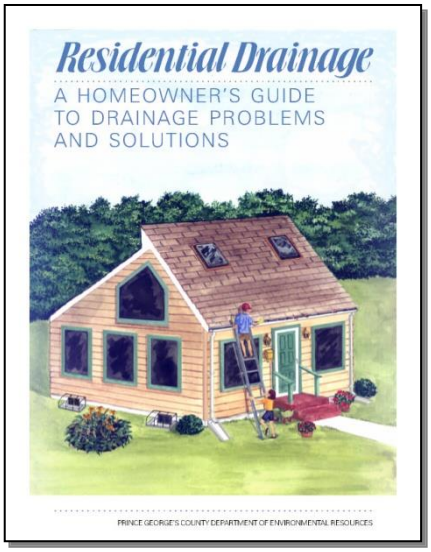


Figure 6-1. Prince George's County Residential Drainage Manual.

SSD investigates an average of 500 complaints per year, some of which evolve into corrective projects. Approximately 45 new drainage projects are initiated annually through homeowner complaints, referrals by other agencies, or requests by County Council Members.

Section 4 of the hazard mitigation plan update summarizes the results of the hazard identification and risk assessment for flood hazards, which indicates that approximately 2,800 residential buildings and 890 commercial buildings are exposed to some degree of flooding associated with the 1%-annual-chance flood (commonly called the 100-year flood) with an estimated at-risk property value of more than $113 Million. The degree of flooding ranges from just a few inches to several feet. Most buildings have not experienced flooding in at least the last 35 years (period for which the County has records). Many of the areas where flood-prone development exists are targeted for urban revitalization, especially inside the Beltway along the Anacostia River, Oxon Run, and Beaverdam Creek.

Comprehensive Watershed Management Plans. The Department of Environment has the responsibility to conduct watershed studies and develop management plans. The purposes of the plans include determination of potential flooding based on planned future development, consideration of mitigation alternatives to control flooding and minimize damage, and identification of stormwater management strategies to alleviate water quality impacts and stream channel erosion associated with development.

Flood hazard mitigation alternatives considered for identified problem areas range from nonstructural (buyout, site modification, elevation) to structural (levees/floodwalls, channel improvements, bridge/culvert improvements, retention/detention structures). Pre-determined criteria are used to evaluate and rank alternatives. Selected projects have been implemented using a mix of County and State funds.

Continued Compliance with the NFIP. Although the County's Floodplain Ordinance is the foundation for its participation in the NFIP, all of its programs and initiatives related to

reducing flood hazards are evidence of the commitment to comply with and exceed the requirements of the federal program.

Table 6-2. Community Participation in the NFIP as of June 30. 2017.

CID	County Name	Community Name	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Reg-Emer Date
245208A	Prince George's County	Prince George's County	N/A	08/04/72	09/16/16	08/04/72

Source: FEMA Community Status Book Report, Maryland June 30, 2017
N/A – Not Available

The Maryland Department of the Environment's Community Assistance Program conducts periodic Community Assistance Visits to review community performance. The report of the December 10, 2010 visit indicated that the program was in good standing and complimented the County on its commitment to strong floodplain management, which is also evidenced in its CRS rating of 5. Program administration highlights include:

- Maintain Elevation Certificates on all new and substantially improved buildings, in computer format, and make copies available;
- Provide Flood Insurance Rate Map information and information on the purchase of flood insurance to inquirers; inform lenders, insurance agents, and real estate offices about the service;
- Maintain current FIRMs and copies of past effective maps;
- Conduct an annual outreach to floodplain residents;
- Require hazard disclosure as part of real estate transactions;
- Maintain materials on drainage problems and flood protection in the public libraries and provide assistance to inquirers and property owners;
- Develop new flood hazard data as part of the development review process and maintain and update changes to the flood hazard maps;
- Preserve open space in the floodplain (over 13,400 acres in stream valley parks) and maintain lots where buildings were acquired as open space;
- Encourage property owners to retrofit flood-prone buildings; and
- Review stormwater management proposals (approximately 500 annually); maintain stormwater management and drainage systems and implement capital projects for drainage and flood control.

NFIP Community Rating System. The NFIP's Community Rating System (CRS) is designed to recognize and encourage community floodplain management activities that exceed the

minimum NFIP standards. NFIP flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote awareness of flood insurance.

As of September, 2016, Prince George's County is rated Class 5 which translates to a 25% reduction in flood insurance rates for local residents and businesses located in mapped special flood hazard areas (and a 10% discount outside of mapped SFHAs). The Class 5 rating places Prince George's County in the top 3% of over 1,000 communities nationwide that participate in the CRS.

Public Information and Outreach. Prince George's County has a robust initiative to inform its citizens about flood hazards and related matters, including:

- Every June is declared "Flood Awareness Month" by the County Executive;
- The Department sponsors a booth with flood information at various fairs;
- The webpage has numerous pages with flood hazard information, including links to related sites;
- A telephone number is dedicated for citizens to use for questions about flooding and stormwater concerns;
- A direct mailing about flood hazards and mitigation measures is sent each June to about 3,700 owners of properties that are impacted by mapped flood hazard areas.
- A direct mailing consisting of s a letter and brochures about the NFIP goes to the 300 insurance agents, mortgage lenders, and real estate agents that do business in the County;
- The Everbrite system is set up for computerized, automated calling to flood-prone property owners; and
- GIS-based flood maps are used to respond to inquiries from homeowners, insurance companies, and lending institutions, about the location of properties and buildings with respect to the mapped floodplain.

Flood Warning Activities. Prince George's County recognizes that with approximately 3,800 buildings located in mapped SFHAs scattered throughout the County, many are not subject to frequent or deep flooding and many will remain subject to some degree of flooding. In addition to the weather monitoring and notification activities of the Office of Emergency Management and WSSC, DER has identified and implemented automated flood warning systems in three areas. Automated flood warning systems rely on a network of rain and stream gauges, and computer models, to monitor and predict conditions conducive to flooding.

Flood-Prone Structures and Elevation Certificates. Elevation certificates are prepared by surveyors and document the ground elevation, floor elevation, and other building characteristics. The County has approximately 760 certificates on file electronically and

available to the public. Property owners may use certificates for flood insurance rating purposes and the County uses the detailed information to evaluate mitigation options. As funding permits the County may collect additional elevation certificates.

Residential Mitigation Activities. The County's damage reduction program places considerable emphasis on mitigation of flood damage to residential properties. This emphasis is reflected in the criteria used to prioritize use of mitigation funds for acquisition and site modifications (floodwalls and grading). For the most part, interest in this program is generated after floods that cause damage. Since the mid-1980s, the County has accomplished numerous residential mitigation projects: Acquisition of Flood-Prone Homes. Using combinations of County, State and federal funds, 75 homes have been acquired and the land dedicated to open space. During 2004, a FEMA grant was awarded to support acquisition of two homes. Since the 2010 hazard mitigation plan update, FEMA Hazard Mitigation Assistance program funds were used to acquire and demolish seven residential structures at high hazard due to the Piscataway Slope Failure which has been exacerbated during periods of heavy rain. The project cost was $2,689,500 and since the property lots are in perpetual greenspace easement there will be no further development on this high risk site. Residential Floodproofing. Using County funds, measures to protect 62 homes have been constructed, primarily using site grading and flood walls around entrances.

The Capital Improvement Program

The Environmental Services Group is involved in construction projects that range from small corrective drainage projects to large community revitalization initiatives. Those that specifically address flood hazards, whether as a primary purpose or adjunct component, include:

- COE County Restoration. This program is a partnership with the U.S. Army Corps of Engineers and will involve the design and construction of environmental enhancement and flood control projects in the Anacostia and Patuxent River watersheds. Numerous projects are in the planning and design phase, including levee improvements, water quality measures, wetland creation, and reforestation and fish blockage removal.
- Environmental Protection Program. This comprehensive effort builds or retrofits existing stormwater management facilities and rehabilitates streams and wetlands to correct serious water quality problems.
- Environmental Revitalization Program. This program entails the use of new and creative technologies to monitor, model, restore and protect the environment in highly urbanized settings. Projects include tree boxes in College Park, municipal storm inlet retrofit program, retrofit of the Port Town's Industrial Park, Port Towns EcoGarden, bio-retention facilities, stormwater retrofits, and stream restoration projects. The program contributes to the restoration of the Anacostia River, and serves as a pilot program to meet requirements of the EPA's NPDES permit. Flood Protection and Drainage Improvement Program.

- The program consists of development of CPS plans, design and construction of flood protection and drainage improvement projects that focus on severe threats to residential, habitable structures. Eligible capital improvement projects address frequent home flooding (water entering the habitable structure area), and alleviate severe road flooding that does not fall under jurisdiction of the county Department of Public Works and Transportation. Also included are flood control system certification, municipal participation, storm drain acceptance and flood warning systems projects. When possible, water quality enhancement features are incorporated in capital improvement projects. Property owners directly benefiting from capital improvement projects must pay for and provide the county with a right of way.
  The Department of the Environment uses a three tiered priority system to outline criteria for projects to be included in the Capital Improvements Program (CIP). Drainage problems are categorized and prioritized by severity and proximity to residential structures. To enable focus of resources and CIP expenditures on improvements to water quality treatment of impervious areas, and Total Maximum Daily Load (TMDL) reductions in accordance with the EPA mandates, the Department addresses and commits funding and resources to providing necessary assistance to creditable flooding and erosion problems. All projects are evaluated for cost versus benefit.
- Floodplain Acquisition Program. The program facilitates environmental restoration and economic revitalization measures in floodplains. Restoration of floodplain areas is pursued through acquisition, with the acquired land set aside for open space compatible uses such as green space, wetland banking, flood mitigation, reforestation, and selective redevelopment.
- Major Reconstruction Program. The Department of Environment may participate in Department of Public Works &Transportation initiatives to redesign, reconstruct and rehabilitate major drainage and flood control projects.
- Water Quality Planning & Implementation. This program involves a coordinated and systematic approach to improve the water quality of local streams and watersheds, and is a component of the County's effort to improve the Chesapeake Bay. It will focus on improving degraded watersheds through planning, monitoring, studies and structural and nonstructural measures. Emphasis will be on existing development and redevelopment for industrial, commercial, and residential land uses, particularly in high density, older communities.

The Maryland-National Capital Park & Planning Commission (Planning)

The Maryland-National Capital Park and Planning Commission (The M-NCPPC) is a bi-county agency, created by the General Assembly of Maryland in 1927. The Commission's geographic authority extends to the great majority of Montgomery and Prince George's Counties. It has three major functions:

- The preparation, adoption, and, from time to time, amendment or extension of the *General Plan* for the physical development of The Maryland-Washington Regional District;

- The acquisition, development, operation, and maintenance of a public park system; and
- In Prince George's County only, the operation of the entire County public recreation program.

The M-NCPPC's Prince George's County Planning Department is managed to help preserve and protect the County's resources by providing planning services and growth management guidance, and by facilitating effective intergovernmental and citizen involvement through education and technical assistance.

To fulfill its responsibilities, the Planning Department undertakes a wide range of planning activities and is responsible for certain reviews of development proposals. Because those activities are so extensive, Section 6.4 summarizes only the responsibilities of the two key offices involved in development review, and the role of the environmental planning and special project's sections in long-range planning. Section 6.4.2 highlights how natural hazards are recognized and addressed. Sections 6.2.1 and 6.2.6 summarize elements of the *General Plan* and the *Green Infrastructure Plan* that touch on natural hazards.

Development Review

The M-NCPPC's Planning Department has a significant role in the review of development proposals for compliance with certain requirements contained in the Zoning Ordinance and the Subdivision Ordinance). Two divisions in the department are mainly responsible for these reviews: the Development Review Division and the Countywide Planning Division.

The Development Review Division is focused on implementation – the phase of review where the policies, land uses, zoning activities, and design guidelines are joined to ordinance requirements, private market development proposals, and land-planning practices. It makes recommendations to the Planning Board, the ultimate decision-making body, whose decisions directly influence the built environment through application of the Zoning Ordinance and the Subdivision Regulations, by bringing together all technical facts, positions of involved parties, potential of the sites, and workable solutions concerning individual development proposals. The Development Review Division consists of six sections:

- The Zoning Review Section processes zoning map amendments, special exceptions, variances, special permits, certification of nonconforming uses, departures from parking and loading schedules, parking lot and loading area design, landscaping, and sign standards. The Subdivision Section processes preliminary plans and final plats of subdivision; reservation and vacation plats; and premise addressing
- The Urban Design Review Section processes comprehensive and specific design plans, conceptual and detailed site plans, and applications for alternative compliance from the Landscape Manual.
- The Permit Review Section reviews submittals for site grading, building construction, signs, and use and occupancy permits.

- The Planning Information Services Section provides zoning, planning, land use, and development information to the public.
- The Application Section which processes applications filings handles referral coordination.

The Countywide Planning Division consists of five sections that work together on countywide issues providing planning services and technical support to the Planning Department and other County, State and regional agencies: Environmental Planning, Historic Preservation, Special Projects and Research, Public Facilities, and Transportation Planning. The sections that have a role in addressing hazards are:

- The Environmental Planning Section prepares an overall review of environmental conditions affecting the site, using information as submitted in the natural resource inventory (NRI), the tree conservation plans (TCPs), and in-house GIS databases and aerial photographs.
- The Special Projects Section of the Countywide Planning Division provides environmental support for the long range plans of the Community Planning Divisions.

