Section 6
Hazard Identification, Profiling and Ranking

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6.1 IFR Requirement for Hazard Identification and Profiling

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the ... location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.
6.2 Hazard Identification

As part of its efforts to support and encourage hazard mitigation initiatives, the University of Maryland’s Hazard Mitigation Core Team (MCT) prepared an assessment of hazards that have caused or have the potential to impact the College Park campus. The term “planning area” is used extensively in this section, and refers to the geographic limits of the UM campus. A significant amount of the open-source information about natural hazards is indexed by County, so this plan includes references to Prince George’s County, Maryland. Where available, the plan includes information about events and probabilities on or at the UM College Park campus.

The following subsections provide an overview of past hazard events in and around the planning area and associated losses. Damage and losses (including physical damage, indirect and economic losses, and injuries and deaths) associated with hazards result when an event affects areas where people and improved property are located. After hazards are identified, risk or vulnerability assessments can be prepared. When the full range of possible natural and man-made hazards is reviewed, it becomes apparent that some events occur frequently and some are extremely rare. Some hazards impact large numbers of people to a limited degree, while others may cause very localized but significant damage.

According to the National Oceanic and Atmospheric Administration (NOAA) database, between 1950 and 2006, Prince George’s County has experienced 184 severe thunderstorms, 14 tornadoes (two F0s, nine F1s, two F2s, and one F3), 57 hail storms (11 of which had greater than one-inch diameter hail), 13 significant lightning events, no reported wildfires, and 25 floods/flash floods. A number of these events caused property damage and injuries, and one event caused two deaths. (Reference: NOAA database, www4.ncdc.noaa.gov/cgi-win/wvqcgi.dll?wvwevent-storms). Prince George’s County has received 2 Presidential Disaster Declarations since 1950 (2000 – Winter Storm; 2003 – Hurricane Isabel).

Overview of the University’s Natural Hazards History

Numerous federal agencies maintain records regarding losses associated with natural hazards. Unfortunately, no single source is considered to offer a definitive accounting of all losses. The Federal Emergency Management Agency maintains records on federal expenditures associated with declared major disasters. The U.S. Army Corps of Engineers and the Natural Resources Conservation Service collect data on losses during the course of some of their ongoing projects and studies. Additionally, the National Climatic Data Center (NCDC) of the National Oceanographic & Atmospheric Administration (NOAA) collects and maintains certain data in summary format, indicating injuries, deaths, and costs. NOAA/NCDC does not, however, describe the basis of these loss estimates, so they should be considered general indications of the monetary effects of hazards in an area, not a definitive record of impacts.

In the absence of definitive data on some of the natural hazards that may occur on the campus, illustrative examples are useful. Table 6-1 provides brief descriptions of particularly significant natural hazard events occurring in College Park’s recent history. This list is not meant to capture every event that has affected the area, but rather lists one or two examples of the types of events than have affected the area in the past.

Data on Presidential Disaster Declarations can help to characterize some of the natural disasters that have affected the planning area. In 1965, the federal government began to maintain records of events determined to be significant enough to warrant declaration of a major disaster by the President of the United States,
usually because the resources of a State were not sufficient to address the results of an event. Presidential Disaster Declarations are made at the county level and are not specific to any one city or sub-area, such as College Park. Between 1950 and 2006, two such disasters have been declared in Prince George’s County and are identified in Table 6-1. The 2001 tornado was not a declared Presidential disaster.

