WSSPC
WESTERN STATES SEISMIC POLICY COUNCIL

We develop seismic policies and share information to promote programs intended to reduce earthquake related losses.

A non-profit earthquake consortium for the western states

Summer 2019
e-Newsletter

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In This Issue

WSSPC NEWS

Mark Your Calendars!

Do you know an individual or program that has shown exceptional creative and innovative efforts within the earthquake hazards reduction community? If so, take some time and write a nomination. WSSPC's Awards Nominations will open September 2nd, 2019.

HETAC Meeting in Honolulu, Hawaii Report Out

Participants at the June HETAC meeting

On July 21st, 2019 WSSPC supported the Hawaii State Earthquake Tsunami Advisory Committee (HETAC) in their second quarterly meeting in Honolulu, Hawaii. During the meeting, issues specific to Hawaii's earthquakes and tsunamis were covered such as the updates on Oahu's high resolution tsunami map, updates to Hawaii's seismic maps, a discussion on local tsunami emergency management programs, and Honolulu's hazard mitigation plan. Additionally, USGS gave a report on aftershock probability and forecasting, specifically in regards to how their models can be applied to Hawaii's seismic activity.

ECA Bay Area Regional Workshop

WSSPC Attended the Earthquake Country Alliance June 4th, 2019 in Oakland, California.
Topics at the event included:

- Residential Seismic Mitigation
- Pre and Post Disaster Mitigation
- Challenges and Opportunities of Aftershock Forecasts
- USGS Near-Real Time Ground Failure Product for the 2018 Anchorage Earthquake
- 2019 Neighbor fest Pilot-Building a Stronger Region form the Block Up!
- ECA 2019 Overview and Plans

Participants at the Earthquake Country Alliance Workshop, June 4th, 2019

For more information on the Earthquake Country Alliance, visit their webpage at: *https://www.earthquakecountry.org/*

NEWS

How a M7.7 Earthquake would Damage San Francisco Today

With the recent 113th anniversary of the 1906 Great San Francisco quake, the question arises of how San Francisco would look if the same magnitude quake shook the city today. According to state and federal projections, the earthquake would kill up to 7,800 people, leave tens of thousands of residents homeless, and cost $98 billion in building damage alone.

Although it has been over 100 years since an earthquake of that magnitude has shaken the Bay Area, this lack of seismic activity will end. A recent USGS study indicates that this lack of activity is a statistical anomaly. According to the study, the chances of not a single site in California experiencing a major earthquake in 100 years is about 0.3%.

Image: Photo of San Francisco after the 1906 quake
Source: San Francisco Chronicle

While California has drastically improved its preparedness in the form of building codes and improved its research capabilities, it has also had a tenfold increase in population size over the last century. This means there are more facilities and infrastructure that support San Francisco, all of which are at risk of being destroyed and becoming potential hazards in the case of an earthquake.

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With the recent lull in seismic activity in California and the Bay Area more specifically, it is critical for not only cities and governments to prepare for an earthquake, but also communities, families, and individuals. Even though a major earthquake has not been experienced in a while, it is sure to happen eventually, and when it does it is crucial that we are prepared.

Resources:
https://www.govtech.com/em/preparedness/How-Much-Could-an-Earthquake-Damage-San-Francisco.html
https://www.sfchronicle.com/bayarea/article/What-a-major-earthquake-would-do-to-San-Francisco-13764363.php

Shoalwater Bay Indian Tribe Plans Tsunami Evacuation Tower

The Shoalwater Bay Tribe has been awarded $2.2 million from a FEMA pre-disaster mitigation grant to build a vertical tsunami evacuation tower near Tokeland, Washington. The tribe will add to the FEMA grant by providing $1 million dollars towards the project. Once completed, this will be the second tsunami evacuation structure in the United Sates, with the other located 10 miles away in Westport, Washington at the Ocosta Elementary School.

The current draft schedule shows “the initial tasks of tsunami model and geotechnical investigations” finishing in June of 2019. They hope for the peer review period to end in August and permitting to be completed by the end of September 2019. This would put them on track to start construction in November 2019 and finish in the summer of 2020, completing the project by October 2020.

