ANNEX B | APPENDIX 8

EARTHQUAKE OPERATIONS PLAN

December 2020

I. INTRODUCTION

A. PURPOSE

This appendix outlines the coordinating actions taken by the State Emergency Response Team (SERT) following an earthquake that impacts North Carolina.

B. SCOPE

This appendix includes the anticipated actions of the Federal, State and local agencies, as well as private sector organizations.

II. SITUATION AND ASSUMPTIONS

A. SITUATION

Earthquakes occur along fault lines, or breaks in the rocks underground. As pressures under the earth's crust exert forces on these faults pressure slowly builds over time. Without any advanced warning, these faults slip, causing an earthquake. The center of the earthquake, or epicenter, can occur at various depths and cause different magnitudes of shaking depending on rock and soil types. While the original earthquake is always the strongest, significant aftershocks may occur for days and weeks afterwards and are capable of causing additional damage.

Scientists use various scales to determine the strength of an earthquake. The Magnitude Scale is an attempt to measure how much energy was released by the earthquake and is the number that most people associate with an example. Typically, earthquakes less than a 2.5 Magnitude are not felt, but recorded on seismometers. Earthquakes with around a 3.5 Magnitude are felt by many people, and local damage usually begins near a Magnitude of 4.5. Earthquakes with a Magnitude of 6.0 are typically destructive with a major earthquake considered anything above a 7.0 Magnitude. The Modified Mercalli Intensity Scale describes how earthquakes "feel" and how much destruction the earthquake causes. Many factors determine the intensity of an earthquake at the surface of the earth, such as the depth where the earthquake originates and what kinds of rock and soil are at the surface. The Modified Mercalli Intensity Scale has twelve levels designated by Roman numerals.

Modified Mercalli Intensity Scale:

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
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.
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.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
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.
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.
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.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

North Carolina can experience earthquakes centered within the state, but also from earthquakes centered outside of the state in five seismic zones: Eastern Tennessee, Charleston South Carolina, Giles County Virginia, Central Virginia, and New Madrid. While earthquakes can be felt across all of North Carolina, the greatest threat is in the western NC and along the North Carolina/South Carolina state line in southeastern NC.

While earthquakes do occur in North Carolina, large and damaging earthquakes are not common. The state has experienced 22 damaging earthquakes from 1735-2018. The greatest damage occurred during the 1861 Wilkesboro, 1886 Charleston South Carolina, 1916 Asheville, and 1926 Mitchell County earthquakes. The 1886 earthquake centered in Charleston, South Carolina is the most damaging earthquake recorded in the Southeast and brought strong to very strong shaking to much of southern and central NC.