<table>
<thead>
<tr>
<th>Date &amp; Disaster (DR)</th>
<th>Nature of Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/10/00 (1324-DR)</td>
<td>WINTER STORM – Between January 25th and 30th of 2000, up to 20 inches of snow fell in Maryland, resulting in the University closing due to treacherous road and sidewalk conditions. In April, the winter storm was declared a disaster, and affected areas of Prince George’s County could apply for Public Assistance.</td>
</tr>
<tr>
<td>9/24/01</td>
<td>TORNADO – A devastating tornado caused 2 deaths, injuries, and property damage on the College Park campus. A larger storm system produced this violent, multiple-vortex F3 tornado in the planning area, College Park. It moved at peak intensity through the campus, before heading parallel to I-95 through Laurel, Maryland, where F3-level damage was also reported. The path of destruction from this storm was measured at 17.5 miles in length in about 126 minutes. Over $16 million in damage was reported for Prince George’s County.</td>
</tr>
<tr>
<td>9/18/03 (1492-DR)</td>
<td>HURRICANE ISABEL – This early fall storm developed into a category F5 and was considered a category F2 when it made landfall in North Carolina with winds between 96 and 110 mph. Around the time it passed into Maryland, Isabel was downgraded to a tropical storm, with winds between 39 to 73 mph. The downgraded storm continued to cause severe destruction, resulting in a disaster declaration in which Individual and Public Assistance was offered in affected areas of Prince George’s County. Throughout the state, about 1.24 million homes lost electrical power and $820 million in damage was reported.</td>
</tr>
</tbody>
</table>

Although the winter storm of 2000 was a significant Statewide event (hence the disaster declaration), effects on the College Park campus were limited to suspension of classes and snow and ice removal. Hurricane Isabel caused some minor and localized flooding on the campus, as well as repeated losses of power. The power interruptions were mitigated by campus technical staff through established procedures that proved very successful.

The College Park tornado is discussed in more detail in Section 7 of this plan.

Weather-Related Deaths and Injuries

According to the National Climatic Data Center, Prince George’s County has experienced two deaths (in College Park) and 69 injuries from natural hazards in the period from 1950 to 2006 (Source: [http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent=Storms](http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent=Storms)).
Section 6.3 Overview of the Type and Location of Natural Hazards that can affect the Jurisdiction

In the initial phase of the planning process, the University of Maryland’s Mitigation Core Team (MCT) considered 10 natural hazards and the risks they create for the University and its material assets, operations, and staff. These hazards were selected for inclusion in the plan by the Core Team. The hazards initially considered were:

1. Floods
2. Wind (Includes Hurricanes, Tropical Storms, and Tornadoes)
3. Lightning
4. Earthquakes
5. Winter Storms
6. Wildfires
7. Hail
8. Extreme Temperatures
9. Droughts
10. Sinkholes and Subsidence

In the initial identification process, the MCT catalogued potential hazards to determine those with the most chance to significantly affect the planning area. The hazards include those that have occurred in the past and may occur in the future. A variety of sources were used in the investigation. These included national, regional, and local sources such as websites, published documents, databases, and maps. See Appendix A for general characterizations of these natural hazards.

Note that hurricanes are not discussed as an individual hazard, but are rather divided into flooding and wind effects. The wind subsection of the Risk Assessment includes a detailed discussion of the hurricane wind risk at UM.

6.3.1 Flood

Description

Floods are the overflow of excess water onto adjacent floodplains from the accumulation of water within a water body (e.g., stream, river, lake, or reservoir). See Appendix A for a general description of the flood hazard.
Geographical Extent

As discussed in more detail in Section 7 (Risk Assessment) there are localized flood problems in several areas of the UM College Park campus, including near the “South Mall” and various areas adjacent to Paint Branch. Although Paint Branch is potentially a significant source of flooding, most floods on the campus are actually related to overland (sheet) flows and ponding in specific areas that are not in a mapped floodplain. The risk assessment section includes a more detailed explanation of these issues.

Figure 6-1
Paint Branch Watershed (source: EyesofPaintBranch.org)

Severity of the Flood Hazard

Flood severity is a function of water depth, velocity, and duration, among other usually less significant factors. As discussed in more detail in the Risk Assessment Section (7) of this plan, none of these elements is especially prevalent on the College Park campus; however, the two areas that are most subject to flooding (see above) are subject to high-frequency events (south mall) or high-frequency events combined with high vulnerabilities because of the criticality of facilities that are exposed to flooding. Note that copies of FEMA “FIRMettes” are included in Section 7 (Risk Assessment).
Impact on Life and Property

The National Climatic Data Center (NCDC) database indicates that there have been 25 floods in Prince George’s County in the period from 1950 to 2005, with damages of over $2.6 million. Figures maintained by NCDC indicate that the County has experienced no deaths and one injury due to floods (Source: http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms). Regarding impacts to life and property on the UM campus, Section 7 of this plan includes a detailed examination of past flood impacts, and projections of expected future flood losses.

