2018 Annual Report

WSSPC
WESTERN STATES SEISMIC POLICY COUNCIL

801 K Street, Suite 1236, Sacramento, CA 95814 | (916) 444-6816 | wsspc@wsspc.org

DISCLAIMER

The views and conclusions contained in this report are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. Government. Mention of trade names or commercial products does not constitute their endorsement by the U.S. Government; by the Western States Seismic Policy Council (WSSPC), or by WSSPC members, agencies and affiliates.

Cover images from upper left, clockwise: Eruption of Kilauea May 4, 2018 (U.S. Geological Survey), Donald Thomas accepting WSSPC Lifetime Achievement Award, Wyoming outreach items, Damage from M7 Alaska earthquake November 30, 2018 (Nathaniel Herz/Alaska Public Media), Kevin Richards and Luke Meyers presenting Certificate of Appreciation from Hawaii Emergency Management Agency to Patricia Sutch, Hawaii Natural Hazards Preparedness wheels, Nevada Billboard outreach.

ACKNOWLEDGMENTS

The 2018 Annual Report summarizes seismic policy development and earthquake/tsunami hazard reduction activities conducted by the Western States Seismic Policy Council for the fiscal year that runs from December 1, 2017 through November 30, 2018. Funding for all activities were provided through FEMA Cooperative Agreements EMW-2017-CA-00096 and EMW-2018-CA-00001. We are thankful for FEMA's support.

We are also grateful to our 8 WSSPC affiliate members who help us defray operating costs not covered by FEMA. The 2018 WSSPC Affiliate members were:

Private Corporation:

California Earthquake Authority, Sacramento, California

Degenkolb Engineers, Inc., San Francisco, California

Saunders Construction, Inc.

Local Government:

City of Las Vegas, Nevada - Building and Safety Department

Clark County, Nevada - Building and Fire Prevention

Non-Profit Organization:

Applied Technology Council, Redwood City, California

Earthquake Engineering Research Institute (EERI)

Individual:

Dominic Sims

SPECIAL RECOGNITION – PATRICIA SUTCH

Patricia Sutch, WSSPC's Executive Director of 20 years, is retiring this year. She brought a wealth of relevant experience to WSSPC with her B.A. degree in Earth Sciences and Anthropology from Case Western Reserve University and her M.S. degree in Engineering Geology (with a seismic hazard focus) from Stanford University.

We would like to take this opportunity to recognize Patti's achievements and her accomplishments here at WSSPC. Aside from being a joy to work with, Patti has truly supported WSSPC and moved it forward in providing support in Earthquake preparedness through the following achievements:

- Organized the first quadrennial National Earthquake Conference in 2000 and collaborated with consortia on the 2004, 2008, 2012, and 2016 conferences
- Put WSSPC on a firm financial footing by building up reserves to cover approximately a year of operation
- Invited state seismic commissions to join WSSPC resulting in 7 new WSSPC members
- Started the Lifetime and Leadership awards to recognize individuals
- Organized and sponsored Earthquake Early Warning Workshops
- Added a fast-track option for policy recommendation adoption by the states
- Established a Policy Liaison with CREW
- Added Monthly Bulletins to WSSPC outreach starting in 2014
- Added Annual Reports starting in 2007
- Re-designed the website and added a Tsunami Center and Earthquake Center to highlight significant events that have occurred in WSSPC states
- Participated in California's Tsunami Policy Working Group and as a NTHMP Reviewer
- Produced Earthquake Emergency Handbook to fulfill a policy recommendation
- Provided State support projects for Alaska, American Samoa, Arizona, California, Guam, Hawaii, Idaho, Nevada, Utah, and Wyoming

Patti is also the Principal and President of REG Review, Inc., a company formed in 1985 to prepare geologists for the national ASBOG® geology licensing exam and California certification exams in engineering geology and hydrogeology. She has been an active volunteer with the Association of Engineering and Environmental Geologists (AEG) and the Earthquake Engineering Research Institute (EERI). She is a California Professional Geologist, Certified Hydrogeologist, and Certified Engineering Geologist.

Although we are going to miss Patti here at WSSPC, we wish her a happy retirement and are grateful for all she has done for this consortia.

Section A

WSSPC ORGANIZATION

Mission and Goals

The Western States Seismic Policy Council (WSSPC) is a regional earthquake consortium representing thirteen states, three territories, one commonwealth, and one province in the western United States and Canada. Organized as a 501(c)(3) non-profit organization – and funded by the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) – WSSPC is an important component of the U.S. National Earthquake Hazards Reduction Program (NEHRP), serving as an efficient and effective clearinghouse for earthquake mitigation information and ideas.

WSSPC's mission is to develop seismic policies and share information to promote programs intended to reduce earthquake-related losses. Our goals are to:

- Promote regional cooperation and the interaction of the State Emergency Management, State Geological Surveys, and State Seismic Councils and Commissions in the formation of seismic policy.
- Improve the overall awareness of earthquake hazards and methods to mitigate the associated risks; develop strategies to enhance earthquake preparedness; and support earthquake studies and earthquake preparedness activities that will reduce or eliminate deaths, injuries and property damage.
- Serve as a resource for earthquake and tsunami-related materials, information, training programs, and workshops in coordination with other regional and national earthquake organizations.
- Adopt policy recommendations that support state earthquake programs, policies, and actions.

Members consist of the directors of the state, provincial or territorial emergency management agencies and geological surveys in the WSSPC region, as well as a designated representative for their seismic safety commission, board or council. Members represent diverse constituencies geographically, demographically, and culturally – bringing broad expertise and perspective to the policy table.

Total population of the region served by WSSPC is 23% of the U.S. and Canada's combined population of 366.27 million, demonstrating the potential reach of policies developed by WSSPC members.

WSSPC Region	Population
USA	**77,410,622**
Alaska	739,795
Arizona	7,016,270
California	39,536,653
Colorado	5,607,154
Hawaii	1,427,538
Idaho	1,716,943
Montana	1,050,493
Nevada	2,998,039
New Mexico	2,088,070
Oregon	4,142,776
Utah	3,101,833
Washington	7,405,743
Wyoming	579,315
US Territories	**268,760**
American Samoa	55,519
Guam	159,358
Northern Mariana Islands	53,883
Canada	**4,889,925**
British Columbia	4,849,442
Yukon	40,483
Grand Total	**82,569,307**

Population Statistics for WSSPC Region

Source: 2010 U.S. Census, 2017 U.S. projected increases (www.census.gov), and 2017 Canadian census (http://www12.statcan.gc.ca)

WSSPC Board and Staff
2017-2018

Board

Chair – Peter McDonough, WSSPC Liaison (At Large, 2017-2019)
Utah Seismic Safety Commission
1140 West 200 South/P.O. Box 45360, Salt Lake City, Utah 84145
pwmcd49@yahoo.com

Vice Chair – Karen Berry, Director & State Geologist (GS, 2017-2019)
Colorado Geological Survey
1801 19th St, Golden, Colorado 80401
kaberry@mines.edu

Mark Ghilarducci, Director (EM, 2017-2019)
California Governor's Office of Emergency Services
3650 Schriever Ave, Mather, California 95655
mark.ghilarducci@caloes.ca.gov

Steve Masterman, Director & State Geologist (GS, 2016-2018)
Alaska Division of Geological and Geophysical Surveys
3354 College Rd, Fairbanks, Alaska 99709
steve.masterman@alaska.gov

John Metesh, Director & State Geologist (GS, 2016-2018)
Montana Bureau of Mines & Geology
Montana Tech 1300 W. Park Street, Butte, Montana 59701-8997
jmetesh@mtech.edu

Brad Richy, Director (EM, 2016-2018)
Idaho Office of Emergency Management
4040 Guard St, Bldg 600, Boise, Idaho 83705-5044
brichy@imd.idaho.gov

Staff

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WSSPC Member Agencies

Area	Agency
Alaska	Alaska Division of Homeland Security and Emergency Management Alaska Division of Geological and Geophysical Surveys Alaska Seismic Hazards Safety Commission
American Samoa	American Samoa Department of Homeland Security
Arizona	Arizona Department of Emergency and Military Affairs Arizona Geological Survey
British Columbia	Emergency Management British Columbia British Columbia Geological Survey
California	California Governor's Office of Emergency Services California Geological Survey Alfred E. Alquist Seismic Safety Commission
Colorado	Colorado Division of Homeland Security & Emergency Management Colorado Geological Survey Colorado Earthquake Hazard Mitigation Council
Guam	Guam Homeland Security Office of Civil Defense
Hawaii	Hawaii Emergency Management Agency Hawaii Earthquake & Tsunami Advisory Committee
Idaho	Idaho Office of Emergency Management Idaho Geological Survey
Montana	Montana Disaster and Emergency Services Division Montana Bureau of Mines and Geology
Nevada	Nevada Division of Emergency Management—Homeland Security Nevada Bureau of Mines and Geology Nevada Earthquake Safety Council
New Mexico	New Mexico Department of Homeland Security & Emergency Management New Mexico Bureau of Geology and Mineral Resources
Northern Mariana Islands	Northern Marianas Homeland Security & Emergency Management
Oregon	Oregon Office of Emergency Management Oregon Department of Geology & Mineral Industries Oregon Seismic Safety Policy Advisory Commission
Utah	Utah Department of Public Safety – Emergency Management Utah Geological Survey Utah Seismic Safety Commission
Washington	Washington Military Department, Emergency Management Division Washington State Department of Natural Resources, Geology & Earth Resources Division
Wyoming	Wyoming Office of Homeland Security Wyoming State Geological Survey
Yukon	Yukon Emergency Measures Organization Yukon Geological Survey

WSSPC Members, Earthquake / Tsunami Program Managers and State Hazard Mitigation Officers

As of November 30, 2018

Area	Geological Survey Director/ Representative	Emergency Management Director	Seismic Council Liaison	EQ Program Manager/Tsunami Program Manager	State Hazard Mitigation Officer
Alaska	Steve Masterman	Mike Sutton		Dan Belanger	Brent Nichols
Arizona	Philip Pearthree	Wendy Smith-Reeve		Michael Conway	Lucrecia 'Lu' Hernandez
California	Bill Short (Acting)	Mark Ghilarducci	Dick McCarthy	Ryan Arba Kevin Miller	Jennifer Hogan
Colorado	Karen Berry	Michael J. Willis	Rob Jackson	Karen Berry	Steven Boand
Hawaii		Thomas Travis	Andrea Chatman	Kevin Richards/ Kevin Richards	Vacant
Idaho	Michael "Ed" Ratchford Zach Lifton	William "Brad" Richy		Susan Cleverley	Susan Cleverley
Montana	John Metesh Mike Stickney	Delia Bruno		Kyle Sturgill-Simon	Jake Ganieany
Nevada	Jim Faulds Richard Koehler	Caleb Cage	Ron Lynn	Janell Woodward	Janell Woodward
New Mexico	Nelia Dunbar Dan Koning	M. Jay Mitchell		Wendy Blackwell	Wendy Blackwell
Oregon	Brad Avy Yumei Wang	Andrew Phelps Matt Marheine	Jay Raskin	Althea Rizzo	Angie Lane
Utah	Rick Allis Steve Bowman	Kris Hamlet	Leon Berrett	Bob Carey	Brad Bartholomew
Washington	Dave Norman Cornia Forson	Robert Ezelle		Maximilian Dixon	Tim Cook
Wyoming	Erin Campbell Seth Wittke	Guy Cameron		Melinda Gibson	Melinda Gibson
American Samoa		Samana Ve'ave'a Jacinta Brown		Mulivanu Aiumu	
Guam		Charles V. Esteves		Leo Rustum Espia (Acting)	Leo Rustum Espia
CNMI		Gerald J. Guerrero (Special Assistant)		Gerald J. Guerrero	Vickie Villagomez
British Columbia	Stephen Rowins	Robert Turner		Robert White	
Yukon	Carolyn Relf	Kelly Johnston			

2018 Affiliate Members

WSSPC welcomes members of the professional community who share our goal of reducing losses from earthquakes and tsunamis. Corporations, local governments or their departments, non-profit organizations, universities, and individuals can join WSSPC as affiliate members; membership fees are used to support program activities not eligible for reimbursement by the federal government.