The Maryland-National Capital Park & Planning Commission (Parks)

The Maryland-National Capital Park and Planning Commission, Department of Parks & Recreation (M-NCPPC) is charged with managing the public park and recreation system within Prince George's County. With more than 27,000 acres of parkland, the Commission strives to provide a balance between natural, undeveloped open space and land that is developed with recreational facilities and trails. The M-NCPPC's improved properties include athletic fields and tennis courts, playgrounds, fitness trails, golf courses, outdoor pools, a trap and skeet range, an equestrian center, several lakes, ice rinks, an airport and miles of paved surface trails. Buildings include community center facilities, nature centers, many historic structures, house museums and sites, cultural arts facilities, Recreations Centers, multi-generation centers, a baseball stadium and the aviation museum in College Park.

Land Acquisition, Park Planning and Development. The M-NCPCC Park Planning & Development Division (PP&D) within the Department of Parks and Recreation provides the planning, engineering, design, landscape plan development, and construction management functions involved in bringing new parks and recreation facilities to the public. Each year, the Division acquires about 100 to 300 acres of land through The M-NCPPC capital improvement funding, grants, mandatory dedication (subdivisions), and surplus property programs. Design, engineering, and management of park construction oversight is the responsibility of the professional in-house staff comprised of planners, landscape architects, engineers, surveyors, architects and construction inspectors.

Stream valley parks are a major component of the park system. Much of this land was purchased or dedicated to The M-NCPPC through the land development process outlined in the County's subdivision ordinance known as mandatory dedication. . These parks are certain

environmentally sensitive features, including floodplains and wetland areas and associated buffers where application of federal, state and local requirements guide development away from these areas.

Long-term plans for the stream valley park system include protection of sensitive habitats, conservation, and where appropriate, development of recreational facilities that include trails, athletic fields, and buildings. Dedications and acquisitions along streams that are least 50-feet wide are preferred.

Existing Facilities and Weather-Related Hazards

The M-NCPPC monitors weather conditions and receives severe weather alerts from the Office of Emergency Management and the National Weather Service and the decisions of County Government regarding closures and delays are followed, except that programs for school children follow the notifications issued by the Prince George's County Public School System. Employees and constituents are advised to listen to local broadcasts for closures.

The Department of Parks and Recreation has a diverse force of maintenance personnel and equipment that allows it to deal with the effects of natural hazard events:

- Recovery from Hurricane Agnes in 1972 took many years and a comparable event has not occurred in the past 45 years. For significant events like 2003's Hurricane Isabel, significant 2010 winter storms and the 2011 Louisa County VA earthquake which damaged some M-NCPPC facilities, the existing resources have been adequate to handle recovery work in-house.
- Snow removal on The M-NCPPC's properties is a seasonal function. Additionally, The M-NCPPC is part of the County's snow emergency plan and crews are designated to support snow removal on public streets. Priority is given to office buildings, community centers, and all operating and programmed facilities. Athletic fields, playgrounds, community and neighborhood parks are plowed after the programmed facilities are deemed accessible. Removal of tree debris from high winds or heavy snows is managed by in-house forces, either by chipping and spreading or disposal at the landfill. Sites are prioritized based on impacts. Area Operations staff are equipped with chain saws and tree removal gear and generally handle smaller, less complex tree and debris removals. Priority is given to blocked building entrances, sidewalks, access roads, and parking lots, followed by trails and woodland areas.
- Maintenance personnel are mobilized when major events are predicted, such as Hurricane Isabel. They are responsible for checking roof drains, securing buildings, and, if flooding is predicted, pulling docks at the Waterfront Park and Patuxent River sites.
- Mobilization of forces for preemptive maintenance is based on the predicted severity of an event, given up-to-date weather information.
- The M-NCPPC is self-insured for damage to its buildings, although flood damage is not explicitly covered. Table 6-3 identifies buildings that are located in mapped flood hazard

areas and buildings for which The M-NCPPC requested flood audits. One flood-prone structure, the Kentland Neighborhood Recreational Center (CRC), has been demolished during the most recent five year planning cycle. Existing parklands and facilities have sustained physical damage due to natural hazard events.

Table 6-3. M-NCPPC Buildings with Identified or Suspected Flood Hazards.

Building/Location	Watershed/Flooding Source
Office building at 6600 Kenilworth Avenue	Northeast Branch
Old Clubhouse at Paint Branch Golf Complex (used for storage only)	Paint Branch
Waterfront Park	Anacostia River
Riverdale CRC	Anacostia River
Lane Manor CRC	Northwest Branch
Adelphi Manor CRC	Northwest Branch
Adelphi Mill Historic Site	Northwest Branch
Hamilton Aquatic Center	Northwest Branch

- Tidal flooding on the Anacostia River affects the Waterfront Park, although notable physical damage has not been sustained since The M-NCPPC has operated the for more than 35 years. Debris and trash collect in the parking lot and along the shoreline. A fairly frequent occurrence is when the capacity of the nearby pump station is exceeded and raw sewage overflows across the entrance road and prompts cleanup.
- Stream bank erosion on property owned by The M-NCPPC has in recent years begun to affect adjacent private property and structures. On the Paint Branch tributary for example, adjacent commercial businesses have been threatened with damage as the stream erodes close to the buildings. Significant private investment in stream realignment and restoration has been necessary to protect structures and parking lots. Small-scale mitigation projects are underway in a number of locations with public and non-profit partners, including the Anacostia Watershed Society, State Highway Administration, City of College Park, and the University of Maryland.

6.1.9 Department of Public Works & Transportation

The Prince George's County Department of Public Works and Transportation (DPW&T) administers a comprehensive transportation system that includes local public transit services. The Department:

- Designs, constructs and maintains county's transportation infrastructure inclusive of roads, bridges, sidewalks, curbs, gutters, and roadside drainage.
- Plans, installs and maintains street lights, roadway regulatory signs, pavement markings and traffic management devices.
- Landscapes and maintains grassy areas and trees in public rights-of-way including litter collection, debris removal, mowing, tree trimming and emergency tree removal.

- Reviews and issues permits for site development projects that include site grading, construction of roadway infrastructure, stormwater management facilities, street lighting and landscaping, as well as inspects and approves all construction before release of permit to ensure compliance to the County Code.
- Maintains flood control facilities, including pumping stations and the storm drainage network.
- Administers the county's Capital Improvement Project (CIP) Program regarding transportation infrastructure.
- Coordinates with the Maryland State Highway Administration (SHA) on the planning, design, construction and operation of state highways within the county.
- Oversees the county's public transportation system (*TheBus*, Call-A-Bus and Call-A-Cab) and coordinates regional public transit services (rail and bus) with the Washington Metropolitan Area Transit Authority.
- Administers and enforces the county's Critical Area, Sediment and Erosion Control and Stormwater Management programs.
- Coordinates with Maryland National Capital Park and Planning Commission on the planning and design of site development projects in the county.
- Evaluates and test construction materials used on CIP and permitted construction sites.
- Coordinates with local Soil Conservation District on site grading when applicable.

Requirements for Roads and Drainage

The Office of Engineering issues permits for site grading, stormwater management, roadway construction, utility construction within the rights-of-way or for construction within the Critical Area to those planning to develop a property or to perform work within the public right-of-way or on private property that will impact on the public road rights-of-way and/or the Chesapeake Bay area or its tributaries.

Requirements imposed through the permit process are intended to ensure that adequate and safe transportation infrastructure is constructed, effective sediment and erosion control is maintained, and requisite stormwater management design requirements are met. The Office of Engineering inspects all permitted construction projects throughout the construction period to ensure county code compliance.

Flood-Resistance Requirements for Roads and Bridges. In addition to meeting County requirements, road and bridge construction that impacts flood hazard areas or non-tidal wetlands must also be approved by the Maryland Department of the Environment. Bridges and culverts are expected to be stable during passage of the discharge equal to the 100-year flood. The above-referenced design standards include provisions for evaluating the potential for scour and providing appropriate protection against scour of abutments, piers, wing walls, and culvert inlets and outlets.

Unstable Soils Requirements. Due to pothole and road damage from freezing and thawing cycles in areas with poor drainage (including Marlboro and Christiana clays), the Department determined it appropriate to mitigate damage by requiring deeper excavation, increased base thickness and additional underdrainage. Design requirements are found in the AASHTO and SHA manuals and apply to roads improved by the county and those built by private developers.

Snow. The AASHTO bridge design criteria include accounting for anticipated snow load.

Road and Drainage Maintenance

Prince George's County maintains more than 1,820 miles of roadways ranging from low-volume rural and secondary roads to high-volume primary collector and arterial roadways. A total of 953 bridges and culverts carry roads over waterways (157 have spans longer than 20-feet; 233 have spans between 6- and 20-feet in width; and 563 are less than 6-feet wide). The Office of Project Management is responsible for inspection and improvement of bridges and drainage channels. The inspection reports help identify required maintenance work and are used to prioritize projects.

Routine maintenance work is authorized by a Regional Letter of Authorization from the Maryland Department of the Environment and the United States Army Corps of Engineers. Work that alters the hydraulic capacity of waterway crossings must be authorized by individual permits that are coordinated by the Department of Environment.

The Office of Highway Maintenance (OHM) is responsible for a wide range of services that help to keep County roads safe, clean, and aesthetically attractive. The work is undertaken by several specialized crews with a total of more than 140 crew members. OHM is charged with roadway patching and surfacing; bridge maintenance; pipe repair and replacement; ditch and channel maintenance and inlet and drainage pipe cleaning; driveway aprons; sidewalk, curb and gutter maintenance; and stormwater management facility maintenance. Additional responsibilities include snow and ice removal, maintaining street trees, and maintenance of various flood control facilities.

The inspection program is an important aspect of maintenance of the system. More than 2,400 service requests are received from County residents annually. Inspectors respond within three working days, unless an emergency is reported, in which case the response is immediate. After high water events, an inspection is performed to determine if maintenance and repairs are warranted. A 24-hour emergency on-call program covers emergency service requests, and flood control and pumping station responses.

Flood Control Facility Maintenance

In the 1940s, the U.S. Army Corps of Engineers constructed the Anacostia Flood Control Project which includes more than three miles of levees (combined length along both sides of the Anacostia River). To manage drainage on the landward side of the levees, the Corps installed four pumping stations (Bladensburg, Colmar Manor, North Brentwood, and Edmonston). The

Department operates and maintains the stations that are instrumented. Signals are transmitted when the pumps turn on automatically based on water levels. The Corps and the Department conduct an annual inspection of the levees, floodway channel and pumping stations. The Department is responsible for maintenance, including mowing, vegetation control, debris removal, and stabilization of erosion. The pumping stations receive quarterly and annual maintenance and testing of the electrical and mechanical equipment.

The U.S. Army Corps of Engineers constructed two other Flood Control Projects. The Upper Marlboro Flood Control project completed in 1964, which included approximately 1,950 linear feet of levee, 3,000 linear feet of channel improvements, 1,413 linear feet of new channels, and 4,430 linear feet of floodway clearing. The Forest Heights Flood Control project completed in 1964 included 4,160 linear feet of channel improvements, 2,250 linear feet of levee, and two drop structures. As with the Anacostia Project, the Corps and the Department conduct an annual inspection of the levee systems.

In addition to maintaining the Anacostia Flood Control Project, the County manages, and maintains several non-federal flood control projects:

- Sligo Creek Flood Control levee, built by the Washington Suburban Sanitary Commission in 1973.
- Northeast Branch Flood and Erosion Control Channelization (above East-West Highway), built by the Washington Suburban Sanitary Commission in 1976.
- Henson Creek Flood Control Levee and Channelization near Morningside, built by the Washington Suburban Sanitary Commission in 1972.
- Oxon Run Flood Control Levee near Green Valley Drive, built by the Washington Suburban Sanitary Commission in 1982.
- Oxon Run Tributary Floodwall, built by the County to protect homes and a school (completed 2004).
- Northeast Branch Flood Control Levee near Allison Street, built by the Washington Suburban Sanitary Commission.

DPW&T Public Information

The Department's Webpage provides topical information to the public, which includes, but is not limited to: snow and ice conditions, traffic management, planned and ongoing Capital Improvement Program road improvements, street repairs, traffic signals, signs and markings, street light repair and installation, storm drainage and other services such as litter and debris removal. The site includes contact numbers for customer service requests, as well as a state-of-the-art traffic center information, and press releases concerning emergency conditions, road closings, outreach activities, etc., are posted The Department also implemented a Community Partnering Program that includes more than 900 members in an effort to facilitate communication and improve services.

A section of the Web site is devoted to *Frequently Asked Questions* which features a specific section about storm drainage.

DPW&T and Natural Hazards
Weather is an important influence on the County's road system and stormwater management facilities in terms of the physical infrastructure and how the County prepares for and responds to events. Weather is monitored through the local news media and the National Weather Service. Four weather-related conditions are influential: snow/ice; heavy rain/flooding; extreme heat; and coastal erosion.

6.1.10 Washington Suburban Sanitary Commission

The Washington Suburban Sanitary Commission (WSSC), a bi-county water and sewer agency, was established on May 1, 1918 to serve Montgomery County and Prince George's County. It is the eighth largest water and wastewater utilities in the country. ,

Dam and Reservoir Operations
WSSC maintains its three reservoirs to comply with all federal and/or State requirements concerning the safety of the dam structures. The dams are periodically inspected and maintenance is performed regularly to assure safe functioning.

