Earthquake

Introduction

Overview

As Alabama is affected by three seismic zones (fig. 1) – the New Madrid Seismic Zone (NMSZ), the East Tennessee Seismic Zone (ETSZ), and Bahamas Fracture Seismic Zone (BFSZ) – it is critical that the State is prepared for response and recovery associated with catastrophic damage of a major earthquake. The hazards U.S. loss estimation software HAZUS loss estimates can be used in structuring an appropriate response and properly facilitating good decision making at the Local, State, Regional and National levels of government. Examples of planning, decision making, and programs HAZUS output can contribute to include:

Land-use planning and facility site decisions (e.g., a map-based analysis of the potential intensity of ground shaking from a postulated earthquake that identifies those parts of the community that will experience the most violent shaking and the buildings at greatest risk of damage)

Prioritization of retrofit or abatement programs (e.g., an estimate of building damage that provides the basis for establishing programs to mitigate or strengthen buildings that may collapse in earthquakes by providing estimates of damages and casualties)

Local, State, and Divisional emergency response and contingency planning (e.g., estimates of casualties and damage to buildings and utilities)

Medical and relief agency preparedness and response (e.g., estimates of casualties and homelessness)

Assistance planning (e.g., an estimate of dollar losses that will help the State and Federal Government plan for assistance to jurisdictions and disaster victims)

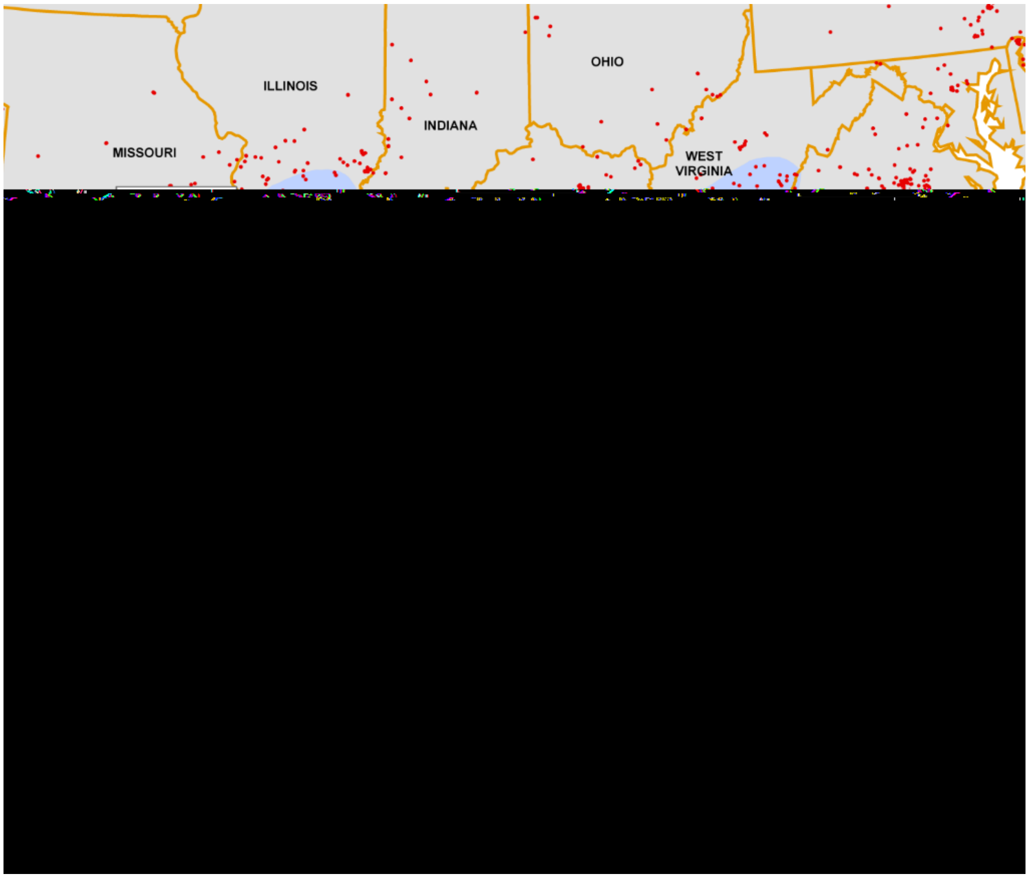

Figure 1: Seismic zones of the southeastern U.S.

Purpose

This annex provides guidance about earthquake response for an earthquake in the State of Alabama. The plan is designed for use at the State level and for organizations that support the Emergency Support Functions (ESFs). Primary and support ESF organizations can use the plan for development of Standard Operating Procedures (SOPs).

Scope

The annex was further refined by using the Scenario-Driven Planning Process. This process uses a detailed and realistic scenario to help achieve planning objectives. It is based on a worst-case NMSZ seismic event for Alabama as determined by the Geological Survey of Alabama, Mid-American Earthquake (MAE) Center and Institute for Crisis, Disaster and Risk Management (ICDRM). It provides the operational framework for implementing the response strategies contained within the Alabama Emergency Operations Plan (EOP). This version of the annex now reflects the information extrapolated from the catastrophic planning workshop and lessons learned from past disasters within and outside the State of Alabama.

The intent of this annex is to reduce the loss of life, property damage, and impact on the environment while supporting a jurisdictional response to a catastrophic incident. Therefore, this annex defines the State's response to an earthquake and applies to all State departments and agencies identified within the EOP.

Plan Implementation

The Alabama Earthquake Plan shall be implemented by AEMA upon a finding by the Executive Director that the threat to life and/or damage to property is beyond the capability of the affected Alabama counties, and that emergency assistance is necessary to save lives, reduce suffering and protect property.

Background Information

Earthquakes

An earthquake is a phenomenon that results from the sudden release of stored energy in the earth's crust that creates seismic waves.[1] At the earth's surface, earthquakes may manifest themselves by a shaking or displacement of the ground, which may lead to loss of life and destruction of property. Earthquakes may occur naturally or as a result of human activities. In its most generic sense, the word earthquake is used to describe any seismic event, whether a natural phenomenon or an event caused by humans, that generates seismic waves. The sudden release of stored energy results in ground shaking, surface faulting, and/or ground failures.

Geology in Alabama

Earthquakes are not uncommon in the State of Alabama. According to the Geological Survey of Alabama, most Alabama earthquakes originate along faults deep within basement rocks.

Alabama is also susceptible to damage from liquefaction and amplification. Liquefaction is a phenomenon that can occur during an earthquake when seismic waves pass through saturated, unconsolidated material causing sediment particles to move in relation to each other. This can be particularly damaging to buildings and structures built on thick sediments, especially in areas where the sediments are saturated with water. Shaking levels at a site may be increased, or amplified, by the focusing of seismic energy caused by the geometry of the sediment velocity structure, such as basin subsurface topography, or by surface topography.

Historical Overview

New Madrid Seismic Zone

1 http://en.wikipedia.org/wiki/Quake_ (natural phenomenon).

The NMSZ (figs. 1 and 2) is a 150-mile-long fault zone spanning four states in the Midwestern United States. Historic earthquakes in the region, such as the 1811–1812 earthquakes, which are estimated to have had magnitudes between ~7.0 and ~8.0. Since the central United States geology is susceptible to soil liquefaction, earthquake damage is magnified over a potentially wider area. The NMSZ is the most seismically active area east of the Rocky Mountains.

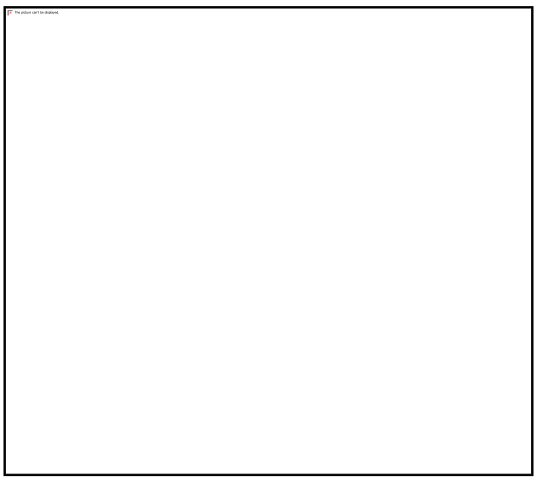

Figure 2: The New Madrid Seismic Zone (red).2

In the winter of 1811-1812, the NMSZ saw some of the largest North American earthquakes in recorded history, including three earthquakes with magnitudes estimated to have been between 7.0 and ~8.0. These earthquakes occurred over a three-month period. Many of the published accounts describe the cumulative effects of the earthquakes, known as the New Madrid Sequence; thus, finding the individual effects of each earthquake can be difficult.