Corporate	California Earthquake Authority 801 K Street, Suite 1000, Sacramento, CA 95814 *www.earthquakeauthority.com*
	Degenkolb Engineers, Inc. 235 Montgomery, Suite 500, San Francisco, CA 94104 *degenkolb.com*
	Saunders Construction, Inc. 1760 Monrovia, Unit #A-1, Costa Mesa, CA 92627 *www.saundersseismic.com/index.php*
Local Government	City of Las Vegas Building and Safety 333 N. Rancho Drive, Las Vegas, NV 89106 *Lasvegasnevada.gov/Government/buildingandsafety.htm*
	Clark County Building and Fire Prevention 4701 W. Russell Rd., Las Vegas, NV 89118-2231 *www.clarkcountynv.gov/depts/development_services*
Non-Profit	Applied Technology Council 201 Redwood Shores Parkway, Suite 240, Redwood City, CA 94065 *www.atcouncil.org*
	Earthquake Engineering Research Institute (EERI) 499 14th Street, Suite 220, Oakland, CA 94612-1934 *www.eeri.org*
Individual	Dominic Sims 900 Montclair Road Birmingham, AL 35213

Section B

ACTIVITIES

Completed in WSSPC FY 2017-2018

2018 WSSPC Annual Meeting

WSSPC held the annual meeting on May 3rd and 4th, 2018 in Seattle, Washington in association with the National Earthquake Program Managers Meeting. The Basin & Range Province Committee; Engineering, Construction and Building Codes Committee; and Tsunami Hazard Mitigation Committee met with full agendas and discussions leading to changes made to the policies. Twenty-one members and/or their proxies were present at the Annual Business Meeting. Four 2018 policy recommendations were adopted by the members (See Section E for 2018 policy recommendations).

The members voted in Board members for 2018-2020 terms: Steve Masterman (AK-GS), John Metesh (MT-GS), Brad Richy (ID-EM), and Caleb Cage (NV-EM), who joined Peter McDonough (UT-SC), Karen Berry (CO-GS), and Mark Ghiladucci (CA-EM) on the Board.

WSSPC Awards Program

WSSPC implemented an awards program in 1996 to support its mission to develop seismic policies and share information to promote programs intended to reduce earthquake-related losses. WSSPC awards have recognized the hard-working, creative and innovative efforts of those within the earthquake hazards reduction community, brought greater visibility to exemplary programs, projects and products, and facilitated the transfer of successful experiences to other agencies.

- Awards in Excellence are awarded annually to honor exemplary programs, projects, and products that have significantly contributed to addressing earthquake risk reduction through demonstrated achievements in earthquake mitigation, preparedness, response and recovery. If warranted, one award is selected to receive the Overall Award in Excellence.

- The National Awards in Excellence are awarded every four years in partnership with the Northeast States Emergency Consortium (NESEC), the Central U.S. Earthquake Consortium (CUSEC), and the Cascadia Region Earthquake Workgroup (CREW). These awards recognize persons, organizations and agencies in acknowledgement of their achievements, leadership and dedication in earthquake hazards reduction as demonstrated through exemplary programs, projects, and products that address earthquake risk reduction with the United States.

- Lifetime Achievement Awards are awarded periodically to honor outstanding leaders who are currently practicing, and who have demonstrated an extraordinary commitment, level of service, and contribution to earthquake risk reduction throughout their careers.

- WSSPC Leadership Awards are awarded periodically to honor individuals within the WSSPC membership who have demonstrated sustained leadership benefitting the WSSPC community.

Since 1996 over 150 awards have been given. In 2018 one Lifetime Achievement Award and two Awards in Excellence were given:

- Donald Thomas from The Center for the Study of Active Volcanoes received the Lifetime Achievement Award.
- The USRC Earthquake Rating System was given an Award in Excellence for Non-Proft Agency Efforts.
- USGS ShakeMap Scenario Suite was given the Award in Excellence for Use of Technology.

Left Image: Eric Thompson, U.S. Geological Survey, accepts the Award in Excellence for the USGS ShakeMap Scenario Suite from Peter McDonough, WSSPC Board Chair. *Right Image*: Evan Reis, U.S. Resiliency Council, accepts the Award in Excellence for the USRC Earthquake Rating System from Peter McDonough, WSSPC Board Chair.

Image: Kevin Richards (nominator), Patricia Sutch (WSSPC Executive Director), Donald Thomas (Lifetime Achievement Award winner), and Peter McDonough (WSSPC Board Chair).

To view awards for past recipients visit: *https://www.wsspc.org/awards/past-awards/*. The Awards in Excellence are indexed by year, state, and category and the Lifetime Achievement and Leadership Awards are indexed alphabetically by name.

Outreach

Events

Jackson Labroatory Community Resource Day—June 27, 2018

On June 27th WSSPC attended the Safety Fair at Jackson Laboratory in Sacramento, California. The fair was held in the morning and was open to all employees of the company. Approximately 60 employees visited the WSSPC table to learn more about WSSPC and what to do before, during, and after an earthquake.

In the course of discussions, there were a suprising number of people who still believed that standing in a doorway during an earthquake is the safest place to be. They left the fair with the knowledge of the best action to reduce the chance of injury is to "DROP, COVER, and HOLD ON."

WSSPC Presents CSG-West Legislators with Earthquake Information—September, 14, 2018

WSSPC was invited by the Council of State Governments (CSG)-West to make an hour-long presentation and participate in their committee round table discussion at their annual meeting September 14, 2018 in Snowbird, Utah. The CSG-West Transportation and Infrastructure Committee, led by Representatives Rick Youngblood (Idaho) and Jake Fey (Washington), held a 3-hour meeting in part to learn about and discuss earthquake issues in the western states. Approximately 30 legislators attended the meeting. Peter McDonough, WSSPC Board Chair and member of the Utah Seismic Safety Commission, focused his talk on transportation infrastructure. He was followed by Bob Carey, Utah Division of Emergency Management, who gave an overview of seismic risk in the western states, and Barry Welliver, of Barry H. Welliver Consulting Engineers, who spoke on seismic safety of schools.

Before WSSPC was incorporated, it worked under the umbrella of CSG-West and shared an office in San Francisco. WSSPC membership of the 13 western states is identical to CSG-West. CSG-West members number over 1300 state legislators. See *https://www.csgwest.org/annualmeeting/Schedule2018.aspx*

CDSS Health and Safety Fair—September, 27, 2018

The California Department of Social Services (CDSS), Disaster Services Bureau, and the committee for the National Disability Employment Awareness Month co-hosted the 2018 Fall Fair on September 27th in Sacramento, California. The Fair focused both on Preparedness Month for September and National Disability Employment Awareness Month for October, and highlighted the importance of promoting citizen actions to better prepare the public for a natural disaster or emergency. WSSPC collaborated with the California Geological Survey (CGS) to help educate approximately 200 participants on both the mechanics of tsunamis, earthquakes, volcanoes, and liquefaction, the importance of being prepared in the case of such an occurrence, and distributed pamphlets on emergency preparedness.

e-Newsletter

Western States Seismic Policy Council has published a quarterly newsletter highlighting WSSPC member news since 1995; in 2008, the newsletter became an electronic "e-Newsletter". Sections include summaries of WSSPC member news; hazard mitigation and preparedness activities; research findings; updates on the recovery and resiliency of previous earthquakes and tsunami-impacted areas; and earthquake and tsunami publications and resources.

The e-Newsletter is distributed by email to WSSPC members and affiliates, other earthquake consortia members, earthquake organizations, Federal Emergency Management Agency (FEMA) representatives, and United States Geological Survey (USGS) contacts. In addition, the e-Newsletter is posted on our website and the link is broadcast through social media announcements on Facebook and Twitter. Current and previous e-Newsletters are available for download from the WSSPC website at *www.wsspc.org/news/e-newsletters*. The e-newsletter is published in January, April, July, and October.

WSSPC encourages member agencies – as well as other earthquake and tsunami organizations – to forward their information and news items for inclusion in upcoming editions. To subscribe to the WSSPC e-Newsletter, click on the "Join Our Email List" button on the home page of *www.wsspc.org* or send an email to *info@wsspc.org.*

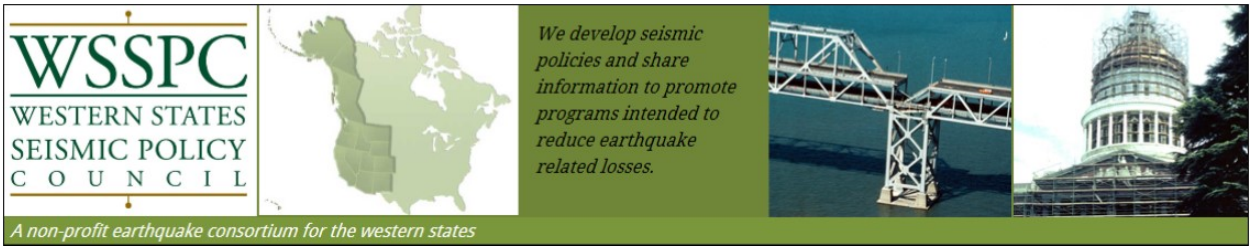
Monthly Bulletin

Western States Seismic Policy Council began publishing a monthly bulletin in December of 2014. The online publication is distributed every month except when a quarterly newsletter is produced. Monthly bulletins include upcoming events and time sensitive news concerning WSSPC members.

The monthly bulletin is distributed by email to WSSPC members and affiliates, other earthquake consortia members, earthquake organizations, Federal Emergency Management Agency (FEMA) representatives, and United States Geological Survey (USGS) contacts. Current and previous monthly bulletins are available for download from the WSSPC website at *www.wsspc.org/news/monthly-bulletins*.

WSSPC encourages member agencies – as well as other earthquake and tsunami organizations – to forward their information and news items for inclusion in upcoming editions. To subscribe to the WSSPC monthly bulletin, click on the "Join Our Email List" button on the home page of *www.wsspc.org* or send an email to *info@wsspc.org.*

Website: https://www.WSSPC.org



The WSSPC website – *https://www.wsspc.org*– showcases official documents, policies and publications, and provides links to WSSPC members' agencies, WSSPC technical committee activities, annual Awards in Excellence profiles, e-Newsletters and Bulletins, and earthquake and tsunami resources. It also provides a password protected section for Board and Committee Members to access working documents and sensitive information.

State Hazard Mitigation Plans

Under the Disaster Mitigation Act of 2000, all U.S. states and territories are required to prepare a hazard mitigation plan that addresses the need to reduce or eliminate the effects of natural hazards. The plans are required to be updated every five years. Once the plans are approved by FEMA, the state is eligible for an increased federal share of the disaster. Approval of an enhanced plan qualifies a state for increased federal hazard mitigation grant funds up to 20% of a declared disaster declaration.

