

Risk of man-made quakes decreasing with reduced oil field disposal

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Damage in Cushing, Okla., which was struck with a magnitude 5 earthquake on Nov. 6 last year. Photo by Jim Beckel, courtesy of AP Images.

Federal officials say the risk from man-made earthquakes in Oklahoma and Texas has diminished as companies have slowed oil field wastewater disposal.

But scientists at the U.S. Geological Survey (USGS) stressed that there's still a significant chance for oil field activity to trigger a damaging quake in the next year.

"Generally, the chance of damage has decreased," Mark Petersen, chief of the USGS National Seismic Hazard Mapping Project, said in a call with reporters. But he noted that the hazard in parts of Oklahoma is still "hundreds of times higher" than before the surge in disposal.

USGS yesterday released its second annual hazard map forecasting the danger of damaging quakes caused by man-made activity. The research was published yesterday in the journal *Seismological Research Letters*.

The forecast showed a slight decrease in Oklahoma, although some portions are still considered to have a 10 to 12 percent risk of a damaging quake. But the Dallas area was removed from the map. That meant the number of people considered to be at elevated risk from man-made quakes dropped from 7 million to about 3.5 million ([Energywire](#), March 29, 2016).

The likelihood of damaging ground shaking in central Oklahoma remains similar to that of natural earthquakes in high-hazard areas of California, according to the USGS assessment. And USGS officials noted the level of hazard remains higher than what current building codes take into account.

The forecast maps released yesterday indicate that the Raton Basin area along the Colorado-New Mexico border also remains at elevated risk. An area in West Texas, where companies have increased production from the Permian Basin, was added as being at a slightly elevated risk of damage from quakes.

Engineers use the forecast maps to assess the safety of buildings, bridges, pipelines and other important structures. The Army Corps of Engineers has used them for guidance on updating their safety assessments of some facilities.

Researchers say the reduced waste injection is a result of both regulatory measures undertaken by state oil and gas officials and a production slump caused by low oil prices. How much each contributes is a hot topic among regulators and scientists.

"It's a little hard to tell," Oklahoma Geological Survey (OGS) Director Jerry Boak said on a call with reporters.

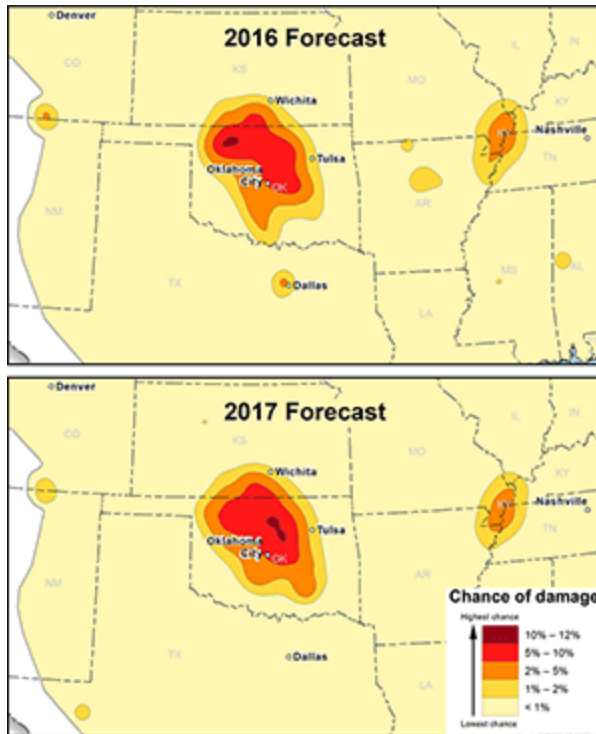
An industry organization said the reduced risk shows that the risk of man-made quakes in the oil field is "small, rare and manageable."

"The lower risk of induced seismicity is a clear sign that the collaborative efforts between industry, scientists and regulators are working," said Katie Brown of Energy In Depth, a campaign of the Independent Petroleum Association of America.

A surprising reduction

The USGS's annual risk forecast is based on the amount of shaking in the previous year. USGS said its forecast map issued last year proved to be accurate, especially in Oklahoma. But it was surprised by the sharp reduction in shaking in the Dallas area.

"We didn't anticipate there would be a reduction like that," Petersen said. "There are some potential reasons, but we don't know them."



[+] The U.S. Geological Survey says the risk of damaging quakes triggered by oil field wastewater disposal is lower this year but still significant. Map courtesy of USGS.

Texas oil and gas officials released a statement pointing to seismicity rules enacted in 2014 by the Texas Railroad Commission (RRC), which oversees oil and gas in the state. It said 39 disposal well permits have been issued with restrictions, and 12 were returned or withdrawn. They also pointed to their new network of seismic instruments, called Texnet.

"The commission's focus remains on enforcing our rules on seismicity and working with the Texnet seismic monitoring program to better understand the potential for natural and induced seismicity in Texas," said RRC spokeswoman Ramona Nye.

In Oklahoma, the number of magnitude 3 and larger earthquakes declined 31 percent last year to 623 ([Energywire](#), Jan. 24). But the state also had its largest earthquake ever in September. Before 2009, the state averaged about two such quakes a year.

Parts of Oklahoma were rattled by two quakes yesterday. The first, a magnitude 3, struck in far western Oklahoma. The second, magnitude 3.1, shook a rural area between Oklahoma City and Tulsa.

Hydraulic fracturing has been linked to a handful of small earthquakes in Oklahoma. But scientists and public officials say the widely felt swarms of earthquakes are linked to deep wastewater injection.

The amount of injection started falling around the time that oil prices started to decline, said Boak of OGS. Then state officials got more aggressive about directing oil companies to cut back on disposal.

At the height of the earthquake swarms in 2015, companies were injecting about 3 million barrels a day in the earthquake-prone area state officials call the "area of interest," according to Tim Baker of the Oklahoma Corporation Commission (OCC). That is now down to about 1.5 million barrels (a barrel is 42 gallons). But if the price of oil shot up and producers wanted to start injecting the maximum amount legally allowed, that could rise to 2.5 million barrels.

But drillers have now moved away from the earthquake-prone areas in north and central Oklahoma where they were producing from the Mississippian Lime formation. The Mississippian Lime produces far more wastewater per barrel of oil than other formations. Instead, Baker said drillers' interest is focused on two plays west of Oklahoma City commonly called the SCOOP and the STACK. Production in those areas requires far less wastewater disposal. Within the Mississippian Lime play, Baker said, new disposal wells are usually being drilled to inject into shallower formations not linked to earthquakes.

Still, last week, OCC moved to head off any sudden increases in injection with new rules for disposal well operators ([E&E News PM](#), Feb. 24).

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