The first earthquake occurred on December 16, 1811, at 2:15 a.m., and had a magnitude estimated between 7.5 and 8.0 with shaking intensities close to X on the Modified Mercalli Intensity Scale (fig. 2). Landslides and geological changes occurred along the Mississippi River, and large localized waves occurred due to fissures opening and closing below the earth's surface. In 1811, the population near the epicenter was small, and thus few buildings were damaged or destroyed. , Larger populations such as Nashville, Tennessee, and Louisville, Kentucky, however, did feel strong shaking, and shaking was felt as far away as New York City, Washington, D.C., and Charleston, South Carolina (fig. 3).

The second earthquake occurred at 9:15 a.m. on January 23, 1812, and also had an estimated magnitude above 7.0. Although the intensity was slightly less, the second and third earthquakes were just as violent as the earlier earthquake.

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2 United States Geological Survey. www.usgs.gov.

The third earthquake occurred on February 7, 1812, at 3:45 a.m., with an estimated magnitude near 7.5. As the epicenter for this quake was near New Madrid, Missouri, the town was destroyed. At St. Louis, many houses were severely damaged and their chimneys were toppled. The meizoseismal area[3] was characterized by general ground warping, ejections, fissuring, severe landslides, and caving of stream banks.

According to the USGS, over 200 moderate to large magnitude aftershocks associated with these NMSZ earthquakes were recorded. These aftershocks occurred between December 16, 1811, and March 15, 1812 and included ten large magnitude shocks estimated to be greater than 6.0.

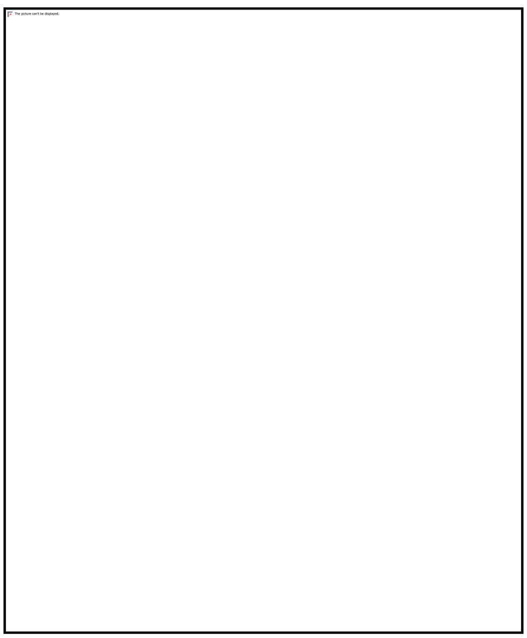

Figure 3: An isoseismic map showing Modified Mercalli shaking intensities for the 1811 New Madrid Seismic Zone event.[4]

This period of earthquakes caused permanent changes in the course of the Mississippi River, which flowed backwards in a short segment in Tennessee. Large areas sank into the earth, fissures opened, lakes permanently drained, new lakes were formed, and over 150,000 acres of forests were destroyed. Hundreds of aftershocks followed over a period of several years.

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3 The *meizoseismal area* in an earthquake is the area of maximum damage.

4 Geological Survey of Alabama, 2007.

In terms of response, it has been reported that the probability of a repeat of the 1811–1812 earthquakes (magnitude 7.5–8.0) is from 7–10% and the probability of a magnitude 6.0 or larger is from 25–40%.[5] However, it is understood that a large magnitude event grows more probable with each passing day. A catastrophic seismic event on the NMSZ could trigger a national response on a larger scale than any recorded earthquake event in modern United States history.

A 2009 Mid-America Earthquake Center Report states that Alabama counties do not meet the planning criteria for damaged infrastructure that is required for an "at risk" classification and as such only residential damages were noted. Because of this, a classification of "Socially Impacted" counties is used for Alabama to describe earthquake damages. Within this area there are 1,384,703 people living in the 21 socially impacted counties. These counties are:

Autauga	Elmore	Lowndes
Baldwin	Escambia	Macon
Bibb	Etowah	Marengo
Bullock	Fayette	Mobile
Choctaw	Geneva	Pickens
Clarke	Hale	Russell
Dallas	Lamar	Tuscaloosa

East Tennessee Seismic Zone

The ETSZ, part of the Southern Appalachian Seismic Zone (SASZ), extends from near Roanoke in southwestern Virginia southwestward toward Birmingham in central Alabama (figs. 1 and 4). Considered a zone of moderate risk, the ETSZ lies within the Appalachian Mountains. The hypocenters of earthquakes in this zone are on deeply buried faults. The greatest earthquake in the zone occurred in 1897 near Pearisburg, Virginia, with an estimated magnitude of 5.8. In Alabama, on April 29, 2003, a 4.9 magnitude earthquake occurred in DeKalb County (fig. 4). The quake was felt in 13 states. The earthquake damaged weaker chimneys and formed cracks in some structures.

5 United States Geological Survey Fact Sheet. http://pubs.usgs.gov/fs/fs-131-02/fs-131-02.pdf.

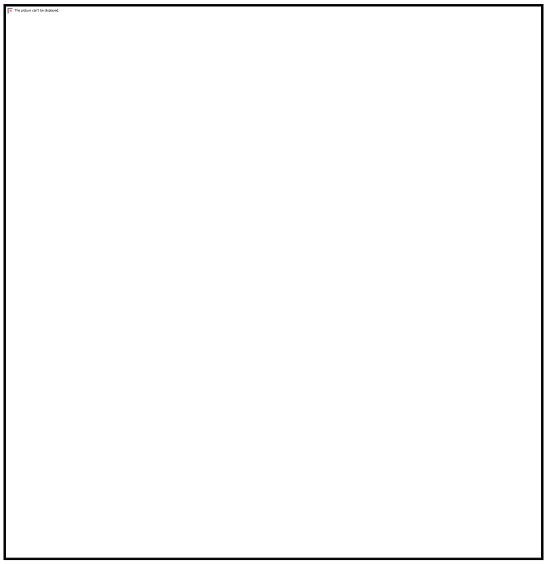

Figure 4: An isoseismic map showing shaking intensities from the 4.9 magnitude earthquake in Fort Payne, Alabama, in, 2003.[6]

The largest known earthquake in Alabama occurred in the ETSZ, near Birmingham, in 1916 (figs. 1 and 5). Although no seismographs existed in the state at the time, the magnitude of the earthquake was calculated from written reports describing the shaking and estimated to be approximately 5.1 in magnitude and with an epicenter near the Irondale.

6 Geological Survey of Alabama, 2007.

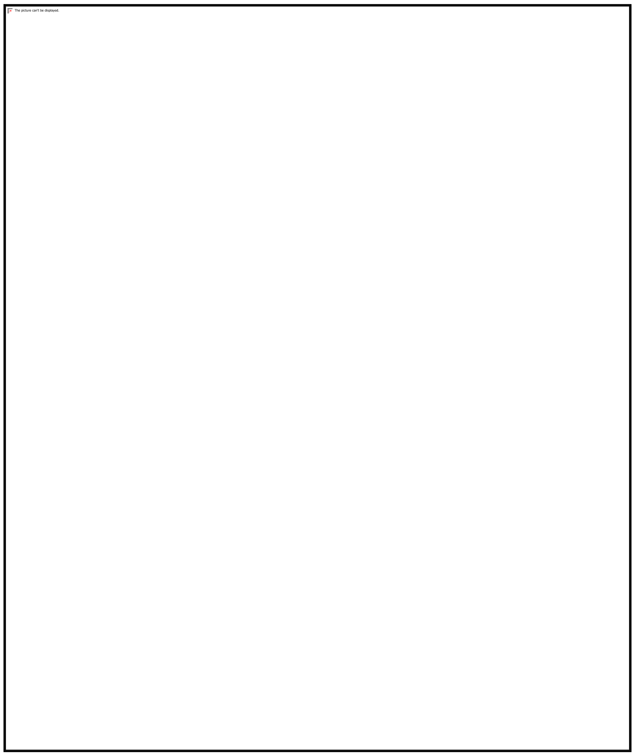

Figure 5: An isoseismic map showing shaking intensities associated with the 5.1 magnitude Irondale earthquake in 1916.[7]

Within Alabama according to the U.S. Census 2014 estimate, there are 2,117,729 people who live in the 14 critical counties of an ETSZ event. Those counties are:

Blount	DeKalb	Jefferson	Morgan
Calhoun	Etowah	Limestone	Shelby
Cherokee	Jackson	Madison	St. Clair
		Marshall	Talladega

Bahamas Fracture Seismic Zone

The BFSZ extends from the panhandle of Florida through Alabama and into Mississippi. It is responsible for the 4.9 magnitude earthquake that occurred on October 24, 1997 in Escambia County, Alabama (figs. 1 and 6). In recent years, there has been an increase in earthquakes from the BFSZ. Historically, the southwestern part of Alabama has had minimal seismic activity, but this quake indicates activity on the

7 Geological Survey of Alabama, 2007.

BFSZ, an ancient basement fault zone that underlies the area. It is not expected that an event on this fault line would create a catastrophic event.

