

Little known Concord fault poses big threat

Matthias Gafni, Bay Area News Group, 4-11-15

CONCORD -- A mysterious earthquake fault slices under central Concord, its jagged, quarter-mile-wide seam running beneath a critical fuel-pumping facility, traversing the edge of a refinery processing 166,000 barrels of crude oil daily, and undercutting strip malls and homes.

While its big sisters, the San Andreas and Hayward fissures, grab the headlines, the Concord Fault -- with its 11-mile-long fracture zone stretching from the Carquinez Strait to the Mount Diablo foothills -- is also capable of producing a catastrophic earthquake, geologists say. And with critical infrastructure in its path, particularly refineries and a vulnerable railroad bridge not far away, a large seismic event could leave the entire northern half of the state without easy access to fuel -- disrupting transportation and the transmission of electricity and water, according to a recent study.

The Concord fissure may be largely ignored by the general public. But not by geologists.

"The Concord Fault is significantly more active than the fault that caused the Napa earthquake," said Chris Wills of the California Geological Survey, referring to the 6.0 wine country temblor last August that caused more than \$400 million in damage. "Nobody would be surprised if a magnitude-6 earthquake happened on the Concord Fault tomorrow."

Make no mistake, Concord's contribution to the Bay Area's geologic activity is significantly smaller than the San Andreas and Hayward zones. Updated U.S. Geological Survey estimates indicate a 3 to 4 percent probability of a magnitude-6.7 or higher earthquake over the next 30 years on the Concord or lower Green Valley Fault, a connected Solano County segment, compared with 6.4 percent for the San Andreas and 14.3 percent for the Hayward Fault.

The Concord Fault creeps a measly 4 to 5 millimeters annually, while the Hayward slips 9 millimeters and San Andreas 25 millimeters.

The last catastrophic temblor on the Contra Costa-Solano combo fault struck more than 400 years ago, but geologists still say it's important to monitor.

"At some point in time that system has to fail -- we just don't know exactly when," said David Schwartz with the USGS. Even if the Concord Fault only produces a 5.0 quake, it could cause significant damage, Schwartz said.

THE GREAT UNKNOWN

On Oct. 23, 1955, a 5.4 quake -- the Concord Fault's last major temblor -- was felt from San Jose to Sacramento. It caused \$1 million in damage (\$8.7 million in today's dollars) and one fatality, according to the USGS. Windows shattered, brick walls cracked and moved, chimneys shifted and wine bottles crashed from liquor store shelves.

What makes the Concord Fault particularly worrisome to regional planners, so much so that it was highlighted in a December study by the Association of Bay Area Governments, is its potential impact on regional and statewide fuel distribution. Without gasoline, every other crucial need, including water, electricity and transportation, will be affected.

In its report, ABAG studied three theoretical earthquakes -- a 7.9 on the San Andreas, a 7.0 on the Hayward and 6.8 on the Concord.

"Originally, we were just going to explore the San Andreas and Hayward faults, but we realized that (there are) a lot of key infrastructure assets in (the Concord) region," said study author Michael Germeraad, an ABAG resilience planner.

Five Bay Area refineries -- all but two are within a couple miles of the fault -- processed 235 million barrels of crude in 2012, about 40 percent of the state's total, according to ABAG. In addition, Kinder Morgan operates a pumping station nearby that receives processed crude from all the refineries and pipes it out to terminals across Northern California and Nevada.

CRITICAL PIPELINES

That pumping station, a critical piece of fuel infrastructure, lies directly above the Concord Fault.

Built in the 1950s, the station receives products from eight facilities and pumps the refined crude through pipelines. It can store about 1 million barrels, but normal inventory is half of that, said Melissa Ruiz, a Kinder Morgan spokeswoman. Its five outgoing pipelines serve Chico, Fresno, Reno, Sacramento, San Jose, Stockton and surrounding cities, in addition to seven military facilities and public airports.

The company has facilities and pipelines in active fault areas throughout California but has never lost a pipeline or tank to a quake and maintains its infrastructure to industry rules and regulations, Ruiz said.

In its report, ABAG said it had concerns because pipelines can fail due to soil liquefaction -- where hard soil loses strength during strong ground shaking -- and fault rupture. Knowing pipeline material, age, weld types and other factors would help scientists know where failures are "more likely," but that information isn't available.

"Damage to the Concord station would interrupt fuel transmission across the northern half of the state," the report concluded.

The study also found that if one Bay Area refinery was damaged, they would all likely suffer damage because of their close proximity to each other, and because they are built on similar soils and have similar construction.

"A conservative restoration estimate of damaged refineries is months," the study found for the Concord quake scenario.

The Tesoro Golden Eagle facility in Martinez sits on 2,206 acres just feet from the fault. Built in 1903, Golden Eagle employs about 650 workers and is the fourth-largest refinery in California.

Spokeswoman Patricia Deutsche said refinery officials are aware it sits next to the fault and a liquefaction zone, but she said the facility follows industry design standards. Piles are driven down hundreds of feet into bedrock, equipment has been retrofitted and the Avon Wharf, an oil terminal located on aging timber piles along the southern shore of Suisun Bay, just received environmental clearance for retrofit up to state quake standards, she said.

Seismic assessments of Bay Area refineries are done every five years, and the building code requirements consider the level of possible ground shaking from any nearby fault, said Gayle Johnson, senior engineer with Simpson Gumpertz & Heger, a national engineering firm.

Johnson, who has investigated the performance of industrial facilities in more than 20 earthquakes worldwide, said since the refinery retrofit programs began in the late 1980s and early 1990s, there has been a "ton of upgrade work done."

OTHER IMPACTS

While fuel infrastructure may be the top concern for the region, a large quake could disrupt other major lifelines. The Benicia-Martinez rail bridge, located between the two vehicle spans, is particularly vulnerable, according to ABAG, and could face "significant or complete damage."

Liquefaction along the Carquinez Strait could cause dredged water channels to slough into the shipping pathways. Runways could rupture at Buchanan Field, which sits adjacent to the fault. Delta levees could breach, creating flooding and impacting drinking water quality, ABAG found.

Two-thirds of the power generated in the region is produced by natural gas facilities, many along the Carquinez Strait.

"In the event natural gas lines are damaged, these facilities will be unable to generate electricity," the study found.

Still, Wills warns that what will happen during a significant quake on the Concord Fault is largely a mystery.

"How it releases is not that well known," he said.