USGS
science for a changing world

Natural Hazards Mission Area

Association of Bay Area Governments
General Assembly
ABAG/MTC - San Francisco, CA
31 May 2018

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with Dale Cox, Anne Wein, Sue Perry, Drew LaPointe, Keith Porter, Laurie Johnson, Jenn Strauss, Grace Kang, Arrietta Chakos, Kara Gross

... and 60+ 'HayWired Coalition' collaborating organizations

HAYWIRED

OUTSMART DISASTER

Business, Consumer Services and Housing Agency
Alfred E. Alquist Seismic Safety Commission
U.S. Geological Survey

Together… we can Outsmart Disaster

USGS Fact Sheet – The HayWired Earthquake Scenario

outsmartdisaster.com

usgs.gov/HayWired

594 pages; USGS SIR
Vol. 1 - Hazards
Vol. 2 - Impacts

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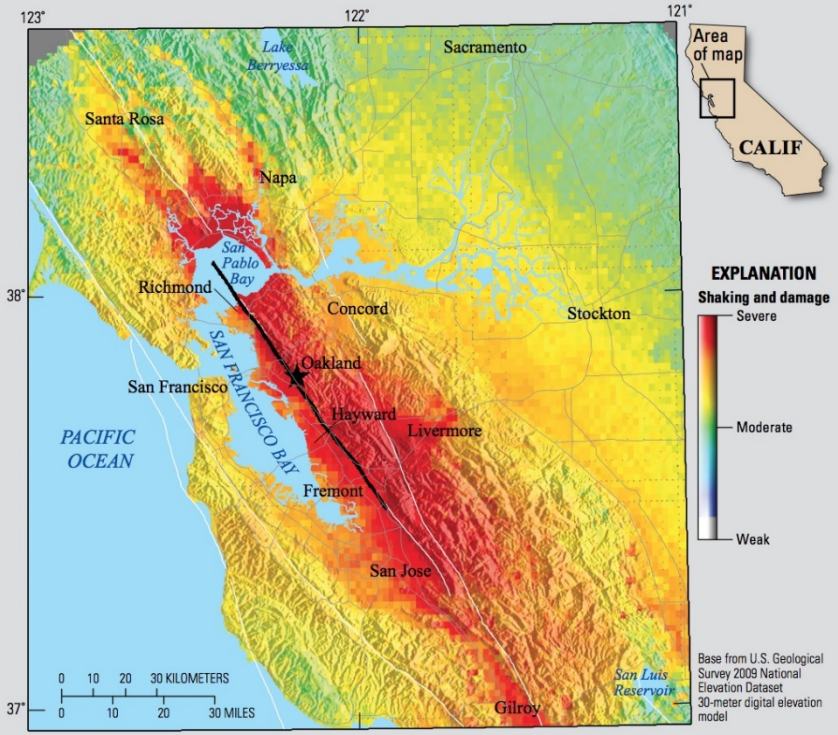
HAYWIRED

The HayWired Earthquake Scenario—
We Can Outsmart Disaster

The HayWired earthquake scenario, led by the U.S. Geological Survey (USGS), anticipates the impacts of a hypothetical magnitude-7.0 earthquake on the Hayward Fault. The fault is along the east side of California's San Francisco Bay and is among the most active and dangerous in the United States, because it runs through a densely urbanized and interconnected region. One way to learn about a large earthquake without experiencing it is to conduct a scientifically realistic scenario. The USGS and its partners in the HayWired Coalition and the HayWired Campaign are working to energize residents and businesses to engage in ongoing and new efforts to prepare the region for such a future earthquake.



This map of the San Francisco Bay region, California, shows simulated ground shaking caused by the hypothetical magnitude-7.0 mainshock of the HayWired earthquake scenario on the Hayward Fault. Red shows the most extreme ground shaking and where damage is the worst. The mainshock begins beneath the City of Oakland (star) and causes the Hayward Fault to rupture along about 52 miles of its length (thick black line). White lines are other major faults in the region.

@HayWiredCA

#HayWired

#OutsmartDisaster

April 18, 2018
Press Event at
U.C. Berkeley

HayWired Uses Innovative Science

The HayWired scenario uses new, innovative science to better understand earthquake-related hazards and damages, as well as the benefits of risk reduction actions. This science helps to:

Understand the Hazards

- More accurately predict ground-shaking intensity throughout the San Francisco Bay region using computer simulations of the way seismic waves travel.
- Pinpoint high-hazard areas using probabilities of landslide and soil liquefaction triggered by earthquake shaking.
- Develop a plan to communicate forecasts of a potential aftershock sequence after a large earthquake.
- Project possible continued surface offsets along a fault after a large earthquake.