The only dam on a waterway in Prince George's County is the T. Howard Duckett Dam on the Patuxent River, which is rated as a "high hazard" dam because of the possible adverse incremental consequences that could result from the release of water due to failure of the dam or rainfall-runoff that exceeds design events in the watershed above the dam. Dams rated as "high hazard" are required by the MDE Dam Safety Division to be capable of safely passing the Probable Maximum Flood (PMF). At the time it was constructed in 1954 the Duckett Dam could pass the PMF. Since that time the PMF has been increased to 32 inches of rain in a 72 hour period. The statistical probability of such a storm is once every 10,000 years. The average annual rainfall in Central Maryland is 42 inches. The change to a more stringent requirement has resulted in Duckett Dam being deemed inadequate to safely pass this theoretical storm, mainly due to potential erosion of earth slopes and foundations. Due ***only*** to the dam's inability to safely pass such a storm, MDE characterized the dam as "unsafe" (such designation does not imply any imminent threat). WSSC responded with a downstream slab scour protection project to allow the dam to safely pass the PMF, which will remove the "unsafe" label from the dam. Construction was completed during 2012. An Emergency Response Plan, approved by the Maryland Department of the Environment, is coordinated with downstream jurisdictions.

The reservoirs are managed to optimize water supplies, not as a flood control system. WSSC's operating protocols specifically address monitoring of weather conditions and management of water levels to minimize flood impacts when feasible. Water level is typically maintained with 3 feet of freeboard (corresponds to runoff from about 1 inch of rainfall in watershed). Water

may be released from the reservoir if major runoff events are forecast. Under some release scenarios flooding occurs in the City of Laurel and other downstream areas in the County. WSSC notifies city and county officials in advance of any releases that could cause flooding.

Construction of Water Supply & Sewer Lines.
WSSC constructs about eighty miles of new (or replacement) water supply lines and eighty miles of new (or replacement) sewer lines annually. Developers install water and sewer lines to WSSC specifications; WSSC takes ownership if inspections during construction indicate compliance with WSSC requirements. Construction in the waters of the State, including installation of utility lines under streams and floodplains, as well as activities that impact non-tidal wetlands, is required to satisfy State regulatory requirements administered by the Maryland Department of the Environment (MDE). WSSC administers the delegated State sediment control program for all utility construction in Montgomery and Prince George's Counties.

Water Supply Adequacy and Drought Plans.
WSSC has determined that water supplies on the Potomac River are "more than adequate" to meet current and future water needs (until 2030) of its service area (includes portions of Prince George's County and Montgomery County). WSSC works with the Interstate Commission on the Potomac River Basin (ICPRB) Co-Op, a regional cooperative with the U.S. Army Corps of Engineers and Fairfax Water, monitoring all municipal and utility requests to withdraw additional waters from the Potomac River. The ICPRB prepares demand forecasts every five years to monitor the Washington metropolitan area's water needs with available flows. Water conservation is an important message that WSSC conveys to its customers. WSSC is a member of the Metropolitan Washington Council of Governments' Regional Task Force on Water Supply Issues. The Metropolitan Washington Water Supply and Drought Awareness Response Plan: Potomac River System was prepared in 2000. Drought has not been a recent concern but the Commission has the structure in place to address drought as needed.

WSSC and Natural Hazards

- The two filtration plants on high ground to distribute water are not subject to flooding, although large flooding events could damage water intake structures (Hurricane Agnes runoff raised the Patuxent River level downstream of the T. Howard Duckett Dam almost to the top of the Rocky Gorge raw water pumping station). Although the wastewater treatment plants are located in low areas to facilitate gravity flow, only small portions of the properties of the three plants located in Prince George's County are located within mapped flood hazard areas. The majority of critical plant infrastructure is above the 100-year flood elevation.
- More than fifty sewage pumping stations are located throughout the bi-county region; several may be located within the mapped 100-year flood hazard area, but critical operating equipment is set on floors above the flood elevation in accordance with state design guidelines. None has been damaged by flooding. Nearly all pumping stations

have dual feed power supply or emergency generators as back up during power failures, which can occur during storm events.

- Urban streams experience erosion and course changes, which occasionally expose water and sewer lines and manholes; infrastructure protection measures for stream crossings are undertaken in compliance with State permit requirements. Some projects to stabilize erosion and restore streams have been undertaken, typically in association with major sewer construction projects that are aligned along watercourses.

6.1.11 Department of Housing & Community Development

The Department of Housing and Community Development (HCD) and the Housing Authority expands access to a broad range of quality housing by creating safe, well planned, attractive residential communities and enabling families to become self-sufficient and communities to become stable. Individuals and families with housing or community improvement needs are served. Special emphasis is given to low and moderate income people who live or work in the County. HCD carries out its mission through aggressive grant leveraging, creative financing, innovative planning, and productive partnerships with public, private and community based organizations.

The Department's work is accomplished by two divisions and through two quasi-independent authorities:

- The Community Planning and Development Division oversees and manages the HUD planning and reporting documents and is responsible for coordinating and preparing the County's 5-year Consolidated Plans and Annual Action Plans for Housing and Community Development, and the Consolidated Annual Performance and Evaluation Reports. The Division is also responsible for oversight and management of the Federal programs: CDBG, HOME, and ESG funds, including the American Dream Down Payment Initiative (ADDI), Community Development Block Grant Recovery (CDBG-R) and Homelessness Prevention and Rapid Re-housing Program (HPRP).
- The Rental Assistance Division enables low-income families to rent from any landlord with Section 8 rental assistance.

6.1.12 Homeland Security/Emergency Management

The Prince George's County Office of Homeland Security Office of Emergency Management develops and maintains comprehensive emergency management programs through planning with federal, State, local officials, and the private sector, to develop a coordinated safety and preparedness strategy. The objective of this office is to protect life, property, and the environment from the effects of natural and man-made disasters, including terrorist acts.

The Office of Emergency Management (OEM) responds to natural hazard events by providing shelter for displaced persons and facilitates rapid restoration of normal conditions. OEM coordinates volunteer programs to assist staff with its responsibilities during emergency incidents and disasters. The Office of Emergency Management is responsible for:

- Coordinating the County's emergency response during times of crisis or disaster;
- Maintaining and updating Prince George's County's Emergency Operations Plan and it's annexes (the Plan was last updated during 2016);
- Operating the County's emergency operations center;
- Radio Amateur Civil Emergency Services and Amateur Radio Emergency Services program, consisting of licensed amateur radio operators that meet FCC qualifications who provide emergency communication services when normal communications are unavailable;
- Representing the County on the Metropolitan Washington Council of Governments' Emergency Managers Committee;
- Conducting multi-media and event outreach to County residents to improve awareness of and preparation for disasters and other emergency events;
- Opening shelters in cooperation with the American Red Cross; and
- Coordination of the resources provided by the federal, State, and County agencies during major emergencies and disasters.

OEM routinely monitors weather conditions and forecasts reported by the National Weather Service and commercial television. When conditions warrant, the NWS directly contacts the County and conference calls are conducted with neighboring counties and the State.

Prince George's County uses the Everbrite Notification System For multi-modal emergency messaging to voice and text messaging to office or personal telephones, cell phones, beepers, pagers, faxes and emails with details of disasters or other incidents. The telephone contact database is built from commercial sources and the County facilitates sign up for notification via other devices.

6.1.13 Office of Central Services

The Office of Central Services administers centralized support services for the County, including facilities operation and management, contract administration and procurement, fleet management, real estate, construction, and administrative services.

The Facilities Operation & Management Division is responsible for building operations, renovations, maintenance services, real estate and lease matters, and space management. Prior to the purchase of a site the Division checks with the Department of Environmental Resources and The Maryland-National Capital Park & Planning Commission to identify site constraints. The policy is to avoid sites with floodplains, wetlands, and unstable soils because complying with applicable requirements drives up the cost of development.

All work on County buildings, including construction of new buildings, work inside existing buildings, and additions to existing buildings, must comply with the Prince George's County

Building Code and all other County requirements. Building permits are obtained and DER conducts inspections during construction.

The County is self-insured. During the past five years, county-owned buildings have not sustained significant damage due to lightning, wind, rain, snow/ice, or hail. County-owned buildings did sustain damage after Tropical Depression Lee in 2011 which resulted in construction of a floodwall to protect the County Administration Building in Upper Marlboro. The US Army Corps of Engineers is presently studying the West Branch watershed in the area to determine mitigation options including for the Bridge at Water and Main Streets. S

6.1.14 Prince George's County Public Schools

As outlined in the Quality Schools Program Strategic Plan, the School System faces opportunities and challenges as it pursues its mission to serve the education needs of the County's citizens. The PGCPS functions as an agency of the State Department of Education. The operating budget is funded by the Prince George's County Government; the capital budget is funded by both State and County funds.

The PGCPS owns its inventory of buildings. The Department of Planning and Architectural Services is responsible for the capital improvement program, including acquisition of land for new facilities, planning renovations and additions to existing facilities, and disposal of surplus property. The PGCPS is self-insured for property damage.

6.1.15 Fire/Emergency Medical Services

The Fire/EMS Department is responsible for fire suppression, emergency medical services, fire prevention, fire and rescue communications, research, training and the coordination of the volunteer fire companies. In addition to responding to structural fires, the department is responsible for coordinating the County's response to hazardous materials incidents and wildfires.

Hazardous Materials.

The Fire/EMA Department maintains the County's hazardous materials response plan and coordinates the Local Emergency Preparedness Committee, a federally-mandated organization that operates under "community right to know" rules established by the federal government, primarily focusing on public awareness and hazardous materials. A database of the physical locations of certain hazards materials as reported in the Tier II reports required by the U.S. Environmental Protection Agency is maintained. Hazardous materials incidents are largely associated with transportation of materials.

Forest & Brush Fire.

At the state level, response to forest and brush fires is coordinated by the Maryland Forest Service, which also operates the Statewide Fire Monitoring System to collect fire weather data and determine fire danger ratings. Some department personnel are trained in wildland fire suppression.

6.1.16 Department of Family Services

The Department of Family Services ensures the development and provision of a comprehensive, responsible and effective community-based human service delivery system that enhances the quality of life for individuals and families of Prince George's County.

The Department's five major agencies are directly involved with citizens, many with special needs and vulnerabilities. Each major agency has an affiliated board or commission which provides the opportunity for citizens to have direct input and a voice in the services made available to the county more vulnerable citizens. The five agencies are:

- Area Agency on Aging;
- Division for Children, Youth and Families;
- Office for Disabilities Resources;
- Mental Health Authority; and
- Office of Women's Resources.

The Department of Family Services activates outreach to its constituencies when extreme heat or prolonged cold spells may threaten health and safety.

6.2 Summary of Existing Mitigation Activities

This section highlights measures and programs in Prince George's County government that reduce the impact of natural hazards. These measures are summarized below:

Table 6-4. Prince George's County Summary: Activities that Reduce Hazard Impacts.

FLOOD
• Department of Environment provides online/handout information to inquirers; site-specific flood hazard information, advice on flood insurance and measures to minimize damage • Department booth at festivals includes flood mitigation and safety materials • June is Flood Hazard Awareness Month • *Master Plan* sets forth policies to preserve environmental features (M-NCPPC; Department of Environment) • *Zoning Ordinance* includes Chesapeake Bay Critical Area Overlay Zone (M-NCPPC; Department of Environment) • *Green Infrastructure Plan* calls for conservation of natural areas, including flood hazard areas (M-NCPPC; Department of Environment)

Table 6-4. Prince George's County Summary: Activities that Reduce Hazard Impacts.

• Developers required to delineate flood hazard areas and wetlands as part of subdivision review layouts and building permits (M-NCPPC; Department of Environment) • Flood hazard area protection and damage-resistant measures imposed through subdivision regulations and floodplain management code requirements (M-NCPPC; Department of Environment) • County participates in the NFIP's Community Rating System (Department of Environment) • Management of increased stormwater runoff required as part of new development (Department of Environment; DPW&T) • Department of Environment identifies, designs and implements structural and nonstructural projects to reduce flood damage • Department of Environment and OEM operate flood-threat recognition and warning capabilities • DPW&T and State standards minimize flood risks and damage for roads, bridges and culverts • DPW&T operates flood control pump stations • DPW&T inspects drainage ways, maintains channels and levees • County and U.S. Army Corps of Engineers in discussions regarding maintenance and upgrades of the Anacostia River levees • WSSC monitors weather and predicted storm activity to manage reservoirs • The M-NCPPC acquires and maintains open space, including active recreational areas and passive open space • Prince George's County Public Schools avoids selecting new school sites that are affected by mapped flood hazard areas
STREAMBANK EROSION
• Department of Environment, Maryland DNR, and The M-NCPPC completing Stream Corridor Assessment
WINTER STORM
• Department of Environment enforces the State building code with criteria for design snow load for buildings and structures • DPW&T requires bridge designs to account for snow load • DPW&T has snow removal plans and capacity • DPW&T has brochures and online content related to snow emergencies and snow removal (in English and Spanish) • Several agencies monitor weather and developing conditions (OEM; DPW&T; Department of Environment, Schools) • Family Services has outreach to elderly residents

Table 6-4. Prince George's County Summary: Activities that Reduce Hazard Impacts.

HIGH WIND/TORNADO
• The State building code is enforced with criteria for design wind load for buildings and structures • Several agencies monitor weather and developing conditions (OEM; DPW&T; Department of Environment, Schools) • OEM coordinates with other agencies to operate Everbrite system for citizen notification; • Housing Authority retrofit public housing facility with code-compliant window assemblies
SEVERE STORM
• The State building code is enforces with criteria for wind design load and lightning protection for buildings and structures • Several agencies monitor weather and developing conditions (OEM; DPW&T; Department of Environment; Schools) • OEM coordinates with other agencies to operate Everbrite system for citizen notification; recovery presentations online/cable
DROUGHT
• WSSC manages reservoirs for water supply • MWCOG Water Supply and Drought Awareness Response Plan • County and City participate in regional planning initiatives (WSSC, Washington COG) • The M-NCPPC complies with water restrictions, focusing limited water supplies on unique horticultural resources, including champion and historic trees and irreplaceable resources
WILDLAND FIRE
• Fire/EMS coordinates with DNR for wildland fire response • Fire/EMS has some personnel trained in wildland fire suppression
DAM FAILURE
• WSSC periodically inspects dams and performs regular maintenance to assure safe functioning • WSSC's Emergency Response Plan for Rocky Gorge Dam (Duckett) is approved by the Maryland Department of the Environment and is coordinated with downstream jurisdictions • WSSC notifies Laurel in advance of releases that may cause flooding
EXTREME HEAT
• Family Services has outreach to elderly residents • DPW&T's road and bridge standards for expansion joint and improvements in joint materials minimize damage due to extreme heat
LAND MOVEMENT/UNSAFE LANDS
• DWP&T requires roads to have deeper excavation, increased base thickness and additional underdrainage in areas with poor drainage (Marlboro and Christiana Clays) • Preliminary plans for subdivisions must depict steep slopes and unstable soils (M-

Table 6-4. Prince George's County Summary: Activities that Reduce Hazard Impacts.

