NEW MEXICO RIO GRANDE RIFT CATASTROPHIC EARTHQUAKE RESPONSE PLAN

Exercise Scenario Overview
To the Exercise Situation Manual
December 18, 2015
The New Mexico Rio Grande Rift (NM RGR) Catastrophic Earthquake Response Plan Exercise Scenario Overview is the companion document to the Situation Manual (SitMan) and provides participants with key elements of information to be considered during the exercise. All exercise participants will need both documents in order to participate in the exercise.

All participants are requested to review the scenario in advance of the exercise and be prepared to provide answers upon arrival at the meeting.
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UNDERSTANDING THE EXERCISE SCENARIO

The accompanying Situation Manual provides a synopsis of considerations that round out estimated impacts. However, the catastrophic earthquake scenario described in this document is based on specific parameters established through two geological studies:

1. *Earthquake scenario and probabilistic ground shaking hazard maps for the Albuquerque-Belen-Santa Fe, New Mexico, corridor* (Wong, et. al., 2004)—based on a ground rupturing, 7.0 magnitude earthquake on the Sandia-Rincon fault in the Albuquerque area.


The two studies were provided to the FEMA REGION 6 Mitigation Division with a request from Response Division to coordinate with appropriate partners such as the U.S. Geological Survey (USGS), National Earthquake Information Center (NEIC) to develop a USGS ShakeMap and FEMA HAZUS report to depict impacts of both shake intensity and liquefaction susceptibility in the area of interest.

Using the best available data, all information derived is being used to develop an accurate risk-based response plan or threat/hazard annex to the FEMA REGION 6 All Hazards Plan (AHP).

A more complete version of the scenario can be found in the Information Analysis Brief Supporting Document, May 2015, which may be requested by stakeholders from Jennifer.Superales@fema.dhs.gov.
THE CATASTROPHIC EARTHQUAKE OCCURS

In mid-March at approximately 2:00 pm, a ground rupturing magnitude 7.0 earthquake occurs without warning in the Rio Grande Rift on the Sandia-Rincon faults immediately impacting Albuquerque, New Mexico, and surrounding areas.

Up to 1.17 million residents throughout 11 counties and multiple pueblos detect varying shake intensity and begin reporting their experience through the USGS DidYouFeelIt? System and other social media like Twitter.

Seismic data from the New Mexico Tech Seismic Network is recorded by the Albuquerque Seismological Laboratory (ASL) seismic station (ANMO) and transmitted to the USGS NEIC in Golden, Colorado.

Within 30 minutes of the incident using the information received, USGS NEIC develops a Prompt Assessment of Global Earthquakes for Response (PAGER) report and distributes it—the PAGER is an automated system for rapidly estimating the shaking distribution, the number of people and settlements exposed to severe shaking, and the range of possible fatalities and economic losses using ShakeMap methodology and software.

![Figure 1: Example USGS ShakeMap and PAGER](image-url)
**SHAKE INTENSITY**

The epicenter of the catastrophic earthquake is determined to be located just east of Bernalillo, New Mexico, along the I-25 corridor. Strong shaking is felt primarily east of the I-25 corridor in Sandoval and Bernalillo counties as well as the San Felipe, Santa Ana, Sandia, and Isleta Pueblos. Violent to extreme shaking is felt and heavy to very heavy damage sustained in east Albuquerque, primarily along NM556 (Tramway Blvd.) and in the residential areas of the Sandia Mountain foothills.

A nearly 48 km (~30 mile) long ground rupture to form along the Sandia-Rincon fault lines extending from the San Felipe Pueblo area down to the east side of Kirtland Air Force Base (KAFB), which includes tenants such as Sandia National Laboratory (SNL) and shares runway with Albuquerque Sunport International Airport (ABQ).