The design is being worked on by Degenkolb Engineering with contracts between the firm and the tribe have already been signed.

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The most up to date renderings of the evacuation tower were recently completed by the State Department of Transportation's Visual Engineering Resource Group.

The tower, when completed, will stand about 50 feet tall and will be able to hold 486 people. With the tribe's total population being around 190 people, this surplus of room highlights the tribe's commitment to community and helping their neighbors. They claim that nobody will be turned away in the case of a tsunami.

In a further attempt to help their neighbors and community, the tribe has been sharing its successful grant application with other communities such as Ocean Shores, Westport, and Aberdeen who are seeking their own tsunami evacuation towers.

Resources:
https://www.fema.gov/news-release/2018/06/26/fema-approves-25-million-shoalwater-bay-indian-tribe-tsunami-vertical
https://www.govtech.com/em/preparedness/Design-Work-Underway-for-Shoalwater-Tsunami-Evacuation-Tower.html

University of Washington Looks to put Earthquake Detectors in Volunteers' Homes

In an effort to greater understand Seattle's risk for earthquakes, the University of Washington is now asking for volunteers to put mini seismic stations in their homes for a three to six week duration. These seismometers are very sensitive, are about the size of a cooler, take under an hour to install, and use about the same amount of power as a night light to run.

By having seismic stations in homes throughout Seattle, researchers will be able to measure how the Puget Sound basin might amplify the shaking caused by a large earthquake.

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This will allow them to have a better understanding of "how seismic waves travel underground and why one area might shake harder than another." They hope to start by measuring data in Seattle and eventually move into the Tacoma area.

Image: seismometers used to map the basin's shape and contents
Source: Pacific Northwest Seismic Network

The seismometers will be able to detect both slow and fast shaking. However, there should be no concern over whether anything in your house will impact the measurements as the researchers tested the machines right next to their laundry machine and it did not interfere with the data.

If you are interested in participating in the study apply online at: *https://pnsn.org/about/seattle-tacoma-urban-experiment*

Resources:
https://www.washington.edu/news/2019/05/30/seismologists-seek-space-on-volunteers-floors-and-lawns-to-study-seattle-seismic-risks/
https://mynorthwest.com/1402391/uw-seattle-earthquake-homes/

Swarm of Small Earthquakes hit Southern California

Since May 25th, there have been over 700 earthquakes in Southern California near the Fontana area. These quakes have all been small, with the largest having a magnitude of 3.2 and only three of them with a magnitude 3.0 or higher. Scientists have assured Californians that this sort of cluster of seismic activity is normal and does not indicate that there is a high chance that this series of tremors will turn into a large quake. However, the likelihood of a larger seismic event is higher than usual, given how many quakes have occurred over this extended period.

These earthquakes, although small in magnitude, have been widely felt due to the fact that they are relatively shallow, beginning between 1 to 2.5 miles under the surface. Although the cause of swarm is unknown, swarms generally are the result of a "fault creep." This is when faults become unstuck and, lubricated by the release fluids, slide rapidly for a period of time. Seismic swarms often preceded eruptions, but rarely indicate large earthquakes.

Scientists encourage California residents to be prepared by storing plenty of water, making a "go kit" with important medicine, food, and other necessities, and taking precautions in their homes to keep furniture from falling in the case of a quake.

Resources:
https://www.latimes.com/local/lanow/la-me-ln-earthquake-swarm-fontana-glen-avon-20190608-story.html
http://temblor.net/earthquake-insights/seismic-swarm-in-progress-in-southern-california-8793/

Portland Earthquake Warning Sign Ordinance Blocked by Judge

A policy that required Portland's 1,600 Unreinforced Masonry Buildings to have plaques placed on them that read "This is an unreinforced masonry building. Unreinforced masonry buildings may be unsafe in the event of a major earthquake" has been blocked by an Oregon judge while the lawsuit of the policy plays out.

