



U.S. Geological Survey

Disaster Earthquake Scenario Unveiled for Southern California

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Contact Information:

U.S. Department of the Interior, U.S. Geological Survey
Office of Communication
119 National Center
Reston, VA 20192

Clarice Nassif Ransom, USGS

Phone: 703-648-4299

Jim Nickles, USGS

Phone: 916-278-3016

Don Drysdale, CGS

Phone: 916-323-1886

***Editors' notes:** A telephone conference call is scheduled for 10:30 a.m. PDT for a brief presentation and opportunity for questions with the principal authors. Call 605-990-0100, and enter conference code 1009678#*

B-roll animations and high-resolution images are available at <http://urbanearth.usgs.gov/shakeout> (<http://urbanearth.usgs.gov/shakeout>).

Scientists today unveiled a hypothetical Scenario describing how a magnitude 7.8 Southern California earthquake -similar to the recent earthquake in China- would impact the region, causing loss of lives and massive damage to infrastructure, including critical transportation, power, and water systems.

In the Scenario, the earthquake would kill 1800 people, injure 50,000, cause \$200 billion in damage, and have long-lasting social and economic consequences. This is the most comprehensive analysis ever of what a major Southern California earthquake would mean, and is the scientific framework for what will be the largest earthquake preparedness drill in California history, scheduled for November 13, 2008.

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The November preparedness exercise, "Golden Guardian '08," will test the ability of emergency responders to deal with the impact of a magnitude 7.8 earthquake on the San Andreas Fault in Southern California, and is being jointly organized by the Governor's Office of Emergency Services and the California Office of Homeland Security. The Golden Guardian exercise will occur during a week-long series of public events planned for the "Great Southern California ShakeOut." A June 4th kick-off event is planned for the "ShakeOut" to help communities plan to respond to the risks highlighted in the Scenario.

The scientific report describing the *ShakeOut Scenario*, jointly published by the U.S. Geological Survey (USGS) and the California Geological Survey (CGS), will be released today during a Congressional hearing in Washington, D.C. The House Committee on Natural Resources, Subcommittee on Energy and Mineral Resources, led by Chairman Jim Costa (D-CA), will hold an oversight hearing on USGS efforts to prepare for future earthquakes, at 10:00 a.m. EDT in Room 1324, Longworth House Office Building

Although imaginary, the *Shakeout Scenario* is based on scientists' best predictions of what would actually occur during and after a major earthquake on the San Andreas Fault.

The Scenario outlines a hypothetical earthquake in which:

- The strongest shaking and greatest damage is near the stretch of the San Andreas Fault that extends through the fastest growing areas of Southern California, including the Coachella Valley, Inland Empire and Antelope Valley.
- At least 10 million people will be exposed to heavy shaking. California's efforts at mitigation have concentrated on life safety and have been largely successful. Thus, in spite of the large numbers of people in highly shaken areas, deaths are estimated at only 1,800.
- Building types known to be vulnerable to damage and collapse, do indeed sustain major damage. All un-reinforced masonry buildings within 15 miles of the San Andreas Fault are completely destroyed. Those that are not retrofitted kill many occupants. Many other older building types without retrofitting contribute to over \$33 billion in damage to buildings.
- The fault offsets all lifelines crossing into Southern California at Cajon Pass (Interstate 15), San Geronio Pass (Interstate 10) and along Route 14, including pipelines, power lines, roads, railways, telecommunications and aqueducts.
- Strong shaking continues in downtown Los Angeles for 55 seconds - nearly 8 times longer than in the Northridge Earthquake
- The prolonged, strong shaking heavily damages and sometimes collapses hundreds of old brick buildings, thousands of older commercial and industrial concrete buildings, many wood-frame buildings, and even a few, high-rise steel buildings. Over 600,000 buildings suffer at least some damage that causes tens of thousands of injuries and hundreds of deaths, and leaves many thousands of people without homes or jobs.
- Fire doubles the fatalities and economic losses. Around Southern California, there will be 1,600 fires started large enough to warrant a 911 call, and some fires merge into conflagrations that burn hundreds of city blocks. Assuming no Santa Ana winds, the models still indicate a further \$65 billion in direct losses and \$22 billion in indirect losses from the fires.
- Nearly two thirds of the hospital beds are non-functional in Los Angeles, Orange, Riverside, and San Bernardino counties. At the same time, 50,000 people will seek treatment at emergency rooms.
- Thanks to a \$6 billion investment in seismic safety, the State highway system fares well. However, although collapse is avoided, some bridges are non-functional so that much of the highway is not passable on the day of the event. The long duration of shaking takes a greater toll on bridges and overpasses under the jurisdiction of cities and counties where the retrofitting processes are not complete or have not begun.
- The largest long-term economic disruption comes from damage to the water distribution system. Damage to this system will be so extensive that some areas will have to replace the whole system, and some buildings will be without water for as long as 6 months. The direct and indirect business interruption costs attributed to the lack of water will be \$50 billion.
- Most of the damage is predictable and much is preventable. Individuals can protect themselves and help their community by:

