

CALIFORNIA EARTHQUAKE EARLY  
WARNING  
**ADVISORY BOARD**  
SEPTEMBER 26, 2019, MEETING



**Cal OES**

GOVERNOR'S OFFICE  
OF EMERGENCY SERVICES

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**Cal OES**  
**GOVERNOR'S OFFICE  
 OF EMERGENCY SERVICES**

**California Earthquake Early Warning Advisory Board**

**Public Notice/Agenda**

September 26, 2019  
 2:00 PM – PDT

**Meeting Site:**

Governor's Office of Emergency Services  
 3650 Schriever Avenue  
 Mather, CA 95655  
 Multipurpose Room 1 and 2

**Date of Notice: September 16, 2019**

**NOTICE IS HEREBY GIVEN** that the California Earthquake Early Warning Advisory Board will meet at the Governor's Office of Emergency Services Multipurpose Room 1 and 2 as set forth below. The Bagley-Keene Open Meeting Act applies to meetings of the California Earthquake Early Warning Advisory Board, which are open to the public. Public participation, comments and questions are welcome for each agenda item. Agenda items may be taken out of order.

<b>Item</b>	<b>Agenda Topic</b>
I	Welcome – Call to Order – Introductions
II	General Program Update
III	Functional Area Updates
IV	Public Comment*
V	Adjourn

\* Public comment will be taken before any official actions.

*PUBLIC COMMENT:* If the board determines that there is not enough time to hear from all those wishing to present comments, the board will select among those wishing to testify to ensure representation of a range of viewpoints and interests. Those providing public comment may choose to supplement their testimony with written statements that will be made part of the official public meeting record.

*SUGGESTIONS FOR SUBMISSION OF WRITTEN MATERIALS:* It is requested that written materials be submitted to the California Earthquake Early Warning Advisory Board Executive Officer prior to the meeting. If this is not possible, it is requested that at least 30 copies be submitted to the California Earthquake Early Warning Advisory Board Executive Officer. This material will be distributed to the California Earthquake Early Warning Advisory Board members.

*ACCESS TO THE HEARING:* The meeting will be accessible to persons with access and functional needs. Persons needing an access and functional needs-related accommodation or modification in order to participate in the meeting may make a request by contacting Rachel Sierer Wooden at (916) 845-8970 or sending a written request to the Governor's Office of Emergency Services at 3650 Schriever Avenue, Mather, CA 95655. Providing your request at least five (5) business days before the meeting will help ensure availability of the requested accommodation.

**For further information, please contact:**

General Information:

Rachel Sierer Wooden, Program Manager and Advisory Board Executive Officer, California Earthquake Early Warning Program at (916) 845-8970 or via email at Rachel.SiererWooden@caloes.ca.gov

Media Information:

Brad Alexander, Public Information Officer, at (916) 845-8455 or via email at Brad.Alexander@caloes.ca.gov.

## **PREVIOUS MEETING MINUTES**

### **California Earthquake Early Warning (CEEW) Advisory Board Meeting Minutes**

California Governor's Office of Emergency Services (Cal OES)  
Multi-Purpose Rooms 1  
Mather, CA  
March 7, 2019

#### **Members Present:**

Mark Ghilarducci, Director of the Cal OES

Bryan Cash, Assistant Secretary of Finance and Administration designee of  
Secretary of the Natural Resources Agency

Darwin Moosavi, Caltrans Sustainability Project Manager, designee of Secretary  
of the California State Transportation Agency

Robert Charbonneau, designee of President of the University of California

Tom Kennedy, designee of the Chancellor of the California State Universities

Lupita Sanchez-Cornejo, the Speaker of the Assembly's appointee representing  
the interests of private businesses.

Michael Lewis, Governor's appointee representing the utility industry

Holly Porter, Senate Committee on Rules appointee representing county  
Governments

#### **Members Absent:**

Secretary of the California Business, Consumer Services and Housing Agency

Secretary of the California Health and Human Services Agency

#### **I. Welcome / Call to Order / Introductions**

- Meeting called to order at 1:09 p.m. by Rachel Sierer Wooden, Advisory Board Executive Officer. A quorum was achieved.
- Motion: Michel Lewis motioned to accept the September 27, 2018 meeting minutes; seconded by Thomas Kennedy. The motion passed.
- Director Ghilarducci provided opening remarks, we are on a path to rollout the system in 2019. There are still challenges with latency, resiliency and redundancy, and we will hear updates on efforts

being made to improve the systems. He also laid out a plan to request more support from the Advisory Board members and their respective oversight as we go throughout the year.

