SECTION 4
HAZARD IDENTIFICATION

This section describes how the Hazard Mitigation Council identified the hazard to be included this plan. It consists of the following five subsections:

- 4.1 Overview
- 4.2 Description of Full Range of Hazards
- 4.3 Disaster Declarations
- 4.4 Hazard Evaluation
- 4.5 Hazard Identification Results

44 CFR Requirement
44 CFR Part 201.6(c)(2)(i): The risk assessment shall include a description of the type, 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.

4.1 OVERVIEW

The MEMA District 1 Region is vulnerable to a wide range of natural hazards that threaten life and property. Current FEMA regulations and guidance under the Disaster Mitigation Act of 2000 (DMA 2000) require, at a minimum, an evaluation of a full range of natural hazards. An evaluation of human-caused (i.e., terrorism) and technological hazards (i.e., hazardous materials incident) is encouraged, though not required, for plan approval. In this plan, the MEMA District 1 Region has focused on completing a comprehensive assessment of all natural hazard that impact the region. It should be noted however, that although great effort was made to identify all potential hazards, this list may not be all-inclusive and will be revisited with each plan update.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, the participating jurisdictions in the MEMA District 1 Regional Hazard Mitigation Plan have identified a number of hazards that are to be addressed in this Regional Hazard Mitigation Plan. These hazards were identified through an extensive process that utilized input from the MEMA District 1 Region Hazard Mitigation Council members, research of past disaster declarations in the participating counties[1], and review of the Mississippi State Hazard Mitigation Plan (2013). Readily available information from reputable sources (such as federal and state agencies) was also evaluated to supplement information from these key sources.

Table 4.1 lists the full range of hazards initially identified for possible inclusion in the Plan and provides a brief description for each. This table includes 21 individual hazards. Some of these hazards are considered to be interrelated or cascading (one hazard event may cause another, i.e. – hurricanes cause flooding), but for preliminary hazard identification purposes these individual hazards are broken out separately.

[1] A complete list of disaster declarations for the MEMA District 1 Region can be found below in Section 4.3.

Table 4.2 lists the disaster declarations that have impacted the MEMA District 1 Region.

Table 4.3 documents the evaluation process used for determining which of the initially identified hazards are considered significant enough to warrant further evaluation in the risk assessment. For each hazard considered, the table indicates whether or not the hazard was identified as a significant hazard to be further assessed, how this determination was made, and why this determination was made. The table works to summarize not only those hazards that *were* identified (and why) but also those that *were not* identified (and why not). Hazard events not identified for inclusion at this time may be addressed during future evaluations and updates of the risk assessment if deemed necessary by the MEMA District 1 RHMC during the plan update process.

Lastly, **Table 4.4** provides a summary of the hazard identification and evaluation process noting that 15 of the 21 initially identified hazards are considered significant enough for further evaluation through this Plan's risk assessment (marked with a "☑"). It should be noted that two hazards (Land Subsidence and Sinkhole) were combined and addressed as one hazard after the initial evaluation.

4.2 DESCRIPTION OF FULL RANGE OF HAZARDS

In this section, hazards are classified into groups including flood-related hazards, fire-related hazards, geologic hazards, and wind-related hazards. In reality, some hazards cross several of these categorizations, but for the purposes of this planning effort, each was assigned to only one of the four categories identified above. As noted, several sources were consulted to determine a list of hazard to be considered by MEMA District 1. These include the MEMA District 1 RHMC members, research of past disaster declarations in the participating counties[2], review of FEMA's Multi-Hazard Identification and Risk Assessment (1997) and review of the State of Mississippi Hazard Mitigation Plan (2013). Readily available information from reputable sources (such as federal and state agencies) was also evaluated to supplement information from these key sources.

TABLE 4.1: DESCRIPTIONS OF THE FULL RANGE OF INITIALLY IDENTIFIED HAZARDS

Hazard	Description
FLOOD-RELATED HAZARDS	
Avalanche	A rapid fall or slide of a large mass of snow down a mountainside.
Dam and Levee Failure	Dam failure is the collapse, breach, or other failure of a dam structure resulting in downstream flooding. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and severe property damage if development exists downstream of the dam. Dam failure can result from natural events, human-induced events, or a combination of the two. The most common cause of dam failure is prolonged rainfall that produces flooding. Failures due to other natural events such as hurricanes, earthquakes, or landslides are significant because there is generally little or no advance warning.