Image: Earthquake Warning Sign on URM in Portland
Source: Elliot Njus , oregonlive.com

The ordinance, originally planned to take effect March 1st, 2019, was criticized by those who brought the lawsuit to court as being unconstitutional under free-speech and due-process rights. Magistrate Judge John Acosta, who made this ruling, wrote that those who oppose the policy have "a substantial likelihood of succeeding in their claim that the signs violate their First Amendment right to free speech, and that enforcing the ordinance in the meantime would cause irreparable harm."

Resources:
https://www.seattletimes.com/seattle-news/northwest/judge-blocks-earthquake-warning-sign-ordinance-during-suit/
https://www.oregonlive.com/portland/2019/05/judge-blocks-portland-earthquake-warning-sign-ordinance-indefinitely.html

Magnitude 8.0 Earthquake hits Peru

On May 26th, 2019 a magnitude 8.0 earthquake caused by the Nazca plate subducting beneath the South American plate hit northern Peru just east of the Andes. Falling debris killed two people and at least 30 more were injured from the quake. There was road damage, bridges fell, and houses collapsed. However, in comparison with the 2007 magnitude 8.0 earthquake in Peru, which killed 519 and injured nearly 1,500, this earthquake caused significantly less damage. This is not only due to the depth of the earthquake, but also because it hit in a sparsely populated area.
Specifically:

- This earthquake occurred 70 miles below the earth's surface, causing less destruction than a shallower quake. Despite this depth, the earthquake awoke people in Lima, Peru, who evacuated their homes in fear.
- The earthquake's epicenter was in a rural and sparsely populated area of the country, on the western edge of the Reserva Nacional Pacaya-Samiria of the Amazon Rainforest. The largest nearby town, Lagunas, has a population of under ten thousand people.

Image: Road damage in Peru
Source: temblor.net

According to the USGS maps of the probability of landslides and liquefaction after a quake, the event is predicted to have severe and widespread liquefaction affecting 74,000 people. Although it is not predicted to have caused extensive landslides, there are aerial surveys showing at least one landslide in the jungle.

Resources:
https://blogs.scientificamerican.com/rosetta-stones/why-perus-m8-earthquake-was-damaging-but-not-catastrophic/?redirect=1;
http://temblor.net/earthquake-insights/deep-earthquake-in-peru-is-felt-along-the-length-of-south-america-8710/

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Wyoming State Geological Survey Published New Teton Fault Map

The Wyoming State Geological Survey published their new map of the Teton Fault in an attempt to provide a better understanding of the risks associated with earthquakes along this fault and other potential hazards.

The fault map was created collaboratively through state, federal, and academic geologists with authors Mark S. Zellman (BGC Engineering Inc.), Christopher B. DuRoss (USGS), and Glenn D. Thackray (Idaho State University). It is the "most detailed mapping ever completed across the length of the fault, which spans the eastern base of the Teton Range in northwestern Wyoming." As this area of Wyoming is a popular tourist destination for those visiting Jackson Hole, to sightsee, hike, or ski at the Teton Range, this new map will give scientists the tools to better prepare these people in the case of a disaster.

The map was created using LiDAR to create a detailed image of the ground surface and map the fault. This allowed the authors to see the fault locations in greater detail and get a sense of the vegetation and terrain in the area.

The creation of this new, more detailed, map of the Teton Fault will allow researchers to continue examining and gaining valuable information about the fault and how it might affect the areas surrounding it.

Resources:
https://apnews.com/a7ea359f09f940d2a256878a3f57cb91
https://content.govdelivery.com/accounts/WYSGS/bulletins/23b72eb

continued

RESEARCH

Signaling the Magnitude of Earthquakes Before Rupture is Completed

Researchers Diego Melgar, an assistant professor at the University of Oregon, and Gavin Hayes of the USGS have discovered a possible defining moment during a rupture that could allow scientists to predict the magnitude of a quake 10-15 seconds into the event. Using GPS data gathered during the peak rate of acceleration of ground displacement, scientists could potentially increase the value of current Earthquake Early Warning systems by better forecasting how powerful the earthquake might become.