The ~4.9 magnitude earthquake was the largest quake at that time recorded by seismographs in Alabama and the largest in the Southeast in the last 30 years.

Figure 6: An isoseismic map showing shaking intensities associated with the 4.9 magnitude Escambia County earthquake[8]

Within Alabama according to the U.S. Census estimate, there are 780,600 people who live in the nine counties of the BFSZ. These counties are:

Baldwin	Conecuh	Mobile
Choctaw	Covington	Monroe
Clarke	Escambia	Washington

Assumptions

Plan Development Assumptions

The following general assumptions pertain to the overall development of this annex. They are global in nature and are further supported by functional specific assumptions for each ESF.

This annex is based on a catastrophic earthquake.

8 Geological Survey of Alabama, 2007.

The Director of AEMA will direct implementation of the Catastrophic Annex and will provide plan information to the various State departments and agencies.

AEMA is the State agency responsible for coordinating with Local, State, and Federal agencies in the mitigation of, preparedness for, response to, and recovery from a catastrophic earthquake event that may occur.

There will be earthquakes and/or aftershocks potentially as large as or larger than the initial earthquake and they may occur for many months. Multiple incidents may occur simultaneously or sequentially in contiguous and/or noncontiguous areas.

Response operations must be automatic and begin without the benefit of a detailed assessment of the situation, as full reconnaissance and situational assessments may not be immediately completed or available.

If air assets are available, reconnaissance via fixed wing and rotary aircraft must be considered early on. These early reconnaissance missions will be vital in developing full situational awareness. Satellites, drones, and unmanned aerial devices may also be used.

As this event is anticipated to be catastrophic in nature, it brings unique management issues and response operations that will require plans to be flexible, be easily adaptable to the situation, and effectively address emerging and unanticipated needs and requirements.

Alabama recognizes that a catastrophic earthquake in the southeast United States will have the potential to affect other adjoining states and that an immediate Presidential Disaster Declaration will be required along with the establishment of a Joint Field Office (JFO).

Other ongoing disasters/emergencies, combined with maintaining a reserve capability for potential subsequent events (e.g., aftershocks, weather-related events, terrorist events, or other types of man-made disasters), must be factored into State planning capabilities.

Planning/Operational Assumptions by ESF

ESF 1: Transportation

Damage to transportation systems may severely hamper recovery efforts following an earthquake. The loss or impairment of major rail, highway, and bridge links serving the city may significantly increase the difficulty of rescue and relief efforts, and may also have a long-term disrupting effect upon regional and national commerce.

River port cities built on alluvial soil may sustain substantial damage to their infrastructure that limits the usefulness of the facilities in relief efforts.

Partial or limited availability of airport facilities is expected following an earthquake. Facilities that rely on electrical power (i.e., navigation aids and runway lighting) may be out of commission for some time, even if emergency power is available. Runways may be available at least for limited use, even in severely affected areas.

Ingress and egress routes may not be usable.

Debris removal may be a major problem.

In the event rubble and debris resulting from an earthquake prevent access to the affected area for a prolonged time, helicopters and alternate forms of transportation may be necessary to bring search and rescue teams in the area.

Transportation routes, such as highways and bridges, may be destroyed or damaged. This may include roads buckling or shifting out of alignment and areas reduced to rubble. Bridges that appear to be structurally sound may in actuality need structural reinforcement prior to resumption of use. Additional modes of transportation—including rail, navigable waterways and ports, and airport runways—may sustain damage that will render them unusable.

ESF 2: Communications

Commercial telephone service is vulnerable, particularly due to the possible rupture of underground cables that cross faults. Should the public switched telephone network (PSTN) fail, satellite phones and the Amateur Radio Emergency System (ARES) and/or Radio Amateur Civil Emergency Service (RACES) may be implemented to support relief efforts. Southern LINC, Cellular telephone, two-way radio towers and associated circuits may be inoperable. The State Emergency Operations Center (SEOC) has amateur radio equipment installed, as well as approximately half of the county Emergency Management Agency (EMA) offices located in the listed critical counties.

AEMA Regional Communications vehicles may be deployed. Regional communication vehicles are located in the following critical counties: Lauderdale, Calhoun, and Mobile. There are other vehicles located throughout the state that can be brought in as needed.

In the case where communications infrastructure is not damaged, there will be an overload of the communication systems after an earthquake.

AEMA will have the following equipment pre-staged in Northern Alabama:

One 100’ tower trailer with repeaters

One radio cache with 50 VHF, 50 UHF, 25 800 MHz, and 6 multiband portable radios

Other state-owned tower trailers and radio caches located throughout the state that may be deployed as needed

AEMA has satellite telephone units assigned to all area coordinators and additional units are located at the SEOC.

ESF 3: Public Works and Engineering

In the non-governmental sector, there may be minimal communications for a considerable length of time.

Many natural gas lines are buried in Alabama. These are vulnerable to rupture, which may result in an explosion and fire.

A number of crude oil pipelines are in operation in Alabama. A break in one of these lines could cause significant environmental damage and could have an impact on potable water service.

If high water conditions exist during the time an earthquake occurs, levees may be sufficiently damaged to allow flooding to occur behind them, especially in low-lying areas.

Earthen dams are not expected to be damaged to the extent they will lose their reservoirs.

One or more dams may fail. An inventory of Alabama dams maintained by the U.S. Army Corps of Engineers and the Alabama Department of Economic and Community Affairs, Office of Water Resources listed 171 dams as “high hazard,” 427 as “significant hazard,” and 1,506 as “low hazard.” Counties should contact the U.S. Army Corps of Engineers and the Alabama Department of Economic and Community Affairs, Office of Water Resources to determine the status of dams.

Water and sewage systems are vulnerable to ground movement. Disruption of the water system can lead to loss of potable water and a loss of water for firefighting. Disruption of the sewage system can result in environmental damage and increased health risks.

ESF 4: Firefighting

Fires, burning out of control, involving major portions of a city are possible in the business sections because of the nature and density of construction in the affected areas. Large, uncontrolled fires are less likely in residential areas because the housing density is less than in the business sections. However, there may be some individual or small group fires that occur as the result of miscellaneous damage-related factors or weather conditions.

The total number of ignitions/responses in a jurisdiction may increase immediately after an earthquake due to ruptured utility lines and injuries sustained during the event.

Prioritization of calls and responses will be required. Matching resource type to incidents where they can provide the most benefit may be used, with lower priority calls not being immediately addressed. Additionally, the type of incident and security considerations will also influence decision making when triaging a particular emergency response.

Personnel will be deployed for longer durations, increasing the fatigue factor.

Response time will be increased due to debris and road damage. Downed power lines may make roads difficult to navigate.

ESF 5: Emergency Management

It may be several hours before personnel and equipment can be mobilized and initial teams deployed to affected areas. Therefore, Regional and Local resources will be relied upon heavily in the period immediately following the earthquake.

During a major earthquake, there is an increased need for the coordination of all activities relevant to the emergency response and recovery efforts. This increased coordination will take place at the SEOC and Division EOCs.

GSA will provide staffing for the positions of Hazard Analyst on the ICS-203.

ESF 6: Mass Care, Emergency Assistance, Housing, and Human Services

Food supply lines could break down.

Emotional, spiritual, and mental health needs will be great.

Shelter workers in affected areas may not be able to report for assignments. This will require an immediate request for outside assistance.

ESF 7: Logistics Management and Resource Support

Affected counties will need to pre-identify base locations for replenishing depleted resources to further manage the incident. The methods for replenishment (air or ground) will need to be communicated to the SEOC.

Assistance from private contractors and voluntary agencies will be forthcoming to help during the incident. Pre-contracted services may be necessary and are encouraged through public- and private-sector organizations and partnerships.

Supply chain coordination and planning must occur at all levels (Local, State, and Federal) within the logistics management process.

Interstate and intrastate mutual aid agreements will be used.

The Emergency Management Assistance Compact (EMAC) will be implemented based on State and Federal declarations.