All of WSSPC's state and territory members' Hazard Mitigation Plans are linked from the website: *https://www.wsspc.org/mitigation/state-hazard-mitigation-plans/.*

Due to the moderate to high earthquake hazard in the western states, provinces, and territories, WSSPC has a policy that encourages the development of mitigation plans and risk-reduction strategies. Policy 18-2: Developing Earthquake and Tsunami Risk-Reduction Strategies can be found here: *https://www.wsspc.org/wp-content/uploads/2018/05/FINAL_web_PR-18-2_Mitigation.pdf*

Tsunami Center

The WSSPC Tsunami Center contains basic information to prepare and respond in the event of a tsunami, as well as state- and territory-specific information in the WSSPC Member Tsunami pages. Tsunamis generated in the Pacific Ocean affect the WSSPC member states and provinces of Alaska, province of British Columbia, California, Hawaii, Oregon, and Washington, and the Pacific territories of Guam, American Samoa, and Commonwealth of the Northern Mariana Islands. Each state and territory affected by tsunamis has online resources available within the Tsunami Center.

Significant tsunamis have occurred during the last 70 years that have impacted the Pacific and Indian Ocean region, and their effects and lessons learned are highlighted in the Tsunami Center Significant Events page. The Tsunami Center can be found: *https://www.wsspc.org/resources-reports/tsunami-center/.*

Earthquake Center
The Earthquake Center web page is a feature added in 2017. The Earthquake Center contains basic information to prepare and respond in the event of an earthquake, Earthquake Resources (publications organized by state or territory and agency), Earthquake Scenarios, and a list of Significant Earthquakes.

Significant earthquakes − earthquakes with a magnitude 7.0 or higher − that have impacted the WSSPC states and territories since 1700 can be found on the main page of the Earthquake Center. Most earthquakes are linked to the U.S. Geological Survey data source for more information.


Search:

Magnitude	Event	Year	Date
9.2	Good Friday, Alaska Earthquake	1964	Mar 27
~9	Cascadia Subduction Zone, WA Earthquake	1700	Jan 26
8.6	S of Aleutians, AK Earthquake	1946	Apr 1
8.6	Aleutians, AK Earthquake/Tsunami	1957	Mar 9
8.3	Kuril Islands Earthquake/Tsunami	2006	Nov 15
8.1	American Samoa Earthquake	2009	Sep 29
~8	Yakutat Bay, AK Earthquake	1899	Sep 10
~7.9	Fort-Tejon, CA Earthquake	1857	Jan 9
~7.9	Island of Hawaii Earthquake	1868	Apr 2
7.9	Andreanof Islands, Aleutian Islands, AK Earthquake	1996	Jun 10

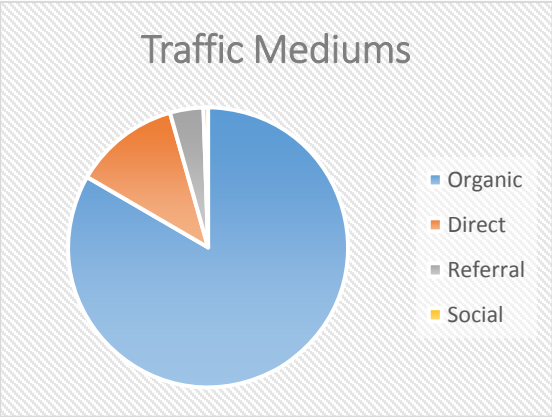
Edit
Showing 1 to 10 of 29 entries
Previous Next

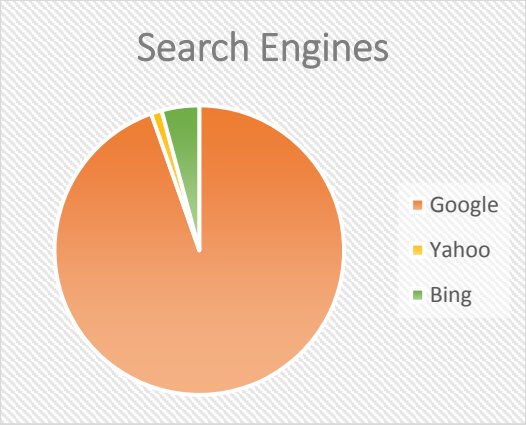
The Earthquake Center is found here: *https://www.wsspc.org/resources-reports/earthquake-center/.*

Website Analytics
To gauge the website's effectiveness and reach, WSSPC has been using Google Analytics to monitor usage statistics on the number of Visitors (Users), the number of Visits (Sessions), and Page Views. These numbers are monitored and provided to FEMA on a quarterly basis. The 2017-2018 WSSPC fiscal year yielded over 25,000 users with over 40,000 page views.

Statistics	Total
Sessions	30,229
Users	25,031
Page Views	42,126

In addition, Google Analytics provides us with an overview of visitors' geographical locations; search engines and social networks used to find our site; visitor types, and much more.

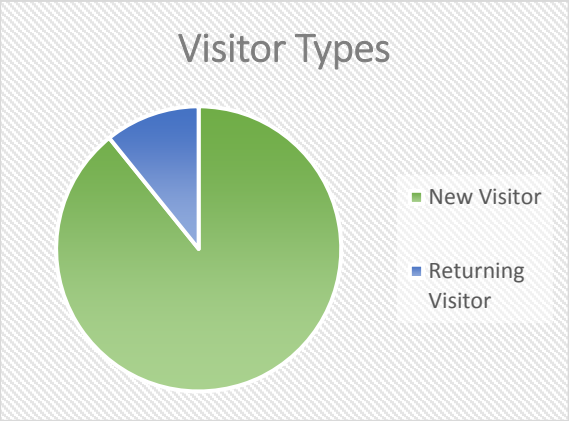


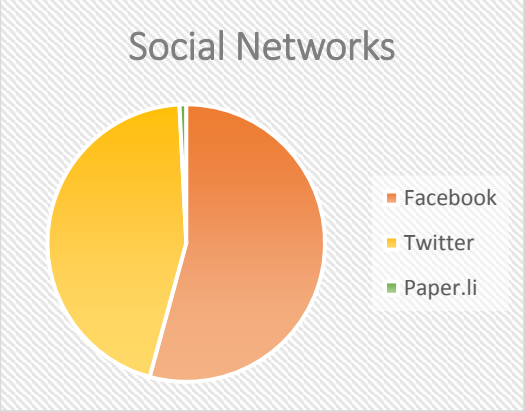


* Traffic Mediums is the general category of the source, for example, organic search, web referral, or direct search.

* Organic traffic is defined as visitors coming from a search engine (Google or Bing) as opposed to traffic that arrives through other referring channels. These are unpaid searches.

* Direct traffic is defined as URLs that people type in directly, reach via their browser bookmarks, or by clicking a link from an email or PDF document.





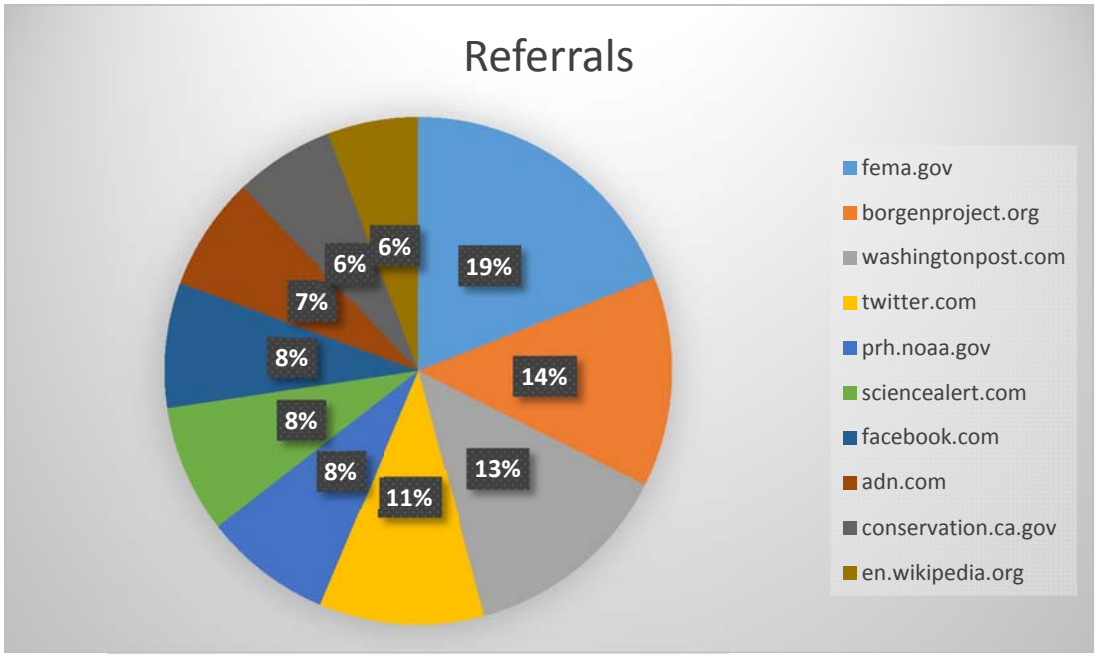
* Paper.li is a content curation tool that enables individuals to create "newspapers" based on topics they choose and "Automatically find, publish & promote engaging articles, photos and videos from across the web."

Below is the graph of the top ten referrers. Percentages are normalized to 100% of the top 10 referrers.

The top 10 referrers to the website are: FEMA, *borgenproject.org, washingtonpost.com, twitter.com*, NOAA, *sciencealert.com*, *facebook.com, adn.com, conservation.ca.gov, and wikipedia.org.*

There were a total of 161 referrers in 2018, down from 179 in 2017.

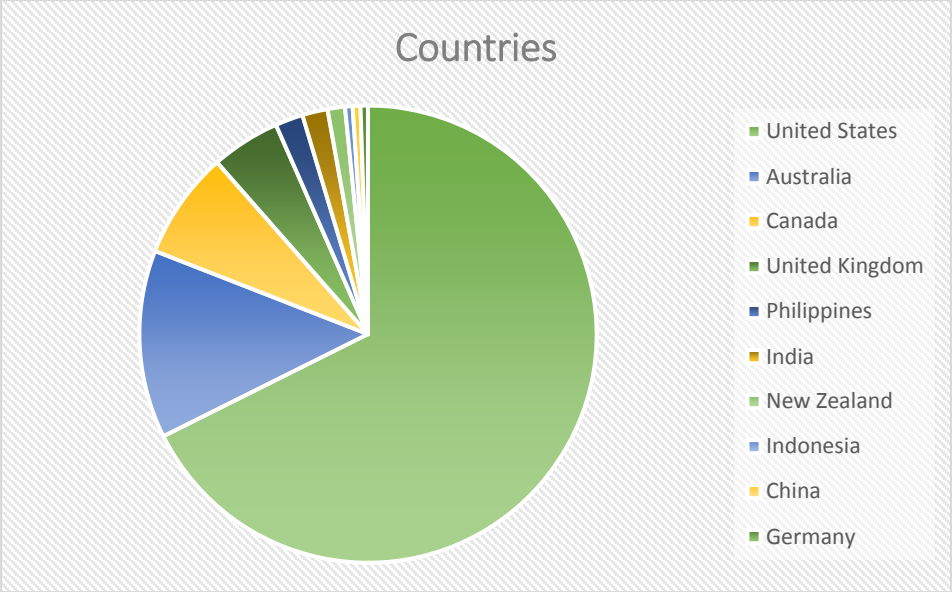
There was also a significant change in the top 10 referrals between 2017 and 2018 with 80% of the top ten being from different websites.