[2] A complete list of disaster declarations for the MEMA District 2 Region can be found below in Section 4.3.

Erosion	Erosion is the gradual breakdown and movement of land due to both physical and chemical processes of water, wind, and general meteorological conditions. Natural, or geologic, erosion has occurred since the Earth's formation and continues at a very slow and uniform rate each year.
Flood	The accumulation of water within a water body which results in the overflow of excess water onto adjacent lands, usually floodplains. The floodplain is the land adjoining the channel of a river, stream ocean, lake, or other watercourse or water body that is susceptible to flooding. Most floods fall into the following three categories: riverine flooding, coastal flooding, or shallow flooding (where shallow flooding refers to sheet flow, ponding, and urban drainage).
Storm Surge	A storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from four to five feet in a Category 1 hurricane up to more than 30 feet in a Category 5 storm. Storm surge heights and associated waves are also dependent upon the shape of the offshore continental shelf (narrow or wide) and the depth of the ocean bottom (bathymetry). A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water close to the shoreline, tends to produce a lower surge but higher and more powerful storm waves. Storm surge arrives ahead of a storm's actual landfall and the more intense the hurricane is, the sooner the surge arrives. Storm surge can be devastating to coastal regions, causing severe beach erosion and property damage along the immediate coast. Further, water rise caused by storm surge can be very rapid, posing a serious threat to those who have not yet evacuated flood-prone areas.
FIRE-RELATED HAZARDS	
Drought	A prolonged period of less than normal precipitation such that the lack of water causes a serious hydrologic imbalance. Common effects of drought include crop failure, water supply shortages, and fish and wildlife mortality. High temperatures, high winds, and low humidity can worsen drought conditions and also make areas more susceptible to wildfire. Human demands and actions have the ability to hasten or mitigate drought-related impacts on local communities.
Lightning	Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a "bolt" when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. 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. On average, 80 people are killed each year by lightning strikes in the United States.
Wildfire	An uncontrolled wildfire burning in an area of vegetative fuels such as grasslands, brush, or woodlands. Heavier fuels with high continuity, steep slopes, high temperatures, low humidity, low rainfall, and high winds all work to increase risk for people and property located within wildfire hazard areas or along the urban/wildland interface. Wildfires are part of the natural management of forest ecosystems, but most are caused by human factors. Over 80 percent of forest fires are started by negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning.

GEOLOGIC HAZARDS	
Earthquake	A sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the surface. This movement forces the gradual building and accumulation of energy. Eventually, strain becomes so great that the energy is abruptly released, causing the shaking at the earth's surface which we know as an earthquake. Roughly 90 percent of all earthquakes occur at the boundaries where plates meet, although it is possible for earthquakes to occur entirely within plates. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area.
Expansive Soils	Soils that will exhibit some degree of volume change with variations in moisture conditions. The most important properties affecting degree of volume change in a soil are clay mineralogy and the aqueous environment. Expansive soils will exhibit expansion caused by the intake of water and, conversely, will exhibit contraction when moisture is removed by drying. Generally speaking, they often appear sticky when wet and are characterized by surface cracks when dry. Expansive soils become a problem when structures are built upon them without taking proper design precautions into account with regard to soil type. Cracking in walls and floors can be minor or can be severe enough for the home to be structurally unsafe.
Landslide	The movements of a mass of rock, debris, or earth down a slope when the force of gravity pulling down the slope exceeds the strength of the earth materials that comprise to hold it in place. Slopes greater than 10 degrees are more likely to slide, as are slopes where the height from the top of the slope to its toe is greater than 40 feet. Slopes are also more likely to fail if vegetative cover is low and/or soil water content is high.
Land Subsidence	The gradual settling or sudden sinking of the Earth's surface due to the subsurface movement of earth materials. Causes of land subsidence include groundwater pumpage, aquifer system compaction, drainage of organic soils, underground mining, hydrocompaction, natural compaction, sinkholes, and thawing permafrost.
Sinkhole	Sinkholes are a natural and common geologic feature in areas with underlying limestone and other rock types that are soluble in natural water. Most limestone is porous, allowing the acidic water of rain to percolate through their strata, dissolving some limestone and carrying it away in solution. Over time, this persistent erosional process can create extensive underground voids and drainage systems in much of the carbonate rocks. Collapse of overlying sediments into the underground cavities produces sinkholes.
Tsunami	A series of waves generated by an undersea disturbance such as an earthquake. The speed of a tsunami traveling away from its source can range from up to 500 miles per hour in deep water to approximately 20 to 30 miles per hour in shallower areas near coastlines. Tsunamis differ from regular ocean waves in that their currents travel from the water surface all the way down to the sea floor. Wave amplitudes in deep water are typically less than one meter; they are often barely detectable to the human eye. However, as they approach shore, they slow in shallower water, basically causing the waves from behind to effectively "pile up," and wave heights increase dramatically. As opposed to typical waves which crash at the shoreline, tsunamis bring with them a continuously flowing 'wall of water' with the potential to cause devastating damage in coastal areas located immediately along the shore.