Estimate Damage and Its Effects

- Estimate building damages from shaking, liquefaction, and landslides, as well as additional building damage due to ongoing aftershocks.
- Understand likely damage to water-supply networks and the vital ways in which lifelines (for example, utilities and roads) are interconnected and depend on one another.
- Provide insights into additional substantial damages from fire following earthquake.
- Predict how many people could be trapped under collapsed buildings or stuck in stalled elevators.

Analyze Benefits of Risk Reduction

- Show that if old, brittle pipes are replaced and repair crews have a back-up fuel plan, water service—including drinking water—is restored faster after an earthquake.
- Demonstrate that enhancing building codes would help to reduce damage to new buildings during strong shaking.
- Better understand what the public expects from building codes, including that buildings will be useable after an earthquake.
- Emphasize that using ShakeAlert (https://www.shakealert.org) earthquake early warning, combined with drills to practice "Drop, Cover and Hold On," could help prevent thousands of injuries and save lives in a powerful earthquake.

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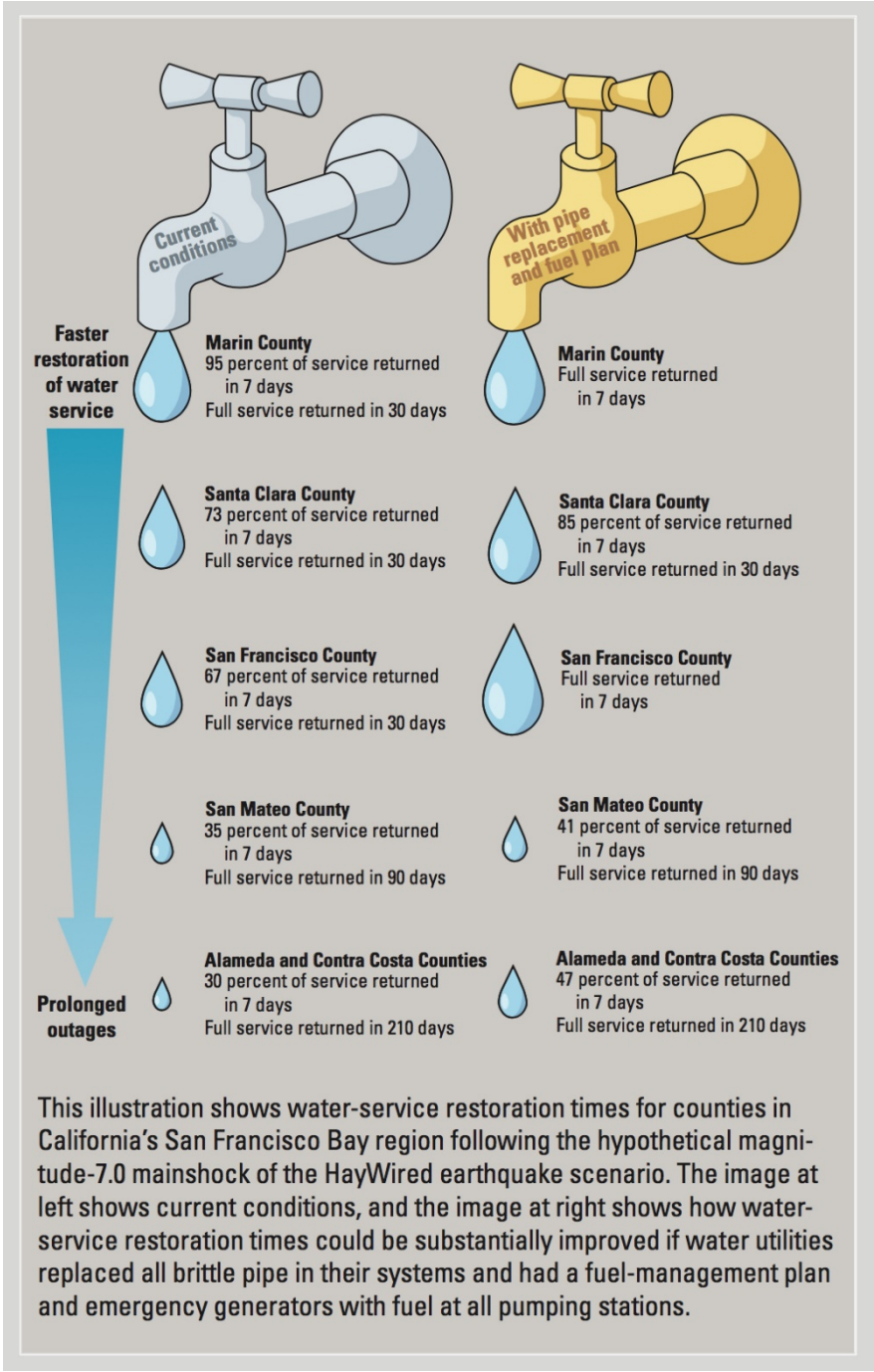
HAYWIRED