NCPPC) • Subdivision of land may be restricted or prohibited if found to be unsafe for development, which may be due to natural conditions such as, but not confined to . . . unstable soils or severe slopes (M-NCPPC) • Department of Environment enforces the State building code with addresses unstable soils, giving the code office authority to require special measures • Grading permits may be denied no reasonable corrective work will eliminate or reduce settlement, slope instability or geological hazards to persons or property (M-NCPPC; Department of Environment)

Table 6-5. City of Laurel Summary: Activities that Reduce Hazards.

FLOOD
• Enforcement of floodplain management requirements. • The Department of Public Works is authorized to close roads when flooding is imminent. • City newsletter, webpage, direct mailing, door hangers, email, telephonic message, public access video and radio used for public information and alerts. • Laurel identifies drainage problems and implements improvements. • Laurel has acquired flood hazard areas along Bear Branch Creek, Crow Branch Creek and the Patuxent River (Riverfront Park) and maintains as open space and passive recreation areas. • Economic and Community Development along with the Emergency Manager use the revised FIRMs to promote flood awareness and to pursue funds to mitigate impacts to residential and commercial properties.
STREAMBANK EROSION
• Laurel addresses riverbank erosion through the purchase of flood hazard areas along Patuxent River (Riverfront Park) and subdivision regulations that require setback. • Prince George's County Department of Environment, Maryland DNR, and the M-NCPPC completing Stream Corridor Assessment (Section 4.6.1).
WINTER STORM
• Economic and Community Development enforces the building codes criteria for design snow loads for buildings and structures. • City newsletter, webpage, direct mailing, door hangers, email, telephonic message, public access video and radio used for public information and alerts • Emergency Management coordinates with Prince George's Office of Emergency Management for outreach to elderly residents. • Emergency Management monitors weather and developing conditions.

Table 6-5. City of Laurel Summary: Activities that Reduce Hazards.

HIGH WIND/TORNADO
• Economic and Community Development enforces the building codes, with criteria for design wind loads for buildings and structures. • Emergency Management monitors weather and developing conditions. • Emergency Management coordinates with other agencies and the County to operate W.A.R.N. system for citizen notification/recovery presentations online/cable.
SEVERE STORM
• Economic and Community Development enforces building codes with criteria for design wind loads for buildings and structures • Economic and Community Development enforces the building code with lightning protection requirements for nonresidential buildings. • Emergency Management monitors weather and developing conditions. • City newsletter, webpage, direct mailing, door hangers, email, telephonic message, public access television and radio used for public information and alerts. • Emergency Management coordinates with other agencies to operate W.A.R.N. system for citizen notification/recovery presentations online/cable.
DROUGHT
• WSSC manages reservoirs for potable water supply. • Laurel participates in regional drought planning initiatives (WSSC, Washington COG).
DAM FAILURE
• City has regular communication with WSSC regarding the upstream dam and receives advance notices of releases that may cause flooding
EXTREME HEAT
• City newsletter, webpage, direct mailing, door hangers, email, telephonic message, public access video and radio used for public information and alerts • Emergency Management coordinates with Prince George's Office of Emergency Management and the Agency for Aging for outreach to elderly residents.

6.3 Plan Implementation

6.3.1 Distribution

Upon adoption, the *Prince George's Maryland and City of Laurel Hazard Mitigation Plan* 2017 Update will be posted on the Prince George's County Maryland Department of Environment's and Office of Emergency web sites along with the City of Laurel's websites. Notices of its availability will be distributed to the following:

- The federal and state agencies that were notified and invited to participate in Plan development;
- The Mitigation Action Committee;
- Adjacent counties and the District of Columbia;
- Citizens who attended public meetings and provided contact information; and
- The organizations, agencies, and elected officials who received notices of public meetings.

6.3.2 Implementation and Maintenance

Through the mitigation planning process, the County agencies and the City of Laurel that are involved in managing hazards and implementing measures to minimize future risk considered a range of mitigation actions. Mitigation actions were identified and prioritized and are shown in Section 5.0. Each action is assigned a lead agency (and support agency in some instances); each lead agency is responsible for factoring the action into its work plan and schedule over the indicated time period.

6.3.3 Monitoring & Reporting Progress

The Prince George's County Department of Environment, and the Office of Emergency Management will coordinate an annual meeting of the Mitigation Advisory Committee and assemble an annual report to the Maryland Emergency Management Agency and FEMA Region III detailing annual progress on mitigation actions (Appendix D) as well as outreach activities. The City of Laurel's Emergency Manager with work with County officials to support annual reporting. In each jurisdiction, the lead agencies will be contacted and asked to report on the status of implementation, including obstacles to progress and recommended solutions.

The Prince George's County Office of Emergency Management will compile an annual report to document progress on the mitigation actions. To monitor progress, DER may convene a meeting of the appropriate agencies to discuss and determine progress, and to identify obstacles to progress, if any.

In addition to the scheduled reports, the Office of Emergency Management, the Department of Environment and the City of Laurel Emergency Manager will convene meetings after damage-causing natural hazard events to review the effects of such events. Based on those effects, adjustments to the mitigation actions and priorities may be made or additional event-specific actions may be identified. Such revisions shall be documented as outlined in Section 9.4.

6.3.4 Evaluation & Revisions

Revisions that warrant changing the text of this Plan or incorporating new information may be prompted by a number of other circumstances, including identification of specific new mitigation projects, completion of several mitigation actions, or to satisfy requirements to qualify for specific funding. Minor revisions may be handled by addenda.

Major comprehensive review of and revisions to this Plan will be considered on a five-year cycle. This Plan was first adopted in 2005 and the first updated was 2012 in 2010. The County and City will adopt the 2017 update following MEMA and FEMA conditional approval of the Draft Plan and enter the next evaluation and review cycle sometime during 2021. The Mitigation Advisory Committee will be re-convened to conduct the comprehensive evaluation and revision. At that time, natural hazard events that have occurred will be incorporated and the risk assessment will be updated if such events indicate new or altered exposures.

Particular attention will be given to progress made on the mitigation actions. Actions that have not been completed and additional actions will be re-prioritized and examined in terms of feasibility given authorities, staff resources, County and City goals, and budget limitations that will need to be taken into account at the time.

The Mitigation Advisory Committee will involve the public in the plan maintenance process and during the major comprehensive review to the Plan in the same ways used during the original plan development. The public will be notified when the revision process is started and provided the opportunity to review and comment on changes to the Plan and the priority action items. It is expected that a combination of informational public meetings and draft documents posted on the web site, and/or public County and City Council meetings may be undertaken.

6.3.5 Incorporating Mitigation Plan Requirements into Other Local Planning Mechanisms

Sections 6.0 and 8.0 describe how Prince George's County and the City of Laurel address hazards as part of their current planning mechanisms and processes, including land development, infrastructure design, and public outreach. The development of the *Hazard Mitigation Plan* did not reveal any significant gaps in how hazards are addressed in existing planning mechanisms and processes.

7 State Requirements

The *Prince George's County and City of Laurel Hazard Mitigation Plan 2017 Update* is consistent with the *Maryland Emergency Management Agency's Local Jurisdiction Hazard Mitigation Plan Update Tool Box, 2009* and the MEMA *Local Mitigation Plan Sample Scope of Work* currently found on the Maryland Emergency Management Agency's website. In particular, Section 4.0 hazards were re-organized as specified in the Sample Scope of Work.

8 City of Laurel Plan

8.1 Community Profile

The City of Laurel has features a landscape characterized by change since European settlement. Growth in the City and surrounding areas has rapidly filled in the space between Baltimore and Washington during the past three decades. Despite this growth, Laurel is a community with an identity and a particular sense of place. This identity provides a perspective of the past, to which Laurel today and Laurel in the future can relate. Laurel's history defines the character of the City; historic sites in the area provide the opportunity to maintain this character, so that the future as a place of community traces back to early colonial beginnings. Arrowheads, stone hatchets and other artifacts uncovered throughout the City of Laurel point to desultory Native American habitation long before the colonists. Human civilization occupied the upper reaches of the Patuxent River in and around the site of modern Laurel for more250 years.

Charles I of England granted Cecil Calvert the charter establishing the Maryland Colony in 1632. The charter conferred upon Calvert almost complete control over the colony subject to continued allegiance to the crown. In setting up his new colony, Calvert took for his model the existing social economic institutions of England, transferring from the Thames to the Potomac the seventeenth-century manorial system of England.

During World War I, Fort George G. Meade was established as a training camp at its present location. Other federal facilities seeking large tracts of land close to Washington also moved into the area, bringing jobs and business. The Department of Agriculture's Research Center at Beltsville was an important addition to the area's economic base. These new developments did much to break the sense of isolation brought on during the town's industrial decline earlier in the twentieth century.

In 1940 Laurel had a population of fewer than 3,000, but by 1950 the population had risen to nearly 4,500. Between 1950 and 1960 Laurel experienced rapid population growth, with the City's population reaching 8,500 by 1960. This increase was accounted for, in part, by the annexation of land, which extended Laurel's boundary south of Montrose Avenue. The decade of the 1960s brought a more moderate rate of growth, with Laurel's population reaching 10,525 by 1970. With additional annexations to the west and south, the City's population as of July 1, 2014 has risen to 24,125 (Maryland Data Services, May 21, 2015). The rapidly developing area southeast of the City, with its expanding population base, has greatly affected traffic conditions in and around the City of Laurel.

During the 1960s the Laurel mill site and the railroad station still delineated the western and eastern extent of the developed portion of Laurel. To the east a belt of marshland and the Patuxent River defines the City. The City annexed western areas extending a portion of its western boundary to Interstate 95 during 1968. The annexation of property to the east, along

MD 197, and that tract's evolution into an upper-income housing and office complex reflects the rising value Laurel's real estate. The outward expansion of the Washington urbanized area toward Laurel, and Laurel's increasing orientation to Washington has reinforced the southerly direction of growth in the area.

8.1.1 Location

The City of Laurel is located midway between the Baltimore and Washington Metropolitan Areas. As these two metropolitan areas have continued to merge, their impact on the City of Laurel has dramatically increased. This influence is also partially attributable to the transportation network linking the two areas. The east and west major arterials serve to link Laurel to Baltimore and Washington. To the east lies the Baltimore Washington Parkway (Gladys Noon Spellman Memorial Parkway) and to the west is I-95, which connects I-495, the Capital Beltway, to I-695, the Baltimore Beltway. In addition, U.S. Rout 1 serving more local traffic bisects the City of Laurel. Located within the northwest corner of Prince George's County, Laurel is also heavily impacted by several other jurisdictions. The north and northeast are Anne Arundel County and Howard County respectively with Montgomery County located approximately a mile to the west. Forming a natural boundary to the north is the Patuxent River, which serves as the dividing line between the City of Laurel and the two adjoining counties.

The Baltimore-Washington corridor has continued as the fastest growing region within the State of Maryland. Due to its strategic location and the transportation network serving it, the areas surrounding the City of Laurel have witnessed dramatic growth rates. Since the 1974 Master Plan, the most significant of these growth areas has been in Columbia in Howard County and the US 29 corridor in Montgomery County. The Columbia 14,000-acre planned community located midway between Baltimore and Washington, DC, is approaching build-out and with a 2007 population of almost 100,000 with a planned population of 110,000. Due to development factors including the use of transfer development rights, much of Montgomery County's growth has occurred along US 29, which has been made more accessible to the City of Laurel by improvements to MD 198.

Recreation attracts people to the area. Within two miles of the Laurel City limits is the Laurel Race Course, a thoroughbred track nearby in Anne Arundel County. Ownership changes and extensive capital improvements leading to substantial attendance increases. The impact of these tracks has been acutely felt in traffic increases through sections of Laurel, especially the U.S. Route 1 corridor.

Total growth within the region can be seen in the following population charts. The Baltimore Region consists of Anne Arundel, Baltimore, Carroll, Hartford and Howard Counties and Baltimore City. The Washington Suburban Region includes Frederick, Montgomery and Prince George's Counties.

Despite many technological and engineering advances, the natural environment still plays an important role in land use and development. Although often viewed as an impediment to development, the existence of the extensive flood plains along the river and its tributaries serve an important function. In addition to their functional role they also serve an aesthetic and recreational role within the overall context of the City's land use plan. From a regional standpoint the plateau region also contains the two water reservoirs within the Brighton Dam and the T. Howard Duckett Dam, which are located nearby in Montgomery and Howard Counties. There are a number of additional environmental characteristics such as soil type, sand and gravel deposits, wetlands, stream valleys and wooded areas that impact the makeup and physical development of the City. These natural attributes should be seen not as constraints to development but as valued characteristics of the City to which future development should be sensitive.