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- Storing more water than they already have

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- Keeping a fire extinguisher and knowing how to use it.

- Securing their space. This means securing building contents from flying around and reinforcing a building they own to the most current standards.

"The planned emergency drill is underpinned by the most comprehensive analysis ever of what a major Southern California earthquake would mean on the ground," said Dr. Lucile Jones, chief scientist for U.S. Geological Survey's Southern California Multi-Hazards Demonstration Project. "We know this science will help state and local agencies develop comprehensive emergency-response plans that will help us avoid the worst impacts of a major quake."

The *ShakeOut Scenario* is the product of an interdisciplinary collaboration of over 300 scientists, engineers, and other experts from several agencies, including the USGS, the California Geological Survey, Southern California Earthquake Center, California Office of Emergency Services and Seismic Safety Commission.

To create the Scenario, geologists determined the amount of potential motion on the part of the San Andreas Fault with the greatest risk of imminent rupture, a 200-mile long section from the Salton Sea in the Coachella Valley to just south of Gorman. From this, seismologists and computer scientists modeled

the ground shaking. Engineers and building professionals used the models of ground shaking to estimate damage to the built environment. And from these damages, social scientists evaluated emergency response, casualties, and the impact on our economy and society.

The following scientists and engineers led the development of individual sections of the *ShakeOut Scenario*. They were responsible for bringing together the appropriate team of experts to analyze that aspect of the earthquake, leading the investigations and ensuring that the final document was written. Each of them can speak to the goals of the Scenario, the main results and the details of their expertise. They can be reached by contacting the USGS.

Dr. Lucy Jones, Seismologist, USGS, Chief Scientist

Dr. Kenneth Hudnut, Geologist, USGS, Geologic setting and ground motion prediction

Dr. Keith Porter (<http://urbanearth.gps.caltech.edu/dr-keith-porter/>), Engineer, University of Colorado, Physical Damages

Dr. Daniel Ponti (<http://urbanearth.gps.caltech.edu/dr-daniel-ponti/>), Geologist, USGS, Secondary Hazards

Ms. Hope Seligson, Engineer, MMI Engineering, HAZUS and loss estimation

Dr. Kimberley Shoaf, Public Health Scientist, UCLA School of Public Health, Mortality and morbidity

Dr. Michael Reichle, Chief Seismologist (ret.), California Geological Survey, Lifelines Dr. Dennis S. Mileti (<http://urbanearth.gps.caltech.edu/dr-dennis-s-mileti/>), Sociologist, California Seismic Safety Commission, Emergency Response

Dr. James Goltz (<http://urbanearth.gps.caltech.edu/dr-jim-goltz/>), Social Psychologist, California Office of Emergency Services, Emergency Response Dr. Richard Bernknopf, Economist, USGS, Economics

Dr. Anne Wein, Decision Scientist, USGS, Economics

Mr. Dale A. Cox, Project Manager, USGS

A copy of the full technical report, *The ShakeOut Scenario*, is available online at <http://pubs.usgs.gov/of/2008/1150> (<http://pubs.usgs.gov/of/2008/1150>).

A non-technical summary narrative of the Scenario is online at <http://pubs.usgs.gov/circ/1324/> (<http://pubs.usgs.gov/circ/1324/>). Paper copies of the narrative are available by request.

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High resolution images, and a computer animation showing the earthquake rupture and its waves of energy spreading across Southern California are online at <http://urbanearth.usgs.gov/shakeout> (<http://urbanearth.usgs.gov/shakeout>).

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