Some new referrers this year include:

- *borgenproject.org* is a non profit that focuses on addressing poverty. WSSPC is linked on their page about the 1958 Lituya Bay Tsunami.
- *sciencealert.com* is an online news platform that focuses on science articles.
- *adn.com* is the Anchorage Daily News that covers events in Anchorage, Alaska.

This year, Google searches led visitors to our pages from 151 countries and territories around the world; the top five include the United States, Australia, Canada, the United Kingdom, and Philippines.



Social Media

Western States Seismic Policy Council has integrated social media into its information sharing mission. WSSPC has Twitter and Facebook accounts that are used to distribute information and connect with a larger audience. Information postings include meeting announcements, webinars offered by partner agencies, calls for WSSPC award nominations, earthquake anniversaries, and other news of interest to our audience. Every time we distribute an e-newsletter or monthly bulletin, we also announce them on both platforms.

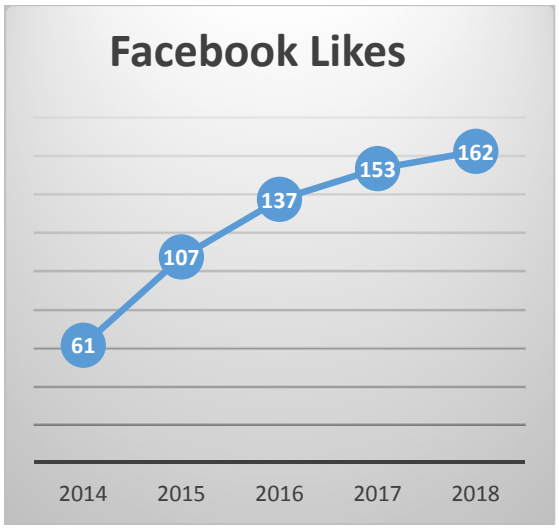
The WSSPC Facebook page is continuing to find new ways to connect to its current viewers and pique the interest of others. One new implementation is the earthquake remembrance update. Links and information about 60 major important earthquakes that have affected the United States (the majority of which are in WSSPC states/territories) are posted on the day of their anniversary so people can learn about these events.

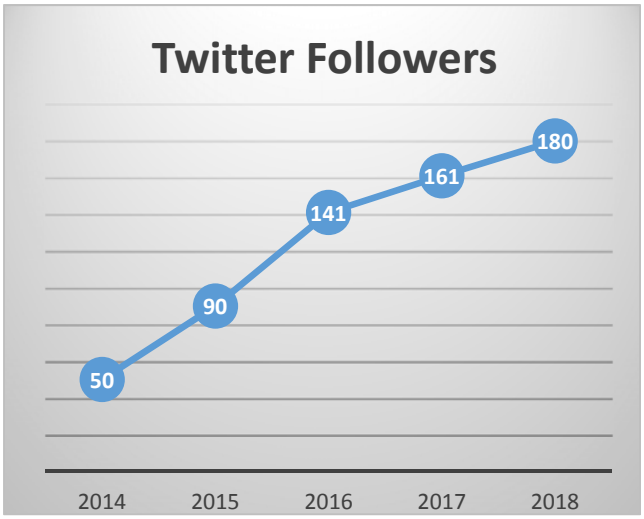
We observed a significant increase in the percentage of Facebook used to connect with our website from 14.6% of the total last year to 70% this year because of these earthquake remembrance postings.

Between December 1, 2017 and November 30, 2018 the WSSPC Facebook page has increased to 162 likes with 165 followers. At the end of November 2018, WSSPC had 180 Twitter "followers," up from 161 the previous year.

Facebook: *www.facebook.com /WSSPC*

Twitter: *https://twitter.com/wss*


Facebook Likes
61
107
137
153
162
2014
2015
2016
2017
2018


Twitter Followers
50
90
141
161
180
2014
2015
2016
2017
2018

Member Links to WSSPC

The following 31 WSSPC members have added a *www.wsspc.org* hyperlink to their agency's website to refer them to WSSPC.

Member Agency	Link Location
Alaska Division of Homeland Security and Emergency Management	http://ready.alaska.gov/Plans/Mitigation/Equake
Alaska Division of Geological and Geophysical Surveys	http://dggs.alaska.gov/links/geology-links.php
Alaska Seismic Hazards Safety Commission	http://seismic.alaska.gov/index.php
American Samoa Department of Homeland Security	
Arizona Department of Emergency and Military Affairs	
Arizona Geological Survey	http://www.azgs.az.gov/hazards_earthquakes.shtml
Emergency Management British Columbia	http://www.empr.gov.bc.ca/mining/geoscience/educationalresources/pages/default.aspx (Linked under "Educational Resources")
British Columbia Geological Survey	http://www.empr.gov.bc.ca/mining/geoscience/educationalresources/pages/default.aspx (Linked under "Earthquake")
California Governor's Office of Emergency Services	http://www.caloes.ca.gov/cal-oes-divisions/earthquake-tsunami-volcano-programs/tsunami-about
California Geological Survey	https://www.conservation.ca.gov/cgs/
Alfred E. Alquist California Seismic Safety Commission	https://ssc.ca.gov/about/links.html
Colorado Division of Homeland Security & Emergency Management	
Colorado Geological Survey	http://coloradogeologicalsurvey.org/geologic-hazards/earthquakes/western-states-seismic-policy-council/
Colorado Earthquake Hazard Mitigation Council	http://coloradogeologicalsurvey.org/geologic-hazards/earthquakes/colorado-earthquake-hazard-mitigation-council-cehmc/ (Linked under "Earthquakes")
Guam Homeland Security Office of Civil Defense	
Hawaii Emergency Management Agency	http://dod.hawaii.gov/hiema/resources/links/
Hawaii State Earthquake and Tsunami Advisory Committee	(They do not have a website)
Idaho Office of Emergency Management	http://www.bhs.idaho.gov/Pages/Preparedness/Hazards/NaturalHazards/Earthquake.aspx

Idaho Geological Survey	https://www.idahogeology.org/links
Montana Disaster and Emergency Services Division	
Montana Bureau of Mines and Geology	http://www.mbmg.mtech.edu/quakes/quake-resources.html
Nevada Division of Emergency Management – Homeland Security	http://dem.nv.gov/links/
Nevada Bureau of Mines and Geology	http://www.nbmg.unr.edu/Links.html
Nevada Earthquake Safety Council	http://www.nbmg.unr.edu/nesc/
New Mexico Dept. of Homeland Security and Emergency Management	http://www.nmdhsem.org/Preparedness_Links.aspx (Linked to "Earthquake and Seismic Activity Information")
New Mexico Bureau of Geology and Mineral Resources	https://geoinfo.nmt.edu/about/commissions.html
Northern Marianas Homeland Security and Emergency Management	http://www.cnmihsem.gov.mp/links
Oregon Office of Emergency Management	http://www.oregon.gov/oem/Councils-and-Committees/Pages/OSSPAC.aspx
Oregon Department of Geology and Mineral Industries	https://www.oregongeology.org/tsuclearinghouse/partners-agencies.htm
Oregon Seismic Safety Policy Advisory Commission	http://www.oregon.gov/oem/Councils-and-Committees/Pages/OSSPAC.aspx
Utah Department of Public Safety – Emergency Management	
Utah Geological Survey	http://geology.utah.gov/about-us/geologic-programs/geologic-hazards-program/for-consultants-and-design-professionals/useful-websites/#toggle-id-11
Utah Seismic Safety Commission	https://ussc.utah.gov/pages/help.php?section=Web+Links
Washington Military Department, Emergency Management Division	http://mil.wa.gov/preparedness
Washington State Department of Natural Resources, Geology & Earth Resources Division	
Wyoming Office of Homeland Security	http://wyohomelandsecurity.state.wy.us/links.aspx
Wyoming State Geological Survey	http://www.wsgs.wyo.gov/hazards/earthquakes
Yukon Emergency Measures Organization	http://www.community.gov.yk.ca/fr/emo/links.html
Yukon Geological Survey	

Collaboration

2018 National Earthquake Program Managers Meeting

The 2018 National Earthquake Program Managers meeting was held in Seattle, Washington on April 30-May 4, 2018. The goal of the meeting was to continue dialogue and relationship building between State Earthquake Program Managers and key stakeholders since the 2016 National Earthquake Conference Meeting in Long Beach, California. At the meeting were 81 people from State and Territorial Earthquake Program Managers, Senior leadership from State and Federal Government, as well as the NEHRP Earthquake Consortia and Program Partners.

Meeting sessions included:

- State, Consortia, FEMA and Partner Updates
- FEMA and State Breakouts
- Improving School Natural Hazard Safety
- NEMA Earthquake Subcommittee Update

The meeting agenda, notes, and presentations are housed on the National Earthquake Program Managers website at *http://eqprogram.net/2018-national-earthquake-program-managers-meeting/*

WSSPC Coordination with Other Organizations

NEMA Earthquake Subcommittee

WSSPC participates as a non-voting member of the National Emergency Management Association (NEMA) Earthquake Subcommittee under the leadership of Robert Ezelle, Washington State Emergency Management Division Director. The Subcommittee reports to the NEMA Response and Recovery Committee. The group met on a call February 7, 2018 at which time the earthquake consortia were asked to prepare an informational "Best Practices" document for the NEMA President. The next meeting was May 3, 2018, following the National Earthquake Program Managers meeting in Seattle, Washington. The committee members were tasked with reviewing a document from the Association of Staff Physician Recruiters (ASPR) Technical Resources, Assistance Center, and Information Exchange (TRACIE) team which was completed by September 12.

National Earthquake Resiliency Coalition (NERC)

The NERC Coalition is made up of 22 representatives from many different organizations who meet periodically to plan for the quadrennial National Earthquake Conference (NEC). The next NEC will be held in San Diego, California, March 4-6, 2020. Visit *www.earthquakeconference.org* for updates.

Resiliency Policy Council

FLASH (Federal Alliance for Safe Homes) assembled leaders from over 20 organizations in 2018 to serve on a policy council. Patricia Sutch was invited to participate as the only representative from the earthquake consortia. Several teleconferences have been held. Robert Andrews from Verisk Insurance Solutions is the Chair.