8.2 Natural Hazards in Laurel

The *Prince George's County and City of Laurel Hazard Mitigation Plan,* 2017 Update Identification and Risk Assessment (Section 4.0) describes the hazards that were investigated and the likely impacts throughout the County and within the City of Laurel where they can be delineated. Four hazards are characterized as uniformly affecting the entire County, including the City or Laurel, and are not separately described in this section: winter storms; high winds/tornadoes; severe storms, and drought. Wildfire occurrence is relatively minor in Laurel because there are no significant agricultural areas in or around the City and forested and open areas largely are confined to the floodplain and open space along the Patuxent River on the east and Fairland Regional Park on the west side of the City. Flood hazards are described.

The City's flood hazard is described in detail in Section 4.0 and its Floodplain Management Program later in this section.

Water

A major natural feature within the City is the Patuxent River, which runs along the northern City boundary. Connected with the river are three major tributaries, Walker, Crow and Bear Branches. Walker Branch traverses the northwest portion of the City and drains into the Patuxent River west of Main Street. Bear Branch originates west of Sweitzer Lane and feeds into Laurel Lakes, and eventually into Crow's Branch within the Greens of Patuxent. A large portion of those areas immediately adjacent to the tributaries is a steep slope. Water flowing through the Patuxent River is impounded between Brighton Dam in Montgomery County and the T. Howard Duckett Dam just west of Interstate 95. Drinking water for the City is pumped from the Rocky Gorge Reservoir to the Patuxent Water Filtration Plant.

A drainage basin for the area extends along a ridgeline west of the City and runs easterly to the Patuxent River near the Baltimore-Washington Parkway. The system includes direct drainage into the Patuxent River as well as into the three major tributaries. Natural drainage for the City is generally poor owing in large part to the relative flatness of the topography.

In 1980 the Maryland General Assembly enacted the Patuxent River Watershed Act. The purpose of this Act was to create a coordinated land management strategy for controlling non-point pollution within the Patuxent River Watershed. The State and all seven counties within the watershed subsequently adopted a policy plan.

As part of this effort, the City is a member of Prince George's County's Patuxent River Watershed Advisory Committee. As Laurel becomes progressively more developed and as more of the ground surface is covered with impervious materials, the amount of storm water runoff is continually increasing. Without effective countermeasures, increased pollution to the river occurs. Consequences of this pollution include silt build-up in riverbeds, brownish water from sediment runoff and debris and litter being washed into the water and along the banks.

In conjunction with this effort, the City has implemented a Patuxent River Primary Management Area, in the form of an open-space (R-OS) zoning category. The purpose of this zone is to implement the water quality and environmental protection goals of the Patuxent Policy Plan and Addendum, and other established natural resource programs, and policies for streams and their streamside environments within the City's Patuxent River Watershed. As part of this zone, minimum setbacks from the river or tributaries are enforced. The desired effect of this effort is to improve water quality through prevention of non-point source sedimentation and pollution. Mandatory increased vegetative cover will also serve to reduce both the velocity and quantity of storm water runoff, slowing the process of erosion and sedimentation.

The City is involved in three other facets of the Patuxent Policy Plan and Addendum:

1) A program undertaken to retrofit several existing storm drainage facilities, which drain into the Patuxent. These infiltration devices help mitigate the pollution impact from urban water runoff.

2) On a larger scale, the Laurel Lakes Planned Development was constructed so as to use the lake system as a regional storm water management system. Benefits of this system include storm water control and improved water quality, in addition to aesthetic and recreational considerations.

3) An ongoing program involves the Department of Parks and Recreation's Riverfront Park. Acquisition of lands adjacent to the River is continuing through the subdivision dedication process for the creation of a largely undisturbed passive park.

8.2.1 Land Use and Development Trends

The City of Laurel of Laurel comprises a total of approximately 3,027 acres, or 4.73 square miles per the *City of Laurel General Plan*, September 26, 2016. This figure represents an increase of 267 acres since 2008 or a total increase of 9.8 percent in area. This increase was due to two Mixed-

Use Transportation annexations; Anderson's Corner, 45 acres and Strittmatter Land, LLC, 62.3 acres. These parcels were "vacant" prior to the annexation.

Nearly 100 percent of the City of Laurel's area is either developed, has received approval for its development, or in some stage of development approval. The City of Laurel land area has increased by 96.58 percent since 1974 through annexation. Since the 1974 General Plan, there has been a significant increase in developed land. This trend is indicative of the suburbanization of the area and the evolving role of the City of Laurel as a full service core urban area. These figures also reflect land values within the City of Laurel, as well as its strategic location.

One land use, which has seen a significant increase in both percentage and acreage, is the Public and Institutional Classification. This category includes active and passive parks, open space, churches, schools, public and quasi-public uses. From 2005-2015, the total land devoted to these uses has increased from 475 acres to 791 acres, a 66.5 percent increase. The majority of this area has been a golf course, the Greenview Drive Park, and Bear Branch Stream Valley Park at the Greens of Patuxent, and the Stephen P. Turney Recreation Complex. Since 2005, land that has been donated to the City of Laurel has been open space, conservation, and forested areas.

Land devoted to transportation, including streets and public rights-of-way, has increased concurrently with development. The 2015 acreage dedicated to transportation use was 490 acres compared to 411 acres in 2005, an 8.45 percent increase.

As land prices have risen, undeveloped land within the City of Laurel has become extremely scarce. There are a few infill lots scattered throughout the City. Residentially zoned land had previously provided the bulk of inventory of vacant land. The 2015 vacant land category includes annexed areas which are now within the City of Laurel since 2005. The City of Laurel's inventory of vacant land has dwindled to a very small proportion, 3 percent.

The analysis of land use presented in the *City of Laurel General Plan* provides a depiction of current and future trends. Due to robust commercial development and ease of access through various transportation modes, Laurel has become a central business and retail center for areas proximate to the City. Increased commercial office space has leveraged employment opportunities for City residents as well as nearby Prince George's County, Montgomery County, Howard County and City of Baltimore residents. While the growth of Laurel area brings challenges, it has also provided a diverse complement of amenities such as increased. Public recreation and open space facilities and more diverse retail development. These trends will inform future land use decisions.

There is very little vacant land within the City, but vacant parcels are scattered throughout the City that are appropriate for infill development. Any sizeable development would require the assemblage of a number of parcels and the razing of existing structures. To facilitate redevelopment and to create additional economic development opportunities for property d the City Zoning Regulations were amended to create Revitalization Overlay Areas. Revitalization

Overlay Areas offer flexibility by offering intensification or increased density of properties in Areas that are targeted for their potential economic development, for superior amenities, land uses, or achieving superior land design.

The Revitalization Overlay to be an alternative form of development designed to facilitate redevelopment and provide for specific land uses and configurations recommended for the continued development and economic health, well-being and stability of city neighborhoods.

The major focus of future growth in proximity to the City is expected to take place within Konterra. This project comprises over 2,000 acres, which are almost entirely undeveloped. Although the project is in the planning stage, its ultimate build-out over a 20-year period is certain to have an effect on not only the City but also the region. Specific land use, population and employment projections were not available for the City.

Table 8-1. City of Laurel Land Use, 2015.

Land Use	Total Acres		% of City's Total Acres	
	2005	2015	2005	2015
Single, two and three family	1.092	790	395	26%
Multi-family	319	200	12%	7%
Total Residential	1,411	990	51%	33%
Commercial	327	433	12%	14%
Industrial	136	154	5%	5%
Public & Institutional	475	791	17%	26%
Transportation	411	490	15%	165
Mixed-use Transportation	0	87	0%	3%
Vacant	0	82	0%	3%
Total	2,760	3,027	100%	100%

Source; City of Laurel General Plan, August, 2016.

8.2.2 Population

The population for the City of Laurel is 26,215 as of the 2015 US Census Bureau population estimates. This is a 4.4 percent increase since 2010 Census. Table 8-2 shows the Population breakdown for the City of Laurel. Projections are not available for the City through the US Census, the Maryland Department of Planning or in the *City of Laurel General Plan* because projections are generally performed only for counties and large cities.

Table 8-2. Population for City of Laurel.

Statistics	Population	Percent Change
Population estimate base, 2010	25,115	
Population estimate 2015	26,215	4.4 percent
Veterans, 2011-2015	1,625	

Source: U.S. Census Bureau QuickFacts

Race and Sex

According to the 2010 U.S. Census Bureau data, the majority of the population in the City of Laurel was reported to be of a single race (88.7 percent). Of the total population reporting one race, 48.9 percent were Black or African America, 30.1 percent were White, and 9.2 percent were Asian. Only 15.5 percent of the population were reported to be of Hispanic or Latino in origin. Table 8-3 shows the demographics for the City of Laurel.

Table 8-3. Race Demographics for City of Laurel.

Statistics	Percent of Population	Approximate Number of Persons
White alone, percent, 2010	30.1%	7,891
Black or African American alone, percent, 2010	48.9%	12,819
American Indian and Alaska Native alone, percent, 2010	0.4%	105
Asian alone, percent, 2010	9.2%	2,412
Native Hawaiian and Other Pacific Islander alone, percent, 2010	0.1%	26
Two or More Races, percent, 2010	3.8%	996
Hispanic or Latino, percent, 2010	15.5%	4,063
White alone, not Hispanic or Latino, percent, 2010	24.4%	6,396

Source: U.S. Census Bureau QuickFacts

In the City of Laurel, there are more females than males. Female persons account for 52.3 percent of the population, equaling 13,710 persons. Male persons make up the remaining 47.7 percent of the population, equaling 12,505 persons. Table 8-4 shows the gender demographics.

Table 8-4. Gender Distribution in the City of Laurel.

Statistics	Percent of Population	Approximate Number of Persons
Female persons, percent, 2010	52.3%	13,710
Male persons, percent, 2010	47.7%	12,505

Source: U.S. Census Bureau QuickFacts

Language

About 25.2 percent of residents in the City of Laurel were foreign-born according to the 2015 U.S. Census bureau data. Census data also reports that 30.3 percent of persons age five and older speak a language other than English at home. These statistics indicate there may be a significant portion of the community that may require special consideration when developing hazard reduction and outreach strategies for the community.

Table 8-5. Language Demographics for City of Laurel.

Statistics	Percent of Population	Approximate Number of Persons
Foreign born persons, percent, 2011-2015	25.2%	6,606
Language other than English spoken at home, percent of persons age 5 years+, 2011-2015	30.3%	7,943

Source: U.S. Census Bureau QuickFacts

Age

Another type of special needs group is characterized by age. The 2010 U.S. Census Bureau data shows that about 8.0 percent of the population in the City of Laurel is under the age of five while approximately 22.6 percent is under the age of 18. Additionally, approximately 7.0 percent of the population is age 65 and above. These figures are not similar to the Maryland State averages, with the 65 and over population being 2.4 percent below the state average (14.1 and the five and under population being 1.9 percent greater than the state average (6.1 percent). Table 8-6 shows the age statistics for the City of Laurel.

Table 8-6. Age Demographics for City of Laurel.

Statistics	Percent of Population	Approximate Number of Persons
Persons under 5 years, percent, 2010	8.0%	2,097
Persons under 18 years, percent, 2010	22.6%	5,925
Persons between 18 and 65 years, percent, 2010	62.4%	16,358
Persons 65 years and over, percent, 2010	7.0%	1,835

Source: U.S. Census Bureau QuickFacts

Education

Data from the 2015 Census estimates shows that about 87.5 percent of residents in the City graduated from high school and 41.8 percent hold bachelor's degrees or higher. These numbers, coupled with the population characteristics described in the previous paragraphs, are important to inform public outreach programs. The content and delivery of public outreach programs should be consistent with the audiences' needs and ability to understand complex information. Table 8-7 shows the education statistics for the City of Laurel.

Table 8-7. Education Statistics for the City of Laurel.

Statistics	City of Laurel	Approximate Number of Persons
High school graduate or higher, percent of persons age 25 years+, 2011-2015	87.5%	22,938
Bachelor's degree or higher, percent of persons age 25 years+, 2011-2015	41.8%	10,958

Source: U.S. Census Bureau QuickFacts

These statistics slightly differ from the Maryland State percentages of 89.4 percent of persons graduated from high school and 37.9 percent hold bachelor's degrees or higher.

Income

As of 2015, the average median household income in the City of Laurel was approximately $68,517, which is approximately 8.1 percent less than the state average according to the 2015 U.S. Census estimates. About 9.9 percent of residents within the City of Laurel live below the poverty line. This rate is significantly lower than that of the national rate of 14.8 percent in 2015 and slightly below the state rate of 9.7 percent. These figures indication that some families will not have available resources for property mitigation projects requiring self-funding or even a grant match. Table 8-8 compares the income statistics for the City of Laurel and the State of Maryland.

Table 8-8. Income Statistics for the City of Laurel and the State of Maryland.

Statistics	City of Laurel	State of Maryland
Median household income (in 2015 dollars), 2011-2015	$68,517	$74,551
Per capita income in past 12 months (in 2015 dollars), 2011-2015	$34,618	$36,897
Persons in poverty, percent	9.9%	9.7%

Source: U.S. Census Bureau QuickFacts

8.2.3 Housing

In 2010, there were 11,397 housing units in the City of Laurel according to the 2010 U.S. Census. When considering mitigation options, special attention should be given to the difference in capabilities between owners and renters. Table 8-9 shows the housing statistics for the City of Laurel.

Table 8-9. Housing Statistics for the City of Laurel.