![Figure 2: Shake Intensity Contours by Color](image)

<table>
<thead>
<tr>
<th>PERCEIVED SHAKING</th>
<th>Not felt</th>
<th>Weak</th>
<th>Light</th>
<th>Moderate</th>
<th>Strong</th>
<th>Very strong</th>
<th>Severe</th>
<th>Violent</th>
<th>Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>POTENTIAL DAMAGE</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Very light</td>
<td>Light</td>
<td>Moderate</td>
<td>Moderate/heavy</td>
<td>Heavy</td>
<td>Very heavy</td>
</tr>
<tr>
<td>PEAK ACC (g)</td>
<td>&lt;.17</td>
<td>.17 – 1.4</td>
<td>1.4 – 3.9</td>
<td>3.9 – 9.2</td>
<td>9.2 – 18</td>
<td>18 – 34</td>
<td>34 – 65</td>
<td>65 – 124</td>
<td>&gt; 124</td>
</tr>
<tr>
<td>PEAK VEL (cm/s)</td>
<td>&lt; 0.1</td>
<td>0.1 – 1.1</td>
<td>1.1 – 3.4</td>
<td>3.4 – 8.1</td>
<td>8.1 – 16</td>
<td>16 – 31</td>
<td>31 – 60</td>
<td>60 – 116</td>
<td>&gt; 116</td>
</tr>
<tr>
<td>INSTRUMENT INTENSITY</td>
<td>I</td>
<td>II – III</td>
<td>IV</td>
<td>V</td>
<td>VI</td>
<td>VII</td>
<td>VIII</td>
<td>IX</td>
<td>X</td>
</tr>
</tbody>
</table>
**LIQUEFACTION**

In addition to shake intensity, a 90 square-mile area of soft, unconsolidated sediment along the Rio Grande primarily west of the I-25 corridor sustains liquefaction-related permanent ground deformation, to include ground settlement and lateral spreads.

Liquefaction susceptibility classes are determined by triggering peak acceleration—simply put, shake intensity, expressed as a percentage of gravity; threshold values are reflected below. Areas in red sustain up to two-foot ground settlement at less than 0.1g or 10%g whereas the areas in orange sustain up to 1-foot ground settlement at 10%g to 20%g—specifically, downtown Albuquerque sustains 24%g to 28%g and therefore causes several buildings to sink and collapse.

![Liquefaction Zone](image)

**Figure 3: Liquefaction Susceptibility Contours by Color**

<table>
<thead>
<tr>
<th>Damage</th>
<th>Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Very High</strong></td>
<td>May trigger at less than 0.1 g (10% g)</td>
</tr>
<tr>
<td><strong>High</strong></td>
<td>May trigger between 0.1 g (10% g) and 0.2 g (20% g)</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td>May trigger between 0.2 g (20% g) and 0.3 g (30% g)</td>
</tr>
<tr>
<td><strong>Low</strong></td>
<td>May trigger at levels above 0.3 g (30% g)</td>
</tr>
<tr>
<td><strong>Very Low</strong></td>
<td>Unlikely to trigger at any level of acceleration</td>
</tr>
</tbody>
</table>
Varying damage is sustained throughout 11 of New Mexico’s 33 counties and multiple pueblos representing over 1.17 million people, 57% of the state’s total population—the majority of whom reside in Bernalillo County and the City of Albuquerque.

The incident immediately receives national and international media attention that requires rapid public messaging when communications are limited in some areas to amateur radio and/or satellite phones. Reports of mass casualties and fatalities—primarily in school and business buildings, damage to essential facilities that perform critical functions, and destruction of thousands of other buildings—primarily residences, are received from multiple sources.

Assessments and declarations are made as quickly as possible but secondary impacts such as widespread gas-related fires exacerbate the situation as do aftershocks of lower magnitude occurring at varying intervals further destabilizing structures that will require re-inspection. Over 6.5 million tons of debris is generated.

It is a no-notice, catastrophic incident that constitutes a Level 1 response, therefore a Presidential Disaster Declaration request received from the New Mexico Governor is expedited with the assistance of FEMA REGION 6.

**CASUALTIES, FATALITIES, and HOSPITALS**

There are over 10,000 casualties, to include 646 fatalities, 333 people with life threatening injuries who will require immediate hospitalization or will become part of the fatality population, and 2,013 people who require hospitalization but whose injuries are not considered life threatening.
In addition, approximately 30% of first responders and emergency management staff are unavailable as they are part of the surviving population and seeking to reunify with their families, or are part of the casualty/fatality population.