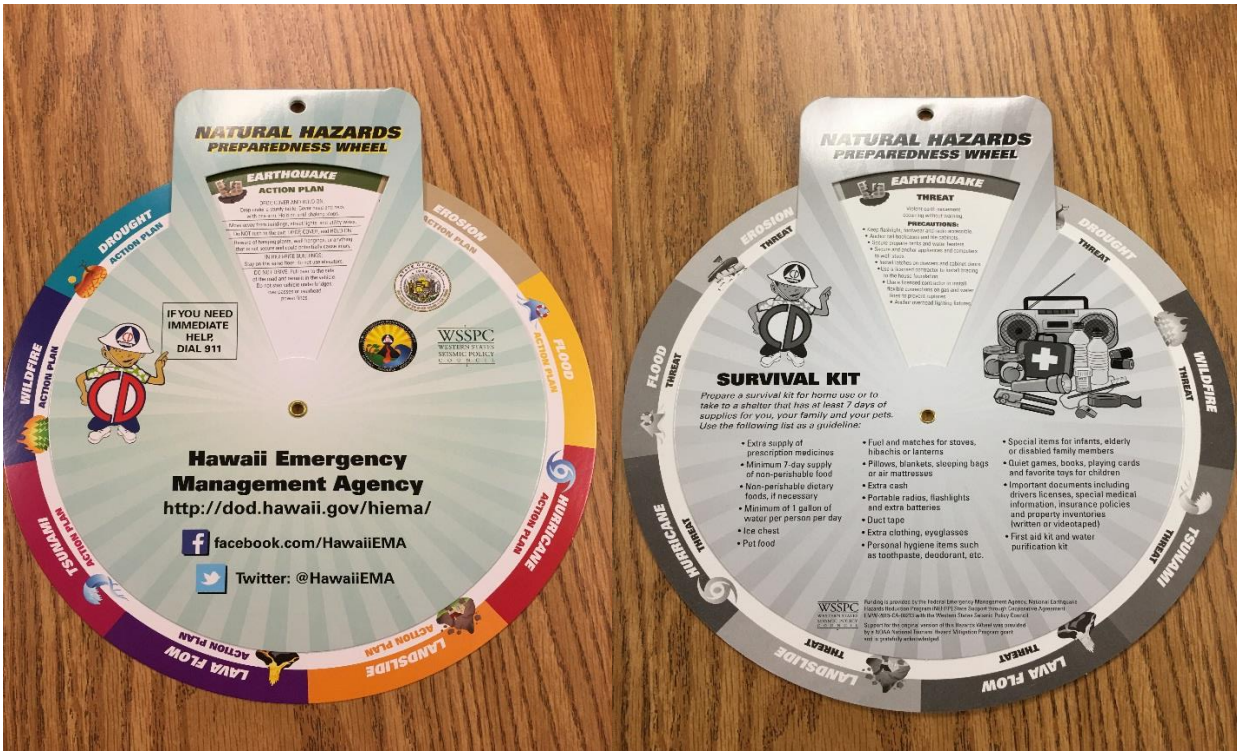
Section C

STATE SUPPORT PROJECTS

Completed in WSSPC FY 2017-2018

Hawaii Outreach (FEMA FY 17)

Hawaii used their state support funding to print 3,500 Natural Hazards Preparedness Wheels, a popular item used in their outreach. The colorful front of the wheel describes nine natural hazards, including earthquakes and tsunamis, and the actions to take when they occur. The reverse side describes the hazard and provides a list of item to have available in the event of an emergency (see images below).



Hawaii Earthquake and Tsunami Advisory Committee (FEMA FY 18)

WSSPC received funding to support the Hawaii Earthquake and Tsunami Advisory Committee. This committee has been providing advice and recommendations to the State of Hawaii for over 26 years. There are 17 standing members from various professional areas (i.e. Sciences, Engineering) and representatives from Pacific Tsunami Warning Center (PTWC), University of Hawaii (UH), Hawaii Volcano Observatory (HVO), Pacific Disaster Center (PTC), and International Tsunami Information Center (ITIC). The first meeting on the FY18 cooperative agreement was held September 7, 2018, and the second one November 30, 2018. WSSPC contracted for the meeting space and supported inter-island travel for several committee members.

Nevada Outreach (FEMA FY 18)

Billboard messaging is available 24 hours a day and thereby enhances the significance of earthquake safety awareness and preparedness through repetitive viewing. Poster-sized billboards and both digital and permanent bulletins were placed in Las Vegas, Nevada and displayed "Are you Prepared? Nevada is Earthquake Country, Drop! Cover! Hold On!" In Round one, WSSPC contracted for 7 posters, 4 regular permanent bulletins, and 11 digital bulletins. The campaign ran for a month starting October 1, 2018. Over 26 million impressions were measured in Round 1 and Round 2 is scheduled for April 2019.

Wyoming Outreach (FEMA FY 18)

Wyoming requested promotional items for their ShakeOut outreach and to engage and inform the public at other events as opportunities became available. WSSPC oversaw the production of 1700 pop sockets, (left image below), 1620 portable power banks (middle image below), and 1800 Smartphone wallets and stands (right image below). The larger items displayed "In An Earthquake" and the "Drop, Cover, Hold On" logo, while the pop sockets had "The Great Wyoming ShakeOut" imprinted. Wyoming utilized these promotional items when interacting with school children, with seniors, at public events where emergency management has a booth or table, at local governmental buildings, and at public meetings.

National Earthquake Program Managers Meeting Travel (FEMA FY 17)

Reimbursements were offered to one earthquake program manager from each WSSPC state and territory for travel to the weeklong National Earthquake Program Managers (NEPM) meeting in Seattle, Washington April 30-May 4, 2018.

The following states and territories were supported by WSSPC in their travel to NEPM:

Alaska
American Samoa
Guam
Hawaii
Idaho
Montana
New Mexico
Washington
Wyoming

WSSPC states eligible for support from WSSPC but absent from the NEPM were Nevada. Other WSSPC member states or territories not on the above list were directly funded by FEMA.

Section D

FINANCIAL REPORTS

Summary of Financial Documents

D-1. WSSPC Independent Accountant's Review and Financial Statements Report
The financial statements were prepared by an accountant for the WSSPC Fiscal Year ending November 30, 2018, and reviewed by both the outgoing and incoming Executive Directors. The Net Assets at the End of the Year increased by $ 1638 over 2017 (see page 3 of financial statements).

WSSPC had 8 Affiliate members in FY 17-18 who contributed $ 2775. Affiliate member contributions help to offset expenses not covered by the FEMA cooperative agreements.

D-2. WSSPC FY 2017-2018 Income and Expense
This document shows how income and expenses were proportioned among the FEMA cooperative agreements during the WSSPC fiscal year and the accounting categories used in the Quickbooks software, before re-allocating the expenses to tasks in the FEMA Work Plan. The left column records the totals.

D-3. FEMA FY17 Cooperative Agreement, August 1, 2017 – August 31, 2018
This document shows the allocation of all expenses to the tasks in the Work Plan of the FEMA FY 17 Cooperative Agreement completed in the WSSPC fiscal year, and includes the State Support projects. All work was completed by July 31, 2018.

D-4. FEMA FY18 Cooperative Agreement, August 1, 2018 – November 30, 2018
This document shows the allocation of expenses to the tasks in the Work Plan of the FEMA FY 18 Cooperative Agreement through the end of the WSSPC fiscal year, and includes the State Support projects.

Subsection D-1

Independent Accountant's Review and Financial Statements Report

Ending November 30, 2018 and 2017

COOK CPA Group

WESTERN STATES SEISMIC POLICY COUNCIL

INDEPENDENT ACCOUNTANT'S REVIEW REPORT
and
FINANCIAL STATEMENTS

NOVEMBER 30, 2018 AND 2017

CONTENTS

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Roseville, CA 95661

INDEPENDENT ACCOUNTANT'S REVIEW REPORT

Board of Directors
Western States Seismic Policy Council

We have reviewed the accompanying financial statements of Western States Seismic Policy Council (a nonprofit organization), which comprise the statements of financial position as of November 30, 2018 and 2017, and the related statements of activities, functional expenses, and cash flows for the years then ended, and the related notes to the financial statements. A review includes primarily applying analytical procedures to management's financial data and making inquiries of management. A review is substantially less in scope than an audit, the objective of which is the expression of an opinion regarding the financial statements as a whole. Accordingly, we do not express such an opinion.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement whether due to fraud or error.

Accountant's Responsibility

Our responsibility is to conduct the review engagement in accordance with Statements on Standards for Accounting and Review Services promulgated by the Accounting and Review Services Committee of the AICPA. Those standards require us to perform procedures to obtain limited assurance as a basis for reporting whether we are aware of any material modifications that should be made to the financial statements for them to be in accordance with accounting principles generally accepted in the United States of America. We believe that the results of our procedures provide a reasonable basis for our conclusion.

Accountant's Conclusion

Based on our review, we are not aware of any material modifications that should be made to the accompanying financial statements in order for them to be in accordance with accounting principles generally accepted in the United States of America.

Cook CPA Group

Roseville, California
February 22, 2019

WESTERN STATES SEISMIC POLICY COUNCIL
STATEMENTS OF FINANCIAL POSITION
NOVEMBER 30, 2018 AND 2017

	2018	2017
Assets:		
Cash and cash equivalents	$ 147,134	$ 170,101
Grants receivables (Note 2)	38,798	20,623
Books and periodicals	500	500
Total Assets	$ 186,432	$ 191,224
Liabilities:		
Accrued expenses and accounts payable	$ -	$ 7,320
Accrued vacation	8,399	7,509
Total Liabilities	8,399	14,829
Net Assets:		
Unrestricted	178,033	176,395
Total Net Assets	178,033	176,395
Total Liabilities and Net Assets	$ 186,432	$ 191,224

See accompanying notes and independent accountant's review report.

WESTERN STATES SEISMIC POLICY COUNCIL
STATEMENTS OF ACTIVITIES
FOR THE YEARS ENDED NOVEMBER 30, 2018 AND 2017

	Unrestricted	
	2018	**2017**
Revenues and Support:		
FEMA cooperative agreements	$ 333,652	$ 377,307
Affiliate donations	2,775	3,800
Interest income and other	239	209
Total Revenues and Support	336,666	381,316
Expenses:		
Program services	295,640	344,058
Management and general	39,388	28,849
Total Expenses	335,028	372,907
Change in Net Assets	1,638	8,409
Net Assets at Beginning of Year	176,395	167,986
Net Assets at End of Year	$ 178,033	$ 176,395

See accompanying notes and independent accountant's review report.

WESTERN STATES SEISMIC POLICY COUNCIL
STATEMENT OF FUNCTIONAL EXPENSES
YEAR ENDED NOVEMBER 30, 2018

	Program Services	Management and General	Total
Salaries and fringe benefits	$ 132,515	$ 20,112	$ 152,627
Payroll taxes	8,783	1,551	10,334
Professional fees - accounting	1,812	7,250	9,062
Professional fees - other	9,515	1,679	11,194
Rent	20,587	3,633	24,220
Insurance	881	294	1,175
Telephone	1,633	545	2,178
Office supplies and miscellaneous	3,304	1,102	4,406
Internet services	2,655	-	2,655
Staff expenses	3,371	-	3,371
Conference expenses	5,783	-	5,783
State assistance	95,395	-	95,395
Executive committee	8,653	963	9,616
Bank and payroll charges	753	2,259	3,012
Total Expenses	$ 295,640	$ 39,388	$ 335,028

See accompanying notes and independent accountant's review report.

WESTERN STATES SEISMIC POLICY COUNCIL
STATEMENT OF FUNCTIONAL EXPENSES
YEAR ENDED NOVEMBER 30, 2017

	Program Services	Management and General	Total
Salaries and fringe benefits	$ 134,746	$ 14,836	$ 149,582
Payroll taxes	8,397	1,483	9,880
Professional fees - accounting	1,102	4,408	5,510
Professional fees - other	1,239	219	1,458
Rent	21,083	3,721	24,804
Insurance	879	293	1,172
Telephone	1,832	612	2,444
Office supplies and miscellaneous	2,808	937	3,745
Internet services	1,236	-	1,236
Staff expenses	27	-	27
Conference expenses	3,664	-	3,664
State assistance	162,492	-	162,492
Executive committee	3,918	436	4,354
Bank and payroll charges	635	1,904	2,539
Total Expenses	$ 344,058	$ 28,849	$ 372,907

See accompanying notes and independent accountant's review report.

WESTERN STATES SEISMIC POLICY COUNCIL
STATEMENT OF CASH FLOWS
NOVEMBER 30, 2018 AND 2017

	2018	2017
Cash flows from operating activities:		
Change in net assets:	$ 1,638	$ 8,409
Adjustments to reconcile change in net assets to net cash used in operating activities:		
(Increase) Decrease in:		
Grants receivable	(18,175)	10,162
Increase (Decrease) in:		
Accounts payable	(7,320)	3,684
Accrued vacation	890	(1,437)
Cash (used in) provided by operating activities	(22,967)	20,818
Net change in cash and cash equivalents	(22,967)	20,818
Cash and cash equivalents, beginning of the year	170,101	149,283
Cash and cash equivalents, end of the year	$ 147,134	$ 170,101

See accompanying notes and independent accountant's review report.