ESF 8: Public Health and Medical Services

A major earthquake would create extraordinary requirements for emergency medical services.

Health care may be seriously impaired by damage, limiting the number of hospital beds and medical supplies that are available immediately following an earthquake.

The number of health care professionals available may also be limited in the event of an earthquake because some professionals may be isolated from their work places or injured.

Depending on the nature of the incident, supplies of preventive and therapeutic pharmaceuticals and treatments will be insufficient or unavailable to meet the demand, both real and perceived. Additionally, there will be insufficient numbers of qualified medical personnel to administer available treatment to both the affected and adjacent populations. Timely provision of treatment may be able to forestall additional people becoming ill and reduce the impact of disease among those already exposed.

The number of fatalities may overwhelm the Local Mortuary Services and the County Coroner. Federal assistance, provided by a Disaster Mortuary Operational Response Team, may be needed.

Deaths and injuries are expected to be principally the result of the failure of man-made structures, particularly older, multi-story, and un-reinforced brick masonry buildings built before the adoption of earthquake resistant building codes.

ESF 9: Search and Rescue

The first few hours following an earthquake are critical in saving the lives of people trapped in collapsed buildings. Therefore, the use of Local resources during the initial response period will be essential until State and Federal support is available.

In situations that entail structural collapse, people may require rescue and medical care, which will need to be coordinated with ESF 8: Public Health and Medical Services.

During the course of a catastrophic earthquake, rescue personnel may encounter extensive damage to the Local infrastructure, such as buildings, roadways, public works, communications, and utilities. Such damage can create environmental safety and health hazards, such as downed power lines, unsafe drinking water, and un-refrigerated food. This could slow the rescue response.

Following an earthquake, the aftershocks, secondary events, and/or other hazards (e.g., fires, landslides, flooding, and HazMat releases) may compound problems and threaten both disaster victims and rescue personnel.

Weather conditions such as temperature extremes, snow, rain, and high winds may pose additional hazards for disaster victims and rescue personnel.

In some circumstances, rescue personnel may be at risk from terrorism, civil disorder, or crime.

Local residents, workers, and/or converging volunteers may initiate Search and Rescue efforts, but will usually lack specialized equipment and training. Spontaneous volunteers will require coordination and direction within the Local incident command structure.

Community Emergency Response Team (CERT) volunteers may be used to assist with Search and Rescue.

Access to damaged areas will be limited. Some sites may be initially accessible only by air or water.

Following a catastrophic earthquake, both disaster victims and rescue personnel may be threatened by aftershocks, secondary events, and/or other environmental disturbances.

ESF 10: Oil and Hazardous Materials Response

Hazardous material releases ranging from minor environmental impact to major environmental impact may occur.

HazMat decontamination priorities and cleanup will be established using the following priorities, in order of importance: life safety, incident stabilization, and property conservation.

Damaged underground storage tanks and natural gas wells may further impede first responder response efforts.

ESF 11: Agriculture and Natural Resources

Pets may be displaced with their owners, potentially requiring evacuation or sheltering. A significant number of pets will likely be housed with their caretakers.

Following a major or catastrophic disaster, there may be widespread damage and destruction to the infrastructure and homes/buildings, resulting in transportation routes being impassable, widespread and prolonged power outages, and contaminated food and drinking water.

Normal food processing and distribution capabilities will be disrupted.

As a result of power outages, many commercial cold storage and freezer facilities within the impacted area will be inoperable.

Shelters should have food and water supplies to manage for 72 hours after the disaster.

ESF 12: Energy

Electrical power systems are among the most fragile in the event of an earthquake. Because they are also among the most essential of the utilities, even a short-term loss can be a major setback to a community. The loss of electric power during an earthquake may mean no water to fight fires or for drinking water, no light or heat, no communications, no sewage pumps, etc.

Petroleum shortages should be anticipated.

ESF 13: ALEA - Public Safety and Security

First responder staffing may be reduced due to the nature of the earthquake and how it has adversely affected them on a personal level.

Accountability for personnel must be considered for response and recovery operations including a check-in process/system for off-duty staff.

Communication systems may be affected and Amateur Radio Emergency System (ARES) and/or Radio Amateur Civil Emergency Service (RACES) may need to be used.

Disasters naturally bring out the curiosity of people in areas both affected and non-affected. The uncontrolled inward flow of unauthorized personnel is detrimental to the efficient handling of traffic flow in affected areas.

In some situations, especially during civil disturbances, firefighters and EMS personnel are expected or required to work in areas that are subject to hostile action (e.g., sniper fire, throwing of bricks and other objects). Security must be provided for these personnel.

Following a disaster, criminals often move into an area in an attempt to take advantage of the situation for their own benefit.

ESF 14: Long-Term Community Recovery *(See the ESF #14 Annex to the AL EOP.)*

> ESF #14 provides a framework for State Government support to other state governments as well as local and tribal governments, non-governmental organizations (NGOs), small non-profit organizations and the private sector to recover from the long-term consequences of disasters and emergencies. This support includes stabilization of regional and local economies, using available programs and resources of state and federal departments and agencies to aid community recovery, especially long-term recovery and to reduce, mitigate, or eliminate risk from future incidents, where feasible.

Business and industry may not be prepared for adequate response to an earthquake. Businesses that rely on computer-based systems are particularly vulnerable.

Failure of banking systems, which use electronic fund transfers, could result in widespread economic problems.

A damaging earthquake may cause a serious loss of employment, which could impact economic factors at the Local, State, and National levels.

Interagency recovery expertise will be needed to provide for strategic guidance across all facets of recovery operations. This would include areas of recovery in individual assistance, public and privately owned public infrastructure, and business redevelopment and organization.

ESF 15: External Affairs

The public (e.g., citizens, students, business owners, faith-based and civic groups, and home health/hospice groups) will need to be educated on how to help each other and their communities.

A catastrophic earthquake may terrify the population, both in the incident area and nationally. Therefore, any catastrophic event, regardless of cause, will result in intense and immediate media attention.

The public may accept hearsay, rumors, and half-truths as fact during periods in which no credible source of emergency public information is available.

Emergency public information is essential to guiding the actions of disaster victims to ensure that they are able to effectively understand what is going on and develop appropriate responses to the threats and circumstances imposed upon them by the disaster.

A joint information system (JIS) will be established with the Governor's Communication Director, other state agency Public Information Officers (PIOs) (who will have a role in releasing information), and State

PIOs in the Central United States Earthquake Consortium states. After the JIS is established, the Joint Information Center (JIC) will be established in a safe place, using all the PIOs in the system.

Concept of Operations

Emergency responsibilities assigned to State agencies for earthquake response parallel those for other disaster operations.

When an earthquake occurs, Local authorities within damaged areas will use available resources to protect life and property and reduce, to the extent possible, the suffering and hardships on individuals. If Local resources prove to be inadequate or are exhausted, assistance will be requested from other jurisdictions through mutual aid procedures.

These procedures need to be in place before the incident to ensure legal and financial conditions are delineated. Jurisdictions in the areas sustaining little or no damage will be called upon to support the affected areas.

When requirements are beyond the capability of Local government, requests for assistance will be forwarded to AEMA in accordance with this plan.

When resource requirements cannot be met with State resources, AEMA will request Federal assistance in accordance with applicable Federal laws, policies, procedures, and plans.

Emergency operations will begin with the occurrence of a damaging earthquake and continue until emergency operations are no longer required.

Phases of the Operation

An earthquake response and recovery operation will be conducted in three major phases. Some phases are continuous and all have a predictable amount of overlap. The response operation may generally flow in this order:

Catastrophic Situation Awareness

Catastrophic Activation and Response

Recovery (Short & Long-Term)

Phase 1: Catastrophic Situation Awareness

Situational awareness refers to the continual process of collecting, analyzing, and disseminating intelligence, information, and knowledge to allow organizations and individuals to anticipate response requirements and to react effectively to those requirements. It involves an interactive process of sharing and evaluating information from multiple sources to include the fusion of domestic and international intelligence and operational reports into a coherent picture. It includes communications and reporting activities and tasks to forecast or predict incidents and to detect and monitor threats and hazards.

Situational awareness can also cover public education. Awareness activities are the basis for advice, alert and warning, intelligence and information sharing, technical assistance, consultations, notifications, and informed decision making at all interagency and intergovernmental levels, as well as within the private sector and the public.

Given that an earthquake is a no-notice event, it is critical to quickly obtain situational awareness of the event so that the appropriate resources can be deployed quickly and efficiently into the affected areas.