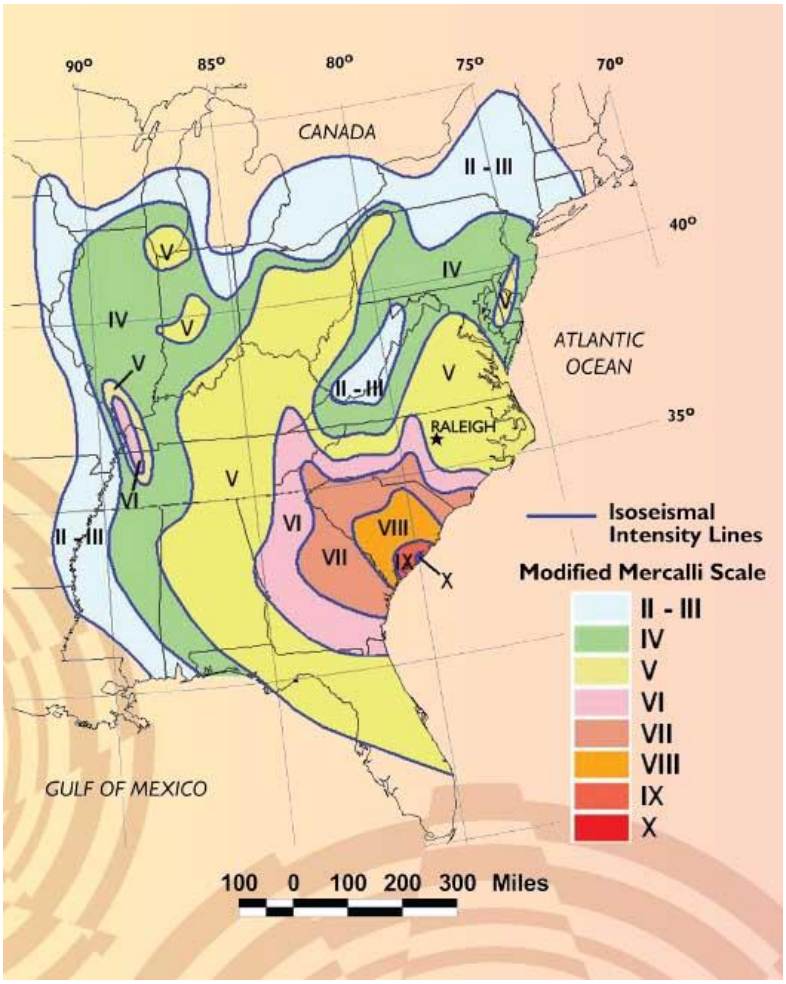

Figure 1: The Modified Mercalli map of the 1886 Charleston, SC earthquake shows strong to very strong shaking across a large portion of NC. An isoseismal map indicates areas of equal

shaking (US Geological Survey Professional Paper 1527).

Although building codes are not as strict as areas prone to major earthquakes, newer buildings and bridges are designed to withstand some amount of shaking. Older buildings, typically built from brick or stone, are most at risk for damage or failure during an earthquake.

Earthquakes are also capable of causing land/rockslides in areas of steeply sloped terrain. This is especially a problem in the Mountains, where these land/rockslides may block major transportation routes.

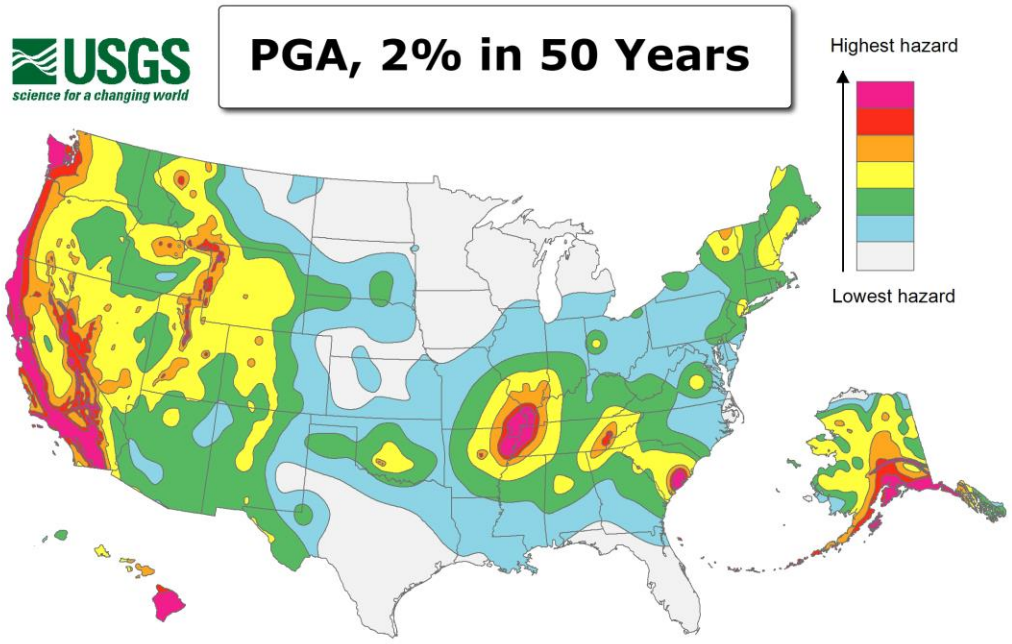

Figure 2: A 2014 simplified seismic hazard map showing the Peak Ground Acceleration with a 2% probability of exceedance. More simply, this map depicts the potential shaking from a future earthquake. While probabilities are low, the western and southern portion of the State is most at risk for a damaging earthquake. (US Geological Survey)

B. ASSUMPTIONS

1. Earthquakes may strike without warning and can occur at any time.

2. Significant damage to infrastructure, including buildings such as hospitals, roads, bridges, gas lines, etc. can be expected. This may limit available resources and mobility in the affected area.

3. Aftershocks are expected. These aftershocks may be powerful enough to cause additional damage to already weakened structures.

4. Ground based communications systems will be disrupted. Alternative means of communications will be needed, such as satellite phones and ham radios.

5. Disruptions to utilities will occur due to damage to powerlines or by damage to a power plant facility itself.

6. The USGS an FEMA will produce PAGERs (Prompt Assesment of Global Earthquakes for Response) to rapidly estimate earthquake shaking and the scope and impact of the earthquake. PAGER results will be released within 10-30 minutes of an earthquake and updated based on available data. An example PAGER and explanation of its contents can be found in Tab A.