The team analyzed 3,000 earthquakes recorded by seismometers and 30 quakes worth of GPS data. They detected "a point in time where a newly initiated earthquake transition into a slip pulse where mechanical properties point to magnitude." Per the article, as the rupture organizes itself after the chaotic growth in the first few seconds after an earthquake, it begins to form a ring-shaped area that moves outward over time. Observations indicate a thinner pulse is less likely to be a large magnitude quake, whereas a thicker pulse is more likely to be. The team argues these differences can determine the final magnitude of the quake long before it ends. If the magnitude of the quake can be determined early on, warning can be given to nearby communities that have yet to be shaken.

In Oregon, one limitation of this form of warning is the delay that comes with using GPS stations. This could lead to those on the coast getting no warning. This is largely due to the lack of sensors on the seafloor to record early acceleration behavior.

Having these capabilities on the seafloor by using fiber optic cables off shore would allow for greater accuracy in Early Earthquake Waring systems. However, such work is expensive, especially in the Cascadia fault zone.

Resources:
https://www.sciencedaily.com/releases/2019/05/190529145107.htm
https://www.nytimes.com/2019/05/29/science/earthquakes-detection-richter-scale.html

Earthquake Law Could Financially Strain California Hospitals

California law SB 1953, which was created after the deadly 1994 Northridge earthquake, requires hospitals to meet seismic safety standards by reducing the risk of collapse by 2020 and have the infrastructure in place so that they can remain in operation after a major earthquake by 2030. The estimated cost to hospitals in between $34 and $143 billion according to a study done by Rand Corp.

Image: Kaiser Permanente building after Northridge Earthquake
Source: Hal Garb, theatlantic.com

Currently, about one third of hospitals in California are in financial distress, and the study estimates that with this law, that number could rise to 50 percent. The most financially vulnerable are public health-care district hospitals, hospitals that serve large numbers of Medi-Cal patients, rural hospitals, and privately owned hospitals.

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While the report raises the question of how the state would help hospitals "meet the safety standards without putting health-care providers at risk of financial distress," a solution could be in the form of public subsidies by the state to share the costs of complying with these laws.

The authors of the study highlight the importance of having resilient hospitals after a disaster and raise the question of how to help financially prepare these hospitals to be prepared and resilient in the case of an earthquake.

Resources:
https://www.govtech.com/em/preparedness/Earthquake-Safety-Law-Could-put-Californias-Hospitals-in-Financial-Distress-Report-Warns.html
https://www.rand.org/news/press/2019/03/28.html

Promising Prospects of Using Algorithms to Predict Fault Slippage

Two papers published in *Nature* offer information on using intelligent algorithms to predict fault slippage, which often precedes large earthquakes. Although there is currently no way to predict an earthquake, nor predict how strong it will be, researchers can speculate on the odds and intervals of seismic situations occurring.

In these papers, researchers used machine learning to use the fact that many earthquakes are preceded by a series of small quakes to analyze the signals from the Cascadia fault and found "a direct correlation between the seismic signals and physical movements of the sides of the fault."

Since major slips are often preceded by many smaller temblors, the elastic energy is radiated in a way that can predict a major disaster the algorithm can pick up. This can be used to suggest that monitoring in Cascadia may provide new information, which can be used towards a possible Earthquake Early Warning system. Currently, it is not clear if the same approach can be used in other seismically active areas.

Resources:
https://www.nature.com/articles/s41561-018-0272-8
https://www.nature.com/articles/s41561-018-0274-6
https://www.zmescience.com/science/could-machine-learning-be-the-next-big-thing-in-earthquake-prediction/

How Tides Can Trigger Earthquakes

In a study published in *Nature Communications,* Christopher Scholz, a seismologist at Columbia University's Lamont-Doherty Earth Observatory, and his colleagues discovered the mechanism as to why some mid-ocean ridge earthquakes are linked with low tides. What he found is this correlation is largely due to magma below the mid-ocean ridges.