Statistics	City of Laurel
Housing units, 2010	11,397
Owner-occupied housing unit rate, 2011-2015	47.1%
Median value of owner-occupied housing units, 2011-2015	$238,000
Median selected monthly owner costs -with a mortgage, 2011-2015	$2,119
Median selected monthly owner costs -without a mortgage, 2011-2015	$617
Median gross rent, 2011-2015	$1,388
Households, 2011-2015	9,995
Persons per household, 2011-2015	2.57
Living in same house 1 year ago, percent of persons age 1 year+, 2011-2015	80.2%

Source: U.S. Census Bureau QuickFacts

Future Growth and Development

Because of Laurel's location within the midst of one of the region's fastest growing areas, it is expected that the City's population will continue to grow. However, without additional annexations, further growth will be limited to infill development in existing residential areas and redevelopment.

Future population characteristics should be expected to follow a number of fairly well established trends. With the general decline in birth rates as well as the continued maturing of the population born during the 1950s and 1960s, it is expected that the average age of Laurel residents could rise. This possibility has important implications for a variety of public services to support the elderly through adequate and affordable housing to accessible public transportation.

Trends influencing household size will also continue as an important factor for future land use decisions. The 2010 Census revealed a reversal in trends. Census numbers for Prince George's County shows a continued drop in household size from 2.89 in 1980, 2.76 in 1990, 2.74 in 2000, but an increase to 2.78 in 2010. Similarly, the City of Laurel household size was 2.4 in 1980, 2.25 in 1990, and 2.22 in 2000, but increased to 2.37 in 2010. Among those factors, influencing household size are choices in life style, housing preferences, the number of two-income families and the available housing stock. One factor, which may partially offset the expected drop in household size, is the development of new housing and who is occupying those new residential units. The declining average household size reflects regional and national trends, which are the result of an aging population and declining birth rates. However, with increased new, younger families moving into the City there will be a corresponding increase in the City's population of 14 years old or younger within the next several years. As these families grow and prosper, it will be important to provide a sufficiently wide choice of housing options. Also, indicative of this smaller household size is the relative increase in unmarried property owners. The percentage of single individuals over the age of 15 within the City increased from 32.0 percent to 34.9 percent between 1990 and 2000, and 37.6 percent in 2010.

Additional population trends which may be expected to continue into the future include climbing educational attainment and demand for skilled professionals requiring a higher educational level. Other anticipated trends include an increase in the number of two-income families and a relative increase in household and per-capita income which will be necessary to keep pace with the higher income housing being built within the City.

The City of Laurel is approximately 3,027 acres, or 4.73 square miles. In 2015, residential land use comprised of 990 acres (33 percent) of the City's total area. Commercial acreage, which includes retail, office, and service delivery use totaled 433 acres (14 percent).

Public and Institutional land use, which includes active and passive parks and open space, churches, schools, public and quasi-public uses totaled 791 acres (26 percent) while Mixed Use Transportation (M-X-T) use totaled 87 acres (2.9 percent). Industrial land use totaled 154 acres (5 percent) and vacant land totaled 82 acres (2.7 percent). The remaining 490 acres (16 percent) is streets and public rights-of-way.

8.2.4 Business and Labor

The sectors with the most employees in the City of Laurel are:

- Retail trade
- Information
- Health care
- Accommodation and food services
- Finance and insurance
- Professional services
- Community services

Table 8-10 lists the establishments with the top employers in the City of Laurel.

Table 8-10. Top Employers in the City of Laurel, 2017.

Company	Product / Service	Total Employed
Booz Allen Hamilton	Management Consulting	825
Safeway	Groceries	716
Domino's	Restaurant	658
Marriott International, Inc.	Hotels & Motels	543
Johns Hopkins University	Medical services	497
Leidos	Research & analysis	471
Harris Teeter	Groceries	436
Y of Central Maryland	Community Services	406
CACI	Information	364
PETSMART	Retail Trade	348

Source: SimplyHired for Laurel, Maryland

As of 2014, there were a total of 3,225 firms in the City of Laurel, according to the U.S. Census. Table 8-11 breaks down business and labor statistics for the City of Laurel. As of December 2016, the unemployment rate for the City of Laurel was 3.5 percent which is lower than the state average of 4.2 percent.

Table 8-11. Business and Labor Statistics for the City of Laurel.

Statistics	City of Laurel
All firms, 2012	3,225
Men-owned firms, 2012	1,629
Women-owned firms, 2012	1,266
Minority-owned firms, 2012	2,207
Nonminority-owned firms, 2012	878
Veteran-owned firms, 2012	334
Nonveteran-owned firms, 2012	2,740

Source: U.S. Census Bureau QuickFacts

8.2.5 Transportation

Laurel is traversed from north to south by U.S. Route 1 (US 1), which links Key West, Florida with the Canada–U.S. border in Maine. On the west, the city is bordered by Interstate 95, and beyond the eastern border lies the Baltimore-Washington Parkway. Crossing all of these highways is the east-west artery Route 198 (MD 198), which intersects with US 1 in the heart of Laurel. Other major state roads in Laurel are MD 216, which connects the city with southern Howard County, and MD 197, which runs from Laurel to Bowie. The eastern terminus of MD 200 (the Intercounty Connector) lies just south of the city limits and connects Laurel with Gaithersburg.

Two MARC train stations on the Camden Line to Baltimore and Washington, D.C. are located in Laurel: Laurel Station and Laurel Racetrack Station, the latter with minimal service. Laurel Station is a particularly notable example of the stations designed by E. Francis Baldwin for the Baltimore and Ohio Railroad.

The Washington Metropolitan Area Transit Authority (WMATA) Metrobus service provides four lines into Laurel, and local Connect-a-Ride and Howard Transit bus service is available. Several taxicab and shuttle services also support the region.

Suburban Airport, a general aviation airport, is located on Brock Bridge Road, nearby in Anne Arundel County border. For decades the airport has provided general aviation access for medivac helicopters, flight training, business travelers, and serves as a relief airport for light traffic into and out of the two major regional airports. Baltimore-Washington International Thurgood Marshall Airport is within 15 miles and Ronald Reagan Washington National Airport is within 25 miles of Laurel.

8.2.6 Infrastructure

The Public Service Commission of Maryland regulates gas, electric, telephone, water, sewage disposal companies, and telecommunications companies.

Electric

The City of Laurel is served by six electricity providers: Constellation Energy, First Energy, Baltimore Gas and Electric, PEPCO, Spark Energy, and SMECO.

Natural Gas

Natural gas is provided to the City of Laurel by Washington Gas and Baltimore Gas and Electric.

Telephone

Local telephone service is provided throughout the City of Laurel by Verizon Communications Inc. and AT&T.

Public Water and Wastewater

In the City, public water and wastewater treatment is provided by the Washington Suburban Sanitary Commission (WSSC).

Television

Cable television service is provided within the City of Laurel by Verizon FIOS, Comcast, and Xfinity along with satellite and internet providers.

Internet

Internet is provided within the City of Laurel by Verizon FIOS, Comcast, and Xfinity.

8.3 Capability Assessment

The City of Laurel uses typical Maryland city management programs, policies and procedures outlined in a series of City Council Ordinances enacted after creation or revision, public hearing, and two readings before the City Council unless a different procedure is followed as appropriate.

8.3.1 City Government Overview

The City of Laurel, Maryland is governed by a Mayor and City Council form of government in accordance with its Charter, adopted on April 4, 1870. The elected officials consist of the Mayor, serving a four-year term, and five Council members who serve two-year terms. The Mayor and City Council provide community leadership, develop policies to guide the City in delivering services and achieving community goals, and encourage citizen awareness and involvement:

- **Office of the Mayor.** The Mayor is the Chief Executive of the City with all the powers necessary to secure the enforcement of all ordinances and resolutions passed by the City Council. As the leading elected official of the City, the Mayor is empowered to approve or veto legislation, prepare the annual budget, and directly supervise the administration of the City. The Mayor has authority to declare emergencies and has broad emergency powers during a declared emergency.
- **City Council.** The City Council, as the legislative body of the City of Laurel, appropriates funds, considers and enacts resolutions, and adopts regulations and ordinances for the protection of rights and privileges, peace and good government, and safety and health of all citizens.

The key elements of the City's organization engaged in planning for, responding to and mitigating natural hazard events as well as regulating land development are:

- **City Administrator.** The City Administrator carries out the charges of the Mayor and City Council through day-to-day management, support, and oversight of all City departments and functions.
- **Police Department.** The Laurel Police Department is a full-service law enforcement agency. In addition to its law enforcement responsibilities, the department works with the Emergency Manager to alert citizens to pending flooding. Police officers have the authority to provide control during situations that may create threats to life and property.
- **Economic and Community Development.** The Department of Economic and Community Development maintains and oversees the built environment within the City of Laurel. The department is responsible for zoning compliance, subdivisions, development and historic preservation review, economic development, affordable housing and implementation of the City's Master Plan. These activities are intended to improve the quality of life in the City. The City's zoning authority is independent of Prince George's County. Article IV, Division 1 of the City's Unified Land Development Code (ULDC) outlines the Floodplain Management Regulations.

- **Public Works.** Public Works provides engineering planning, design, and construction administration for street rehabilitation and construction projects on City property. Technical support is provided to other City departments. It conducts engineering review of plats and plans for subdivisions and site plans for single lot developments. To assure compliance with City requirements, subdivision improvements are inspected during construction. The department maintains record drawings of construction improvements and topographic maps, develops and implements the Capital Improvement Program (CIP).
- **Budget and Personnel Services.** The Department administers all of the financial activities of the City government, administration of all employee benefits and advises and assesses the City management staff in all other personnel matters.
- **Parks and Recreation.** Parks and Recreation maintains the City's 21 park and recreation facilities and approximately 288 acres of parkland and associated equipment. It is responsible for developing and implementing recreational programs. During times of emergency the department is responsible for opening shelters and procuring food. The City's two shelters have been certified by the American Red Cross (and both are outside the mapped floodplain).

Services Department. Emergency Management. The Emergency Manager (EM) is the City's designated official responsible for managing the Emergency Operations Center (EOC) during activations to support the Incident Commander responding to and mitigating all hazard emergency incidents. The EM is responsible to identify, develop, and implement rules, regulations, and policies regarding the preparedness, mitigation, response, and recovery from disasters within the City boundaries. During normal operations the EM works for the Emergency Services Director and coordinates closely with the City Administrator. However, during emergency activations the EM works directly for the Mayor and coordinates with the Emergency Services Director and the City Administrator to ensure the management of resources during these incidents. Additionally, the EM is the City's designated Floodplain Manager who works closely with and coordinates with the Department of Economic & Community Development on all floodplain issues within the City of Laurel.

- **Emergency Services Department.** The Department of Emergency Services (ES) reports to the City Administrator's Office and the Deputy City Administrator is the Director of Emergency Services. The department coordinates activities associated with the Laurel Police Department and the two fire service departments within the City (Laurel Volunteer Fire Department & Laurel Volunteer Rescue Squad) regarding providing emergency services to the citizens of Laurel. The ES Department provides guidance and leadership to the EOC's Policy Room during emergency activations and major incidents within the City. Additionally, the ES Department coordinates the activities of the

Emergency Manager and all associated programs within the emergency management field.

8.3.2 City of Laurel Master Plan

The City of Laurel strives to maintain a high quality of life for its citizens through the regulation of land uses and the protection of natural resources. The City approved a Comprehensive Master Plan in 1961 and subsequent Master Plans in 1974, 1989, 1997, and 2008, amended September 28, 2009 by City Ordinance Number 1647. The most recent City Master Plan was adopted by City Council through Ordinance Number 1873 on September 26, 2016. The Master Plan is kept on file and available for inspection at the office of the clerk to the city council and is available online.

8.3.3 Development Controls:

The Unified Land Development Code was adopted on September 26, 2016 with the Master Plan through Ordinance Number 1877. Various governmental functions related to land use, development and re-development are administered through this code and amendments.

Sectional Map Amendment – The City has adopted the Sectional Map Amendment which coordinated the City Zoning Map with the proposed Land Use Categories approved in the Master Plan Comprehensive Land Use Plan Map. The Sectional Map Amendment was enacted to bring zoning in compliance with the Master Plan. Approval of any future Zoning Map amendments will be predicated upon findings as stipulated in Land Use, Division I. Single-Jurisdiction Planning and Zoning, Maryland Land Use Code Annotated (2014) as may be amended.

Comprehensive Land Use Map – As in the previous master plans, a study area outside the City's corporate limits is considered. General land use proposals are made for those areas surrounding the City which are integral to the functioning of the City. Development on the boundaries of the City has and will continue to have an impact on the City in terms of the quality of life and the ability to deliver services to City residents. Land use recommendations are made in anticipation of future development

Zoning Regulations – The City Zoning Regulations, contained within the Unified Land Development Code, Chapter 20 of the Laurel City Code is a major tool which implements the goals and objectives of the Master Plan. Within the Code are the specific regulations that detail permitted uses and the location of buildings in relation to the land. The City of Laurel pursuant to the authority vested in it by Title I – V inclusive, of Article 66(B), as amended, of the annotated Code of Maryland (1957 Edition) adopted City Ordinance Number 427 on January 9, 1961 creating and establishing regulations dividing the City into districts or zones for zoning purposes

The City of Laurel Land Development Code provides for twenty-three individual zoning districts organized into five general zoning classifications: residential, commercial, office, industrial and planned development. The Code also provides for revitalization, neo-traditional, mixed use, transit-oriented and arts & entertainment overlay areas to supplement the "by right" development options available within the five zoning classifications.

Subdivision Regulations – Subdivision regulations provide for orderly growth and well-planned development by setting standards for the uniform control of development which involves the subdivision of land into more than one parcel. Subdivision regulations should encourage a desirable relationship of subdivision design to the general physical characteristics of an area and also encourage preservation of natural attributes to foster compatibility of development with the natural character of the land. Subdivision regulations should also provide standards for density, open space, suitable building space, and vehicular and pedestrian traffic. Requirements for the provision of potable water, sanitary sewer, stormwater drainage, and other utility systems are established within these regulations. Other factors, such as the limitations on development created by steep slopes, soils type(s), and flood plains are also contained in the Subdivision Regulations.