Hospitals in the impacted area sustain damage limiting available beds to 967 or 35% of the 2,784 total beds available on a typical day. Certain hospitals sustain extensive damage and should be prioritized for patient evacuation and reconstitution of emergency room (ER) operations to receive incoming survivors; they include:

- University of New Mexico Hospital (UNMH) (southeast Albuquerque), a teaching hospital that houses the only Level 1 Trauma center, only Children’s Hospital, and only Burn Unit in the state.
- Raymond G. Murphy medical center (southeast Albuquerque near UNMH), the only VA hospital in the state.

Contracts with Albuquerque Ambulance Service (AAS) and Superior Ambulance Service, Inc. are activated but conflict due to near simultaneous activation by multiple stakeholders.

The National Disaster Medical System (NDMS) through ESF-8 can be used to support hospital to hospital transfer of patients but in will take up to 72 hours from the time of request to be operational. To augment ambulances, the National EMS contract through AMR can be requested—it would include 300 ground ambulances, 3,500 para transit (wheel-chair capable bus) seats, and 25 air ambulances (fixed and rotary wing).

Specific to a mass fatality incident, the New Mexico Office of the Medical Investigator (OMI) will remove, store, examine, identify, and certify death. The OMI will coordinate with the IC to determine the level of response. As part of NDMS, Disaster Mortuary Operational Response Teams (DMORT) can support mortuary services to include identifying and processing the deceased.

**COOP/DEVOLUTION**

Rapid assessment of facilities (primary, secondary, and tertiary) staff, and equipment must be performed to determine if Continuity of Operations (COOP) and/or devolution plans will be necessary to effectively manage response operations and to maintain Continuity of Government (COG) at all levels.

The status of federal agencies is ascertained from the New Mexico Federal Executive Board (FEB) in coordination with the FEMA REGION 6 COOP Coordinator; however, the FEB Chair and Co-Chair are located in Albuquerque and therefore are not readily available due to COOP/devolution being executed by their respective agencies.

State, tribal, and local agencies will also need to ensure COOP/devolution plans, if they exist, are activated; otherwise certain critical services and functions will cease for an undetermined period of time and will impact the incident command structure necessary for effective incident management and incident support.

**COMMUNICATIONS, 911, and 311**

Multiple communications facilities on Sandia Peak at the Sandia Crest Antenna Farm sustain extensive damage impacting radio, television, and other communications. City and county communications assets have redundancy and portable radios are used in the interim.
If functioning, city and county 911/311 systems are overwhelmed with requests from up to 1.17 million survivors for emergency services or information.

Bernalillo County 911 Center at Bernalillo County Sheriff Sabriva Substation (northeast Albuquerque) sustains extensive damage that requires 911 call redirect to the Albuquerque 911 center, collocated with the Albuquerque EOC (west Albuquerque).

The Albuquerque 311 Citizen Contact Center (southwest in downtown Albuquerque) is operational and provides non-emergency but critical information such as school evacuation and reunification locations.

**TRANSPORTATION**

**Roads:** The mobility of dispatched first responder’s is limited due to portions of I-25 and I-40 and NM556 (Tramway Blvd.) and other roads being impassable due to damage/debris. Landslides along Sandia Mountain also impact the narrow eastern I-40 pass between Albuquerque and Tijeras. Loss of bridges across the Rio Grande also divides and isolates east from west Albuquerque.

**Rail:** Railroad that supports Burlington Northern-Santa Fe (BNSF) and Union Pacific (UP) railroad—two major transcontinental rail corridors critical for the movement of goods through the state on the national freight network, and the AMTRAK North Route (passenger) that serves the New Mexico Road Runner Express (commuter)—two long distance intercity passenger rail routes and commuter rail service in the Albuquerque and Santa Fe regions, sustain extensive damage particularly where the tracks run closest to NM313 (S. Camino del Pueblo).

**Airports:** In addition, damaged runways at the joint civil-military airport, Albuquerque International Sunport (ABQ) and Kirtland Air Force Base (KAFB) need rapid repair to re-establish full commercial and military air traffic. This is significant as rotary and fixed-wing air support is critical to move people, equipment, and commodities into and/or out of inaccessible areas.
**WATER and ELECTRIC**

An estimated 256,970 households, more than 55% of the total 462,725 households in the impacted region, loose potable water and electric power; by day 7 there will still be an estimated 47,826 households affected—this contributes to an increased number of displaced households and people seeking temporary shelter.