NOTE 1 – SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Description of Organization

The Western States Seismic Policy Council (the Council) was founded in 1979 and incorporated in 1996 as a 501 (c)(3) non-profit organization. The Council provides a forum to develop seismic policies and share information to promote programs to reduce earthquake losses throughout the western region of the United States, three U.S. territories, a Canadian territory, and a Canadian province. It is funded primarily by the Department of Homeland Security's Federal Emergency Management Agency (FEMA).

Basis of Accounting

The Council prepares its financial statements in accordance with accounting principles generally accepted in the United States of America, which involves the application of accrual accounting; consequently, revenue and support are recognized when earned, and expenses are recognized when incurred.

Financial Statement Presentation

Financial statement presents information regarding its financial position and activities according to three classes of net assets: unrestricted net assets, temporarily restricted net assets, and permanently restricted net assets. The Council has no temporarily and permanently restricted net assets during 2018 and 2017.

Allowance for Uncollectible Accounts

No allowance for uncollectible accounts has been provided since management considers all accounts to be collectible as the grants receivable have historically been received in full.

Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management makes estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Cash and Cash Equivalents

For the purposes of reporting cash flows, the Council considers all unrestricted highly liquid investments with an initial maturity of three months or less to be cash equivalents.

NOTE 1 – SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Functional Allocation of Expenses

The costs of providing the Council's programs and supporting services have been summarized on a functional basis. Accordingly, certain costs have been allocated among the programs and supporting services.

Grants and Cooperative Agreements

The grants and cooperative agreements are cost reimbursement type agreements; therefore, the Council records income when expenditures are made in compliance with the terms of the agreements.

Income Taxes

The Council under preliminary determination is a not-for-profit organization that is exempt from income taxed under Section 501(c)(3) of the Internal Revenue Code and Section 23701(d) of the California Revenue and Taxation Code.

Property and Equipment

Property and equipment are recorded at cost when acquisition costs are greater than $5,000. Depreciation is provided on the straight-line basis over five years.

Recent Accounting Pronouncements

In August 2016, the FASB issued ASU No 2016-14, Not-for-Profit Entities (Topic 958): Presentation of Financial Statements of Not-for-Profit Entities. The new accounting standard improves the usefulness of information provided to donors, grantors, and other users of the financial statements by eliminating the distinction between resources with permanent and temporary restrictions, requiring the use of the placed-in-service approach for reporting gift restrictions and enhancing disclosures. Topic 958 is effective for annual financial statements issued for fiscal years beginning after December 15, 2017. Therefore, application of this statement is effective for the year ending November 30, 2019. The Council is currently evaluating the impact adoption of the new standard on its financial statements.

In May 2014, the Financial Accounting Standards Board (FASB) issued Accounting Standards Update No. 2014-09, Revenue from Contracts with Customers (Topic 606). The new accounting standard develops a common revenue standard that will remove inconsistencies and weakness in revenue requirements, provide a more robust framework for addressing revenue issues, improve comparability of revenue recognition practices, provide more useful information to users of financial statements, and simplify the preparation of financial statements.

NOTE 1 – SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Recent Accounting Pronouncements (continued)

Topic 606 is effective for annual reporting periods beginning after December 15, 2017. Therefore, application of this standard is effective for the Council for the year ending November 30, 2019. The Council is currently evaluating the impact of adoption of the new standard on its financial statements.

In February 2016, the Financial Accounting Standards Board (FASB) issued Accounting Standards Update (ASU) No. 2016-02, Leases (Topic 842). The new accounting standard requires lessees to recognize a lease liability measured on a discounted basis and a right-of-use asset for all leases. The amendments in this Update are effective for fiscal years beginning after December 15, 2018. Therefore, the application is effective for the Council for the year ended November 30, 2020 The Council is currently evaluating the impact of adoption of the new standard on its financial statements.

Subsequent Event

Management has evaluated subsequent events for potential recognition and/or disclosure through February 22, 2019, the date the financial statements were available for issuance.

NOTE 2 – GRANTS AND COOPERATIVE AGREEMENT RECEIVABLES

The Council has a receivable from FEMA in the following amounts as of November 30:

	2018	2017
FEMA	$ 38,798	$ 20,623
Total	$ 38,798	$ 20,623

NOTE 3 – OFFICE EQUIPMENT

Property and equipment consist of the following as of November 30:

	2018	2017
Computer equipment	$ 3,136	$ 3,136
Office equipment	4,067	4,067
Total	7,203	7,203
Less accumulated depreciation	(7,203)	(7,203)
Capital assets, net	$ -	$ -

There was no depreciation expense for the years ending November 30, 2018 and 2017.

NOTE 4 – FEMA REVENUE

FEMA revenue consists of the following for the year ended November 30:

	2018	2017
2015 FEMA	$ -	$ 49,515
2016 FEMA	-	259,921
2017 FEMA	211,962	67,871
2018 FEMA	121,690	-
Total	$ 333,652	$ 377,307

NOTE 5 – DEFINED CONTRIBUTION PLAN

The Council sponsors a defined contribution plan (a SIMPLE IRA plan) covering regular employees who meet certain eligibility requirements. The Council matches an employee's contribution dollar for dollar up to 3% of compensation per year. Employees who qualify under Internal Revenue Service rules may make catch up contributions to this plan. The contributions made during the years ended November 30, 2018 and 2017 were $2,703 and $2,637, respectively.

NOTE 6 – LEASE AGREEMENT

The Council leases office space for its office location in Sacramento, California. On February 1, 2017, the Council signed a new sublease agreement that began February 1, 2017 and will expire December 31, 2020. Rent expenses totaled $24,220 and $24,804 for the years ended November 30, 2018 and 2017, respectively.

Future minimum lease payments as of November 30, are as follows:

2019	$ 24,885
2020	25,305
2021	2,135
Total	$ 52,325

NOTE 7 – COMMITMENTS AND CONTINGENCIES

The Council received a cooperative agreement grant from FEMA for an amount of $403,547 for the time period from August 1, 2018 to July 31, 2019: $227,000 for basic operations and $176,547 for supporting state projects designated by FEMA. As of November 30, 2018, there was a total of $281,857 remaining to be used by the Council for performance of various services in accordance with the terms of the grant.

During the fiscal year ending November 30, 2017, the previous grant monies available from 2015 and 2016, by extensions, were utilized in their entirety.

Subsection D-2

WSSPC FY 2017-2018 Income and Expense
December 1, 2017 through November 30, 2018

Western States Seismic Policy Council
Income and Expense
December 2017 through November 2018

Accrual Basis

	FEMA 2017	FEMA 2018	WSSPC
Ordinary Income/Expense			
Income			
401.0 · Interest Inc			
401.1 · Money Mkt Interest Income	0.00	0.00	216.81
401.2 · CD Interest Income	0.00	0.00	19.79
Total 401.0 · Interest Inc	0.00	0.00	236.60
410.0 · Membership Dues	0.00	0.00	1,700.00
450.0 · Grants Earned			
460.0 · FEMA Grants Earned			
460.13 · 2017 FEMA Grants Earned	211,961.65	0.00	0.00
460.14 · 2018 FEMA Grants Earned	0.00	121,690.21	0.00
Total 460.0 · FEMA Grants Earned	211,961.65	121,690.21	0.00
Total 450.0 · Grants Earned	211,961.65	121,690.21	0.00
Total Income	211,961.65	121,690.21	1,936.60
Gross Profit	211,961.65	121,690.21	1,936.60
Expense			
500.0 · P/R Expenses			
500.1 · Salary	87,731.92	43,450.96	0.00
500.2 · Benefits			
500.7 · Employee IRA Contribution			
500.701 · Employer IRA Contrib-forSutch	1,801.92	900.96	0.00
500.7 · Employee IRA Contribution - Other	0.00	0.00	0.00
Total 500.7 · Employee IRA Contribution	1,801.92	900.96	0.00
500.2 · Benefits - Other	11,814.55	5,035.28	0.00
Total 500.2 · Benefits	13,616.47	5,936.24	0.00
500.3 · Employer Contrib/Taxes	6,854.40	3,479.15	0.00
500.4 · Workers' Comp	563.25	435.89	0.00
500.5 · Payroll Service	1,563.73	1,350.22	0.00
Total 500.0 · P/R Expenses	110,329.77	54,652.46	0.00
506.0 · Prof Fees Accounting	9,062.00	0.00	0.00
507.0 · Prof Fees Consulting	4,960.00	6,233.90	0.00
510.0 · Office Supplies	1,645.06	1,629.71	313.78
515.0 · Telephone	1,452.57	725.27	0.00
520.0 · Printing	587.23	22.42	0.00
522.0 · Postage and Delivery	51.46	33.52	0.00
525.0 · Internet Services	1,260.49	1,394.36	0.00
530.0 · Staff Expenses			
530.1 · Staff Meals	392.60	0.00	9.79
530.2 · Staff Mileage	61.21	16.36	0.00
530.3 · Staff Transportation	731.96	70.00	0.00
530.4 · Staff Hotel	2,089.20	0.00	0.00
Total 530.0 · Staff Expenses	3,274.97	86.36	9.79
535.0 · Executive Committee Expense			
535.1 · Meals Exec Comm	179.86	0.00	719.16
535.2 · Mileage Exec Comm	337.23	28.08	0.00

Western States Seismic Policy Council
Profit & Loss
December 2017 through November 2018

	FEMA 2017	FEMA 2018	WSSPC
535.3 · Transportation Exec Comm	3,145.50	1,492.05	0.00
535.4 · Hotel Exec Comm	2,409.07	1,287.90	0.00
535.0 · Executive Committee Expense - Other	17.37	0.00	0.00
Total 535.0 · Executive Committee Expense	6,089.03	2,808.03	719.16
550.0 · Workshops/Projects			
550.10 · State Support - NV Billboards	0.00	15,000.00	0.00
550.2 · EQ Program Managers Meeting	18,067.74	0.00	0.00
550.4 · State Support-HI	33,419.91	1,862.66	57.50
550.9 · State Support - WY	0.00	26,986.52	0.00
Total 550.0 · Workshops/Projects	51,487.65	43,849.18	57.50
554.0 · Conferences			
554.12 · 2018 WSSPC Annual Meeting	6,325.42	0.00	-542.46
Total 554.0 · Conferences	6,325.42	0.00	-542.46
570.0 · Insurance			
570.1 · Liability Insurance	1,006.00	0.00	0.00
570.3 · Insurance Other	271.00	0.00	0.00
570.0 · Insurance - Other	0.00	0.00	0.00
Total 570.0 · Insurance	1,277.00	0.00	0.00
575.0 · Rent	13,965.00	10,255.00	0.00
580.0 · Bank Service Charges	99.00	0.00	0.00
583.0 · Miscellaneous Expenses	0.00	0.00	5.00
591.0 · Licenses and Permits	95.00	0.00	0.00
Total Expense	211,961.65	121,690.21	562.77
Net Ordinary Income	0.00	0.00	1,373.83
TOTAL	2,570.48		

Subsection D-3

FEMA FY 17 Cooperative Agreement
August 1, 2017 – August 31, 2018

Showing Budget and Allocation of Expenses to Tasks

in the Completed Work Plan

Western States Seismic Policy Council
FEMA FY 2017 Cooperative Agreement
August 1, 2017 - August 31, 2018
Cooperative Agreement #EMW-2017-CA-00096