The City of Laurel pursuant to the authority and provisions of Titles I – IV, inclusive, of Article 66(B) of the Annotated Code of Maryland (1968 Edition, as amended) and pursuant to the authority and provisions of the Charter of the Mayor and City Council of Laurel adopted City Ordinance Number 476 on April 14, 1969 establishing subdivision regulations governing procedures for approving preliminary plans and final plats, design standards for streets, alleys, easements, blocks, lots, public sites and open spaces, required improvements of paving, stormwater drainage, potable water supply, and sanitary sewers. These regulations have been updated frequently; most recently through the On December 23, 1974 the Mayor and City Council adopted City Ordinance Number 525, a comprehensive amendment to the City Subdivision Regulations. The Regulations have been amended, as necessary, to comply with State regulations and subsequently adopted Master Plans.

Historic Districts – On November 10, 1975 the Mayor and City Council adopted City Ordinance Number 535 creating the City of Laurel Historic District Commission. In May 1978 Historic Districts Number 1, 2 and 3 officially recognized in order to safeguard the heritage and atmosphere of the older sections of the City. Historic District Number 4 was established in May 1979, District 5 in May 1980, District 6 in July 1981and District 7 in September 1983. In accordance with the powers afforded under Article 66(B) of the Annotated Code of Maryland, the Historic District Commission, through the Building Permits process, oversees all construction, improvements, and requested demolitions within the seven (7) Historic Districts. Decisions made by the Commission are based on a Historic District Design Guidelines meant to ensure the retention of Laurel's historic structures. As a part of this program the City also offers a tax credit program to encourage public participation.

Housing-Property Maintenance Code – A property maintenance code governs the maintenance of existing residential structures and all existing premises and constitute minimum requirements and standards for premises, structures, equipment and facilities for light, ventilation, space, heating, sanitation, protection form the elements, life safety, safety from fire and other hazards, and for safe and sanitary maintenance.

In September 1977 the Mayor and City Council adopted a Housing-Property Maintenance Code for single-family and multi-family dwellings within the City that established minimum standards governing the condition and maintenance of dwellings, multi-family dwellings and dwelling units. The City of Laurel adopted the Prince George's County Housing Code in August 1983 and made a concentrated effort of enforcement through a residential rental licensing process.

The rental licensing program is a program that sets minimum property maintenance standards that must be met by all rental property owners. This includes multi-family, single-family detached, townhouse, duplex, condominium, apartment units above or below businesses and individual rooms rented out. All rental units are re-inspected every three (3) years. This program is effective in maintaining a higher level of quality and safety among rental dwellings.

The Mayor and City Council subsequently adopted the Building Officials and Code Administrators International, Inc. 1990 Edition of the National Property Maintenance Code in November 1993, the 1998 Edition in February 1999, the 2006 Edition in April 2009. The International Code Council (ICC) 2012 Edition of the International Property Maintenance Code was adopted in July 2012, and the 2015 Edition in April 2015.

Building Code – A Building Code regulates the construction of buildings and structures. The purpose of the Code is to establish the minimum requirements to safeguard the public health, safety and general welfare through structural strength, stability, sanitation, adequate light and ventilation, energy conservation, and safety to life and property from fire and other hazards.

The Mayor and City Council of Laurel adopted a Building Code in July 1954 to regulate the design, construction, alteration, repair, equipment use, location, occupancy, maintenance, demolition and removal of buildings and structures. The City has over time amended and reorganized the provisions of the Building Code to keep-up-to-date with the latest edition of the International Building Code. The Mayor and City Council adopted the International Code Council International Building Code, 2015 in April 2015.

The building codes include provisions to ensure that buildings are designed and constructed to resist certain environmental loads. The minimum design must account for loads associated with a basic wind speed (3-second gust) of 90 miles per hour. The minimum snow load for roof design is 25 pounds per square foot.

Floodplain Management – Tropical Storm Agnes in June 1972 generated the flood of record in Laurel where WSSC measured high water marks that indicated the recurrence interval of the

event was slightly greater than the 1 percent-annual-chance flood (100 years). This event continues to influence the City's approach to floodplain management and public safety 45 years later.

The most significant natural hazard that impacts Laurel is flooding, particularly flooding of the Patuxent River (Figure 8-1). A large water supply dam that is owned and operated by the Washington Suburban Sanitary Commission (WSSC) is located immediately upstream of I-95 above the City. Three Patuxent tributaries flow through the City: Walker, Crow and Bear Branches.

Laurel has two distinct types of flood risk. The more probable risk is riverine flooding due to prolonged rainfall that causes waterways to overflow their banks and which may prompt WSSC to open floodgates. Although failure of the dam is extremely unlikely, the consequences associated with dam breach have been examined. Because of the City's proximity to the dam, City officials are in regular communications with WSSC and participate in periodic exercises of the emergency plan and notification procedures.

The City of Laurel does not have any properties that are designated by FEMA as "repetitive loss properties" (insured by the NFIP and have received two or more flood insurance claims of at least $1,000) or "severe repetitive loss properties" but continues to monitor property status annually.

The City adopted new flood insurance rate maps, the Special Flood Hazard Area and a new, updated floodplain management ordinance, which is Article IV of the Unified Land Development Guide on September 16, 2016 through City Ordinance 1868. As with all city ordinances, the Floodplain Management Ordinance is accessible online.

It has long been an ambition of the City to pursue participation in the Community Rating System (CRS) which can provide a reduced flood insurance premium depending on how FEMA evaluates the City's floodplain management program and awards categorized points for program performance. It is anticipated that the City will begin evaluating CRS requirements and its eligible status to receive CRS points later in 2017.

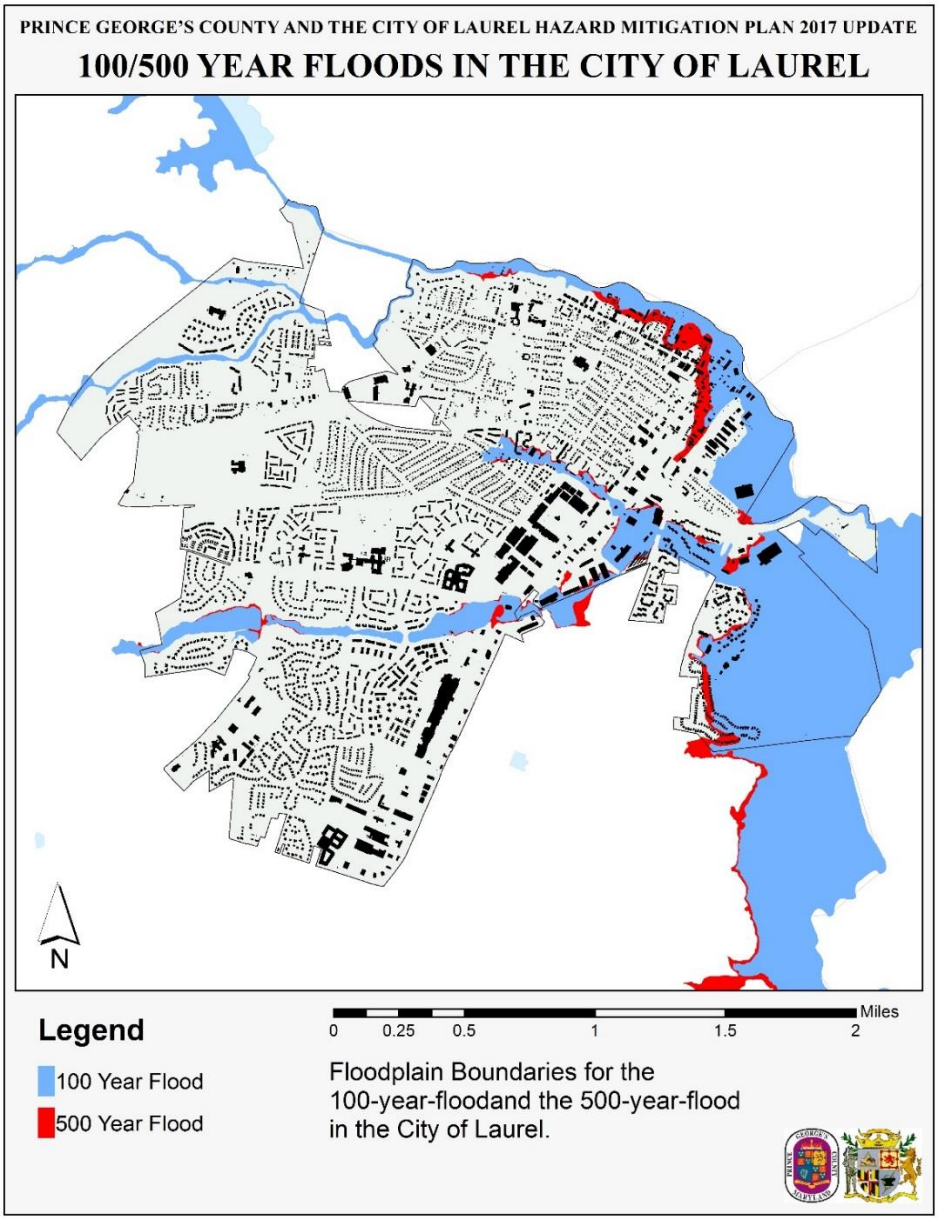


Figure 8-1. 100- and 500-Year Floodplain, City of Laurel, Maryland.

Table 8-12. Community Participation in the NFIP as of June 30. 2017.

CID	County Name	Community Name	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Reg-Emer Date
240053A	Prince George's County	City of Laurel	08/09/74	11/01/78	09/16/16	11/01/78

Source: FEMA Community Status Book Report, Maryland June 30, 2017

The City of Laurel administers regulations and ordinances to regulate flood hazard areas to minimize exposure of people and property. Administration of the floodplain management ordinance is the joint responsibility of the City's Floodplain Manager (Director of Economic and Community Development). The Emergency Manger is becoming involved with the floodplain management program.

The effective Flood Insurance Rate Map is currently under review by FEMA for revisions to reflect new development and mitigation efforts. The current Flood Insurance Rate Map (Panel #240053 0001E, revised 9/16/16) is used as the minimum flood hazard area within which development must conform to floodplain management regulations. If a floodplain has not been delineated, the City can require applicants to provide a survey that evaluates and defines the flood hazard area.

All proposals for work in flood hazard areas are subject to the requirements of the Maryland Department of the Environment. The City requires applicants to obtain all State permits prior to issuing the local permit.

The City's standard procedure for determining the extent of the mapped flood hazard area through ground-truthing is to measure off of the centerline of the waterway shown on the flood hazard map and apply that distance to the applicant's site plan. Where Base Flood Elevations are shown, there is no cross check with the topography and the flood zone is superimposed on the site plan.

For individual building permits issued for single lot development, the City requires owners to submit an Elevation Certificate to document compliance before the Use and Occupancy Permits are issued.

The Subdivision Regulations of the City of Laurel outline the requirements for the design, review and approval of subdivisions. The City expressly restricts the subdivision for development of any real property which lies within the fifty-year floodplain of any streams or drainage courses. Preliminary plans (plat plans) are required to show waterways, drainage structures, and flood elevations and boundaries of flood-prone areas (including floodways). Where a proposed subdivision includes a floodplain area and the area is to be left in open space, the area is placed in a floodplain easement or made available for public park or recreation uses. Areas under a floodplain easement may be used for utility lines or storm drainage facilities.

In approved subdivisions that include floodplain areas, development permits are not issued for any type of new construction within the area delineated as floodplain. Platted lots may include flood hazard areas (or other areas deemed to be "unsafe land") provided proposed building sites meet zoning setbacks, 100-foot setback from the edge of a watercourse shown on the flood insurance rate map plus an additional 25-foot setback from the floodplain. If the proposal includes fills or other structure elevating techniques, levees, channel modifications, or other

methods to overcome flood or erosion-related hazards, they must be designed in compliance with the City's flood hazard prevention requirements.

Applicants for work on existing buildings are required to submit the value of work proposed. For work on floodplain buildings, that value is compared to the assessed value as a screening for whether the proposed work constitutes a substantial improvement (50 percent or more of market value). Every application for renovation, improvement, or repair of existing buildings is checked to determine if the building is located in the mapped flood hazard areas. The City's Floodplain Manager or an authorized designee must review and sign-off on any permits for work on existing flood-prone buildings.

For the rehabilitation of structures within the floodplain, the City requires mitigation efforts where possible. Most structures already in the floodplain are slab-on-grade. Elevation Certificates are required before any permits are issued to insure that, in as much as possible, that floor elevation changes are such that the grade of the finished first floor is above the floodplain elevation and that all electrical outlets are at least 1.5 feet above the flood elevation.

Three buildings are associated with the Laurel Municipal Swimming Pool are flood-prone. Critical facilities exposed to the flood hazard include an existing building that was purchased in 2007 and converted to the Police Station (partially encroaches the floodplain and several buildings in the maintenance complex. Mitigation solutions are being evaluated for these sites. In addition, Laurel has engaged with a consultant to evaluate potential mitigation projects eligible for FEMA Hazard Mitigation Assistance funding and will pursue the highest ranked potential projects as funding opportunities arise.

The Maryland Department of the Environment periodically conducts a compliance audit of the City's floodplain permitting and review activities. The City has consistently been found in compliance since 1978 (confirmed by the most recent visit was December 21, 2010), when the City began participation in the National Flood Insurance Program. The Community Assistance Visit letter and report dated March 27, 2012 found Laurel's administration of their floodplain management program to be in good standing and noted the city's commitment to the floodplain management program.