Volcano	A mountain that opens downward to a reservoir of molten rock below the surface of the earth. While most mountains are created by forces pushing up the earth from below, volcanoes are different in that they are built up over time by an accumulation of their own eruptive products: lava, ash flows, and airborne ash and dust. Volcanoes erupt when pressure from gases and the molten rock beneath becomes strong enough to cause an explosion.
WIND-RELATED HAZARDS	
Extreme Heat (Heat Wave)	A heat wave may occur when temperatures hover 10 degrees or more above the average high temperature for the region and last for several weeks. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions can provoke dust storms and low visibility. A heat wave combined with a drought can be very dangerous and have severe economic consequences on a community.
Hailstorm	Any storm that produces hailstones that fall to the ground; usually used when the amount or size of the hail is considered significant. Hail is formed when updrafts in thunderstorms carry raindrops into parts of the atmosphere where the temperatures are below freezing.
Hurricane and Tropical Storm	Hurricanes and tropical storms are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and with a diameter averaging 10 to 30 miles across. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation, and tornadoes. Coastal areas are also vulnerable to the additional forces of storm surge, wind-driven waves, and tidal flooding which can be more destructive than cyclone wind. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season, which extends from June through November.
Nor'easter	Similar to hurricanes, nor'easters are ocean storms capable of causing substantial damage to coastal areas in the Eastern United States due to their associated strong winds and heavy surf. Nor'easters are named for the winds that blow in from the northeast and drive the storm up the East Coast along the Gulf Stream, a band of warm water that lies off the Atlantic coast. They are caused by the interaction of the jet stream with horizontal temperature gradients and generally occur during the fall and winter months when moisture and cold air are plentiful. Nor'easters are known for dumping heavy amounts of rain and snow, producing hurricane-force winds, and creating high surf that causes severe beach erosion and coastal flooding.
Severe Thunderstorm/ High Wind	Thunderstorms are caused by air masses of varying temperatures meeting in the atmosphere. Rapidly rising warm moist air fuels the formation of thunderstorms. Thunderstorms may occur singularly, in lines, or in clusters. They can move through an area very quickly or linger for several hours. Thunderstorms may result in hail, tornadoes, or straight-line winds. Windstorms pose a threat to lives, property, and vital utilities primarily due to the effects of flying debris and can down trees and power lines.

Tornado	A tornado is a violently rotating column of air that has contact with the ground and is often visible as a funnel cloud. Its vortex rotates cyclonically with wind speeds ranging from as low as 40 mph to as high as 300 mph. Tornadoes are most often generated by thunderstorm activity when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The destruction caused by tornadoes ranges from light to catastrophic depending on the intensity, size, and duration of the storm.
Winter Storm and Freeze	Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Blizzards, the most dangerous of all winter storms, combine low temperatures, heavy snowfall, and winds of at least 35 miles per hour, reducing visibility to only a few yards. Ice storms occur when moisture falls and freezes immediately upon impact on trees, power lines, communication towers, structures, roads, and other hard surfaces. Winter storms and ice storms can down trees, cause widespread power outages, damage property, and cause fatalities and injuries to human life.