Scholz and his team studied the Axial Volcano along the Juan de Fuca Ridge in the Pacific Ocean. Due to the volcano's eruption being about every ten years, there is a dense network of ocean bottom instruments set up to monitor it. The team used these instruments to model the different possible causes of low tides inducing earthquakes.

During fault movement, the upper portion of the mid-ocean fault slides down with respect to the lower portion of the fault. Scientists would expect that at high tides the water would push the upper potion down and cause earthquakes, however earthquakes are linked to low tides, not high ones.

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This can be explained with Scholz's new discovery: when the tide is low, there is less water on top of the magma chamber, allowing it to expand. As it expands and strains the rock around it, the lower portion slips slide up the fault and cause an earthquake.

Resources:
https://www.sciencedaily.com/releases/2019/06/190607091035.htm
https://www.zmescience.com/science/geology/tides-are-turning-in-earthquake-discoveries/

MITIGATION

14 Percent of "Soft-Story" Structures are Compliant with 2015 Los Angeles Seismic Retrofit Law

A 2015 law signed by Los Angeles Mayor Eric Garcetti requires 15,000 buildings, specifically wooden structure and vulnerable concrete buildings, in L.A to get seismic upgrades. At the time, this law gave Los Angeles the nation's strongest earthquake safety building codes.

A recent analysis found that 14 percent of the soft story wooden structures in Los Angeles are now compliant with the 2015 seismic safety laws, but no vulnerable concrete buildings have been retrofitted. The ordinance requires wooden structures must have seismic retrofits by 2022 and concrete buildings must be seismically retrofitted by 2040, with benchmark goals expected to be completed along the way.

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According the report, the city found 13,821 of the wood frame, soft story buildings and 1,376 concrete buildings met the criteria for the ordinance when it was passed in 2015. However, 7 percent of each category has now been found to be exempt due to previous retrofitting. There are three phases of compliance and the 14 percent of soft story wood buildings that are now considered compliant have completed all three.

Image: Soft story apartment complex in L.A after Northridge
Source: A. CLARY/AFP/Getty Images

As retrofitting can be expensive, costing upwards of $130,000 for wood frame buildings and millions for concrete buildings, the city of Los Angeles voted last year to explore financial assistance programs to help property owners afford seismic retrofits. Although there are currently programs that "focus on cost recovery for owners," there are none that provide upfront money to lessen the financial burden of retrofitting.

Resources:
https://www.julianconstruction.com/blog/14-percent-of-soft-story-structures-in-l-a-now-comply-with-seismic-retrofit-law-zero-progress-on-concrete-buildings
https://www.dailynews.com/2019/03/31/14-percent-of-soft-story-structures-compliant-with-2015-l-a-seismic-retrofit-law/

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California Geological Survey Releases map of Bay Area neighborhoods most at risk for liquefaction

In April, 2019, the California Geological Survey (CGS) updated its Seismic Hazard Zone map. The updated map reveals the places in the Bay Area most prone to liquefaction such as the Mission, the Castro, and the Haight neighborhoods of San Francisco.

In the case of a major earthquake, defined by CGS as one over magnitude 5.5 on the Richter scale, the majority of the damage would come from the shaking. However, the areas highlighted on the map for vulnerability to liquefaction have a greater likelihood of being damaged by hazards other than structural shaking.

Image: collapsed apartment building in the Marina District of San Francisco following the Loma Prieta earthquake in 1989 Source: AP Photo/George Nikitin

The map not only highlights the high-risk areas in San Francisco, it also makes it clear "the entire city of Alameda lies within a liquefaction zone, as does most of San Leandro and Hayward. West Oakland and most of Emeryville face liquefaction risks, as does the western flank of Berkeley."

The map allows users to search their physical address to see what kinds of hazards they might face and use the information to prepare themselves, their families, and their homes.

Resources:
https://sf.curbed.com/2019/4/15/18311670/earthquake-map-california-geological-survey-liquefaction
https://www.mercurynews.com/2019/04/05/earthquake-maps-for-san-mateo-contra-costa-counties-show-vulnerable-areas/

$628.5 Million Public Safety Bond Approved by San Francisco

On Tuesday, June 11th, the San Francisco Board of Supervisors unanimously approved $628.5 million towards paying for public safety seismic upgrades. A vote for this Earthquake Safety and Emergency Response bond is expected to come before voters March 2020 with a final vote by the board thereafter.

