New data on 2 Bay Area faults cause worry about next big quake

David Perlman, San Francisco Gate, 1-2-15

The Hayward Fault, which ruptured in a devastating Bay Area earthquake nearly 150 years ago, could be linked to the quieter Rodgers Creek Fault deep beneath San Pablo Bay, and that would pose the threat of a far more powerful quake in the future, a new seismic study has found.

Traces of both faults in the Earth's crust have long been a puzzle to seismologists. Most thought they terminated separately beneath the floor of the shallow bay, and seismic maps show their ends being at least 2½ miles away from each other.

Now Janet Watt, a research geophysicist at the U.S. Geological Survey's Pacific Coastal and Marine Science Center in Santa Cruz, has completed an underwater survey of the two faults and reports clear evidence that the strands of the two faults are tied together, with no gaps or "offsets" between them.

The magnitude of an earthquake depends on the length of the fault that produces it. Recent surveys indicate the Hayward Fault is about 60 miles long, running roughly from San Pablo Bay south to Alum Rock in San Jose, while the Rodgers Creek Fault measures about 39 miles, running north from San Pablo Bay to Healdsburg.

If the two should in fact rupture along their combined 99-mile length, they could be capable of triggering an earthquake with a magnitude of 7.2, Watt said. That would be a far larger quake than the 6.8 Loma Prieta quake of 1989.

The killer quake that struck when the Hayward Fault ruptured between Berkeley and Fremont in 1868 has been estimated at a magnitude 6.8 and shook the ground violently across 1,000 square miles. It toppled buildings along the fault in Hayward and San Leandro, and shook others as far away as San Francisco and San Jose, both relatively far from the fault.

In those days, only about 260,000 people lived in the area affected by the quake and 30 people died in the violence, but millions now live in the heavily urban region.

Watt reported on her San Pablo Bay research during the annual meeting of the American Geophysical Union in San Francisco in December and discussed it during an interview.

Research by other scientists has long suggested that the two faults might be connected, but early fault maps have shown wide gaps or "step-overs" between them.

"Certainly, connectivity is an important issue, and if what we have been calling sections of faults using different names are physically connected, the potential for a longer rupture is greater," said David P. Schwartz, a leading expert on seismic faults at the U.S. Geological Survey in Menlo Park.

The possible links between the two faults “has been discussed and debated for years,” Schwartz said. Watt’s new work “can significantly help improve our understanding of the geometry of the fault system,” he said.

Watt and her colleagues examined San Pablo Bay’s rocky bottom, which is covered with thick sediment, using an acoustic instrument called a sub-bottom chirp profiler, which penetrates rock with sound waves to record its contours.

The scientists deployed their instrument on pontoons towed by the 34-foot USGS research vessel Parke Snavely, which crossed the bay 15 to 20 times over five days in strong winds, swells and choppy conditions that created “some very noisy seismic data,” which they were able to clean, Watt recalled.

“The ‘chirp’ is aptly named,” Watt said, “because the sound that comes out of the instrument is like a high-pitched bird’s, and it’s really obnoxious.”