4.3 DISASTER DECLARATIONS

Disaster declarations provide initial insight into the hazards that may impact the MEMA District 1 Regional planning area. Since 1971, 21 presidential disaster declarations have occurred in the region. This includes 13 events related to tornadoes, 4 events related to severe storms/flooding, 2 events related to hurricane and tropical storm, and 2 events related to winter storm events. It should be noted that several events were declared as disasters as a result of multiple hazards.

TABLE 4.2: MEMA DISTRICT 1 REGION DISASTER DECLARATIONS BY COUNTY

Year	Disaster Number	Description	Coahoma	DeSoto	Grenada	Panola	Quitman	Tallahatchie	Tate	Tunica	Yalobusha
1971	302	STORMS & TORNADOES			X			X			X
1973	368	HEAVY RAINS, TORNADOES & FLOODING	X	X	X	X	X	X	X	X	X
1979	577	STORMS, TORNADOES, FLOODS						X			
1983	683	SEVERE STORMS, TORNADOES, AND FLOODING						X			
1984	703	TORNADOES				X		X			X
1990	859	SEVERE STORMS, TORNADOES & FLOODING	X			X	X	X			
1991	895	SEVERE STORMS & FLOODING	X		X	X	X	X			X
1991	906	SEVERE STORMS, TORNADOES & FLOODING	X		X	X	X	X	X		X
1992	939	SEVERE STORMS & TORNADOES									X
1994	1009	SEVERE WINTER STORM, FREEEZING RAIN AND SLEET	X	X	X	X	X	X	X	X	X
1997	1178	FLOODING								X	

Year	Disaster Number	Description	Coahoma	DeSoto	Grenada	Panola	Quitman	Tallahatchie	Tate	Tunica	Yalobusha
1999	1265	SEVERE WINTER STORMS, ICE AND FREEZING RAIN			X			X			X
2001	1360	SEVERE STORMS AND TORNADOES	X		X	X	X	X	X		X
2001	1398	SEVERE STORMS, TORNADOES AND FLOODING	X	X	X	X	X	X	X	X	
2005	1604	HURRICANE KATRINA	X	X	X	X	X	X	X	X	X
2010	1916	SEVERE STORMS, TORNADOES, AND FLOODING				X					
2011	1972	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND ASSOCIATED FLOODING	X	X	X	X	X		X	X	
2011	1983	FLOODING	X	X						X	
2012	4081	HURRICANE ISAAC			X						
2016	4248	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING	X			X	X	X			
2016	4268	SEVERE STORMS AND FLOODING	X			X	X	X	X	X	
TOTAL NUMBER OF DECLARED DISASTERS:			**12**	**6**	**11**	**13**	**11**	**15**	**8**	**8**	**10**

4.4 HAZARD EVALUATION

TABLE 4.3: DOCUMENTATION OF THE HAZARD EVALUATION PROCESS

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
FLOOD-RELATED HAZARDS			
Avalanche	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of US Forest Service National Avalanche Center web site	• The United States avalanche hazard is limited to mountainous western states including Alaska, as well as some areas of low risk in New England. • Avalanche was not considered in the State of Mississippi Hazard Mitigation Plan since it poses no threat to the state. • Avalanche is not included in any of previous MEMA District 1 Region hazard mitigation plans. • There is no risk or history of avalanche events in Mississippi.
Dam and Levee Failure	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of MS Department of Environmental Quality dam inventory	• The National Inventory of Dams shows dams are located in every state. • Dam/levee failure is identified in the state plan as a limited hazard. • The previous MEMA District 1 Region hazard mitigation plans address dam failure. • 37 dams in the region are classified as high-hazard (high hazard is defined where dam failure may cause loss of life or serious damage).