The bond does not specify exact projects that it would fund, but rather would require voters to decide which projects get funded. However, it does provide general categories the funding must fall into such as seismically improving fire stations, police stations, disaster response facilities, and Emergency Firefighting Water System projects.

This bond is an extension of the Earthquake safety and Emergency Response bond program, which began in June 2010 with a $412 million bond. The bond grew in 2014 with an additional $400 million bond and is now continuing with a third bond of over $600 million. The total cost with interest from this most recent bond is expected to be $1.08 billion over the next 20 years.

Resources:
https://www.sfexaminer.com/the-city/san-francisco-supervisors-approve-628-5-million-public-safety-bond/
https://www.sfchronicle.com/bayarea/article/SF-planning-big-disaster-preparedness-bond-for-13808167.php?psid=9weOe

continued

Washington Geological Maps Help Residents Escape Tsunamis

Washington State created maps that outline pedestrian escape routes in the case of a tsunami induced by a Cascadia subduction zone earthquake. The maps outline routes for coastal communities in Bellingham, Hoquiam, Anacortes, Aberdeen, and Port Angeles. They outline the walking routes coastal communities can take to escape inundation zones and estimates how long it will take them to reach safety. They also gives secondary evacuation routes in the case of the main evacuation route no longer being accessible due to damages from the earthquake.

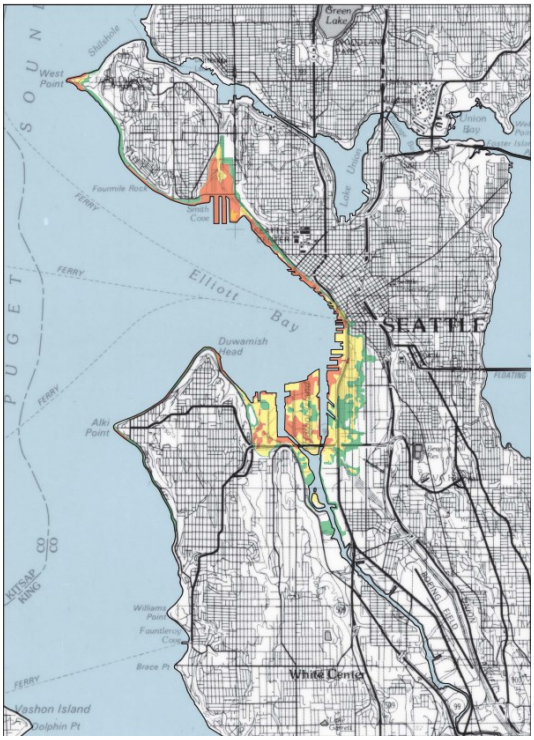

Image: Tsunami Hazard Map of Seattle
Source: Washington DNR

The maps were created using LIDAR imaging to track elevation changes and type of land cover to better estimate the walking speed along the various routes, while simultaneously accounting for all elements like terrain and vegetation.

By getting a clearer idea of the terrain of the area, the researchers were able to create the best possible escape routes for people in the case of a tsunami.

These maps allow Washington residents to plan ahead for a possible tsunami. The geologists who made them recommend doing a practice run to be prepared, especially for those with disabilities or children.

Resources:
https://mynorthwest.com/1336570/tsunamis-earthquake-washington/?
https://www.theolympian.com/news/local/article228914459.html

RESILIENCE

New Earthquake Map Shows Washington's At-Risk Buildings

In their effort to identify how dangerous a community is in the case of a disaster, Washington State has created a new map that helps determine the risk of various buildings in the case of an earthquake. The map was produced by Governor Jay Inslee's subcabinet committee on seismic safety in an effort to prepare Washington for the "Big One" and move in the direction of disaster mitigation. This map allows the user to zoom in and out of the map to see which specific buildings are most at risk. In the case of Seattle, URMs pose the greatest threat.