HayWired scenario
Water Service Disruption



This illustration shows water-service restoration times for counties in California's San Francisco Bay region following the hypothetical magnitude-7.0 mainshock of the HayWired earthquake scenario. The image at left shows current conditions, and the image at right shows how water-service restoration times could be substantially improved if water utilities replaced all brittle pipe in their systems and had a fuel-management plan and emergency generators with fuel at all pumping stations.

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HAYWIRED

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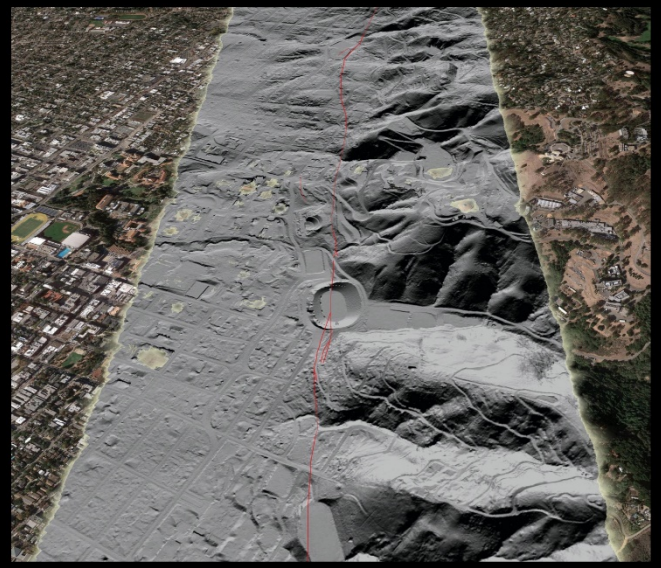
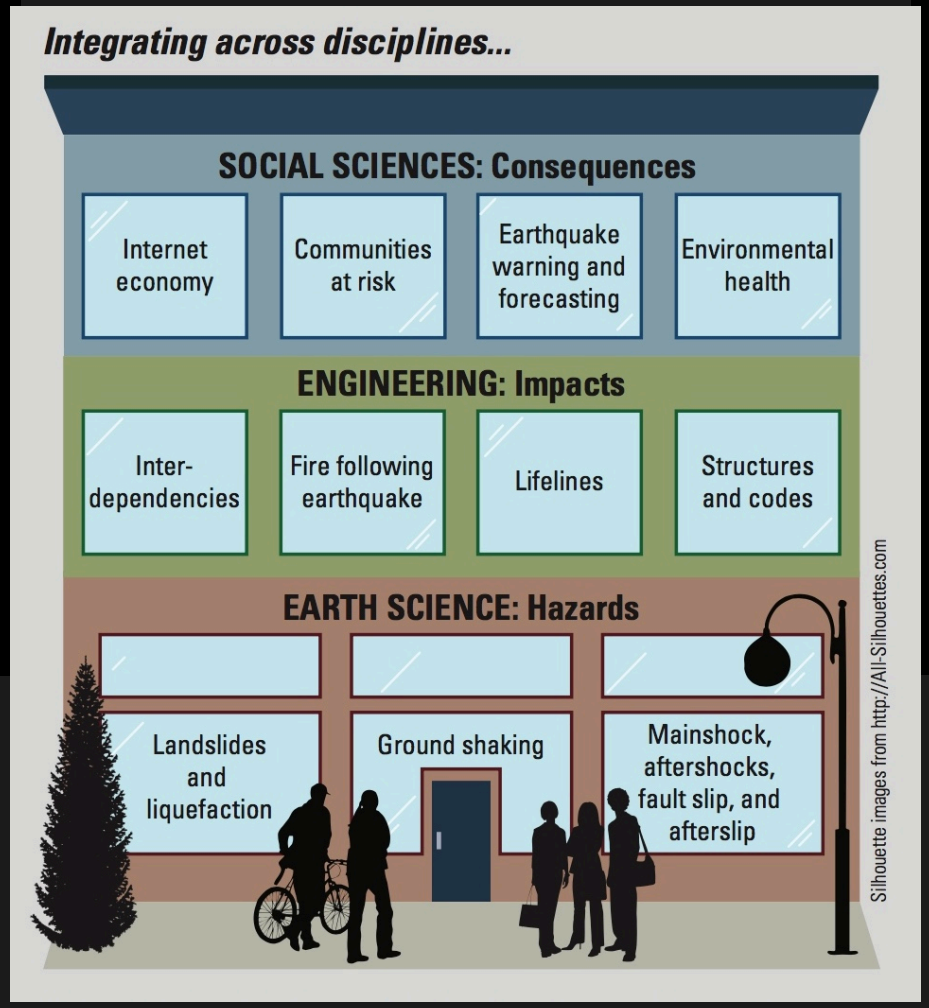
Prepared in cooperation with the California Geological Survey