Occurrence of Flood Hazard

The NCDC database reports 26 floods in Prince George’s County since 1950. This information is provided just to give a general sense of the frequency County-wide. UM has experienced many more localized floods than are expressed here, particularly in the south mall and Campus/Stadium Drive areas. Section 7 (Risk Assessment) includes a much more detailed characterization of the flood hazard on the College Park campus.

![Figure 6-2](Image)
Floods in Prince George’s County, Maryland, 1950 – 2006 (Source: NOAA National Climatic Data Center)
6.3.2 Wind
(Includes Hurricanes, Tropical Storms, and Tornadoes)

Description

Wind is the uneven horizontal movement of air resulting from the irregular heating of the Earth's surface. It can range from local breezes produced by heat from land surfaces and lasting tens of minutes to powerful global winds resulting from solar heating of the Earth. Severe winds in the planning area typically result from hurricanes, tropical storms, tornadoes, or thunderstorms.

Geographical Extent

The entire planning area is subject to the same basic probability of tornado and high winds. The highest potential is in the spring and summer months for tornadoes and high-velocity straight-line winds, and summer and fall for hurricane-related winds.

Severity of the Wind Hazard

For both hurricanes and tornadoes, severity is measured in terms of wind speed, although other factors influence the damages that these events cause. Tornadoes are measured on the Fujita scale, an empirical post-event method that stratifies wind speeds into six levels. Hurricanes also fall into six categories, also based on wind speed, although hurricane wind speed can be determined in real time. As expected, the lower classes of events are more common. Although the potential severity of the wind hazard at UM is relatively low compared to areas in “tornado alley” and those on the coast, the State is subject to both hazards, and has experienced moderately severe events in the past.

Impact on Life and Property

For Prince George’s County from 1950 to 2006, there were five injuries, no deaths, and $4.085 million of property damage reported in the NCDC database for thunderstorm and high wind events. In addition, there were two deaths, 60 injuries, and nearly $110.8 million in property damage attributed to tornadoes.

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Figure 6-3
The 2001 tornado killed two UM students and resulted in millions of dollars in damage to the College Park campus.
The total impact on life and property from high wind events in Prince George’s County since 1950 is 2 deaths, 65 injuries, and $114,885 million in property damage (Source: [http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms](http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms)). Of those statistics, most damage came from the category F3 tornado that hit College Park in 2001, causing the deaths of two students, 55 injuries, and $101 million in property damage. According to reports from campus officials, 12 buildings on the campus were damaged, including three trailers that housed staff and equipment from the Maryland Fire and Rescue unit. Several dormitories on the northwest part of the campus had sufficient damage to windows that residents had to relocate until repairs were completed. The tornado caused highly localized power losses, but the effects were very limited because nearly all of the electrical infrastructure on the campus is underground.

Other than the 2001 tornado, there have been very few damaging wind events on the campus. As shown in Section 7, Table 7-4, in 2004, the campus experienced a thunderstorm that caused about $44 thousand in damage to roofs and non-structural building elements (from the State Treasurer’s Office database). There are no reports of wind-related casualties or injuries from wind events other than the 2001 tornado. The campus also lost power repeatedly during Hurricane Isabel (September 2003), but existing procedures and backup equipment allowed UM to restore power relatively quickly when it was lost.

To protect life and property from wind events, the building code administered within the incorporated areas of Prince George’s County requires all new construction to be designed and constructed for 90 mile per hour wind loads.

### Occurrence of the Wind Hazard

Data indicated that between 1950 and 2006, there have been numerous severe storms causing significant damage in Prince George’s County. In that timeframe, 14 tornadoes have touched down in the County, with a category distribution of two F0s, nine F1s, two F2s, and one F3 tornado.

The Washington, D.C. region experienced a series of devastating tornadoes in 2001 that caused injury, death, and property damage. After a category F4 tornado on the Fujita scale was reported in rural Virginia, a second supercell to the southeast spawned a family of tornadoes that also moved through the Washington region. Two more tornadoes (F0 and F1) were confirmed in Virginia, one of which dissipated near the west end of the Mall in Washington, D.C. and was followed by many reports of funnel clouds. The same storm soon produced a violent, multiple-vortex F3 tornado in the planning area, College Park. This storm moved at peak intensity through the University campus causing injury and death, before heading parallel to I-95 through Laurel, Maryland, where F3-level damage was also reported. The path of destruction from this storm was measured at 17.5 miles in length.