7. After a significant earthquake, there is an immediate need to conduct safety inspections of buildings as residents need to be kept from using unsafe buildings. Qualified inspectors will evaluate buildings using Applied Technology Council's Procedures for Postearthquake Safety Evaluation of Buildings procedure (ATC-20 Building Safety Evaluation Forms and Placards). Green-tagged buildings are inspected as safe, yellow-tagged buildings have restricted use, and red-tagged buildings are unsafe.

III. ORGANIZATION AND ASSIGNMENT OF RESPONSIBILITIES

A. LEAD STATE AGENCY

1. NC DEPARTMENT OF PUBLIC SAFETY (NCDPS)

NORTH CAROLINA EMERGENCY MANAGEMENT (NCEM)

a. Support local government efforts through resource and technical assistance during emergencies and coordinate State and Federal response and recovery activities.

b. Lead the State's actions in the earthquake response.

c. Serve as State Liaison in discussions with federal agencies concerning the response actions to be taken.

d. Coordinate the provision of all State earthquake response resources through NC Sparta and provide radio communication support as needed.

e. Manage public information and engagement of local media at critical phases concerning the earthquake emergency response through the

State Joint Information Center (JIC), including the dissemination of information to all State Agencies.

f. Through the Risk Management Section, maintain and graphically display current information on the status and extent of damage from the earthquake.
g. Maintain contact with emergency management agencies in adjacent states and provide coordination if warranted by the location and magnitude of earthquake.

h. Provide aerial imagery (video, photos, and photogrammetry) via unmanned aerial vehicles (UAVs).

B. LEAD TECHNICAL AGENCY

1. NC DEPARTMENT OF ENVIRONMENTAL QUALITY (NCDEQ)

ENERGY, MINERAL, AND LAND RESOURCES DIVISION

NC GEOLOGICAL SURVEY

a. Provide a qualified geologist to serve as Earthquake Technical Advisor to the SERT Leader.

b. Collaborate with the U.S. Geological Survey (USGS) to run the Hazards US Multi-Hazard (HAZUS-MH) software as required to estimate earthquake damage based on the magnitude and location of the earthquake.

AIR QUALITY AND WATER RESOURCES DIVISIONS

a. Assume the lead role in coordinating the emergency response to air and water quality problems resulting from an earthquake.

ENVIRONMENTAL EDUCATION AND PUBLIC AFFAIRS DIVISION

a. Assist local governments in evaluation ramifications from chemical spills or releases that adversely affect the environment.

C. SUPPORTING STATE AGENCIES

1. NC DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES (NC DA&CS)

EMERGENCY PROGRAMS DIVISION

a. Coordinate Food and Agriculture response for NCDA&CS and partners.

b. Provide veterinary expertise and coordinate animal response support.

2. NC DEPARTMENT OF HEALTH AND HUMAN SERVICES (NCDHHS)

DIVISION OF PUBLIC HEALTH (DPH)

a. Coordinate public health nurses.

b. Monitor health of shelter populations for potential infectious disease outbreaks.

c. Coordinate well water testing for contaminates to render safe to drink after flooding due to damage such as dam failure resulting from an earthquake.

DIVISION OF HEALTH SERVICE REGULATION (DHSR)

OFFICE OF EMERGENCY MEDICAL SERVICES (OEMS)

a. Provide leadership in coordinating and integrating the overall State efforts that provide medical assistance to a disaster-affected area.

b. Coordinate and direct the activation and deployment of State resources of medical personnel, supplies, equipment, and pharmaceuticals with Public Health as needed.

c. Assist in the development of local capabilities for the on-site coordination of all emergency medical services needed for triage, treatment, transportations, tracking, and evacuation of the affected population with medical needs.

d. Establish and maintain the cooperation of the various State medical and related professional organizations in coordinating the shifting of

Emergency Medical Services resources from unaffected areas to areas of need.

e. Coordinate the catastrophic medical sheltering response by implementing the Medical Support Sheltering Plan.

DIVISION OF HEALTH SERVICE REGULATION (DHSR)

RADIATION PROTECTION SECTION

a. In the event of an earthquake affecting one of the three Nuclear Power Plants in NC (Harris, McGuire, or Brunswick) or Catawba in SC, each plant's emergency operations plan will be put into effect in conjunction with the State EOP and State Earthquake Operations Plan.

b. Dispatch to incident site if radiological release occurs.

c. Establish and supervise a system for radiological monitoring as needed.