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Erosion	YES	• Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans	• Coastal erosion was excluded from the State of MS Hazard Mitigation Plan as a hazard, however, it is addressed under the hurricane hazard. Riverine erosion is not addressed in the plan. • Erosion is identified as a hazard in some of the previous MEMA District 1 Region hazard mitigation plans. • Erosion is a natural and continuous process that may impact the region.
Flood	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of NOAA NCDC Storm Events Database • Review of historical disaster declarations • Review of FEMA FIRM/DFIRM data • Review of FEMA's NFIP Community Status Book and Community Rating System (CRS)	• Floods occur in all 50 states and in the U.S. territories. • The flood hazard is thoroughly discussed in the state plan. Much of the state is located in the 100-year floodplain. Further, flash floods are a common occurrence during rain storms. • The previous MEMA District 1 Region hazard mitigation plans address the flood hazard. • NCDC reports that MEMA District 1 Region counties have been affected by 211 flood events since 1997. In total, these events caused 7 recorded deaths, 10 injuries, and an estimated $1 billion (2016 dollars) in property damages. • 4 out of 20 disaster declarations were primarily flood-related, an additional 2 were hurricane or tropical storm-related which caused flooding issues, and several others listed flooding as one of the causes of the declaration. • 40 of the 43 MEMA District 1 jurisdictions participate in the NFIP.

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Storm Surge	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of NOAA NCDC Storm Events Database	• Given the inland location of the MEMA District 1 Region, storm surge would not affect the area. • Storm surge is discussed in the state plan under the hurricane hazard and indicates that only the costal shoreline counties are subject to storm surge. • None the previous hazard mitigation plans in the MEMA District 1 Region identify storm surge as a potential hazard. • No historical events were reported by NCDC.
FIRE-RELATED HAZARDS			
Drought/Heat Wave	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of US Drought Monitor website • Review of NOAA NCDC Storm Events Database	• Drought is a normal part of virtually all climatic regimes, including areas with high and low average rainfall. • Droughts are identified in the State of MS Hazard Mitigation Plan as a limited hazard. • Drought is addressed in the previous MEMA District 1 Region hazard mitigation plans. • There are reports of the most extreme (exceptional) drought in each of the MEMA District 1 Region counties according to the US Drought Monitor. • NCDC reports that the MEMA District 1 Region counties have been affected by 119 drought events since 2006.

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Lightning	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1hazard mitigation plans • Review of NOAA NCDC Storm Events Database • Review of Vaisala's NLDN Lightning Flash Density Map	• The central region of the Florida has the highest density of lightning strikes in the mainland U.S.; however, lightning events are experienced in nearly every region. • Lightning events are discussed in the MS State Hazard Mitigation Plan. • Lightning is addressed under the in most of the previous hazard mitigation plans, and given the damage and reported injuries, individual analysis is warranted. • NCDC reports 20 lightning events for the MEMA District 1 Region since 1997. These events have resulted in 5 deaths, 8 recorded injuries, and $1 million (2016 dollars) in property damage. • According to Vaisala's U.S. National Lightning Detection Network, the MEMA District 1 Region is located in an area that experienced an average of 4 to 12 lightning flashes per square kilometer per year between 2005 and 2014.

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Wildfire	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of Southern Wildfire Risk Assessment (SWRA) Data • Review of Mississippi Forestry Commission website	• Wildfires occur in virtually all parts of the United States. Wildfire hazard risks will increase as low-density development along the urban/wildland interface increases. • The State of MS Hazard Mitigation Plan identifies wildfire as a significant hazard and regular occurrence. • The previous MEMA District 1 Region hazard mitigation plans address wildfire. • A review of SWRA data indicates that there are areas of concern in the MEMA District 1 Region. Wildfire hazard risks will increase as low-density development along the urban/wildland interface increases. • According to the Mississippi Forestry Commission, the MEMA District 1 Region experiences an average of 60 fires each year which burn a combined 1,254 acres annually.

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
GEOLOGIC HAZARDS			
Earthquake	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of National Geophysical Data Center • USGS Earthquake Hazards Program website	• Although the zone of greatest seismic activity in the United States is along the Pacific Coast, eastern and central regions have experienced significant earthquakes. • Earthquake events are identified as a limited hazard in the State of MS Hazard Mitigation Plan, and all counties in MS are considered to be susceptible to the effects of earthquakes. • Earthquakes have occurred in and around the State of Mississippi in the past. The state is affected by the New Madrid (near Missouri) and White River Fault lines which have generated a magnitude 8.0 earthquake in the last 200 years. • The previous MEMA District 1 Region hazard mitigation plans address earthquake. • 16 events are known to have occurred in the region according to the National Geophysical Data Center. The greatest MMI reported was a 7.
Expansive Soils	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of USGS Swelling Clays Map	• The effects of expansive soils are most prevalent in parts of the Southern, Central, and Western U.S. • Expansive soils are not addressed in the previous MEMA District 1 Region hazard mitigation plans. • According to USGS, the MEMA District 1 Region is predominately located in an area that is underlain with "generally less than 50%" clay having high swelling potential.