## **II. Business Plan Update**

- Mr. Ryan Arba, Seismic Hazards Branch Chief at Cal OES, provided an outline for the meeting, and an overview of the requirements and outlined the materials that will be included in the Business Plan Update.
- Director Ghilarducci spoke to the long-term approach taken with the Business Plan and explained that Cal OES will continue to expand the network of funders who would benefit directly moving forward. The additional required funding is a relatively low sum of money when compared to the potential benefit to be distributed over a broad range of stakeholders. We will work with the board to refine the funding structure overtime. Significant investments have been made since 2016, thanks to the support of this redundant, resilient and effective program and due to the support of Governor Jerry Brown.
- Mr. Lewis asked when the new ongoing funding would need to begin and Director Ghilarducci responded that funding would need to begin in 2020.
- Mr. Moosavi asked about existing commitments and discussions with transportation agencies. Mr. Arba responded that discussions have been ongoing about presentations to California Transportation Commission and other transportation agencies.
- Ms. Sanchez-Cornejo asked about other sectors we are looking at moving forward. Director Ghilarducci responded that we are looking to broaden to transportation, municipal utilities, the chemical industry and military branch.
- Director Ghilarducci spoke about the increased focus on alert and warning following recent disasters. There has also been an increased focus on upgrading the 911 system from analog to digital. As we upgrade 911, earthquake early warning (EEW) and other warning systems will be incorporated in the updates. There will also be advancements with NextGen 911 project. We are continuing to increase the relationship with the private telecommunication companies. EEW is making strives to be quick enough, but we need to continue to work with telecommunications to continue to improve latency.

- Ms. Sanchez-Cornejo thanked Mr. Arba for the report and the Governor's focus on CEEWS.

### **III. Functional Area Updates**

- Mr. Arba provided updates on the overall program objectives, CEEWS System Operations; Communication, Education, Training, and Outreach activities and plans; Research and Development efforts; and overall Finance and Investment.
- Director Ghilarducci explained the vision of the program and the need to work through the Advisory Board by utilizing the expertise of the board and already existing education delivery channels used by the Advisory Board members.
- Ms. Porter commented on the value of utilizing all existing communication mechanisms, but wants to ensure that we are taking advantage of existing resource such as already existing county emergency management mobile applications. Director Ghilarducci, commented that we are looking at all communication pathways. He also reiterated that the system can be made ready for public use, while also continuing to improve processes.
- Ms. Porter asked about additional Wireless Emergency Alert (WEA) tests for different topographies. Mr. Arba talked about the planning process for tests, possibly more frequent, as WEA technology advances.
- Ms. Sanchez-Cornejo asked about the location of the upcoming Oakland WEA test and the average population that is likely to be reached.
- Mr. Cash asked if we need more participation and Mr. Arba responded that a notice will be sent to the Advisory Board about upcoming meetings to provide information about the WEA test.
- Ms. Sanchez-Cornejo asked if others outside of the test area, like the Board could receive the messages. Mr. Arba responded that this is not possible due to the methods in which WEA messages are distributed and based on a phone's proximity to the targeted cell phone tower.
- Ms. Porter asked who would make the decision about when to release an alert. Mr. Arba responded that the United States Geological Survey (USGS) would automatically initiate the alert being distributed due to extremely short period of discision making for the alert generation.
- Director Ghilarducci described the collaborative efforts undertaken by California Geological Survey (CGS), the other California Integrated Seismic Network (CISN) partners to install the sensors, streamline California Environmental Quality Act (CEQA), and utilize state and local land. Mr. Arba outlined recent success of utilizing State Parks land and several local government partners to host instruments.