8.3.4 Fiscal Programming:

Capital Improvement Program – The Capital Improvement Program is a fiscal plan, or a schedule, for financing public improvements over a period of time. The schedule balances the City's need for public improvement with its ability to finance improvements. It spreads the improvements over a six (6) year period in order to stabilize expenditures and to avoid sharp fluctuations in ad valorem tax rates. With capital programming it is possible to reconcile major improvements with financial resources.

The Capital Improvement Program is developed using the general guidelines outlined in the Master Plan. These guidelines for growth and development help City officials to anticipate the need for public improvements by approximating the period by which facilities must be in place and by determining the type of facility needed. The plan, in delineating future development and population levels which are based on phasing considerations, presents the factors which influence the demand or need for future public facilities and other capital expenditures and the general framework required for capital expenditure. If the Capital Improvement Program is developed on the basis of the Master Plan, 2016.

The City Capital Improvement Program is updated annually to provide a continuous plan for the scheduling of major capital expenditures and for formulating the annual City budget. Annual revisions include the addition of a capital budget to fund projects in the next fiscal year. At the time the Capital Improvement Program is updated, proposed improvements are review against Master Plan goals and objectives to insure consistency.

There are several noteworthy ongoing and new initiatives related to the Master Plan:

- Base Map Update: Project Description and Justification: This project is intended to provide photometric mapping and asset inventory in support of the City's proposed GIS system and is needed in order to comply with "GASB 34". This effort will provide a valuable data base for the City's planning and maintenance activities. The current base map was compiled in 1991, and does not include any features constructed after that time. This project is on-going and will be done in several phases 2018: This project will fund the necessary GIS changes to bring the city's base map into compliance with NEXGEN 911 requirements. Project funded with Public Safety Surcharge money.
- River Monitoring System: Project Description and Justification:
    - FY2015: Monitoring system that alerts City Administration if water levels rise above a certain fixed depth. Project was completed in fall 2015.
    - FY2018: Routine maintenance. Project funded with Public Safety Surcharge money.

- **Hazard Mitigation:** Project Description and Justification: The Hazard Mitigation project was added to the FY2017 by Ordinance 1904. Prince George's County is now requiring the City of Laurel to provide its own hazard assessment for inclusion in the Prince George's County and City of Laurel Maryland (Five-Year) Hazard Mitigation Plan.

  Plan. Funding of $34,000 is available from the Public Safety Surcharge Fee. These funds will be utilized to work with a consulting firm that will perform the hazard assessment and develop the City's Hazard Mitigation Plan to enable the City to qualify for Federal mitigation grant funding.

- **Bridge Repair**: Project Description and Justification: Prince George's County provides the City with Inspection reports for the Bridges in the Laurel Area. This is the first of two projects designated to provide necessary repairs to bridges the City is responsible for maintaining. Additional bridges are in need of repair. Dorset Road over Tributary to Patuxent, Fifth Street over Tributary to Patuxent and Eighth Street Bridge. Although there is work to be done, there are no structural concerns and the bridges are safe. The work is primarily maintenance related. On-going Bridge Maintenance is necessary to address minor repairs to City Bridges to reduce the possibility of these problems becoming larger problems affecting the convenience and safety of the motoring public. FY2018: Funding is requested for necessary bridge repairs as indicated by P.G. County inspectors.

The budget proposed for FY 2018 is $32,071,586 with $525,184 allotted to emergency management.

8.3.5 Fiscal Programming:

On April 13, 2015, The City approved Ordinance 1845, which officially adopted the following Codes:

- The International Building Code, 2015 Edition (hereinafter referred to as the "IBC"). (Ref: COMAR 05.02.07)
- The International Existing Building Code, 2015 Edition (herein referred to as the "IEBC"). (Ref: COMAR 05.16)
- The International Residential Code for One- and Two-Family Dwellings, 2015 Edition (hereinafter referred to as the "IRC"). (Ref. COMAR 05.02.07)
- The Maryland Accessibility Code (MAC). (Ref: COMAR 05.02.02)
- The International Energy Conservation Code, 2015 Edition (hereinafter referred to as the "Energy Code"). (Ref. COMAR 05.02.07)
- The International Mechanical Code, 2015 Edition. (Ref: COMAR 05.02.07)
- The International Fuel Gas Code, 2015 Edition. (Ref: COMAR 05.02.07)
- The National Electrical Code, 2014 Edition. (Ref: COMAR 05.02.07)
- National Fire Protection Association, NFPA 1 Fire Code, 2015 Edition.
- National Fire Protection Association, NFPA **101** Life Safety Code, 2015 Edition.
- International Swimming Pool and Spa Code, 2015 Edition.
- The building codes include provisions to ensure that buildings are designed and constructed to resist certain environmental loads. The minimum design must account for

loads associated with a basic wind speed (3-second gust) of 115 miles per hour. The minimum snow load for roof design is 30 Pounds per square foot.

8.4 Communicating with Citizens

The City of Laurel actively communicates with its residents using a variety of media, each of which can be used to convey information about preparing for and responding to natural hazards:

- The monthly newsletter, MayorGram, is posted on the City's web page, emailed to all residents and businesses that sign up for it, and is available in hardcopy at all City facilities. The newsletter reports on City activities and progress on various initiatives, and informs readers about upcoming activities and events. It is available to convey information important to the residents relating to hazard and how to mitigate the effects. Content related to flooding and flood safety has been addressed.
- Several documents related to preparing for disasters and emergencies can be downloaded from City's web page, including brochures specific to tornadoes, winter storms, heat waves, and hurricanes (also in Spanish).
- The City's regulations are accessible through the web page and public access to GIS maps is provided through the Prince George's County's and the Maryland-National Capital Parks and Planning Commission's online applications and web viewers.
- The Streets & Drainage page on the County's web site includes answers to typical questions posed by citizens.
- The local government public access video channel is accessible to residents who subscribe to cable and internet providers and through the City's streaming video link (www.laurel.md.us/streaming). Mayor and City Council meetings, other public meetings and critical watches, warnings and mitigation efforts are shown on this channel.
- After major flooding, the City posts information on the public access video channel, including information about the City's post-disaster permitting requirements.
- Local AM/FM radio station broadcasts emergency information on an as-needed basis (AM 600, 630, 980, 1090, 1500 and FM 88.1, 95.5, 103.5.
- Door hangers, email, telephonic messages and targeted direct mailings have been used after floods to inform people of their post-flood responsibilities; the contact/mailing list is considered to be comprehensive, including addresses in the floodplain and other homes that have flooded.
- City Emergency Response staff offer briefings to residential associations and business groups to improve awareness of natural and man-made hazards.

8.5 Ongoing & Previous Mitigation Initiatives

This section highlights Laurel's activities and programs that reduce the impact of natural hazards. **Error! Reference source not found.** summarizes measures described in other sections for ready reference.

Revised Flood Insurance Rate Maps. Engineering studies to revise the floodplain maps resulted in revised Flood Insurance Rate Maps which were reviewed during a lengthy public review process during 2015 and 2016. The map were formally adopted by the City Council on September 16, 2016. The revised maps show somewhat higher flood elevations than shown on previous the FIRM map.

Property Mitigation. Three flood prone properties have been identified during the planning cycle. One has been acquired and demolished, mitigation solutions are being sought for the others. As mentioned previously, priority mitigation projects have been identified by the City's consultant and a pathway for funding is being explored.

Stormwater Management. Working with The Maryland Department of Environmental Resources and Prince George's County Department of Environment the City will attempt to alleviate several concerns relating to stormwater runoff that affects several residential areas that are outside of the floodplain as shown on the FEMA map. Stormwater management for the City is administered through the Prince George's County Department of Environment.

Drainage Maintenance. Prince George's County is responsible for public drainage infrastructure in the City. However, due to its proximity to the Patuxent River, the City recognizes the critical importance of adequate drainage and biannual inspections of storm drains and cleans inlets to reduce blockage.

Insurance for Public Buildings. The City maintains property insurance coverage on its buildings to cover damage due to structural fire, wind and lightning and flood. Three NFIP flood insurance policies are in effect for buildings that form the Laurel Municipal Swimming Pool which is in the floodplain of the Patuxent River.

Table 8-13. Laurel Summary: Activities that Reduce Hazard Impacts.

FLOOD
• Enforcement of floodplain management requirements. • The Department of Public Works is authorized to close roads when flooding is imminent. • City newsletter, webpage, direct mailing, door hangers, email, telephonic message, public access video and radio used for public information and alerts. • Laurel identifies drainage problems and implements improvements.

Table 8-13. Laurel Summary: Activities that Reduce Hazard Impacts.

• Laurel has acquired flood hazard areas along Bear Branch Creek, Crow Branch Creek and the Patuxent River (Riverfront Park) and maintains as open space and passive recreation areas. • Economic and Community Development along with the Emergency Manager use the revised FIRMs to promote flood awareness and to pursue funds to mitigate impacts to residential and commercial properties.
STREAMBANK EROSION
• Laurel addresses riverbank erosion through the purchase of flood hazard areas along Patuxent River (Riverfront Park) and subdivision regulations that require setback. • Prince George's County Department of Environment, Maryland DNR, and the M-NCPPC completing Stream Corridor Assessment (Section 4.6.1).
WINTER STORM
• Economic and Community Development enforces the building codes criteria for design snow loads for buildings and structures. • City newsletter, webpage, direct mailing, door hangers, email, telephonic message, public access video and radio used for public information and alerts • Emergency Management coordinates with Prince George's Office of Emergency Management for outreach to elderly residents. • Emergency Management monitors weather and developing conditions.
HIGH WIND/TORNADO
• Economic and Community Development enforces the building codes, with criteria for design wind loads for buildings and structures. • Emergency Management monitors weather and developing conditions. • Emergency Management coordinates with other agencies and the County to operate W.A.R.N. system for citizen notification/recovery presentations online/cable.
SEVERE STORM
• Economic and Community Development enforces building codes with criteria for design wind loads for buildings and structures • Economic and Community Development enforces the building code with lightning protection requirements for nonresidential buildings. • Emergency Management monitors weather and developing conditions. • City newsletter, webpage, direct mailing, door hangers, email, telephonic message, public access television and radio used for public information and alerts. • Emergency Management coordinates with other agencies to operate W.A.R.N. system for citizen notification/recovery presentations online/cable.
DROUGHT
• WSSC manages reservoirs for potable water supply. • Laurel participates in regional drought planning initiatives (WSSC, Washington COG).
DAM FAILURE

Table 8-13. Laurel Summary: Activities that Reduce Hazard Impacts.

• City has regular communication with WSSC regarding the upstream dam and receives advance notices of releases that may cause flooding
EXTREME HEAT
• City newsletter, webpage, direct mailing, door hangers, email, telephonic message, public access video and radio used for public information and alerts • Emergency Management coordinates with Prince George's Office of Emergency Management and the Agency for Aging for outreach to elderly residents.

Status of the 2010 City of Laurel mitigation strategies may be found in Appendix C. The new 2017 to 2022 strategies are summarized in Section 5.0 and fully detailed in Appendix D.

8.6 Natural Resources

The City of Laurel values its open space and encourages protection of trees and wetlands in its development processes. Activities proposed within wetland areas must be approved by the Maryland Department of the Environment under state statute, and by the U.S. Army Corps of Engineers under the authority of Section 404 of the Clean Water Act.

Open Space. Open Space is addressed in the City's Subdivision Ordinance (Sections 15-7 and 15-8). The City may require up to 10 percent of gross area or water frontage for park, school or recreational purposes. The location of set-aside areas are to be approved by the Parks and Recreation Director using a ratio of one acre of park for every 100 dwelling units. Areas must be appropriate in area, shape and terrain for intended park uses. City may elect to accept a fee as alternate to dedication, in whole or in part, to maximize accessible locations.

Forest Conservation (Ordinance No. 1079). In 1992, the Mayor and City Council adopted the Forest Conservation ordinance to comply with State requirements. Applications for subdivisions and plan approvals, site plan approvals, development plan approvals, grading permits or sediment control permits for an area of land of forty thousand (40,000) square feet or greater shall submit a forest stand delineation and a forest conservation plan. Methods to protect delineated forest stands and trees during construction shall be accomplished using methods approved by the department, as provided in the Forest Conservation Technical Manual. The City submits Forest Stand Delineations and Forest Conservation Plans to the Maryland Department of Natural Resources for review of all development proposals.

9 References

Note: some of the source material for the 2010 plan had not been updated from the original 2005 plan, specifically information in the HIRA. Source data in the 2017 update Section 4.0 is provided for each table and figure. General source data for the update is listed as follows:

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United States Census Bureau. (2015). Quick Facts for Maryland retrieved from http://www.census.gov/quickfacts/

2016 State of Maryland State Hazard Mitigation Plan, MEMA.

Draft Prince George's County Emergency Operations Plan

Plan Prince George's 2035 – Guiding Today and Tomorrow; Prince George's County General Plan

City of Laurel Maser Plan: Goals, Objectives and Policies

NOAA and US Army Corps of Engineers climate reports

Maryland National Capital Park and Planning Commission Data and GIS datasets

Prince George's County Data and GIS datasets

Maryland Forest Service wildfire data and reports

Landslide Incidence and Susceptibility in the Conterminous United States, U.S. Geological Survey (USGS).

FEMA Risk Mapping, Assessment, and Planning FIRMS and FIS, Prince George's County and the City of Laurel, MD

FEMA TEIF 2.0 Analysis 2017 methodology for flood risk analysis performed by Dewberry

USDA Census of Agriculture

2010 US Census Bureau population data

2010 – 2014 American Community Survey population estimates