**Water:** Extensive damage is sustained by potable water and waste water facilities to include a network of underground clay pipes located throughout Albuquerque leading to the only waste water treatment center in the city. If damaged, the San Juan Chama Water Treatment Plant can be backed up by the city’s older well water system for surface water, but there is no back up system for treating waste water. Water storage tanks also fail.

This limits access to water for emergency services, such as firefighting in addition to industrial use and requires extensive reconstruction. Sanitation becomes a primary concern as assessments and service restoration takes several weeks making long term evacuation necessary.

In addition to potable and waste water concerns, certain dams and levees require inspection—specifically:

- **Four (4) dams on Sandia Pueblo** (approximately 4 miles north of Albuquerque), monitored for safety by the Bureau of Indian Affairs (BIA)
- **Cochiti Dam** (approximately 50 miles north of Albuquerque) monitored by U.S. Army Corps of Engineers (USACE) as one of the four projects for flood and sediment control on the Rio Grande River (operating in conjunction with Abiquiu, Galisteo, and Jemez Canyon Dams)
- **Albuquerque levee system for flood protection** (completed in the 1950s)

New Mexico’s largest water utility is based in Albuquerque in an area with high susceptibility to liquefaction—the Albuquerque Bernalillo County Water Utility Authority, provides potable and waste water services to more than 200,000 customer accounts representing some 606,780 water users. It maintains more than 3,000 miles of water supply pipeline and more than 2,400 miles of sewer collector pipeline.

**Electric:** Extensive damage is also sustained by electric power facilities primarily throughout eastern Albuquerque and north toward the San Felipe Pueblo. Backup generators are necessary for critical functions but require fuel and maintenance—supply chain disruptions due to transportation or fuel source availability issues will need to be addressed quickly to minimize cascading effects.

**Public Service Company of New Mexico (PNM)—the state’s largest electricity utility,** is based in Albuquerque in an area with high susceptibility to liquefaction—it provides electricity and electric services to more than 753,000 residential and commercial customers New Mexico and Texas through its two utilities, PNM and TNMP.

**GAS and OIL.**

There are multiple breaks and leaks in natural gas and oil pipeline and associated facilities near Placitas sustain extensive damage. Distribution of petroleum products is disrupted resulting in a 1 to 3 day reserve before a critical shortage is experienced.

Oil and gas development is a key part of New Mexico’s economy providing 31.5% of the state’s General Fund, which in turn funds schools, hospitals, and other government services in 2013.

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**Exercise Scenario Overview**

**NM RGR Exercise**

**Homeland Security Exercise and Evaluation Program (HSEEP)**

**FEMA REGION 6**
emphasize the national significance of the oil and gas industry in the state, in 2013 New Mexico was the 6th highest oil producer and 7th highest natural gas producer in the United States.

New Mexico Gas Company—the state’s largest utility overall and provider of natural gas, is based in Albuquerque in an area with high susceptibility to liquefaction. It provides natural gas to more than 513,000 residential, commercial, and transportation customer accounts representing 60% of the state’s population across 23 of 33 counties.

DISPLACED HOUSEHOLDS, SHELTERS, and EVACUATION

There are approximately 20,397 households displaced by the earthquake; the assumption is the majority of these people will seek shelter with friends and family. However, at least 12,529 people will seek shelter within their communities; in addition, those without potable water and/or electrical power will also seek shelter until such time as utilities can be restored. It is also anticipated that approximately 7,650 people are disabled and require assistance while they are in the shelters.

There will also be a need to shelter approximately 37,938 pets that will accompany their owners to shelters. Companion animals are handled jointly by ESF-8 and ESF-11 through the Disaster Animal Response Team (DART) but pet sheltering is handled jointly by ESF-6 and ESF-11. In addition, the Agriculture Livestock Incident Response Team (ALIRT) is available to provide veterinarian services.

New Mexico relies on the American Red Cross (ARC) for shelter management. There are nine ARC offices located throughout the state; its Regional Headquarters located in Albuquerque is operational and there is also an ARC office on Kirtland Air Force Base.

Survivors are encouraged to register through American Red Cross’s (ARC) Safe and Well website; in addition, ESF-6 will assist New Mexico in tracking the movement of transportation-assisted evacuees, their pets/service animals, luggage, and medical equipment using the National Mass Evacuation Tracking System (NMETS).