- Ms. Sanchez-Cornejo asked where the CEEWS ads were being run. Mr. Arba responded statewide and that we can provide more information about the exact stations.
- Director Ghilarducci directed staff to distribute existing and future educational materials to the Advisory Board for their education and distribution.
- Ms. Sanchez-Cornejo asked about what languages the ads were being aired in and Mr. Arba responded in English and Spanish. Director Ghilarducci said that covering more languages is another area where we hope to expand over time.
- Director Ghilarducci expanded on the organizational structure outlined in legislation. As the program reaches a point where it can expand rapidly, we hope to have people from the organizations represented by this board to provide technical expertise in a long-term collaborative effort, as the system is developed. As the system continues to evolve, work groups could also provide guidance and expertise for future funding and policy guidance.
- Mr. Charbonneau spoke about the expanded use of University land resources for sensors and establishing interagency agreements (IA) with other state agencies for land use.
- Ms. Porter would like to be directly involved in system operations, commit staff to education and outreach and help secure additional sensor locations and pilot applications. Ms. Porter would like to continue working to ensure that the system is designed to be best utilized to those with access and functional needs.
- Mr. Kennedy commented that the California State University (CSU) maintains a standing peer review board and those services could be utilized for the research and development group.
- Mr. Lewis offered a utilities liaison within Cal OES to the board and to continue the discussion with CEEW Program staff on how their expertise could best be of service.
- Robert de Groot, USGS ShakeAlert EEW Education and Outreach Coordinator, spoke about the incorporation of access and functional needs (AFN) needs within previous research and is customized to any existing protocols in a given environment.
- Ms. Sanchez-Cornejo volunteered to participate in the System Operations group.
- Mr. Morgan asked for more clarity on what CEEWS requires in last mile telemetry from the California Department of Technology and noted that this would fall under the research and development working group.

- Mr. Cash offered to assist Mr. Charbonneau in establishing connections that fall under the California Natural Resources Agency.

**IV. Public Comment**

- No further public comments were made.

**V. Adjourn**

- Mr. Sanchez-Cornejo motioned and Mr. Lewis seconded.
- The motion to adjourn passed.

**MEETING MATERIALS**



**Cal OES**  
GOVERNOR'S OFFICE  
OF EMERGENCY SERVICES

**California Earthquake Early  
Warning Advisory Board Meeting**

September 26, 2019

**Public Rollout Planning**



**Brian Ferguson**  
Deputy Director of Crisis Communications  
Cal OES

# WEA Test Results



**Robert-Michael deGroot**  
Coordinator for Communication, Education, Outreach, and Technical Engagement  
Chair, USGS ShakeAlert Joint Committee for Communication, Education, and Outreach  
USGS

## Wireless Emergency Alert (WEA) Tests: Oakland and San Diego, CA

### Preliminary Results

S.K. McBride, R.M. de Groot, D. Given A. Llenos, G. Parker, D. Sumy, P. Schuback, R. Arba, R. Sierer Wooden, E. Holland, H. Porter, C. Hadley, Darius Fattahipour, A. Bell, G. Kearney





**Note: this is preliminary data only; the San Diego data has yet to be internally peer reviewed. Changes in findings may occur with further analysis.**

**ShakeAlert**



## **Thanks to all involved**

- Cal OES
- FEMA
- Alameda County
- City of Oakland
- San Diego County Office of Emergency Services
- Caltrans
- USGS
- Cascadia Region Earthquake Workgroup (CREW)
- Cell Phone Providers Participating in the IPAWS WEA System.

**ShakeAlert**

## Purpose:

# 1. Determine latency and potential distribution issues of WEA

2. Exploratory study on what people understand about ShakeAlert, how they want to receive messages, and what information they value most.

ShakeAlert

## Two methods of testing:

- Technical tests: recording video of phones and devices receiving the alerts
- Community surveys
- **Reasoning:** the technical tests were in a controlled environment where receipt of messages could be recorded and verified. Community feedback can have issues, including inaccuracies and bias but these also assist us in know how far the messages were received and if the geofence held.

ShakeAlert



## Community Feedback - SurveyMonkey

- 13 Questions: 9 technical questions, 4 perception question/attitude questions.
- Focus on quantitative data collection with limited qualitative questions.
- Sent out via internal emails, media release, social media.
- Paperwork reduction act (PRA) fast track approved, internally tested. PRA is still in process and should be completed for public distribution of data in November.
- Estimated time to be 6 minutes to completion.
- Instructions to have time set at [www.time.is](http://www.time.is) and record exact time. Non-receipt of message also encouraged to fill out survey.