Catastrophic Earthquake Initial Assessment (0–24 hours)

While the ability to quickly perform reconnaissance and to gather, verify, consolidate, and distribute confirmed situation information is vital to the response, it is equally important that initial response strategies are developed with an accurate picture of the potential scope of the disaster. Resource requests must quickly be made from the Local level to the State, and then on to the Federal level without delay. Quickly identifying the potential scope of damage following a major earthquake is critical to mounting an effective response; however, this may be extremely difficult initially due to limited communications capability, information overload, limited staff, and fragmented or conflicting damage reports.

Immediately following the earthquake, it may be possible to establish an initial assessment of the impact using available analytical tools. This assessment can be used to direct initial response activities toward those areas that are most likely to be seriously affected, given the location and magnitude of the earthquake and shaking potential. Key information about the earthquake should be provided by Geological Survey of Alabama (GSA) and include the following:

Source fault (e.g., New Madrid (fig. 2))

Location of the epicenter

Magnitude

Shaking intensities (figs. 3, 4, 5, and 6)

Duration of shaking

If Internet access is available through existing networks or satellite backup systems, information about the earthquake can be found at the following Web sites:

United States Geological Survey (USGS)
http://earthquake.usgs.gov/
The USGS provides information on earthquake characteristics within minutes of the event. They also operate a notification service, with subscription details found at https://sslearthquake.usgs.gov/ens/?page=help.

Center for Earthquake Research and Information http://www.ceri.memphis.edu/

Cooperative Mid-America Madrid Seismic Network – NM http://www.eas.slu.edu/Earthquake_Center/NM/

If the magnitude, source fault, or epicenter location varies significantly from the potential earthquake scenarios, initial damage assessment assumptions may be based on the perceived shaking and damage potentials identified on the Isoseismic map showing Modified Mercalli shaking intensities for the State of Alabama in the Historical Overview section on page 5 of this Annex.

The Geological Survey of Alabama (GSA) will be contacted during this phase as subject matter experts to assist in hazard analysis and any interpretation of scientific data related to the seismic event. GSA will provide staffing at the SEOC for ESF-5 Planning Section as the Hazard Analyst.

SEOC Operations Information List for Initial Situation Assessment

The SEOC Operations Information List (see **Error! Reference source not found.**) is a tool designed to serve as a reference document for the SEOC and it can easily be adapted for Local use. It provides a starting point for assisting with information collection and can be used when an earthquake is felt or reported.

Phase 2: Catastrophic Activation and Response

Direction and Control of disasters that impact the citizens of Alabama will be exercised by the Governor through the Director of AEMA. The activation and deployment of State assets for a catastrophic earthquake will be formally initiated by the Operations Section at the SEOC.

The SEOC is responsible for forwarding all requests that the State is unable to fulfill to the State Coordinating Officer (SCO), who will eventually be located at the JFO. Until the JFO is established, the SEOC will forward these requests directly to FEMA Region IV.

The SCO passes the State's needs to the Federal Coordinating Officer (FCO), who is also located at the JFO. The FCO is responsible for integrating and coordinating the resources of the entire Federal Government and serving as the Federal single point of contact to the SCO and SEOC.

As outlined in the NRF, the Governor will still maintain overall responsibility for requesting Federal assistance for a catastrophic earthquake event within the state. Even though the Federal response may be automatic using a "pushed" Logistics System, the State will formally document all requests for Federal assistance.

Phase 3: Recovery

There are usually no clear distinctions between when the Response Phase ends and the Recovery Phase begins. There is typically a time period after the earthquake in which both phases are in effect simultaneously. The Recovery Phase begins a few days after the earthquake and can last as long as ten years for a catastrophic disaster. During this phase, the Federal government provides disaster relief upon Presidential Disaster Declaration. Functions during this phase include Federal relief under PL 93-288 for public and individual assistance, establishment of Disaster Recovery Centers (DRC), establishment of temporary housing facilities, and Federal disaster loans and grants. Long-term recovery includes restoration of affected areas to their normal or an improved state.

Support to Neighboring States

Support to Mississippi and/or Tennessee will depend on the severity of damages incurred by the State of Alabama from a catastrophic earthquake event. Alabama will strive to support the needs of their neighboring states to the best of their availability and resources.

Reported potential resource (equipment, personnel, supply) shortfalls from neighboring states requiring support include, but are not limited to the following:

1. Operational control at local EOCs
2. Building Code inspectors
3. SAR Teams
4. Law Enforcement officers and vehicles
5. DOT bridge and roadway Survey Teams
6. Shelter facilities and staff

Review and Maintenance

Maintenance and update of this appendix will be consistent with the overall Alabama Emergency Operations Plan (EOP) maintenance and update policies. As a minimum, the state agency contact will coordinate and conduct an annual review of this tab with all support agencies. Additional reviews may be conducted if experience with an incident or regulatory changes indicate a need.

Recommendations for change will be submitted to AEMA for approval, publication, and distribution. Exercise of the provisions of this tab should occur periodically. Inclusion of FEMA and other federal partners is strongly encouraged in the functional exercises. Each state agency will develop internal procedures for administrative support.

Appendix A: New Madrid Seismic Zone Area Map

The picture can't be displayed.

Appendix B: Glossary

Active Fault:

A fault is active if, because of its present tectonic setting, it can undergo movement from time to time in the immediate geologic future. This active state exists independently of the geologists' ability to recognize it. Geologists have used a number of characteristics to identify faults, such as historic seismicity or surface faulting, geological recent displacement inferred from topography, or physical connection with an active fault.

However, not enough is known about the behavior of faults to ensure identification of all active faults by such characteristics. Selection of the criteria to identify active faults for a particular purpose must be influenced by the consequences of fault movement on the engineering structures involved.

Aftershock:

An earthquake that follows a larger earthquake or the main shock and is in the same general region. A large shock normally has many aftershocks, generally decreasing in frequency and size with time.

Amplification:

Shaking levels at a site may be increased, or amplified, by focusing of seismic energy caused by the geometry of the sediment velocity structure, such as basin subsurface topography, or by surface topography.[9]

Basement Fault:

Harder and usually older igneous and metamorphic rocks that underlie the main sedimentary rock sequences (softer and usually younger) of a region and extend downward to the base of the crust.[10]

Fault:

The area of contact between two blocks of rock that have moved relative to each other is called a fault. The direction of relative motion of the blocks may be horizontal, vertical, or a combination of these

9 United States Geological Survey

10 United States Geological Survey

motions. The force that causes the stress within the rock that makes it break along a fault is a result of the movement of or within giant sections (or plates) of the earth's outer layer.11

Liquefaction:

Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading. Liquefaction occurs in saturated soils, that is, soils in which the space between individual particles is completely filled with water.12

Magnitude:

A quantity characteristic of the total energy released by an earthquake, as contrasted to intensity that describes its effects at a particular place. Magnitude is expressed in terms of the motion that would be measured by a standard type of seismograph located 100 km from the epicenter of an earthquake. Several other magnitude scales in addition to Local magnitude (ML) are in use; for example, body wave magnitude (mb) and surface-wave magnitude (MS), which utilize body waves and surface waves, and ML. The scale is theoretically open-ended. The largest known earthquakes have had MS magnitudes near 8.9.

Modified Mercalli Intensity Scale:

In seismology, a scale of seismic intensity is a way of measuring or rating the *effects* of an earthquake at different sites. The Modified Mercalli Intensity Scale is commonly used in the United States by seismologists seeking information on the severity of earthquake effects. Intensity ratings are expressed as Roman numerals between I at the low end and XII at the high end. The Intensity Scale differs from the Richter Magnitude Scale in that the effects of any one earthquake vary greatly from place to place, so there may be many Intensity values (e.g., IV, VII) measured from one earthquake. Each earthquake, on the other hand, should have just one Magnitude, although the several methods of estimating it will yield slightly different values.13

Richter Scale:

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11 Geological Survey of Alabama

12 University of Washington

13 John N. Louie, Ph.D. University of Nevada at Reno.

The Richter Scale measures the energy of an earthquake by determining the size of the greatest vibrations recorded on a seismogram. On this scale, one step up in magnitude (from 5.0 to 6.0, for example) increases the energy more than 30 times.14

Seismic Waves:

Seismic waves are waves that travel through the Earth, most often as the result of a tectonic earthquake, sometimes from an explosion.

Seismic Zone:

A generally large area within which seismic design requirements for structures are uniform.