Commodities (food, water, etc.) will be needed for shelters and to be distributed through Points of Distribution to other survivors. In Albuquerque there is one Feeding America Food Bank, the Roadrunner Food Bank, which distributes nearly 90,000 pounds of food each day to nearly 40,000 children, adults, and vulnerable seniors. The average income of those served is $900 a month and 8% of those served are homeless.

ECONOMIC LOSS

The total economic loss totals to over $15.7 billion dollars, to include building and lifeline related losses:

- Building (income and capital stock) loss—$15.3 billion dollars
- Transportation system loss—$129.2 million dollars
- Utility lifeline system loss—$223.5 million dollars

In addition to the estimated economic loss, poverty levels should be considered—according to St. Martin’s Hospitality Center (St. Martin), Albuquerque’s poverty level is ranked the fifth highest in the nation further complicating the situation and impacting overall community resilience.

New Mexico also has no law preventing construction on active faults—and, while modern building code requires high earthquake resistance standards for construction of schools, hospitals, and
public buildings, those standards do not apply to residential buildings. Specific concern is
associated with collapse old adobe buildings, many of which have historical value or are sacred
and invaluable to native peoples and would incur significant cost to be restored.

**Historical Disasters:** According to the FEMA Common Operating Picture Disaster Statistics
Dashboard, in the last 25 years there have been 22 disasters declared in New Mexico. 76.5% have
been Public Assistance (PA) focused with an average obligation of over $15 million—only three
(3) have also included Individual Assistance (IA).

**SNAP-SHOT OF WHAT IS ASSUMED?**

It is assumed this constitutes a catastrophic incident that requires a Level 1 response to support
New Mexico and will result in a Presidential Major Disaster Declaration to include PA and IA
programs. It is also assumed no pueblo, tribe, or nation will request for a separate disaster
declaration.

In response, multiple Incident Command Posts (ICP) are established for incident management and
Emergency Operations Centers (EOC) are activated for incident support. ICPs will be established
to assess the situation, manage organic resources, and coordinate cross-jurisdictional emergency
services necessary for immediate lifesaving and life safety operations. EOCs will be activated to
support sourcing and fulfilling resources requested by ICPs and to plan for and coordinate life
sustaining operations necessary for the transition from response to recovery. The organization,
coordination, and mobilization of resources will be in accordance with the New Mexico
Emergency Operations System, which incorporates the Incident Command System (ICS) to
include Unified Command and the Multi-Agency Coordination System (MACS)—2013 NM EOP.

As the situation is assessed by Incident Commanders and additional resources are deemed
necessary, ICP requests will be quickly processed through city then county EOCs to be forwarded
to the NM EOC for fulfillment through the IntraState Mutual Assistance System (IMAS). If
additional or unique resources are needed beyond what is available through IMAS, the NM EOC
will request through the Emergency Management Assistance Compact (EMAC), which includes
the activation of the IntraState Emergency Response Support Plan (IERSP).

In response to the state EOC in Santa Fe being activated to a Level 1 by NMDHSEM, FEMA
REGION 6 activates the Regional Response Coordination Center (RRCC) in Denton, TX to a
Level 1—the National Response Coordination Center (NRCC) in Washington, D.C. also activates.

The R/NRCC alerts and deploys federal resources from all Emergency Support Functions (ESFs).
A FEMA REGION 6 IMAT (with additional Action Trackers and IT support), a National IMAT,
and assets from various Mobile Emergency Response System (MERS) detachments deploy to the
NM EOC to establish an IFO and then a JFO. A Unified Coordination Group (UCG) will phase
in additional resources as supporting structures are established—such as: an Incident Support Base
(ISB) at Roswell; a Responder Support Camp (RSC) at the Isleta Amphitheater, south of
Albuquerque; and the Personnel Mobilization Center (PMC) at the Federal Law Enforcement
Training Center (FLETC) in Artesia.

All agencies responding initially operate under their respective Statutory Authorities and properly
document expenditures. Resource requests being sourced must be de-conflicted, particularly with
USACE, DOD, DOE and EPA to include any required radiological/nuclear response operations
specific to KAFB and SNL.