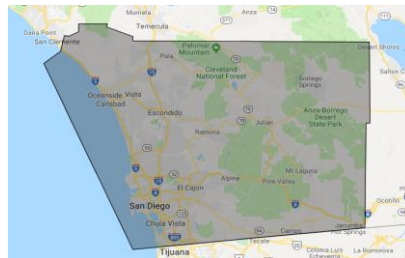
ShakeAlert



## Testing Areas

### San Diego County

- 6/27/19
- 3.34 million residents
- 4526 square miles



### Oakland – Lakeside Commercial Area

- 3/27/19
- 40,000 residents
- 60 square blocks

ShakeAlert



## Testing IPAWS & Wireless Emergency Alert (WEA)



Message Content: Test of the CA Earthquake Warning System. No action required. THIS IS A TEST.



## Testing IPAWS & Wireless Emergency Alert (WEA)

Test		Reports	Earliest Alert (s)	Median (s)*	%>60s	% Not Received	Seconds in IPAWS Gateway
National	10/3/18	356	4 s*	13 s	6%	15%	1.2 s
Oakland	3/27/19	666	4 s*	13 s	7%	28%	3.5 s
San Diego County	6/27/19	2,134	7 s*	~10 s	N/A	26%	5.8 s

\*Human reports may be inaccurate

- Delivery speed is variable
- Speed depends on carrier, phone type, etc.
- ~25% do not receive the alert





### Other Outcomes

- 36 people received the alerts outside alerting polygon in Oakland tests. San Diego is still being analyzed but there were reports of receipt of messages from México and north of San Diego County.
- Oakland's alerting area was 40,000 people and San Diego was 3.34 million. Geofencing, according to the community surveys, largely held in both tests.
- Further analysis is required to understand what is contributing to latencies; larger alerting areas do appear to have some latency issues than more targeted locations.