Officials say that this information allows people to work together to come up with what the best next step is.

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The map allows the users to see specifics such as when the building was made, how it was built, and the threats those details might have on the resilience of that building. Although this map solely informs the user which buildings are safer in an earthquake, it can also be used as a tool for future efforts of bolstering building codes and further preparing the state for disasters.

Resources:
https://mynorthwest.com/1325587/washington-earthquake-buildings-map/
https://www.governor.wa.gov/news-media/database-shows-buildings-could-pose-safety-risk-during-earthquakes

RESPONSE

Oakland Residents got a California Earthquake Early Warning Alert Test

40,000 Oakland residents received an earthquake early warning alert on their cell phones on March 27th, 2019. Hosted by the ShakeAlert System from USGS, this message was used as a test and trial run of California's early warning system in the case of an actual earthquake in the future.

The test was carried out through the USGS in partnership with the city of Oakland, Alameda County, and the California Governor's Office of Emergency Services (Cal OES). After the Wireless Emergency Alert was issued, the recipients had the opportunity to fill out a survey. Specific survey inquiries included the time the alert was received, what cellphone provider they had, and how they would prefer to receive alerts in the future.

USGS and Cal OES officials observed their own phones during the exercise. They found their phones started going off in four seconds. Some of the officials' phones took longer to receive the waring and some didn't receive a warning at all.

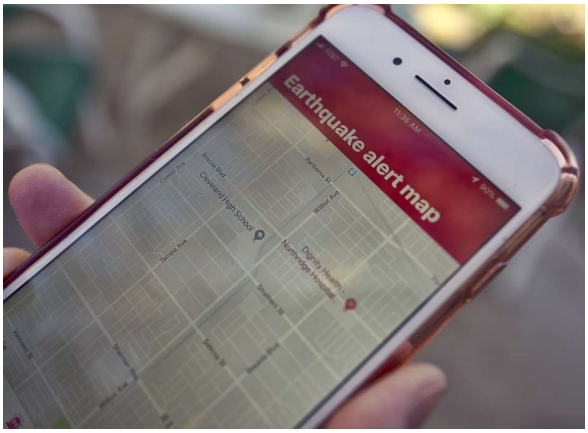

Image: Earthquake Waring Application on IPhone
Source: AP Phone/Richard Vogel

This exercise provided USGS with the opportunity to see the strengths and weaknesses in their program. Although there were some inconsistencies in the dissemination of the warning message, it gave the organizations a chance to see what people wanted and how to better provide them with pertinent information in the case of an earthquake.

Resources:
https://www.govtech.com/em/preparedness/California-Earthquake-Early-Warning-System-Gets-an-Early-Test.html
https://www.sfchronicle.com/bayarea/article/Thousands-of-Oakland-residents-to-get-an-13715805.php

CONFERENCES, WORKSHOPS & EVENTS

California Prep Day
September 14, 2019
Sacramento, California
https://www.caloes.ca.gov/ICESite/Pages/California-Day-of-Preparedness.aspx

Association of Environmental and Engineering Geologists (AEG) 62nd Meeting
September 17-22, 2019
Asheville, North Carolina
https://www.aegannualmeeting.org/

American Geophysical Union (AGU) Fall Meeting
December 9-13, 2019
San Francisco, California
https://www2.agu.org/fall-meeting

National Earthquake Conference (NEC)
March 4-6, 2020
San Diego, California
http://earthquakeconference.org/

Thank You 2019 WSSPC Affiliate Members!

WSSPC welcomes all members of the professional community who share the common goal of reducing losses from earthquakes. Thanks to our 2019 Affiliate Members:

Corporate

California Earthquake Authority

Saunders Construction, Inc.

Individual

Dominic Sims

Government

City of Las Vegas Building and Safety

Clark County Building and Fire Prevention

Non-Profit Organizations

Applied Technology Council

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If you have a newsworthy item for our e-Newsletter, please forward it to Lara Brodetsky Program Manager at: *lbrodetsky@wsspc.org*