14 The Regents of the University of California.

Appendix C: General Earthquake Information

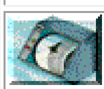
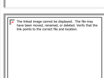
Table 1

Intensity	Shaking	Description/Damage	Richter Scale (Approximate)
I	Not felt	Not felt except by a very few under especially favorable conditions.	1-2
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.	3
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.	3.5
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	4
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.	4.5
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.	5
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	5.5
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.	6
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial	

		collapse. Buildings shifted off foundations.	6.5
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.	7
XI	Very Disastrous	Few buildings survive; bridges damaged or destroyed; all services interrupted; electrical, water, sewage, railroads; severe landslides.	7.5
XII	Catastrophic	Total destruction; objects thrown airborne; river courses and topography altered.	8+

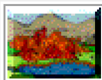
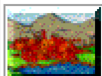
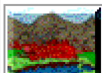
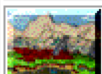
Table 2

Modified Mercalli Intensity Scale15

MMI Value		Description of Shaking Severity	Summary Damage Description Used on 1995 Maps	Full Description
	I.			Not felt. Marginal and long period effects of large earthquakes.
	II.			Felt by persons at rest, on upper floors, or favorably placed.
	III.			Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.

15 Association of Bay Area Governments and Campagna Mulitmediale di Informazione of the Osservatorio Geofisico Sperimentale

	**IV.**			Hanging objects swing. Vibration like passing of heavy trucks, or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, and doors rattle. Glasses clink. Crockery clashes. In the upper range of IV, wooden walls and frames creak.
	**V.**	**Light**	**Pictures Move**	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, and/or open. Shutters and/or pictures move. Pendulum clocks stop, start, and/or change rate.
	**VI.**	**Moderate**	**Objects Fall**	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, and/or glassware broken. Curios, books, etc. off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small bells ring (church, school). Trees and bushes shaken (visibly, or heard to rustle).
	**VII.**	**Strong**	**Nonstructural Damage**	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices, and un-braced parapets and architectural ornaments. Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.
	**VIII.**	**Very Strong**	**Moderate Damage**	Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, and/or elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.

	**IX.**	**Violent**	**Heavy Damage**	General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations.) Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas, sand and mud ejected, earthquake fountains, and/or sand craters.
	**X.**	**Very Violent**	**Extreme Damage**	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, and/or embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.
	**XI.**			Rails bent greatly. Underground pipelines completely out of service.
	**XII.**			Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

Masonry A: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.
Masonry B: Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces.
Masonry C: Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces.
Masonry D: Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

Table 3

Richter Magnitude Scale[16]

Magnitude	Earthquake Effects at or near the Epicenter	Estimated Number Each Year
2.5 or less	Usually not felt, but can be recorded by seismograph.	900,000
2.5 to 5.4	Often felt, but only causes minor damage.	30,000
5.5 to 6.0	Slight damage to buildings and other structures.	500
6.1 to 6.9	May cause a lot of damage in very populated areas.	100
7.0 to 7.9	Major earthquake. Serious damage.	20
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.	One every 5 to 10 years

<u>Geological Survey Support Potential to ESFs for Earthquake Response and Planning</u>

Topic (and ESFs affected)	Description of Potential Damage	GSA Action and Products
Shaking intensity (All ESFs)	Damage is more likely in areas of stronger shaking intensity. Dependent on: Distance from epicenter; Bedrock and surface Geology	Products GSA can interpret: 1. ShakeMap (computer estimated intensity) 2. Did-You-Feel-It (citizen report intensity) 3. PAGER (computer estimated economic and social impact) 4. GIS data for the above
Aftershocks (All ESFs)	Aftershocks (large, moderate, and small magnitude) follow large magnitude earthquakes. Can impact previously compromised: Response efforts; Resources; Infrastructure; Surface	Continual monitoring and data collection of seismic activity following an earthquake. Information shared in tables, maps, and map data (for interactive map capabilities).

16 UPEeis

		Interpretation of seismic activity and patterns of aftershocks.
Landslides (ESFs 1, 3, 5, 7, 9?)	During strong shaking portions of hillsides may separate and slide downslope. Can impact: Structures; Roads and bridges; Travel/Transportation	Field geologists will report location and descriptions and photos of landslides. Landslide susceptibility maps can be used to identify areas with a higher likelihood of triggered landslides.
Liquefaction (ESFs 1, 3, 5, 11, 14)	During strong shaking sediment can be displaced, losing vertical cohesion and ability to support structures. Areas most prone to liquefaction: unconsolidated water-saturated sediments such as built up soils, floodplains, marshes, drained marsh/swamp, and agricultural areas. Can impact: Structures; Roads and bridges; Pipelines; Agriculture	Field geologists will report location and descriptions and photos of liquefaction. Liquefaction/soil amplification susceptibility maps: 1. Can be used to help identify areas with a higher likelihood of liquefaction. 2. Can be referred to after large earthquakes as a planning tool prior to aftershocks.
Lateral Spreading (ESFs 1, 3, 5, 11, 14)	Strong shaking sediment can be displaced, losing horizontal cohesion and ability to support structures. Areas most prone to lateral spreading: Levees/earthen dams/berms and structures on or near these. Can impact: Roads and bridges; Structures; Agriculture	Field geologists will report location and descriptions and photos of lateral spreading. Remote sensing/GIS analyses
Karst/ Sinkholes (ESFs 5, 8, 10, 11, 14)	Strong shaking can dislodge soil and underground rock in areas with limestone. Areas most prone to earthquake-triggered sinkholes are areas already having sinkholes, caves, and caverns. Can impact: Roads and bridges; Structures; Water supplies; Pipelines	Field geologists will report location and descriptions and photos of sinkholes. Karst maps are available from GSA that identify location of karst geology and larger sinkholes. 1. May be helpful for planning purposes for ground failure 2. May be helpful from an environmental contamination and groundwater resource perspective.

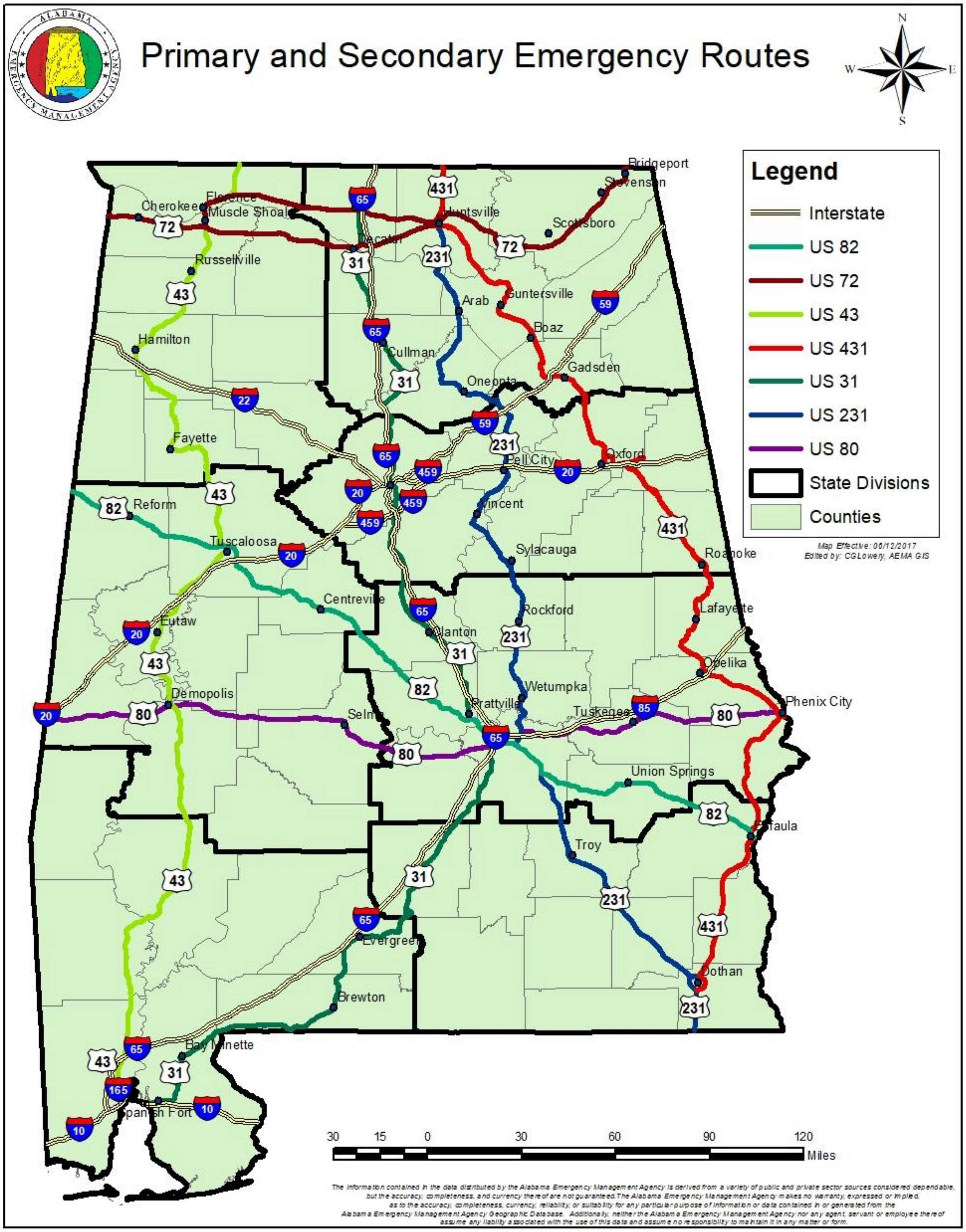
Groundwater Supply/Water Wells (ESFs 3, 11)	Shaking can increase siltation in water supplies, including aquifers, reservoirs, and other water bodies. Groundwater levels can rise or fall, and increased siltation can clog and shut down pumps. Can impact: Water supply; Water quality; Agriculture	Hydrologists can help assess groundwater effects, data, and alternative water well supplies.
Environmental/ Toxic Pollutants (ESFs 5, 8, 10, 11, 14)	Strong shaking can impact structures their contents, including storage integrity of retaining ponds, treatment facilities, and industrial processes. Some toxic contents may pose environmental risk. Can impact: Water supply; Water quality; Human health/safety; Environmental health/safety; Agriculture	GSA karst maps can be consulted for identifying connections between surface water (and contaminants) and groundwater. GSA groundwater flow paths/directions can be analyzed for plume analysis.
Oil/Gas Pipeline and Well Damage (ESFs 4, 5, 8, 10, 11, 14)	During episodes of strong shaking, pipelines and wells can be damaged. Potential release/spill of toxic contaminants, petroleum- or gas-related products is possible. Can impact: Pipelines; Fire; Water supply; Water quality; Human health/safety; Environmental health/safety; Agriculture	Information and maps of locations of pipelines and operations for reference. Interpretation of possible risk from petroleum products.
Changes in landcover/landuse (ESFs 4, 5, 6, 7, 9, 13, 14)	Strong shaking can damage or destroy surface structures.	Geologists and GIS specialists can help locate and acquire imagery and Lidar. Geologists can help analyze and model change detection in populated areas, structures, and ground surface (such as landslides).
Long Term Impacts (ESFs 5, 15, and more)	Large earthquakes can significantly impact communities, infrastructure, the land, and much more.	GSA may be able to provide support in continued research following a major earthquake to study impacts to the land and communities. This information can be shared with EMAs for support in planning and recovery efforts. Information, maps, and analyses that show location of damage or changes to the ground (landslides, liquefaction, etc.) and natural resources (groundwater,