ShakeAlert

# Mobile Application Development



**Richard Allen**  
Director, Berkeley Seismological Laboratory  
UC Berkeley

Enhancing  
with the



*CEEWS*



Cal OES

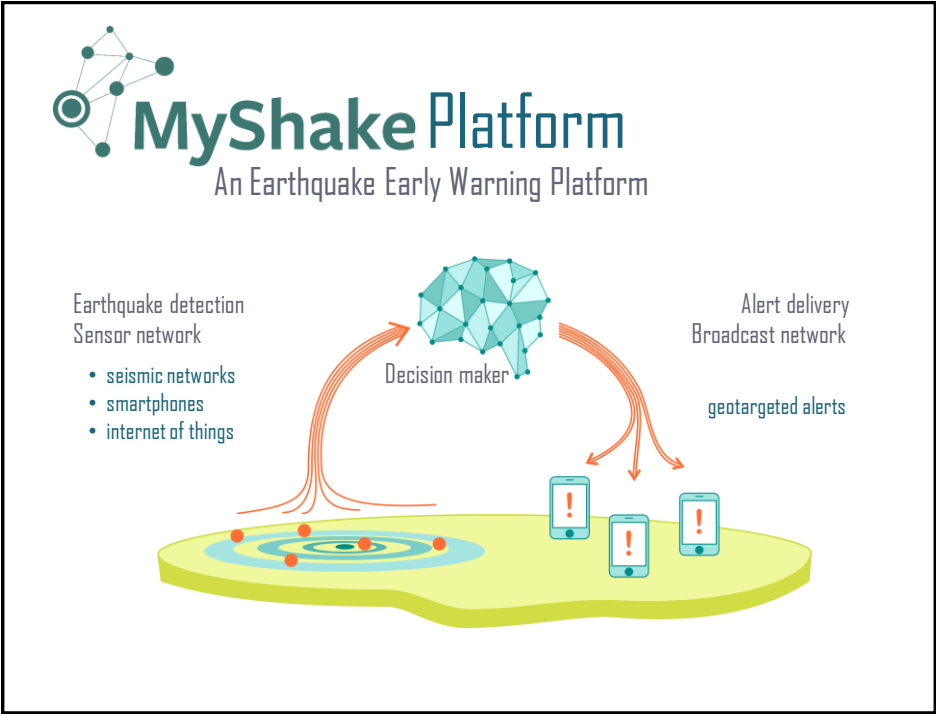
# MyShake Platform

Faster alerts to everyone in California  
*progress update*

Richard Allen  
Professor, Director



Berkeley  
Seismology Lab



## The MyShake team



Richard Allen  
PI



Jenn Strauss  
Project manager



Dingkai Kong  
Researcher



Sarina Patel  
PhD student



Sharon Pothan  
User Experience  
Designer



Stephen  
Thompson



Steve  
Allen



Akie Mejia

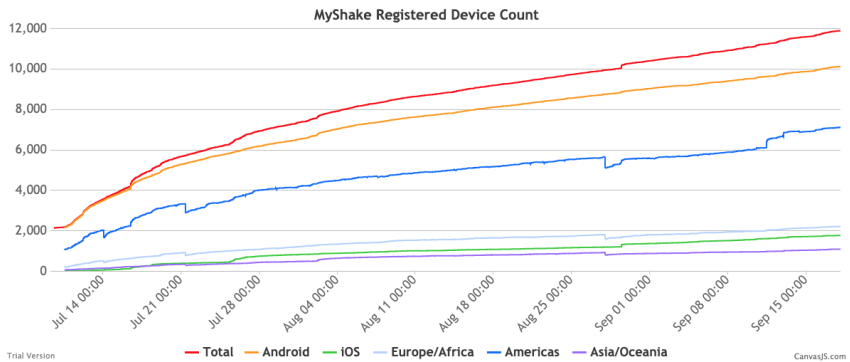
Developer team



# 2.0

1. quiet  
release

July 2019

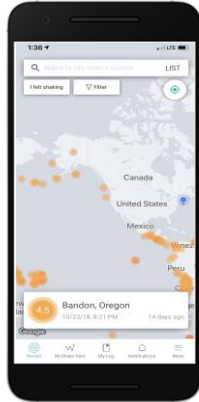


MyShake 2.0 1. quiet release

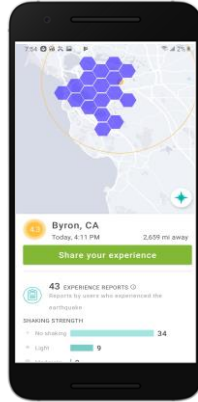
Available on the App Store

Available on Google Play

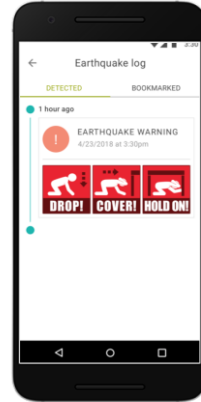
July 2019



Realtime earthquake information around the globe



Detailed damage information reported by users



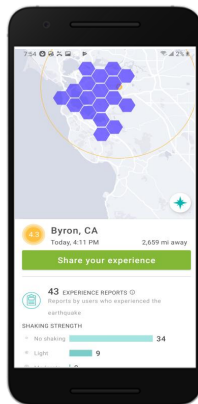
Early warning delivery (ShakeAlerts fall 2019)

MyShake 2.0 Quiet release

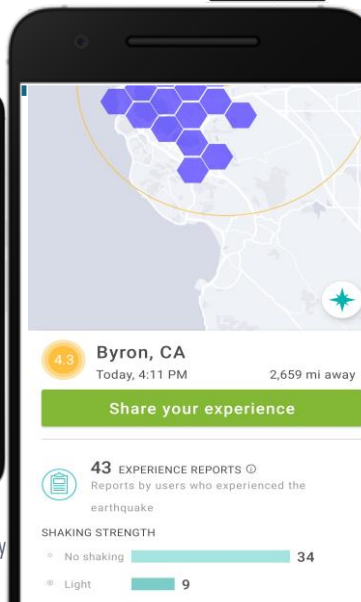
Available on the App Store

Available on Google Play

July 2019



Detailed damage information reported by users





1.1  
MyShake 2.0 update released  
September 2019



First update: Android and iOS

- Improvements to event map details
- Log linking through to event on maps
- Alert pop-up card for 1 minute after event
- Bug fixes to client-server communications

Normal update cycle:  
update every 6-8 weeks

Faster for critical bug fixes should they occur

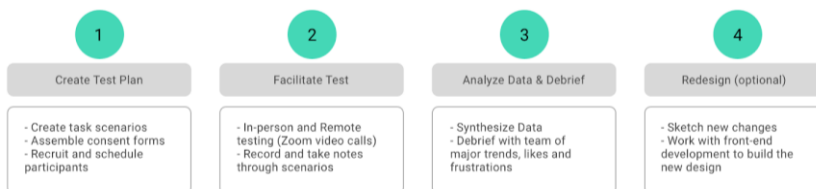
## 2. Usability

Testing, feedback and implementation

Reviews and email feedback



Usability testing feedback



## 2. Usability

Testing, feedback and implementation



Pulsing circles for recent quake

Problem: Users had trouble identifying the most recent earthquake from map view

User comment: "It would be nice to see the glowing/ripple effect from the earthquake"