PLANNED TASKS / EXPENSES	Aug 2017	Sep 2017	Oct 2017	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018	Apr 2018	May 2018	Jun 2018	Jul 2018	
SUMMARY PLANNED COSTS													
Total Cooperative Agreement Amount	279,833.00												
Amt Budgeted Per Month	16,145.41	17,145.45	16,200.45	18,145.45	23,118.25	22,255.45	49,865.45	18,123.00	16,190.45	49,552.75	16,145.45	16,945.44	
Cumulative Amount Budgeted	16,145.41	33,290.86	49,491.31	67,636.76	90,755.01	113,010.46	162,875.91	180,998.91	197,189.36	246,742.11	262,887.56	279,833.00	
Cumulative Budget Remaining	263,687.59	246,542.14	230,341.69	212,196.24	189,077.99	166,822.54	116,957.09	98,834.09	82,643.64	33,090.89	16,945.44	0.00	
SUMMARY ACTUAL COSTS													
Amt Expended Per Month	18,017.20	15,979.47	13,251.85	20,622.83	22,954.31	22,127.23	16,575.81	41,990.62	17,436.87	42,475.09	18,667.30	29,734.42	
Amount Expended to Date	18,017.20	33,996.67	47,248.52	67,871.35	90,825.66	112,952.89	129,528.70	171,519.32	188,956.19	231,431.28	250,098.58	279,833.00	
Cumulative Funds Remaining	261,815.80	245,836.33	232,584.48	211,961.65	189,007.34	166,880.11	150,304.30	108,313.68	90,876.81	48,401.72	29,734.42	0.00	
PLANNED MONTHLY COSTS - BASE PLAN $225	**16,145.41**	**17,145.45**	**16,200.45**	**18,145.45**	**23,118.25**	**22,255.45**	**49,865.45**	**18,123.00**	**16,190.45**	**49,552.75**	**16,145.45**	**16,945.44**	**279,833.00**
TASK 1.0 DEVELOP SEISMIC POLICIES	**1,100.00**	**1,237.26**	**2,249.21**	**2,798.50**	**6,572.80**	**2,560.21**	**2,800.00**	**2,800.00**	**2,304.20**	**9,386.65**	**2,497.00**	**2,821.00**	39,126.83
1.1 Develop & Adopt Policy Recommendations	600.00	800.00	749.21	1,198.50	480.00	800.00	900.00	900.00	1,004.20	900.00	1,297.00	1,100.00	
1.2 Conduct Board Meetings	500.00	437.26	1,500.00	1,600.00	6,092.80	1,760.21	1,900.00	1,900.00	1,300.00	8,486.65	1,200.00	1,721.00	
TASK 2.0 PROVIDE FORUMS	**1,500.00**	**1,002.89**	**2,446.25**	**2,097.00**	**1,300.00**	**3,350.06**	**4,215.00**	**3,696.85**	**3,630.93**	**11,802.50**	**2,300.00**	**1,996.00**	39,337.48
2.1 Hold WSSPC Annual Meeting (including Awards)	1,355.00	762.89	2,096.25	1,747.00	800.00	1,550.06	1,815.00	1,848.42	1,630.93	6,302.50	1,700.00	1,196.00	
2.2 Earthquake Program Managers Meeting	145.00	240.00	350.00	350.00	500.00	1,800.00	2,400.00	1,848.43	2,000.00	5,500.00	600.00	800.00	
TASK 3.0 PROVIDE OUTREACH AND EDUCATION	**5,357.39**	**5,642.50**	**4,285.00**	**4,219.56**	**5,518.00**	**4,499.98**	**4,096.39**	**5,397.49**	**4,597.70**	**4,342.43**	**4,792.39**	**4,647.38**	57,396.21
3.1 Website	1,362.00	1,600.00	1,200.00	1,500.00	1,500.00	1,200.00	1,000.00	1,000.00	1,400.00	1,442.43	1,400.00	1,800.00	
3.2 Quarterly Electronic Newsletter & Monthly Bulletins	2,960.39	3,142.50	2,185.00	2,719.56	3,018.00	2,199.98	2,296.39	3,097.49	2,700.00	2,900.00	3,392.39	2,847.38	
3.3 Annual Report *	0.00	0.00	0.00	0.00	1,000.00	1,100.00	800.00	1,000.00	497.70	0.00	0.00	0.00	
3.4 Conduct Community Education and Outreach	1,035.00	900.00	900.00	0.00	0.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	
TASK 4.0 MAINTAIN & ENCOURAGE PARTNERSHIPS	**1,038.00**	**1,478.04**	**502.60**	**830.00**	**1,230.00**	**510.20**	**761.06**	**313.75**	**342.19**	**301.29**	**499.90**	**1,081.06**	8,888.09
4.1 Maintain & Encourage Partnerships	52.00	986.00	300.00	330.00	230.00	100.00	381.06	213.75	242.19	201.29	399.90	581.06	
4.2 Affiliate Member Program	986.00	492.04	202.60	500.00	1,000.00	410.20	380.00	100.00	100.00	100.00	100.00	500.00	
TASK 5.0 FINANCIAL AND GRANTS MANAGEMENT	**7,150.02**	**6,159.76**	**5,467.39**	**6,200.39**	**7,872.45**	**7,985.00**	**7,468.00**	**5,914.91**	**4,065.43**	**3,886.88**	**5,431.16**	**5,150.00**	72,751.39
5.1 Manage Cooperative Agreement	1,850.00	1,200.00	1,138.00	810.39	1,372.45	1,000.00	800.00	800.00	950.00	800.00	1,200.00	1,200.00	
5.2 Manage WSSPC Finances	1,700.00	1,959.76	1,329.39	890.00	1,500.00	2,085.00	2,650.00	2,277.55	1,000.00	1,200.00	1,800.00	1,650.00	
5.3 Maintain Office and Support Personnel	3,600.02	3,000.00	3,000.00	4,500.00	5,000.00	4,900.00	4,018.00	2,837.36	2,115.43	1,886.88	2,431.16	2,300.00	
TASK 6.0 OUTCOMES REPORT	**0.00**	**625.00**	**1,250.00**	**0.00**	**625.00**	**1,250.00**	**625.00**	**0.00**	**1,250.00**	**0.00**	**625.00**	**1,250.00**	7,500.00
6.1 Prepare quarterly Outcomes Reports	0.00	625.00	1,250.00	0.00	625.00	1,250.00	625.00	0.00	1,250.00	0.00	125.00	0.00	
6.2 Prepare final Outcomes Report	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	500.00	1,250.00	
TOTAL BASE PLAN													225,000.00
TASK 7.0 SUPPORT STATES $54,833.00	**0.00**	**1,000.00**	**0.00**	**2,000.00**	**0.00**	**2,100.00**	**29,900.00**	**0.00**	**0.00**	**19,833.00**	**0.00**	**0.00**	54,833.00
7.1 Support Travel to NEPM $19,833.00										19,833.00			
a. R VI New Mexico													
b. R VIII Montana													

Western States Seismic Policy Council
FEMA FY 2017 Cooperative Agreement
August 1, 2017 - August 31, 2018
Cooperative Agreement #EMW-2017-CA-00096

c. R VIII Wyoming													
d. R IX Nevada													
e. R IX Hawaii													
f. R IX Guam													
g. R IX American Samoa													
h. R IX Northern Mariana Islands													
i. R X Alaska													
j. R X Idaho													
k. R X Washington													
7.2 Hawaii Workshop* **$35,000.00**		1,000.00		2,000.00		2,100.00	29,900.00						
a. Secure meeting space		1,000.00					13,000.00						
b. Support travel				2,000.00			16,900.00						
c. Support registration						2,100.00							
* Indicates Contracts are included in these tasks													

Western States Seismic Policy Council
FEMA FY 2017 Cooperative Agreement
August 1, 2017 - August 31, 2018
Cooperative Agreement #EMW-2017-CA-00096

ACTUAL TASKS / EXPENSES	Aug 2017	Sep 2017	Oct 2017	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018	Apr 2018	May 2018	Jun 2018	Jul 2018	
ACTUAL MONTHLY COST - BASE PLAN	**18,017.20**	**15,979.47**	**13,251.85**	**20,622.83**	**22,954.31**	**22,127.23**	**16,575.81**	**41,990.62**	**17,436.87**	**42,475.09**	**18,667.30**	**29,734.42**	
TASK 1.0 DEVELOP SEISMIC POLICIES	**461.85**	**1,818.94**	**1,218.06**	**1,271.23**	**4,153.08**	**1,390.61**	**1,165.59**	**51.44**	**1,440.34**	**3,932.95**	**1,033.67**	**235.02**	
1.1 Develop & Encourage Adoption of Policy Recommenda	170.16	1,448.20	566.54	0.00	242.88	212.64	1,070.44	25.72	1,008.24	871.61	0.00	39.17	
1.2 Conduct Board Meetings	291.69	370.74	651.52	1,271.23	3,910.20	1,177.97	95.15	25.72	432.10	3,061.34	1,033.67	195.85	
TASK 2.0 PROVIDE FORUMS	**461.84**	**46.34**	**623.19**	**635.61**	**437.15**	**1,679.82**	**1,615.89**	**1,616.80**	**5,785.35**	**13,330.09**	**-264.98**	**39.17**	
2.1 Hold WSSPC Annual Meeting (including Awards)	461.84	0.00	18.88	0.00	0.00	1,254.55	880.14	846.62	3,648.85	**7,350.31**	-264.98	**39.17**	
2.2 Earthquake Program Managers Meeting	0.00	46.34	604.31	635.61	437.15	425.27	735.75	770.18	2,136.50	5,979.78	0.00	0.00	
TASK 3.0 PROVIDE OUTREACH/PUBLIC EDUCATION	**7,856.63**	**6,998.26**	**5,080.35**	**5,289.00**	**6,109.74**	**6,314.17**	**5,998.25**	**10,528.80**	**5,170.28**	**5,209.08**	**8,649.46**	**5,671.40**	
3.1 Website	1,731.12	1,541.41	2,001.82	2,667.10	2,588.23	2,635.57	1,335.89	1,864.11	1,534.34	3,126.28	2,990.12	2,204.80	
3.2 Quarterly Electronic Newsletter & Monthly Bulletins	3,962.14	4,182.43	1,661.84	2,039.26	3,400.08	2,721.74	1,451.04	5,954.06	2,928.68	1,539.46	4,548.15	2,839.87	
3.3 Annual Report	0.00	0.00	434.69	503.19	48.57	935.60	2,545.27	2,659.19	587.23	0.00	0.00	0.00	
3.4 Conduct Community Education and Outreach	2,163.37	1,274.42	982.00	79.45	72.86	21.26	666.05	51.44	120.03	543.34	1,111.19	626.73	
TASK 4.0 MAINTAIN & ENCOURAGE PARTNERSHIPS	**996.61**	**208.55**	**660.96**	**768.03**	**412.86**	**106.32**	**380.61**	**334.35**	**360.08**	**90.56**	**25.84**	**352.54**	
4.1 Maintain & Encourage Partnerships	996.61	92.69	113.31	0.00	48.57	63.79	380.61	334.35	360.08	90.56	25.84	313.37	
4.2 Affiliate Member Program	0.00	115.86	547.65	768.03	364.29	42.53	0.00	0.00	0.00	0.00	0.00	39.17	
TASK 5.0 FINANCIAL AND GRANTS MANAGEMENT	**7,559.66**	**6,768.35**	**4,857.25**	**9,467.98**	**9,425.76**	**12,487.46**	**4,638.58**	**7,045.91**	**3,240.76**	**6,904.93**	**7,468.26**	**7,875.87**	
5.1 Manage Cooperative Agreement	3,269.37	2,803.73	910.58	331.05	510.01	637.91	261.66	1,954.68	888.21	135.83	1,188.72	705.07	
5.2 Manage WSSPC Finances	1,045.23	1,367.11	963.11	1,231.50	3,584.90	7,129.03	832.57	2,815.06	624.15	1,245.15	1,576.35	959.68	
5.3 Maintain Office and Support Personnel	3,245.06	2,597.51	2,983.56	7,905.43	5,330.85	4,720.52	3,544.35	2,276.17	1,728.40	5,523.95	4,703.19	6,211.12	
TASK 6.0 OUTCOMES REPORT	**680.61**	**139.03**	**75.54**	**26.48**	**194.29**	**42.53**	**142.73**	**604.41**	**1,440.06**	**135.83**	**1,703.37**	**1,717.51**	
6.1 Prepare quarterly Outcomes Reports	680.61	139.03	75.54	26.48	194.29	42.53	142.73	604.41	1,440.06	135.83	1,703.37	0.00	
6.2 Prepare final Outcomes Report	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,717.51	
TASK 7.0 SUPPORT STATES $54,833.00	**0.00**	**0.00**	**736.50**	**3,164.50**	**2,221.43**	**106.32**	**2,634.16**	**21,808.91**	**0.00**	**12,871.65**	**51.68**	**13,842.91**	
7.1 Support Travel to NEPM $19,833.00	0.00	0.00	0.00	264.84	0.00	0.00	0.00	0.00	0.00	12,849.01	0.00	4,967.91	
a. R VI New Mexico										1,210.96			
b. R VIII Montana										1,070.13			
c. R VIII Wyoming										1,514.52			
d. R IX Nevada										0.00			
e. R IX Hawaii										2,208.00			
f. R IX Guam										3,623.05			
g. R IX American Samoa										0.00		4,967.91	