Because they are a relatively rare phenomenon in the mid-Atlantic, and because their area of impact is small, there is not reliable way to estimate the probability of future tornadoes in a limited geographic area. It is reasonable to expect that Prince George’s County will continue to experience tornadoes on the order of a few a decade, based on past experience, but this should be considered a broad estimate. Tropical storms (especially nor’easters) impact the U.S. east coast regularly, on the order of once or twice a year. Hurricanes are much less frequent.
Figure 6-4
Tornado Occurrences, Classes and Damages in Prince George’s County, Maryland, 1950 – 2006 (Source: NOAA National Climatic Data Center)
6.3.3 Lightning

Description

Lightning is a discharge of electricity in the atmosphere. Usually, but not always, lightning occurs during rain storms. See Appendix A for a detailed description of the lightning hazard.

Geographical Extent

Lightning is fairly prevalent over the entire planning area, particularly during the spring and summer months, when thunderstorms are relatively common.

Severity of the Lightning Hazard

Severe lightning events can occur in the planning area. Even during common events, the lightning current can branch off to strike a person from a tree, fence, pole, or other tall object. In addition, electrical current may be conducted through the ground to a person after lightning strikes a nearby tree, antenna, or other tall object. The current also may travel through power lines, telephone lines, or plumbing pipes to a person who is in contact with an electric appliance, telephone, or plumbing fixture. Lightning may use similar processes to damage property or cause fires.

Impact on Life and Property

Since 1950, there have been five injuries, no deaths, and approximately $715,000 in property damages related to lightning in Prince George’s County. About 100 deaths and 500 injuries are reported annually across the U.S. from this hazard. (Source: http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent=Storms. UM has experienced several damaging lightning strikes in the past few years, and these are briefly discussed in the Assessment Section. Like most other natural hazards, higher population and building densities mean that there is more risk from lightning (as differentiated from probability, which is one component of risk).

As is the case with most high-density urban environments, structures on the UM campus are struck by lightning fairly regularly, although the University has neither the need nor the means to track where or when strikes occur. The electrical system is fully grounded and generally protected from surge effects throughout the campus, although there were two State insurance claims in 2006 related to power surges; these totalled approximately $7,500. There are very rarely any power interruptions related to lightning, and when they do occur they are of short duration. With the exception of the Pocomoke Building (discussed in the wind risk section of this plan), electrical infrastructure on the campus is almost entirely below grade, and not especially vulnerable to lightning. As noted, the relatively high population density on the campus increases the risk of someone being struck by lightning. The University has a siren system that is used to warn students and staff (and residents of the City of College Park) of extreme weather, including the potential for lightning and tornadoes. It is possible to get to a safe location (building) fairly quickly from almost anywhere on campus once an alert is recognized.
Occurrence of the Lightning Hazard

There were 13 instances of lightning reported in the NCDC database for Prince George’s County from mid-1995 to mid-2005. However, lightning occurs very frequently during the spring and summer months, but is not reported to or by NOAA because it is so common, and usually causes relatively little damage. The probability of future events is very high, but generally speaking the effects of the hazard are not significant.

Figure 6-5
Lightning Occurrences, Classes and Damages in Prince George’s County, Maryland, 1950 – 2006 (Source: NOAA National Climatic Data Center)
6.3.4 Earthquake

Description

An earthquake is “…a sudden motion or trembling caused by an abrupt release of accumulated strain in the tectonic plates that comprise the earth’s crust.” These rigid plates, known as tectonic plates, are some 50 to 60 miles in thickness and move slowly and continuously over the earth’s interior. The plates meet along their edges, where they move away, past or under each other at rates varying from less than a fraction of an inch up to five inches per year. While this sounds small, at a rate of two inches per year, a distance of 30 miles would be covered in approximately one million years (FEMA, 1997).

