

# Marin, Bay Area earthquake probabilities increase, updated USGS forecast says

Mark Prado, Marin Independent Journal, 9-23-16

The chance of a major earthquake rocking Marin has just increased, according to the U.S. Geological Survey.

The Working Group on California Earthquake Probabilities has updated its earthquake forecast and determined there is a 72 percent probability — up from 63 percent — of at least one earthquake of magnitude 6.7 or greater striking somewhere in the Bay Area before 2043.

“Earthquakes this large are capable of causing widespread damage; therefore, communities in the region should take simple steps to help reduce injuries, damage, and disruption, as well as accelerate recovery from these earthquakes,” according to the report released last month.

“The number really doesn’t matter, either one is big,” said David Schwartz, a USGS geologist in the earthquake program. “No one is immune. There is no escape in the Bay Area from a strong earthquake and everyone has to be prepared.”

Marin sits smack dab in the middle of two major faults. To the east is the Rodgers Creek-Hayward fault just a few miles from Marin’s shores through San Pablo Bay, which the U.S. Geological Survey estimates has a 33 percent likelihood of a 6.7-magnitude quake or greater in the next 30 years — the highest probability of any Bay Area fault to slip.

But movement on those faults could be worse than originally thought. The Rodgers Creek-Hayward fault, thought to be two separate faults, actually may be linked and have the potential to cause more damage than previously determined, according to USGS research.

The Rodgers Creek Fault runs from Sonoma County into San Pablo Bay near Marin’s shore. The Hayward Fault runs through the western part of Alameda County into San Pablo Bay east of San Rafael and Novato. They were thought to be offset by about two miles under San Pablo Bay. But underwater exploration done in 2014 seems to link them. More study will occur to confirm those initial findings.

So instead of two smaller faults, the region might now have one 99-mile fault that could deliver quite a jolt — up to a magnitude 7.2 quake — if it ruptured at once.

Part of the reason why it has a high probability is because it has not had a recent historic event. Slippage along the northern Hayward fault alone in a 6.7-magnitude quake would leave 2,690 housing units uninhabitable and 6,725 people homeless in Marin, according to an Association of Bay Area Governments report. A quake along the entire Hayward fault would leave about 5,300 people in Marin homeless by knocking out 2,125 housing units. There are no calculations for a larger event.

To the west is the San Andreas fault, which stretches from San Jose, through West Marin and out to sea. The USGS reports there is a 22 percent chance of a 6.7-magnitude earthquake along some part of that fault. The famous 7.9-magnitude 1906 quake, which shifted the landscape of parts of West Marin in a matter of seconds, was on the San Andreas fault.

Scientists studying earthquakes now know temblors of significant magnitude were relatively common during the 1800s in the Bay Area. Between 1836 and 1906 there were 17 earthquakes of magnitude 6.0 and greater. Seven of those earthquakes were of magnitude 6.5 or greater.

After the 7.9-magnitude 1906 earthquake, there was only one quake that reached 6.0-magnitude over the next 73 years. It wasn't until that quake shook Gilroy in 1979 that significant activity resumed. Scientists believe the 1906 San Francisco earthquake was of such great power, it served to relieve pressure on faults around the Bay Area for the ensuing seven decades.

“The Bay Area has been anomalously quiet,” The USGS’s Schwartz said. “That has to end.”

Now scientists fear the tension is beginning to mount again. While the 1989 Loma Prieta quake was major, it did little to relieve pressure from faults outside the Santa Cruz Mountains, according to the USGS.

“Earthquakes are one of the top three things we plan for most, along with flood and fire,” said Chris Reilly, the emergency services manager for the Marin County Sheriff’s Office. “We try to plan how to get the county food and supplies after a large earthquake. It will take time. We ask people to have a preparedness plan that will allow them to be on their own for up to 96 hours. The threat is only growing.” Some agencies have taken steps to protect infrastructure to keep access open to Marin after a major quake.

Work has finished on the Richmond-San Rafael Bridge to allow the span to remain standing after an 8.3-magnitude quake. In addition, the California Department of Transportation has spent roughly \$60 million to retrofit key sections of Highway 101 at the Richardson Bay Bridge, the Corte Madera Creek Bridge and the San Rafael viaduct.

The Golden Gate Bridge district is retrofitting the entire span. When finished, the upgrade will allow the bridge to withstand an 8.3-magnitude quake. Work was completed to replace Doyle Drive, the southern approach to the bridge, which was vulnerable in a big quake.

“This bridge is designed to be a lifeline, so that after an earthquake you can get emergency vehicles across it,” noted Denis Mulligan, general manager of the Golden Gate Bridge district. The most vulnerable parts of the structure — the north and south pieces — have been retrofitted, but the center suspension portion needs \$460 million in work, money that is being sought.

“There is no threat of a collapse in an earthquake, but there would be extensive damage that could shut it down,” he said. “That’s why we need to do this final phase.”