

Press Release

May 25, 2005	Catherine Puckett, USGS	707-442-1329	catherine_puckett@usgs.gov
	Mark Benthien, SCEC	213-740-0323	benthien@usc.edu
	Cheryl Dybas, NSF	703-292-7734	cdybas@nsf.gov

Major Losses of Up to \$250 Billion Projected for Earthquakes on Puente Hills Fault Under Los Angeles

Infrequent but Deadly Earthquakes Pose Hazard, Show Need for Preparedness

Potential earthquakes on the Puente Hills fault beneath the Los Angeles area could result in 3,000 to 18,000 fatalities, 142,000 to 735,000 displaced households, and more than \$250 billion in total damages, according to U.S. Geological Survey (USGS) and Southern California Earthquake Center (SCEC) research.

The Southern California Earthquake Center (SCEC) is a consortium funded by the National Science Foundation (NSF) and the USGS. SCEC involves over 400 scientists at more than 50 research institutions, and is headquartered at the University of Southern California (USC).

The new research results, published in the May 2005 issue of the Earthquake Engineering Research Institute's *Earthquake Spectra*, were based on shaking scenarios created using newly available software for seismic hazard analysis developed by SCEC and the USGS, coupled with HAZUS loss-estimation software developed by the Federal Emergency Management Agency (FEMA).

The Puente Hills fault was discovered in 1999. In 2003, a study led by SCEC researchers at USC found that the fault had ruptured at least four times in the last 11,000 years, with magnitudes ranging from 7.2 to 7.5. To determine probable losses from such earthquakes on the Puente Hills fault, the authors of the new study created 18 different scenarios depicting different possible shaking levels throughout the region. The authors noted that it is vital to understand that the loss scenarios themselves are somewhat uncertain because of the many variables involved in predicting ground shaking, including whether the full fault ruptures or just part of it. Also, the formal quantification of loss estimates is still a challenging and imprecise science, even using the best available models and scientific data.

USGS researcher Ned Field, the lead author of the study, said that although the scenarios show that the vast majority of losses will occur in Los Angeles County, directly over the rupture surface, tangible losses are also predicted for San Bernardino and Orange counties located east and south of the Puente Hills fault. The losses predicted for this event are greater than those experienced during the 1994 Mw 6.7 Northridge earthquake, both because of the higher potential magnitudes and because the heavily shaken area during Northridge was mostly wood-frame residential structures, whereas Puente Hills sits under older and more vulnerable commercial and industrial structures.

The authors also emphasize that a full Puente Hills fault rupture is a rare event, occurring once every 3,000 years or so. “In fact,” said Field, “as an individual your odds of dying of a heart attack or an auto accident are much greater than dying from this earthquake.” “That being said,” Field added, “there are other sources of earthquakes throughout the region, and it’s not question of if, but when, so everyone should take necessary safety precautions. With USGS science, we are striving to prevent these natural hazards from becoming disasters.” Furthermore, he said, a Puente Hills earthquake would have widespread impact, so it’s also up to emergency and public policy officials to plan accordingly.

“Quantifying earthquake risk is difficult and fraught with many uncertainties,” said Tom Jordan, director of the Southern California Earthquake Center, and a co-author of the new study. “One of the main goals of this study was to use our improved knowledge of seismic hazards in Southern California to evaluate – and hopefully reduce – the uncertainties in this type of risk analysis.”

The researchers determined a probable range of estimated losses by averaging losses predicted under each scenario and model. The scenarios all assumed an earthquake occurring at 2 p.m. during a weekday, when many people are at work. The number of casualties would be significantly less if an earthquake were to occur on the fault at night when most people are at home. Their results showed that:

- The estimated number of fatalities could range between 3,000 and 18,000, with an average of 7,600. Northridge, with a Mw of 6.7 resulted in 33 direct fatalities, and the 1995 Mw 6.9 Kobe, Japan earthquake resulted in 6,348 fatalities.
- The total number of injuries could range between 56,000 and 268,000, or an average of about 120,000.
- The number of displaced households ranged from 142,000 to 735,000, with an average of 274,000.
- Relief agencies would have to provide short-term public shelter for 42,000 to 211,000 people, with an average of 80,000 people needing short-term public shelter.
- The amount of debris generated by such an earthquake would range between 30,000 and 99,000 tons, averaging 51,000 tons.

These projections assume that no efforts have occurred that would improve infrastructure so as to reduce earthquake losses before the earthquake happens, Jordan noted, adding, “If society chooses to invest in mitigation, many of these losses could be avoided.”

“The Puente Hills blind thrust loss estimation results illustrate how much we have been able to learn about the complexities of earthquakes, the associated ground shaking, and their societal effects,” said Kaye Shedlock, program director in NSF’s division of earth sciences, which funds SCEC. “These results also help clearly focus what we still need to learn to mitigate the loss of life and the economic impacts from earthquakes.”

SCEC gathers new information about earthquakes in Southern California, integrates this information into a comprehensive and predictive understanding of earthquake phenomena, and communicates this understanding in order to increase earthquake awareness, reduce economic losses, and save lives.

The USGS serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.