Geographical Extent

The entire planning area is susceptible to the effects of earthquakes, although the northeast U.S. is for the most part not subject to severe earthquake risk because of the nature of the geology in the area.

Severity

The severity of earthquakes is a function of the depth of the fault that causes the event, as well as the nature of the geology in a particular area, especially the soils. Neither the geology of the planning area nor its soil characteristics suggest that earthquake severity would be significant.

Impact on Life and Property

There are no reported deaths, injuries, or property damage from earthquakes in Prince George’s County or on the UM campus. Although central Maryland is generally not susceptible to significant earthquakes (small ones occur regularly, see below), some older buildings on the UM campus are probably vulnerable to the potential effects of larger events. Structures that were built prior to the introduction of modern engineering practices and building codes, particularly those that are of unreinforced masonry construction, may be subject to structural failure if they are exposed to ground shaking. At this point there exists no comprehensive database of structure types at UM such that the University could accurately determine which structures are in this general category. There exists the potential for loss of life, injuries and damage to building contents if a significant earthquake were to occur, but the likelihood of this is very low, as discussed below.

Occurrence of Earthquakes

Since 1885, earth vibrations felt in Maryland have been associated with sources for adjacent states and points as far away as the St. Lawrence Valley and even Canada. The great earthquake of August 31, 1886, near Charleston, South Carolina, affected a total area with a radius of about 800 miles, including all of Maryland. The most severe earthquake in the history of Virginia (May 31, 1897, Giles County) shook an area of about 280,000 square miles. Baltimore and southern Maryland along the eastern shore reported distinct shaking. An earthquake near Luray, Virginia (April 9, 1918) reached many points in Maryland, including College Park. (Source: USGS). Estimating the probability of future earthquake is practically impossible. However, it is reasonable to presume that there will be minor quakes nearly every year, though most will not be felt.
Marylanders are more likely to feel one of these out-of-state earthquakes than one from a source within the State. As of late 1993, 47 earthquakes had been reported within Maryland’s borders. Over the next ten years, that total reached 61 (Maryland Geological Survey). Maryland’s history of low magnitude and low intensity events suggests future events will likely follow a similar pattern in the state, known as a seismic quiet zone. Determining earthquake probabilities is practically impossible except in the most general sense, especially in areas that are relatively inactive from a seismic perspective (such as the mid-Atlantic region). It is appropriate to state that Maryland will likely continue to experience periodic small events, but that the likelihood of a significant earthquake occurring in or affecting the State is very small.
6.3.5 Winter Storm

Description

Winter storms bring various forms of precipitation that occur only at cold temperatures, such as snow, sleet, or a rainstorm where ground temperatures are cold enough to allow icy conditions. These cold weather storms can also take the form of freezing rain or a wintry mix. See Appendix A for a general description of the winter storm hazard.

Geographical Extent

The potential for winter storms is uniform for the entire planning area. All people and assets are considered to have the same degree of exposure.

Severity of Winter Storm Hazard

Although the NCDC database has not categorized any previous storms in Prince George’s County as blizzards, this is perhaps the most severe type of winter storm, characterized by low temperatures, strong winds, and heavy blowing snow. Because the climate of the mid-Atlantic is moderate, there are occasional winter storms, but generally they are not of high severity as measured by amount of snow, wind or duration.

Impact on Life and Property

According to the NCDC database, there has been only one report of heavy snow in 1993 for Prince George’s County since 1950. There were no injuries, deaths, or property damage noted for that storm (Source: http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent–Storms). In January of 2000, however, a severe winter storm event caused enough damage to require federal disaster assistance for some properties. It is presumed that not all winter events are categorized as snow and ice storms in the database.

Occurrence of Winter Storms

Severe snow and ice storms occur infrequently in the planning area and can be considered a fairly low threat to people and property. Generally, the winter storm season in Maryland runs from December to March. The NCDC database reveals since 1950 there has been one recorded heavy snow storm in Prince George’s County, in 1993, although the database may not be current in this regard. The probability of future severe winter storms is relatively low.
6.3.6 Wildfire

Description

Wildfires are uncontrolled fires often occurring in wildland areas, which can consume houses or agricultural resources if not contained. Wildfires/urban interface is defined as the area where structures and other human development blend with undeveloped wildland.