Solution: Add pulsing circles on map for the 10 mins that an earthquake has been detected



## 3. Alert delivery

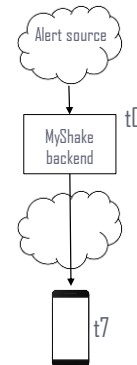
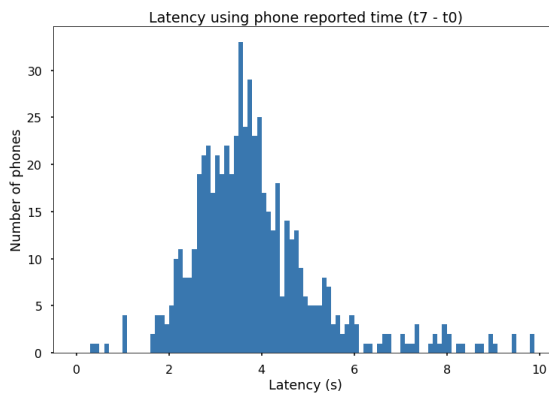
Silent alerts to all MyShake users - testing

$t_7 - t_0$

# alerts sent: 1537

50% received in 3.7 sec

75% received in 4.8 sec



- Test date: 9/17/19
- Android phones in Americas region
- Phones active in last 24 hours: 1537
- Receipts received for 50% of phones (709)
- Plus users processed first taking 1.5 sec

# 4. Enhanced earthquake detection

Dataset development

Berkeley earthquake  
M 4.4 - Jan 4<sup>th</sup> 2018

Traditional sensors: 54

MyShake phones:

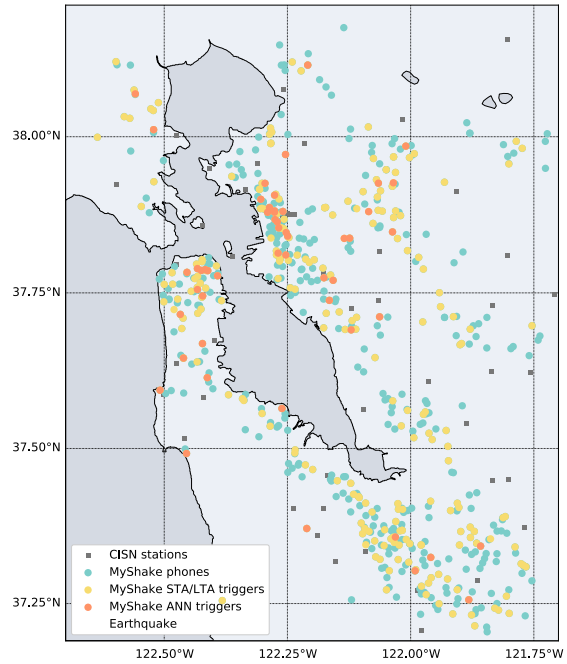
593 operating

278 triggers

Magnitude estimate: 4.8

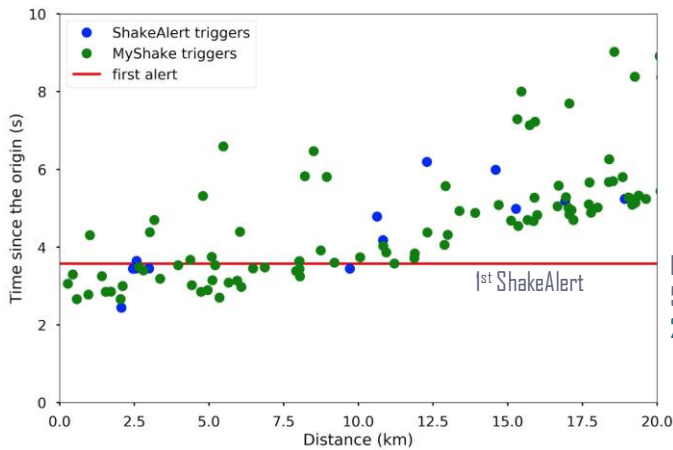
Location/time error: 1.1 km

Origin time error: 0.5 sec



# 4. Enhanced earthquake detection

Berkeley earthquake  
M 4.4 - Jan 4<sup>th</sup> 2018



Detections:  
5 traditional sensors  
28 MyShake triggers

## Next steps

*How  
best to  
scale?*

### Rollout and testing

- Expanded testing group?
- Public roll-out - when?