	As with any major disaster, long-term relief can include many aspects.	surface water, and others) can be made available as research and mapping efforts are conducted.
Debris (ESFs 5, 10, 14)	Large quantities of debris can be generated during large earthquakes. Can impact: Infrastructure; Recovery; Health/safety; Environment	Groundwater hydrologists and mapping staff can contribute to landfill site identification by providing feedback on permeability and groundwater maps.

EMERGENCY SUPPORT FUNCTIONS (ESFs) ANNEXES Introduction

ESF # 1 Transportation
ESF # 2 Communications
ESF # 3 Public Works and Engineering
ESF # 4 Fire Fighting
ESF # 5 Emergency Management
ESF # 6 Mass Care, Emergency Assistance, Housing and Human Services (Interim)
ESF # 7 Logistics Management and Resource Support
ESF # 8 Public Health and Medical Services
ESF # 9 Search and Rescue
ESF # 10 Oil and Hazardous Materials Response
ESF # 11 Agriculture and Natural Resources
ESF # 12 Energy
ESF # 13 Public Safety and Security
ESF # 14 Long-Term Community Recovery
ESF # 15 External Affairs

Appendix D: Alabama Primary/Secondary Emergency Routes


Primary and Secondary Emergency Routes
N
S
W
E
Legend
Interstate
US 82
US 72
US 43
US 431
US 31
US 231
US 80
State Divisions
Counties
Map Effective: 06/12/2017
Edited by: CGLowery, AEMA GIS
Bridgeport
Stevenson
Huntsville
Scottsboro
Cherokee
Florence
Muscle Shoals
Decatur
Russellville
Guntersville
Arab
Boaz
Hamilton
Cullman
Gadsden
Oneonta
Fayette
Pell City
Oxford
Reform
Vincent
Tuscaloosa
Sylacauga
Roanoke
Centreville
Rockford
Lafayette
Eutaw
Clanton
Opelika
Wetumpka
Demopolis
Prattville
Phenix City
Selma
Tuskegee
Union Springs
Eufaula
Troy
Evergreen
Dothan
Brewton
Bay Minette
Spanish Fort
30
15
0
30
60
90
120
Miles
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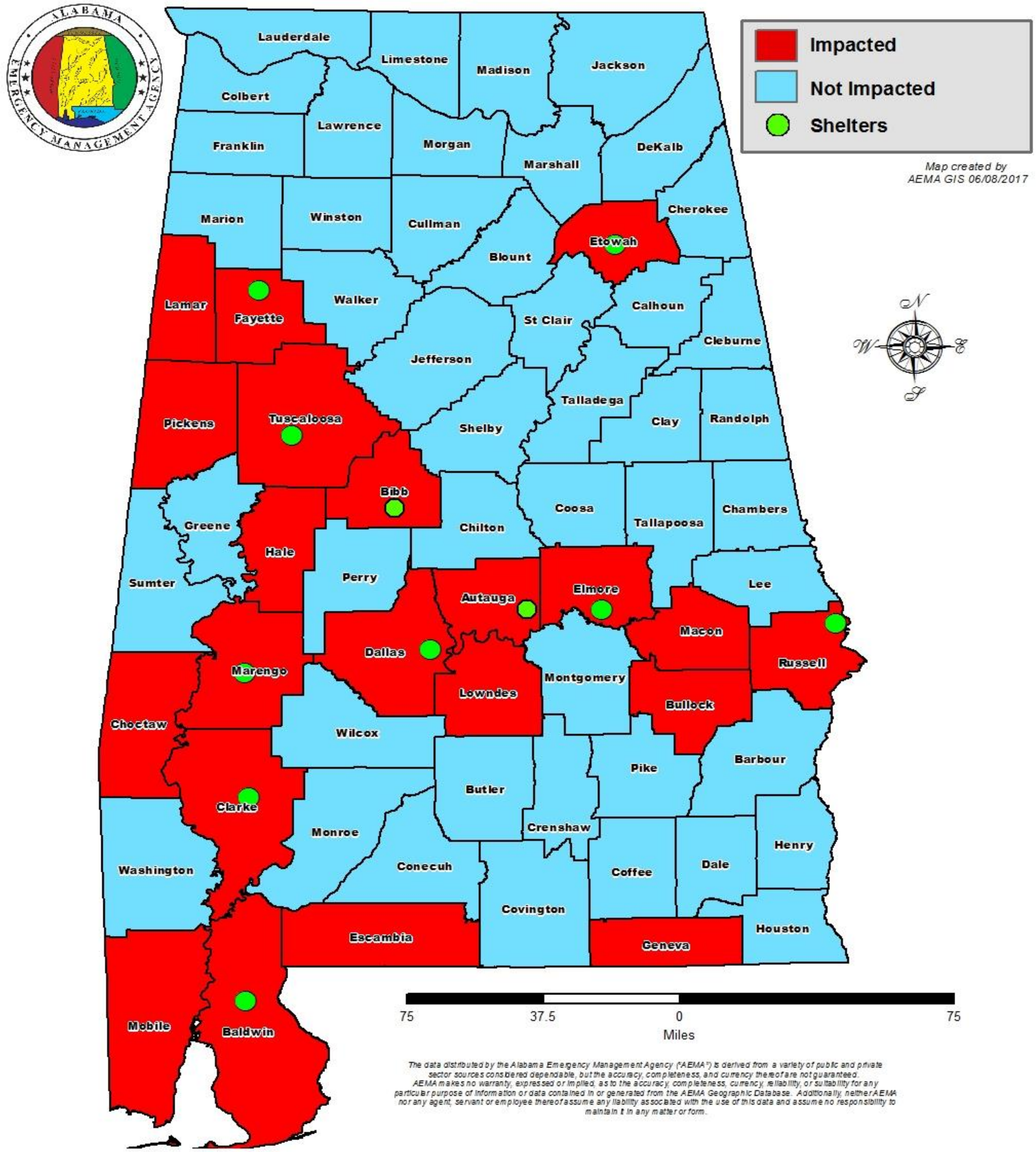
Appendix E: Alabama NMSZ Socially Impacted Counties

Alabama Counties Socially Impacted for a NMSZ 7.7 M Earthquake



Appendix F: Alabama NMSZ Planning Factors

(Data is from 2017 FEMA HAZUS Run, WITH Adjusted State Figures)

ALABAMA COUNTIES SOCIALLY IMPACTED (21 counties):

Autauga, Baldwin, Bibb, Bullock, Choctaw***, Clarke, Dallas, Elmore***, Escambia, ***Etowah***, ***Fayette***, Geneva, Hale, Lamar, Lowndes, Macon, ***Marengo***, Mobile, Pickens, ***Russell***, ***Tuscaloosa***

The state of Alabama has no "at risk" counties. All Alabama counties failed to meet the criteria for damaged infrastructure required to be rated at risk, although social impacts were prominent in several counties. (Socially Impacted counties include counties with residential building impacts only, no infrastructure impacts. The term also includes commodities and search and rescue requirements plus mass care needs for displaced, shelter, and special needs populations. Alabama is the only state with this designation.)