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Landslide	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of USGS Landslide Incidence and Susceptibility Hazard Map	• Landslides occur in every state in the U.S., and they are most common in the coastal ranges of California, the Colorado Plateau, the Rocky Mountains, and the Appalachian Mountains. • The State of MS Hazard Mitigation Plan excludes the landslide hazard because there is no extensive history of landslides in Mississippi. • The previous MEMA District 1 Region hazard mitigation plans do not address landslides. • USGS landslide hazard maps indicate "high susceptibility" in several counties in the region.
Land Subsidence	YES (combined with Sinkhole)	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans	• Land subsidence affects at least 45 states, including Mississippi. However, because of the broad range of causes and impacts, there has been limited national focus on this hazard. • The state plan does not identify land subsidence as a hazard because there is no significant historical record of the hazard in the region. • The previous MEMA District 1 Region hazard mitigation plans did not identify land subsidence as a potential hazard but it was considered worthwhile to examine its risk.

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Sinkhole	YES (combined with Land Subsidence)	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans	• The states with the greatest number of active sinkholes are Alabama, Florida, Georgia, Indiana, Missouri, Pennsylvania, and Tennessee. • The state plan does not identify sinkholes as a hazard because it did not identify any significant historical record of the hazard in the region. • Sinkholes are not addressed in the previous MEMA District 1 Region hazard mitigation plans but they are considered similar to sinkholes and so are evaluated in conjunction with that hazard in this plan.
Tsunami	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of USGS Regional Assessment of Tsunami potential in the Gulf of Mexico • Review of FEMA "How-to" mitigation planning guidance (Publication 386-2, "Understanding Your Risks – Identifying Hazards and Estimating Losses)	• No record exists of a catastrophic tsunami impacting the Gulf of Mexico coast. • Tsunami inundation zone maps are not available for communities located along the U.S. Gulf Coast. • The tsunami hazard is excluded from the state plan. There is no historical record of tsunamis in the Gulf of Mexico. • None of the previous MEMA District 1 Region hazard mitigation plans address tsunami. • FEMA mitigation planning guidance suggests that locations along the U.S. Gulf Coast have a relatively low tsunami risk and need not conduct a tsunami risk assessment at this time.

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Volcano	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of USGS Volcano Hazards Program website	• More than 65 potentially active volcanoes exist in the United States and most are located in Alaska. The Western states and Hawaii are also potentially affected by volcanic hazards. • There are no active volcanoes in Mississippi. • The volcano hazard is excluded from the state plan. There is no historical record of this hazard in the region.
WIND-RELATED HAZARDS			
Extreme Heat	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of NOAA NCDC Storm Events Database	• Many areas of the United States are susceptible to extreme heat and heat waves, including Mississippi which is located in the hot and humid southeastern United States. • Extreme heat was excluded from the State of MS hazard mitigation plan even though it was recognized that it can create emergencies in state. • Extreme heat is addressed in some of the previous MEMA District 1 Region hazard mitigation plans. • NCDC reports that the MEMA District 1 Region counties have been affected by 139 extreme heat events since 2000.

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Hailstorm	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of NOAA NCDC Storm Events Database	• Although hailstorms occur primarily in the Midwestern states, they do occur in every state on the mainland U.S. Most inland regions experience hailstorms at least two or more days each year. • Hailstorm events are discussed in the MS State Hazard Mitigation Plan. • Hail is addressed in nearly all of the previous MEMA District 1 hazard mitigation plans. Given the frequency of the event, individual analysis is warranted. • NCDC reports 497 hailstorm events (0.75 inch size hail to 4.00 inches) for the MEMA District 1 Region since 1958. For these events, there was over $1.5 million (2016 dollars) in property damages reported.
Hurricane and Tropical Storm	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Analysis of NOAA historical tropical cyclone tracks and National Hurricane Center Website • Review of NOAA NCDC Storm Events Database • Review of historical presidential disaster declarations	• The Atlantic and Gulf regions are most prone to landfall by hurricanes and tropical storms. • The State Hazard Mitigation Plan profiles the hurricane hazard and identifies it as a significant hazard, noting its devastating impacts on the state. • The hurricane and tropical storm hazard are not addressed in the previous MEMA District 1 Region hazard mitigation plans. • NOAA historical records indicate 36 hurricanes and tropical storms have come within 75 miles of the MEMA District 1 Region since 1860. • 2 out of 20 disaster declarations in the MEMA District 1 Region are directly related to hurricane and tropical storm events.