DIVISION OF SOCIAL SERVICES (DSS)

a. Coordinate efforts to provide emergency shelters, mass care facilities, feeding, water, distribution of relief supplies for victims of a disaster, emergency assistance, and disaster public assistance/information.

b. Coordination/facilitation of the provision of sheltering during an emergency/disaster event includes those persons with functional needs (sensory, physical, mental limitations, and non-English speaking) with counties.

c. Coordination/facilitation of the provision of relief efforts provided by volunteer organizations with counties.

d. Work with state agencies and NCEM ESF 6/8 on the provision of mental health crisis counseling to victims at shelters, mass care facilities, fixed feeding sites, and emergency response efforts with counties.

e. Work with state agencies and NCEM ESF 6/8 on the provision of emergency first aid to victims at shelters, mass care facilities, and fixed feeding sites with counties.

f. Ensure all DHHS Divisions are staffed for Response, Recovery and Mitigation.

g. Ensure all DHHS Divisions are on standby and are ready to deploy Division resources.

h. Notify Sensory and Foreign Language Interpreter Staff of NC DHHS and NC DHHS interpreter contracts to be on standby and ready to deploy if requested.

i. Support the American Red Cross and other agencies in shelter staffing at designated Red Cross Shelters.

j. Coordinate with the following agencies for resource services – Child Development and Early Education, Vocational Rehabilitation Services, Services for the Blind, Deaf and Hard of Hearing, Office of Economic Opportunity, Office of Rural Health, Medicaid, Aging and Adult Services, and Mental Health.

DIVISON OF AGING AND ADULT SERVICES (DAAS)

a. Communicate with area agencies on aging, local service providers, and counties on the exchange of information relevant to the needs and outcomes of the aging and disability populations.

b. Collaborate as requested with human services agencies to assist counties in meeting the needs of individuals needing functional support sheltering services.

c. Collaborate as requested with NCEM ESF 8, DHSR, and DPH for individuals needing medical support sheltering services.

DIVISON OF MENTAL HEALTH, DEVELOPMENTAL DISABILITIES AND SUBSTANCE ABUSE SERVICES (MHDDSAS)

a. Coordinate/facilitate the provision of mental health/crisis counseling to victims at shelters, mass care facilities, and fixed feeding sites with counties.

b. Coordinate distribution of Naloxone to shelters, mass care facilities, and fixed feeding sites with counties.

3. NC DEPARTMENT OF INSURANCE (NCDOI)

OFFICE OF STATE FIRE MARSHAL (OSFM)

a. Coordinate firefighting assets.

b. Restoration of firefighting services and protection.

c. Coordinate additional building inspection teams.

4. NC DEPARTMENT OF TRANSPORTATION (NCDOT)

DIVISION OF HIGHWAYS (DOH)

a. Erect and maintain such signs, lights, barricades or other traffic control devices as deemed appropriate to maintain or control traffic along the affected routes or detour routes.

b. Provide SERT partners lists of contractors/suppliers to assist in the cleanup efforts of sites outside the State maintained right of way.

c. Develop and administer contracts for the removal of debris from private roads. Such contracts will be pre-approved by NCEM prior to advertisement and award.

d. Provide structural engineering expertise to support municipal DOTs support in evaluation of bridges and roads systems.

5. NC DEPARTMENT OF PUBLIC SAFETY (NCDPS)

SEARCH AND RESCUE (SAR)

a. Coordinate and deploy regional search and rescue as required to support local government operations.

NORTH CAROLINA NATIONAL GUARD (NCNG)

a. Provide trained military police for traffic control.

b. Provide security at established shelters.

c. Provide military forces to assist local law enforcement in the emergency area for security, control of entrance to and exit from disaster area, and protection of people and crowd control.

d. Provide NCNG mission capable packages as requested through NCEM.

URBAN SEARCH AND RESCUE (USAR)

a. Coordinate and deploy regional search and rescue as required to support local government operations.

b. Locate and rescue those trapped in collapsed buildings or structures.

STATE HIGHWAY PATROL (SHP)

a. Coordinate traffic control measures and isolation of the impacted area as needed.

b. Provide communications support as requested by the SERT Leader.

c. Provide air support for reconnaissance of damage transportation road systems.

6. UTILITY PROVIDERS (DUKE ENERGY, etc.)

a. Provide decision makers with up-to-date power outage information and expected restoration times.

b. Provide support as needed to other utilities if able.

c. Restore electrical power to residences and business.

d. Repair and restore any downed power lines and/or transformers.