### Ongoing improvements

- UI: Two-level alerting; Spanish language
- Backend: Continue to reduce latency

### Research and development

- Enhanced earthquake detection
  - more data with public roll-out

## Functional Areas Update

# Finance



**Tabitha Stout**  
Acting Deputy Director, Finance and Administration  
Cal OES

## Recent Budget Allocations

- \$16.3 million one-time General Fund to finish the build-out of the California Earthquake Early Warning System
- Includes:
  - finishing seismic stations installation
  - adding GPS stations to the network
  - improving telemetry
  - launching a statewide education and outreach campaign.



# Training and Education



**Brian Ferguson**  
Deputy Director of Crisis Communications  
Cal OES

## Education, Training, and Outreach

### ***Prepare people to receive the alerts.***

- Opportunity for comment and to operationalize the rollout plan.
- The California Broadcaster's Agreement has been utilized to air over 30,000 radio ads statewide since September 2018.
- New television and radio spots are being developed.
- Sector specific community engagement events continue.
- Provide media advances, B Roll and media availability on the day of the event and the week before.
- Planning is underway for when we receive additional education, training and outreach funding.



# Research & Development



**Henry O'Neill**  
Emergency Communications Division Chief  
Cal OES

## Research and Development

***Ensure we are always pursuing improvements and innovation.***

- Coordination for the WEA Tests
- Draft Mobile Application Guidelines
  - Including:
    - Minimum qualifications
    - Disclaimers that must be provided to end users
    - Providing proper credit for IP
    - Cybersecurity guidelines
    - Transmission time and performance requirements
    - Educational material that must be provided to end users
    - Penalties for not following guidelines
- Serve as stakeholders in the Benefit Cost Analysis



# System Operations



**Dana Ferry**  
System Operations Project Manager  
Cal OES

## Sys Ops 2016 Work Plan Overview



**Objective:** Continue CEEWS build-out by installing EEW seismic stations statewide increasing telemetry, and improving system performance.

Allocated \$6.4 million

- Installed 183+ new EEW stations
- SoCal/NorCal State Microwave Pilot Project – Connected Caltech and USGS Menlo Park to State Microwave



# CEEWS System Operations



**Bureau of Land Management  
Substation (Fresno County)  
(Madera County)**  
NC.PCE  
NC.MGS



**Rhys Vineyard (San Mateo County)**  
NP.JPE



**PG&E Gregg**



# Sys Ops 2018 Work Plan Overview



**Objective:** Continue CEEWS build-out by EEW installing seismic stations statewide and improving telemetry capabilities.

Allocated \$13.8 million

- Install 150 new EEW stations
- Connect up to 25% (280) of CEEWS seismic stations to the state microwave network for real-time telemetry
- Add UC Berkeley and CA Geological Survey to the State Microwave
- Upgrade Microwave Communication Pathways
- Pilot private LTE network for alternative CEEWS communication pathways



# Sys Ops 2019 Work Plan Overview



**Objective:** Enhance, modernize and upgrade CISON seismic stations and network infrastructure for improved CEEWS performance through one-time capital improvements and augmentation of operations and maintenance (O&M) service contracts.

Allocated \$8.1 million

- Upgrade CISON Display Enhancement for Emergency Managers
- One-time CISON capital cost including upgrades of EEW and GPS stations, telemetry, and network infrastructure
- CISON Operations and Maintenance Augmentation including field and network personnel to perform telemetry and network improvements



## CEEWS Seismic Station Build Out Totals (September 2019)

### CEEWS Network Goal of 1115 stations

Currently # of Stations Contributing: **697 (+107 since 2018)**

Completed/Undergoing Data Quality Controlled: **114**

#### SFY 2016 Funding

CalOES Funded: **183+ (Completed)**

USGS Funded: **34 (Completed)**

#### SFY 2018 Funding

CalOES Funded: **130**

USGS Funded: **50**

Remaining Stations Needed: **124**

#### **Challenges:**

- Obtaining new and renewing land-use permits
- Weather
- Ongoing funding for O&M



# How You Can Help

- Publish buttons on your Agency and Department's Home Pages
- Passing along notifications to your employees
- Push the app to agency and department state phones