The HayWired Earthquake Scenario—Earthquake Hazards



Scientific Investigations Report 2017–5013–A–H



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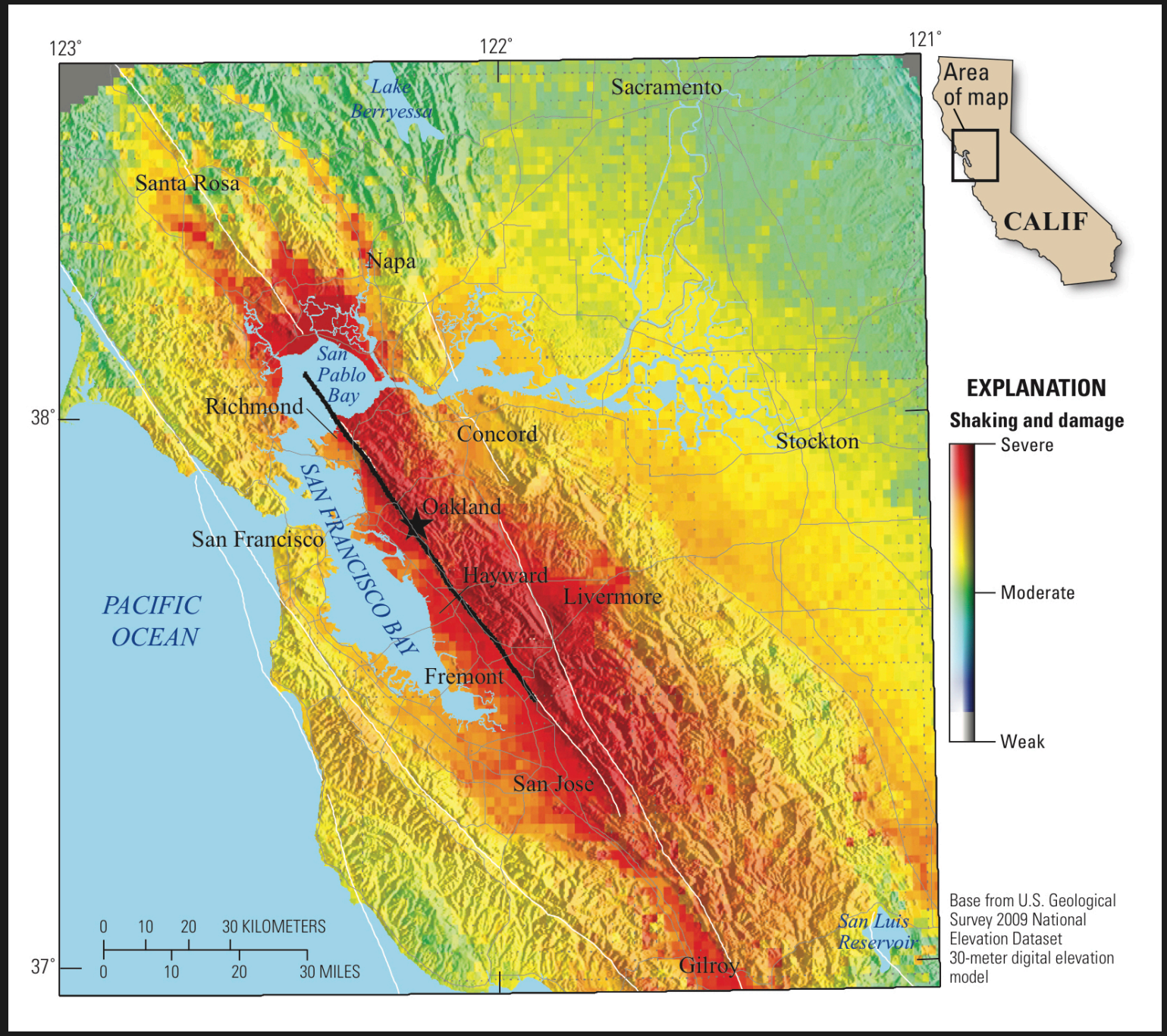
The HayWired Earthquake Scenario—Engineering Implications