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Nor'easter	NO	• Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of NOAA NCDC Storm Events Database	• Nor'easters are not profiled or discussed in the state plan. • Nor'easters are not identified in the previous MEMA District 1 Region hazard mitigation plans. • NCDC does not report any nor'easter activity for the MEMA District 1 Region counties.
Severe Thunderstorm/ High Wind	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of NOAA NCDC Storm Events Database • Review of historical presidential disaster declarations	• Over 1,000 thunderstorms are estimated to occur each year or the U.S. mainland, and they are experienced in nearly every region. • Severe thunderstorm events were not profiled in the State Hazard Mitigation Plan because they do not typically impact the entire state, invoking a state response. However, severe thunderstorms were identified as a significant concern at the local level. • Severe thunderstorms and high winds are addressed in the previous MEMA District 1 Region hazard mitigation plans. • NCDC reports 872 thunderstorm events in the MEMA District 1 Region counties since 1955. These events have resulted in 4 deaths, 31 injuries, and $22 million (2016 dollars) in property damage. • 13 of 20 disaster declarations in the MEMA District 1 Region are related to severe storm and high wind events.

Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Tornado	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of NOAA NCDC Storm Events Database • Review of historical presidential disaster declarations	• From 1991 to 2010, Mississippi experienced 9.2 tornadoes per 10,000 miles, making it the 5th ranked "tornado state" in the U.S. • Tornado events are listed in the State of MS Hazard Mitigation Plan as a significant hazard and are referenced as a common disaster. • Tornado events are addressed in all of the previous MEMA District 1 Region hazard mitigation plans. • NCDC reports 151 tornado events in MEMA District 1 Region counties since 1953. These events have resulted in 34 recorded deaths, 350 injuries, and $527.3 million (2016 dollars) in property damage with the most severe being an EF4. • 13 out of 20 disaster declarations in the MEMA District 1 Region are related to tornado events.
Winter Storm and Freeze	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of State of MS Hazard Mitigation Plan • Review of previous MEMA District 1 Region hazard mitigation plans • Review of NOAA NCDC Storm Events Database • Review of historical presidential disaster declarations	• Winter storms affect every state in the continental U.S. and Alaska. • Extreme winter weather is identified in the state plan as a limited hazard. • Winter storm events are addressed in the previous MEMA District 1 Region hazard mitigation plans. • NCDC reports that the MEMA District 1 Region counties have been affected by 195 winter weather events since 1996. These events resulted in roughly $4.8 million (2016 dollars) in property damages. • 2 out of 20 disaster declarations were directly related to winter storm events.

4.5 HAZARD IDENTIFICATION RESULTS

TABLE 4.4: SUMMARY RESULTS OF THE HAZARD IDENTIFICATION AND EVALUATION PROCESS

FLOOD-RELATED HAZARDS	GEOLOGIC HAZARDS
☐ Avalanche	☑ Earthquake
☑ Dam and Levee Failure	☐ Expansive Soils
☑ Erosion	☑ Landslide
☑ Flood	☑ Land Subsidence/Sinkhole
☐ Storm Surge	☐ Tsunami
FIRE-RELATED HAZARDS	☐ Volcano
☑ Drought	**WIND-RELATED HAZARDS**
☑ Lightning	☑ Extreme Heat
☑ Wildfire	☑ Hailstorm
	☑ Hurricane and Tropical Storm
	☐ Nor'easter
	☑ Severe Thunderstorm/High Wind
	☑ Tornado
	☑ Winter Storm and Freeze

☑ = Hazard considered significant enough for further evaluation in the MEMA District 1 Region hazard risk assessment.