

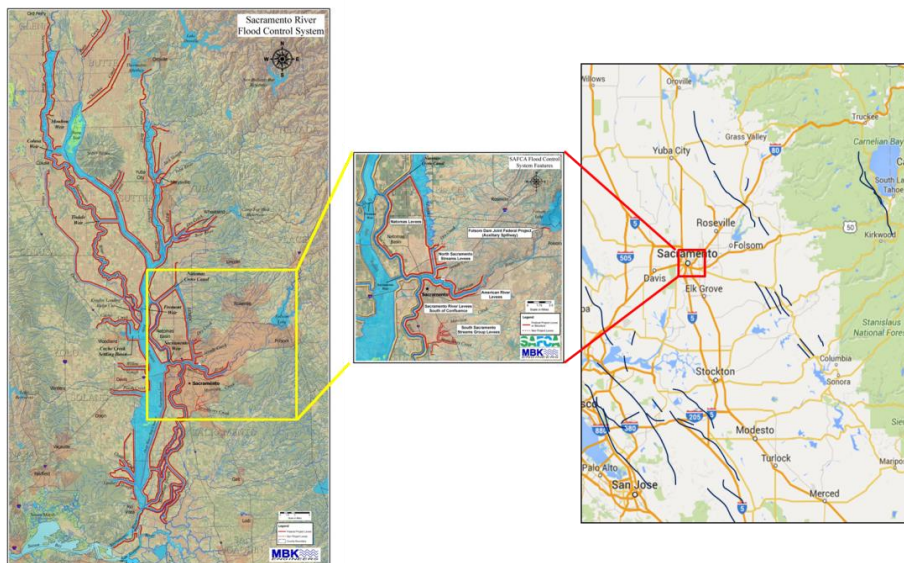
When the Levee Breaks – Sacramento’s Earthquake-Flood Potential

“The levee situation was worse than New Orleans...before Katrina...a monstrous accident waiting to happen.” Robert Verchick¹

Sacramento’s levee system is now receiving more attention and greater investment, but the combined risk of earthquakes and extreme weather create a severe flood risk for the city and the Central Valley.

Sacramento is not likely to suffer a devastating hurricane like Katrina nor does the city rely on subway systems like New York’s that flooded in Sandy to keep its economy moving. However, the city is located at the confluence of the Sacramento and American Rivers, near the Central Valley Delta (Sacramento-San Joaquin Delta). After New Orleans, this city is among the most at-risk regions in nation for catastrophic flooding and has the greatest flood risk of any major urban area in the country.

But why is that? Most Sacramento residents live below sea-level. The 2.5 million people living in the Sacramento metropolitan area (2010² census bureau) rely on an aging levee system for flood protection. This area saw population growth of 20% in the last decade with population expected to reach 7.5 million by 2050³. California’s state capital sits at the intersection of major north/south (I5, H99) and east/west (I80, H50) West Coast transportation corridors. Disruption to this infrastructure could have serious economic consequences for the State.



The Central Valley Delta is the state’s water distribution hub, supplying drinking water to the major urban populations of San Francisco’s Bay Area and Southern California, as well as to the agricultural production areas of the Central Valley. More than 56% of the non-urban levees responsible for separating drinking water from salt water are considered high hazard by the California’s Department of Water Resources (December 2011 report). This unique geographic location and economic conditions put Sacramento at great risk⁴ if the levee breaches. Levee failures not only impact the residents, local businesses and agriculture; the drinking water used by Bay Area and Southern California could be at risk of contamination.

¹ Gauthier-St. Martin Chair in Environmental Law at Loyola University New Orleans and a former EPA deputy associate administrator

² United States Census Bureau: American Fact Finder - Results

³ http://ccrm.berkeley.edu/resin/pdfs_and_other_docs/Ludy_RiskPerception_Boards.pdf

⁴ Tyler Stalker, a spokesman for the U.S. Army Corps of Engineers Sacramento District



A levee break is very difficult to predict with precision and a disaster would depend on many variables such as the location of levee breach, river stream flows and the time of the year. In the United States, levees are typically built to a “100-year flood” standard. This stems from the National Flood Insurance Program (NFIP) which requires those in floodplains with at least that level of risk to carry federal flood insurance. California adopted an even tougher 200-year flood standard for levees protecting urban areas. However:

- About 55 percent of the California levee system is considered “high hazard” and at risk of failure according to California’s Department of Water Resources.
- The flood standard estimates do not account for the future development and climate change conditions. While flooding might seem less of a concern as California contends with its current drought, upcoming storms driven by El Niño Southern Oscillation (ENSO) could pose even more of a threat than usual because dry ground is less able to absorb precipitation.

Although Sacramento does not face the same level of earthquake threat as the San Francisco Bay Area or the greater Los Angeles metropolitan area, it has felt the effects of earthquakes in the past. A research team at University of California Los Angeles (UCLA) predicted that an earthquake like the 2014 Napa Valley event with a 6.0 magnitude is strong enough to result in levee failures. One concern is the potential impact of liquefaction, particularly on the levees that surround much of the community. The UCLA study shows that the soil under the levees would be susceptible to liquefaction during an earthquake event of this magnitude or higher.

In 2014, the USGS⁵ updated their seismic hazard maps. A new fault system was added to the hazard maps west of Lake Tahoe near Sacramento and Central Valley Delta. This fault zone could potentially generate earthquakes with magnitudes ranging from 6.3 to 6.9. According to the USGS, since the fault connects to other fault mechanisms in the area the magnitude could be even higher if they ruptured at the same time. Dams and canals that supply two-thirds of the state’s water lie near the fault system. Any activity from the new fault could lead to the rupture of a nearby water system and subsequent flooding of the area. Furthermore, the USGS estimates a potential magnitude 7.8 earthquake on the southern portion of the San Andreas Fault. An earthquake in this magnitude could also cause major damage to infrastructure, including water lines and dams in the region.

According to the Deputy Director at California’s Department of Water Resources, many of these levees are not considered to be designed to current engineering practices. More than half of the levees in the state need major repairs to hold up during an earthquake⁶.

Based on survey results (114 usable responses) collected by UC Berkeley, only 20% of Sacramento area residents have flood insurance and about 13% included some level of precautionary measures such as a disaster supply kit, evacuation plans, built home on elevated-level, or stored valuables on a second story. Only 12% of Californian homeowners have earthquake coverage according to the California Earthquake Authority (CEA). *What are the alternatives for reducing losses and providing funds for recovery? As John F. Kennedy said “Fix the roof while the sun is shining”.*

To discuss any of the contents of this paper, please contact:

| | |
|---|---|
| Maryam Haji | Monica Mason |
| Research Analyst | Global Head of Catastrophe Modeling |
| T: 1 212 365 2347 | T: 1 212 365 2340 |
| E: mhaji@transre.com | E: mmason@transre.com |

⁵ The United States Geological Survey (USGS)

⁶ December 2011 report issued by California’s Department of Water Resources