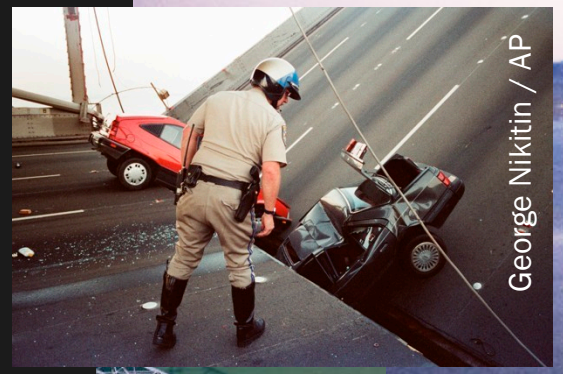
Scientific Investigations Report 2017–5013–I–Q

SIR Vol. 3 – Oct. 2018

Deanne Fitzmaurice / SF Chronicle / Polaris

Steve Dykes / LA Times


123°
122°
121°
38°
37°
Lake Berryessa
Sacramento
Santa Rosa
Napa
San Pablo Bay
Richmond
Concord
Stockton
SAN FRANCISCO BAY
Oakland
San Francisco
Hayward
Livermore
PACIFIC OCEAN
Fremont
San Jose
San Luis Reservoir
Gilroy
0 10 20 30 KILOMETERS
0 10 20 30 MILES
Area of map
CALIF
EXPLANATION
Shaking and damage
Severe
Moderate
Weak
Base from U.S. Geological Survey 2009 National Elevation Dataset 30-meter digital elevation model