Geographical Extent

The potential for wildfires exists over the entire planning area, although the probability is relatively low because the area is highly urbanized, and detection and suppression capabilities are good.

Severity of Wildfires

The frequency and severity of wildfires is dependent on weather and on human activity. In the planning area, severity has historically been very low, and duration a matter of hours to a day. Risk and potential severity are increased by development within the zone commonly referred to as the “urban-wildland interface.” Within this zone of natural landscape, buildings become additional fuel for fires when fires do occur. Most wildland fires are man-caused and occur in the interface of developed lands and forest and range lands. In particular, the dry conditions, high temperatures, and low humidity that characterize drought periods set the stage for wildfires.

Impact on Life and Property

There are no recorded deaths or injuries and no loss of property from wildfires in the planning area since 1950. The most notorious fire in College Park is the Great Fire of 1912, which caused substantial damage to what was known as the Maryland Agricultural College (MAC). What later became the University of Maryland was nearly shut down due to the loss of all but one of its academic/dormitory buildings. Although there was much property damage in the Great Fire, there were no reported injuries or deaths. Presently, fire detection and suppression capabilities are very good (and UM buildings are in compliance with applicable fire codes), so potential effects from urban-wildland interface fires are negligible.

Occurrence of Wildfires

There have been no reported wildfires in Prince George's County since 1950 (Source: http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent=Storms). The probability of wildfires occurring in the planning area is relatively low based on past records.
6.3.7 Hail

Description

Hail is a form of precipitation comprised of spherical lumps of ice. Known as hailstones, these ice balls typically range from 5 mm–50 mm in diameter on average, with much larger hailstones forming in severe thunderstorms. For a general description of the hail hazard, see Appendix A.

Geographical Extent

The potential for hail exists over the entire planning area of College Park.

Severity of the Hail Hazard

The severity of hailstorms is measured by duration, size of the hail itself, and geographic extent. All of these factors are directly related to the weather phenomena that create the hail, thunderstorms. There is wide potential variation in these severity components, but the planning area is not particularly prone to severe hail events.

Impact on Life and Property

There are no known instances of injuries or death from hail events in Prince George’s County. The National Climatic Data Center (NCDC) database shows $12,000 in previous property damage. Presumably there may be additional damages, likely addressed by citizens or insurance companies, and therefore there is no readily accessible record of damages. These unreported damages are presumably quantified as an order of magnitude less than other hazards such as floods or hurricane winds.

Occurrence of Hail

The National Climatic Data Center reported 57 hail events from the period 1950 through 2006 in Prince George’s County. The planning area has comparatively low potential for significant hail events, based on previous records, although there are large variations in severity. Lesser hail events are likely to happen once or twice a year.
6.3.8 Extreme Temperature

Description
Temperatures that range far above or below normal are considered extreme temperatures. Heat stress can be indexed by combining the effects of temperature and humidity. For a detailed description of the extreme temperature hazard, please see Appendix A.

Geographical Extent
The entire planning area is subject to extreme temperature hazards, although the probability of occurrence is relatively low based on historical observation.

Severity of Extreme Temperatures
The severity of extreme temperature events is measured by temperature, duration, and humidity. Most events are of less than a week in duration.

Impact on Life and Property
The NCDC database shows no incidence of injuries or deaths from extreme temperatures in the period 1950 – 2006 in Prince George’s County. Damages from the extreme temperature hazard are generally confined to effects on humans, although occasionally there may be effects on infrastructure such as electric grids.

Occurrence of Extreme Temperatures
There have been no recorded extreme temperature events in Prince George’s County in the period between 1950 and 2006. The probability of extreme temperatures is relatively low, based on past data.
6.3.9 Drought

Description
A drought is an extended dry climate condition when there is not enough water to support urban, agricultural, human, or environmental water needs. It usually refers to a period of below-normal rainfall, but can also be caused by drying bores or lakes, or anything that reduces the amount of liquid water available. Drought is a recurring feature of nearly all the world's climatic regions. See Appendix A for a general description of the drought hazard.

Geographical Extent
Drought is possible throughout the planning area, but the data has revealed no reported droughts since 1950 in NOAA's National Climatic Data Center database.