GENERAL INFORMATION:

1. 21 Socially Impacted counties in Alabama total 17,485 square miles (Total Alabama land area is 51,613 square miles)
2. 4,779,736 Alabama state population (2010 Census)
    1. 1,384,703 people in the 21 Socially Impacted Counties
    2. 543,020 households in 21 Socially Impacted Counties (based on 2.55/household)

POPULATION IMPACTS:

1. 10 deaths
2. 615 injuries
    1. 542 requiring medical aid
    2. 67 requiring hospital care
    3. 6 received life threatening injuries requiring urgent critical care

ESSENTIAL FACILITY IMPACTS:

1. 1,979 schools – none damaged
2. 805 fire stations – none damaged

3. 470 police stations – none damaged
4. 21 EOCs
5. 43 hospitals (within 21 impacted counties) – none damaged
    1. 6,709 total hospital beds
    2. 6,169 available hospital beds

UTILITY IMPACTS: NONE

SECURITY IMPACTS:

Jails and prisons in the 21-county area are not affected

BUILDING IMPACTS:

Approximately 2.0 million buildings in the state of Alabama, 1.9 million are residences. (1,492,881wood frame structures with 17,544 damaged and 115,831 unreinforced masonry buildings with 7,247 damaged)

1. 12,331 buildings damaged
2. 65 buildings complete damage (uninhabitable)
    1. 22 single family residences
    2. 19 multi-family residences
    3. 16 commercial
    4. 8 other

1. 65 collapsed buildings (separated into the ensuing categories)
    1. 0 Type I
    2. 3 Type II
    3. 21 Type III
    4. 41 Type IV
2. 11 Search & Rescue Teams comprised of 268 personnel
    1. 3 Type II team with 32 members

    2. 1 Type III teams with 66 members
    3. 1 Type IV teams with 30 members

TRANSPORTATION IMPACTS:

1. 0 airports damaged
2. 0 bridges damaged
3. 0 ports damaged
4. 0 railroad bridges damaged
5. 0 impacted highway miles of state primary/secondary routes

OTHER CRITICAL IMPACTS:

1. 0 dams damaged
2. 0 levees damaged
3. 0 HazMat facility damage

DEBRIS IMPACTS:

1. 270,000 tons of debris
2. 10,960 truckloads (@ 25 tons per truck) to remove debris

DIRECT ECONOMIC LOSSES:

1. $731.28 million in total direct economic losses
    1. $718.66 million in building losses
    2. $0 in transportation losses
    3. $0 in utility losses

SHELTER REQUIREMENTS:

2. 387 households displaced due to earthquake (2.55/hh=986ppl)
3. 265 people will seek temporary shelter
4. 34 people with diabetes and 8 with mental disorders will need shelter
5. 152 dogs & 16 cats need sheltering COMMODITY REQUIREMENTS:
   "At Risk" population MAE-C 2017 (387 Households displaced) (986 people)

1. 8,874 liters (3liters/person/day) x 72 hours
2. 5,916 MREs (2qty/person/day) x 72hours

"This event" shelter seeking population of 265

1. 2,385 liters (3liters/person/day)
2. 1,590 MREs

Appendix G: Earthquake Safety Instructions

Federal, State, and local emergency management experts and other official preparedness organizations all agree that "**Drop, Cover,** and **Hold On**" is the appropriate action to reduce injury and death during earthquakes.

You cannot tell from the initial shaking if an earthquake will suddenly become intense…so always Drop, Cover, and Hold On immediately!

In MOST situations, you will reduce your chance of injury if you:

DROP where you are, onto your hands and knees. This position protects you from being knocked down and also allows you to stay low and crawl to shelter if nearby.

COVER your head and neck with one arm and hand

1. If a sturdy table or desk is nearby, crawl underneath it for shelter
2. If no shelter is nearby, crawl next to an interior wall (away from windows)
3. Stay on your knees; bend over to protect vital organs

HOLD ON until the shaking stops.

1. Under shelter: hold on to it with one hand; be ready to move with your shelter if it shifts
2. No shelter: hold on to your head and neck with both arms and hands.

If there is no table or desk near you, drop to the ground and then if possible move to an inside corner of the room. Be in a crawling position to protect your vital organs and be ready to move if necessary, and cover your head and neck with your hands and arms.

Do not move to another location or outside. Earthquakes occur without any warning and may be so violent that you cannot run or crawl. You are more likely to be injured if you try to move around during strong shaking. Also, you will never know if the initial jolt will turn out to be start of the big one…and that's why you should always Drop, Cover, and Hold On immediately!

The following are guidelines for most situations:

Indoors: Drop, Cover, and Hold On. Avoid exterior walls, windows, hanging objects, mirrors, tall furniture, large appliances, and kitchen cabinets with heavy objects or glass. However, do not try to move more than 5-7 feet before getting on the ground. Do not go outside during shaking! The area near the exterior walls of a building is the most dangerous place to be. Windows, facades and architectural details are often the first parts of the building to break away. If seated and unable to drop to the floor: bend forward, Cover your head with your arms, and Hold On to your neck with both hands.

In a wheelchair: Lock your wheels and remain seated until the shaking stops. Always protect your head and neck with your arms, a pillow, a book, or whatever is available. See EarthquakeCountry.org/disability for recommendations for people who use wheelchairs, walkers, or are unable to drop to the ground and get up again without assistance.

In bed: Do not get out of bed. Lie face down to protect vital organs, and Cover your head and neck with a pillow, keeping your arms as close to your head as possible, while you Hold On to your head and neck with both hands until shaking stops. You are less likely to be injured by fallen and broken objects by staying where you are.

In a high-rise: Drop, Cover, and Hold On. Avoid windows and other hazards. Do not use elevators. Do not be surprised if sprinkler systems or fire alarms activate.

In a classroom: Drop, Cover, and Hold On. Laboratories or other settings may require special considerations to ensure safety. Students should also be taught what to do at home or other locations.

In a stadium or theater: Drop to the ground in front of your seat or lean over as much as possible, then Cover your head with your arms (as best as possible), and Hold On to your neck with both hands until shaking stops. Then walk out slowly, watching for anything that could fall during aftershocks.

In a store: Drop, Cover, and Hold On. Getting next to a shopping cart, beneath clothing racks, or within the first level of warehouse racks may provide extra protection.

Outdoors*:* Move to a clear area if you can safely do so; avoid power lines, trees, signs, buildings, vehicles, and other hazards. Then Drop, Cover, and Hold On. This protects you from any objects that may be thrown from the side, even if nothing is directly above you.

Driving: Pull over to the side of the road, stop, and set the parking brake. Avoid overpasses, bridges, power lines, signs and other hazards. Stay inside the vehicle until the shaking stops, then proceed carefully by avoiding fallen debris, cracked or shifted payment, and emergency vehicles. If a power line falls on the car, stay inside until a trained person removes the wire.

Near the shore: Follow instructions above for your particular location. Then as soon as shaking reduces such that you are able to stand, walk quickly to high ground or inland as a tsunami may arrive soon. Don't wait for officials to issue a warning. Walk, rather than drive, to avoid traffic, debris, and other hazards.

Below a dam: Follow instructions above for your particular location. Dams can fail during a major earthquake. Catastrophic failure is unlikely, but if you live downstream from a dam, you should know flood-zone information and have prepared an evacuation plan for getting to high ground.