1989
Loma
Prieta

Bay
Bridge
Retrofit

N. View from Divisadero & North Point

1906
Howard & 17th Streets

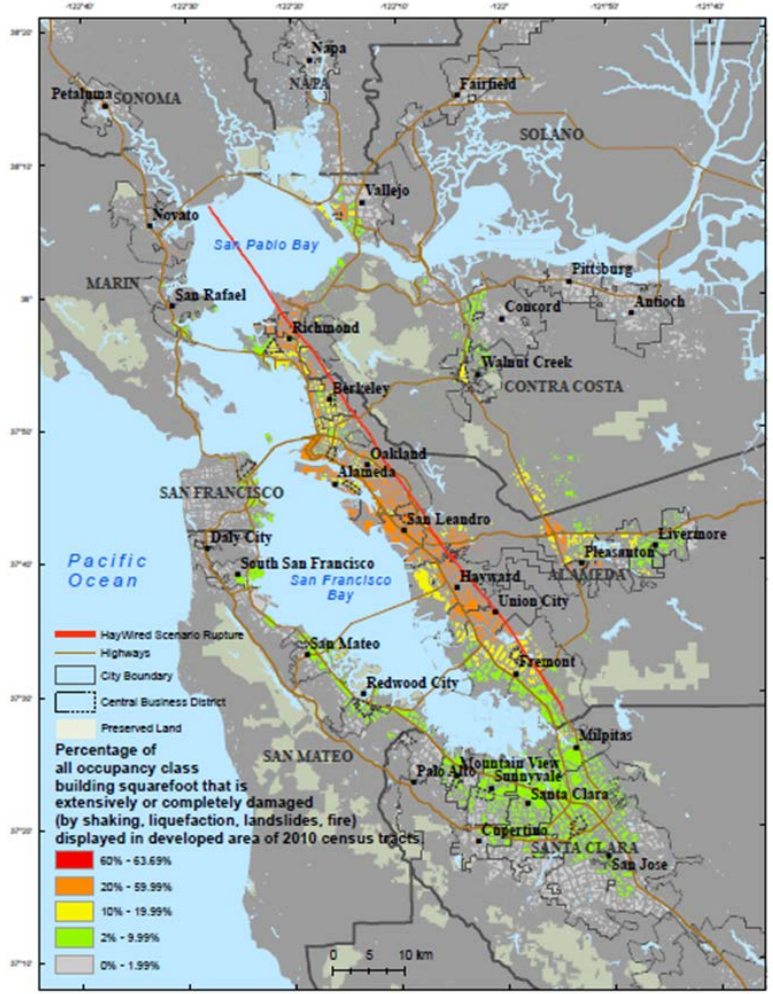
G.K. Gilbert / USGS

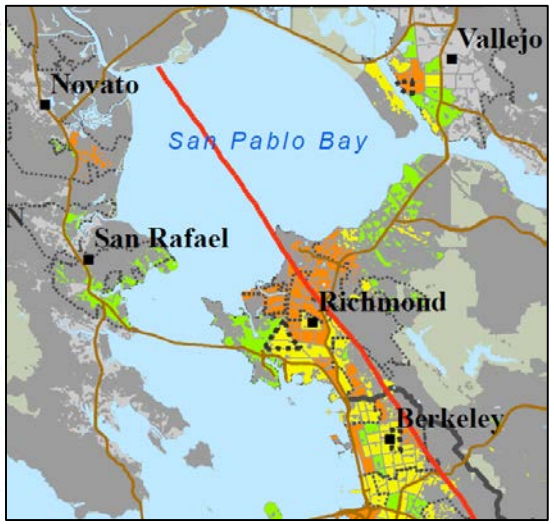
Liquefaction & ground motion amplifications seen in 1868, 1906 and 1989 & HayWired

1989
Marina District; NW corner of Scott & Divisadero

J.E. Estrem / USGS

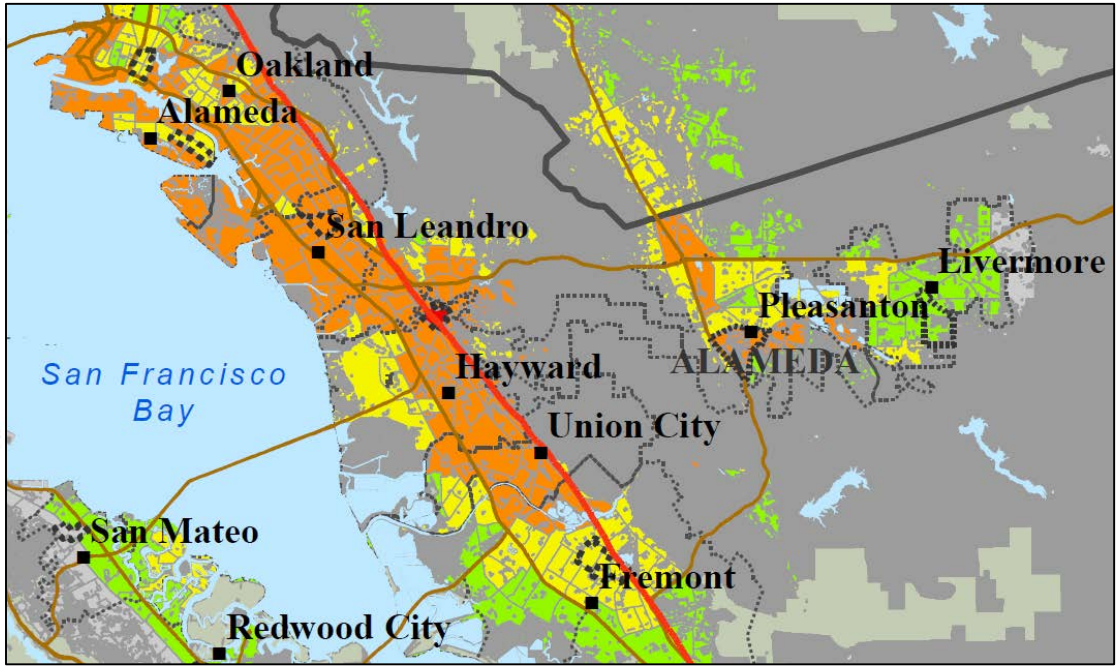
High Impact Communities-at-Risk





Percentage of all building square footage in a census tract in an extensive or complete damage state

- >60%
- 20% - 60%
- 10% - 20%
- 2% - 10%
- <2%



HAYWIRED

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Residents evacuating

San Francisco in 1906 and New Orleans in 2005

Source: U.S. National Archives and Records Administration, and M. Reiger, Federal Emergency Management Agency

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