D. SUPPORTING FEDERAL AGENCIES

1. UNITED STATES GEOLOGICAL SURVEY (USGS)

a. Provide verification that an earthquake has occurred by providing an interface to view recent earthquakes in the US.

b. Distribute maps outlining the spatial extent and intensity of shaking.

IV. CONCEPT OF OPERATIONS

A. GENERAL

Since earthquakes occur without warning, it will be hard to determine the extent of the impacted area immediately after the event. If not felt at the State EOC, reports of an earthquake will come in through a myriad of sources including emergency operations centers, citizens, law enforcement dispatchers and news reporters.

It will be essential to determine the reported distribution and intensity of the shaking to develop a map indicating where the most significant damage is located. There are several tools which can help determine the location of the epicenter of the earthquake, as well as the distribution of the intensity of the shaking. The United State Geological Survey (USGS) website contains real time plots depicting all recent earthquakes in the US Additionally, within tens of minutes of the earthquake occurring, the USGS's "Did You Feel it" page will contain plots showing the spatial distribution of shaking, reported by website users. This plot will assist in determining which areas were most affected and where any State resources and personnel will need to be deployed.

Once sufficient information on the impact of the earthquake is known, the SERT Leader will determine if it is necessary to activate the State EOC. Limited impacts and damage may only result in a partial activation of the State EOC, while extensive damage and request for State aid will likely result in a full-scale activation. In the event of a full scale activation, the necessary SERT agencies will report to the State EOC and the (NCEM) Field Branch offices will become Regional Coordination Centers (RCCs). These RCCs will serve as a control center for the distribution of information and resources in the RCC's area. RCCs that are not impacted will be prepared for deployment and other support to the impacted RCC.

These RCCs are staffed by various agencies and local emergency managers; they may also be staffed with members from Incident Management Teams (IMTs).

B. RESPONSE ACTIONS

In general, activation levels will be declared after the extent of damage is known. Typically, for earthquakes that only result in minor to moderate damage, the SERT Leader will set the State EOC activation level to 4 or 3. During more significant impacts, where infrastructure is seriously damaged,

and numerous State resources are requested, the SERT Leader may activate the State EOC to level 2 or 1.

The activation levels are highly dependent on the observed impacts and may vary on a case to case basis. For information on staffing and general response associated with an activation level, please refer to the North Carolina Emergency Operations Basic Plan.

The Branch Office(s)/RCCs will begin to evaluate the disaster impact and establish priorities related to life, property and the environment at risk. The Branch Manager will coordinate the establishment of priorities with the SERT Leader and/or the Operations Section Chief to ensure consistency between the State EOC and the Branch Offices(s). At the direction of the Operations Chief, the State EOC staff will assign inventory and dispatch resources to the Branch Office(s)/RCCs in support of response activities.

The Civil Air Patrol, Aerial Reconnaissance Teams (ARTs) and Risk Management will begin an aerial reconnaissance of the disaster area. ARTs will coordinate their efforts with the FEMA. The State EOC determines priorities for immediate assistance using damage reports from the counties and ART information. Building and infrastructure inspections must be completed. Many concrete and masonry structures may be damaged by the earthquake and could present a danger to officials and civilians. When the SERT Leader determines that immediate needs are met, the State EOC and Branch Office(s) will demobilize.

C. RECOVERY ACTIONS

1. INITIAL

If State resources are overwhelmed and additional assets are needed, mutual aid agreements between neighboring States will be implemented. This will be largely dependent on the disasters effect on the neighboring State.

Initial recovery efforts will begin immediately after the confirmation of the earthquake. Agencies and first responders involved in the recovery must remain wary of aftershocks, since they are capable of causing additional damage. Initial recovery efforts will include, but are not limited to:

- Inspecting buildings and infrastructure for structural integrity
- Clearing roadways of debris in the disaster area
- Identifying potential consequences as a result of the earthquake
- Controlling access to maintain order and protect civilians.

- Begin the process of opening shelters and directing resources to assist those displaced by the earthquake

2. CONTINUING

Continuing recovery efforts will occur until the disaster area has been returned to a somewhat normal state. These recovery actions may include, but are not limited to the following:

- Operate shelters until those affected are able to return home
- Rebuild infrastructure damaged by the earthquake

V. REFERENCES

A. North Carolina Disaster Recovery Framework

B. Chapter 166A of the North Carolina General Statutes, North Carolina Emergency Management Act, as amended.