Severity of the Drought Hazard
The severity of drought is measured primarily by duration and reduction in water levels in reservoirs and (over a longer period) in underground aquifers. Although the Baltimore-Washington area and the mid-Atlantic region sometimes experiences short-term drought, generally the area is not especially subject to this hazard.

Impact on Life and Property
There are no known deaths, injuries, or damages from droughts in the planning area.

Occurrence of Drought
According to the NCDC database, Prince George's County has experienced no drought events in the period from 1950 to 2006. The County has a low probability of future drought occurrences.
6.3.10 Sinkholes and Land Subsidence

Description
A sinkhole is a natural depression or hole in the surface topography caused from the removal of soil or bedrock by water. They can vary in size, form either gradually or suddenly, and are found worldwide. Sinkholes commonly occur in urban areas due to water main breaks or sewer collapses when old pipes give way. Subsidence is the motion of the Earth’s surface as it shifts downward, relative to sea-level. Subsidence can be caused by karst geology and removal of water or natural gas from below the surface, among other human actions.

Geographical Extent
Sinkholes do occur in urban areas, so the planning area is vulnerable to this generally man-made hazard. Land subsidence is generally found in areas of very distinct geography, such as places where there is extensive gas or groundwater (that has been extracted), or in areas of karst topography or mines. Without more extensive engineering investigation, it is not possible to state definitively which sections of the campus are more and less subject to sinkholes, so this plan assumes that the hazard is relatively uniform across the planning area.

Severity of Sinkholes and Land Subsidence
The severity of land subsidence has no generally established measure, except that it can be described in terms of change in ground elevation relative to sea level. Subsidence is generally permanent, although it can be abated with proper management methods. Sinkholes are generally of short duration, although if not repaired they can become permanent features of the landscape. Severity can also be expressed empirically by indicating the effects on the human environment, i.e. a sinkhole resulted in a particular type and level of damage.

Impact on Life and Property
There have been no reported instances of sinkholes or land subsidence in the planning area, and thus no injuries, deaths, or damages.

Occurrence of Sinkholes and Land Subsidence
The planning area is not particularly subject to sinkholes or land subsidence, and there are no reports of such effects in Prince George’s County. The probability of sinkholes and subsidence occurring in the planning area in the future is relatively low, based on review of geologic and loss records.
6.4 Methodology for Identifying Natural Hazards for Additional Analysis (Risk Assessment)

Various national, regional and local sources were used to identify and classify hazards at the University of Maryland. In order to identify these hazards and broadly characterize the level of risk they pose to the campus, a scoring classification of low (1), medium (2), and high (3) was given to each hazard, based on five criteria. The resulting numerical rankings were used to determine which hazards would be given priority in developing detailed risk assessments later in the process. The criteria used were:

1. **History.** High rating indicates that the hazard has affected the jurisdiction often in the past, and that the hazard has occurred often and/or with widespread or severe consequences.

2. **Potential for mitigation.** High rating indicates that there are ways to address the hazard, and that the methods are technically feasible and have the potential to be cost-effective (i.e., mitigation measures are available at a reasonable cost, and damages to property, lives and/or community functions would be reduced or eliminated.)

3. **Presence of susceptible areas.** High rating indicates that the College Park campus has numerous facilities, operations or populations that may be subjected to damage from the hazard.

4. **Data availability.** High rating indicates that sufficient quality data is available to permit an accurate and comprehensive risk assessment.

5. **Federal disaster declarations and local emergency declarations.** High rating indicates that Prince George’s County has received numerous disaster declarations for the particular hazard.

The classification process provided a clear stratification of the hazards. The Mitigation Core Team determined that Floods and Wind (including Hurricanes, Tropical Storms, and Tornadoes), would be the focus of additional risk assessment and vulnerability studies, while the balance of the hazards would be profiled but not subjected to rigorous risk assessment. The profiles are included in the present section.

### Table 6-2
University of Maryland Hazard Ranking

<table>
<thead>
<tr>
<th>Hazard</th>
<th>History</th>
<th>Mitigation</th>
<th>Vulnerability</th>
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<th>Total</th>
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<td>3</td>
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<td>3</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Wind</td>
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