Western States Seismic Policy Council
FEMA FY 2017 Cooperative Agreement
August 1, 2017 - August 31, 2018
Cooperative Agreement #EMW-2017-CA-00096

h. R IX Northern Mariana Islands										0.00			
i. R X Alaska										1,507.18			
j. R X Idaho										1,405.67			
k. R X Washington										309.50			
7.2 Hawaii Workshop **$35,000.00**	0.00	0.00	736.50	2,899.66	2,221.43	106.32	2,634.16	21,808.91	0.00	22.64	51.68	8,875.00	
a. Secure meeting space													
b. Support travel													
c. Support registration													
CONTRACTS / TOTAL	Aug 2017	Sep 2017	Oct 2017	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018	Apr 2018	May 2018	Jun 2018	Jul 2018	
Task 1.0													
Task 2.0													
Task 3.3 Copy, assemble, print tabs, bind Annual Report $600								600.00					
Task 4.0													
Task 5.0													
workshop meeting space $14,000		1,000.00					13,000.00						

Subsection D-4

FEMA FY18 Cooperative Agreement
August 1, 2018 – November 30, 2018

Showing Budget and Allocation of Expenses to Tasks

in the Work Plan

Western States Seismic Policy Council
NEHRP Earthquake Consortium and State Support
FY 2018 Cooperative Agreement Program Budget
Projected Monthly and Quarterly Costs

PLANNED TASKS / EXPENSES	Aug 2018	Sep 2018	4th Quarter	Oct 2018	Nov 2018	Dec 2018	1st Quarter	Jan 2019	Feb 2019	Mar 2019	2nd Quarter
SUMMARY PLANNED COSTS											
Total BASE PLAN Amount	227,000.00										
Amt Budgeted Per Month	16,249.00	16,549.00		16,379.00	19,923.00	18,309.00		19,279.00	20,713.15	18,123.02	
Cumulative Amount Budgeted	16,249.00	32,798.00		49,177.00	69,100.00	87,409.00		106,688.00	127,401.15	145,524.17	
Cumulative Budget Remaining	210,751.00	194,202.00		177,823.00	157,900.00	139,591.00		120,312.00	99,598.85	81,475.83	
SUMMARY ACTUAL COSTS											
Amt Expended Per Month	22,330.56	17,105.27									
Amount Expended to Date	20,556.63	37,661.90									
Cumulative Funds Remaining	206,443.37	189,338.10									
PLANNED MONTHLY COSTS - BASE PLAN $227,000	**16,249.00**	**16,549.00**		**16,379.00**	**19,923.00**	**18,309.00**		**19,279.00**	**20,713.15**	**18,123.02**	
TASK 1.0 DEVELOP SEISMIC POLICIES	**1,300.00**	**1,037.26**	**2,337.26**	**1,949.21**	**6,008.70**	**2,018.94**	**9,976.85**	**1,560.21**	**2,672.55**	**2,399.95**	**6,632.71**
1.1 Develop & Encourage Adoption of Policy Recommendations	600.00	500.00		749.21	998.50	400.00		800.00	910.55	900.00	
1.2 Conduct Board Meetings	700.00	537.26		1,200.00	5,010.20	1,618.94		760.21	1,762.00	1,499.95	
TASK 2.0 PROVIDE FORUMS	**1,500.00**	**1,002.89**	**2,502.89**	**896.44**	**697.00**	**637.15**	**2,230.59**	**1,138.56**	**2,615.00**	**2,142.47**	**5,896.03**
2.1 Hold WSSPC Annual Meeting (including Awards)	1,200.00	762.89		697.25	200.00	400.00		938.00	1,215.00	1,199.00	
2.2 Earthquake Program Managers Meeting	300.00	240.00		199.19	497.00	237.15		200.56	1,400.00	943.47	
TASK 3.0 PROVIDE OUTREACH AND EDUCATION	**5,960.98**	**6,771.15**	**12,732.13**	**5,985.00**	**3,636.29**	**6,130.46**	**15,751.75**	**4,602.05**	**5,821.54**	**7,352.49**	**17,776.08**
3.1 Website	1,718.88	2,041.41		2,200.00	1,417.00	1,812.00		1,200.00	1,550.00	1,355.00	
3.2 Quarterly Electronic Newsletter & Monthly Bulletins	3,154.64	3,455.74		2,885.00	2,219.29	3,318.00		2,299.05	2,296.54	4,097.49	
3.3 Annual Report	0.00	0.00		0.00	0.00	1,000.46		1,103.00	1,975.00	1,600.00	
3.4 Conduct Community Education and Outreach	1,087.46	1,274.00		900.00	0.00	0.00		0.00	0.00	300.00	
TASK 4.0 MAINTAIN & ENCOURAGE PARTNERSHIPS	**538.00**	**878.04**	**1,416.04**	**780.96**	**930.62**	**930.00**	**2,641.58**	**510.20**	**761.06**	**313.75**	**1,585.01**
4.1 Maintain & Encourage Partnerships	152.00	300.00		278.36	430.00	130.00		100.00	381.06	213.75	
4.2 Affiliate Member Program	386.00	578.04		502.60	500.62	800.00		410.20	380.00	100.00	
TASK 5.0 FINANCIAL AND GRANTS MANAGEMENT	**6,950.02**	**6,859.66**	**13,809.68**	**6,067.39**	**8,650.39**	**8,592.45**	**23,310.23**	**10,667.98**	**8,843.00**	**5,914.36**	**25,425.34**
5.1 Manage Cooperative Agreement	1,650.00	1,800.00		1,188.00	1,350.00	972.45		1,200.00	1,975.00	950.00	
5.2 Manage WSSPC Finances	1,700.00	1,959.66		1,879.39	1,100.39	2,120.00		4,667.98	3,268.00	2,527.00	
5.3 Maintain Office and Support Personnel	3,600.02	3,100.00		3,000.00	6,200.00	5,500.00		4,800.00	3,600.00	2,437.36	
TASK 6.0 OUTCOMES REPORT	**0.00**	**0.00**	**0.00**	**700.00**	**0.00**	**0.00**	**700.00**	**800.00**	**0.00**	**0.00**	**800.00**
6.1 Quarterly Outcomes Report	0.00	0.00		700.00	0.00	0.00		800.00	0.00	0.00	
6.2 Final Outcomes Report											
PLANNED MONTHLY COSTS	**16,249.00**	**16,549.00**		**16,379.00**	**19,923.00**	**18,309.00**		**19,279.00**	**20,713.15**	**18,123.02**	
QUARTER TOTALS			**32,798.00**				**54,611.00**				**58,115.17**

Western States Seismic Policy Council
NEHRP Earthquake Consortium and State Support
FY 2018 Cooperative Agreement Program Budget
Projected Monthly and Quarterly Costs

Apr 2019	May 2019	Jun 2019	3rd Quarter	Jul 2019		
17,410.00	30,829.85	16,549.00		16,686.98		
162,934.17	193,764.02	210,313.02		227,000.00		
64,065.83	33,235.98	16,686.98		0.00		
						Subtask
					TOTAL	**TOTAL**
17,410.00	**30,829.85**	**16,549.00**		**16,686.98**	227,000.00	
2,474.20	**7,550.10**	**2,597.00**	**12,621.30**	**1,130.10**	32,698.22	
974.20	1,118.00	1,097.00		800.00		9,847.46
1,500.00	6,432.10	1,500.00		330.10		22,850.76
2,630.45	**11,058.05**	**2,100.00**	**15,788.50**	**0.00**	26,418.01	
1,630.45	7,058.05	1,600.00		0.00		16,900.64
1,000.00	4,000.00	500.00		0.00		9,517.37
5,197.73	**4,942.43**	**5,952.10**	**16,092.26**	**5,847.38**	68,199.60	
1,600.00	2,042.00	2,160.00		2,100.00		21,196.29
2,600.03	2,900.43	3,792.10		3,247.38		36,265.69
997.70	0.00	0.00		0.00		6,676.16
0.00	0.00	0.00		500.00		4,061.46
242.19	**201.29**	**399.90**	**843.38**	**581.06**	7,067.07	
242.19	201.29	399.90		581.06		3,409.61
0.00	0.00	0.00		0.00		3,657.46
5,965.43	**7,077.98**	**5,500.00**	**18,543.41**	**7,928.44**	89,017.10	
1,465.00	1,377.70	700.00		1,400.00		16,028.15
2,300.00	2,600.28	1,900.00		1,728.44		27,751.14
2,200.43	3,100.00	2,900.00		4,800.00		45,237.81
900.00	**0.00**	**0.00**	**900.00**	**1,200.00**	3,600.00	
900.00	0.00	0.00		400.00		2,800.00
				800.00		800.00
17,410.00	**30,829.85**	**16,549.00**		**16,686.98**	227,000.00	227,000.00
			64,788.85	**16,686.98**		

Western States Seismic Policy Council
NEHRP Earthquake Consortium and State Support
FY 2018 Cooperative Agreement Program Budget
Projected Monthly and Quarterly Costs

PLANNED MONTHLY COSTS - STATE SUPPORT $176,547		Aug 2018	Sep 2018	4th Quarter	Oct 2018	Nov 2018	Dec 2018	1st Quarter	Jan 2019	Feb 2019	Mar 2019	2nd Quarter
7.1 GUAM	$30,000				8,000.00			8,000.00	3,000.00	7,000.00	12,000.00	22,000.00
7.2.1 HAWAII-1	$15,000		3,750.00	3,750.00			3,750.00	3,750.00			3,750.00	3,750.00
7.2.2 HAWAII -2	$15,000	8,000.00		8,000.00						7,000.00		7,000.00
7.3 IDAHO	$30,424										3,000.00	3,000.00
7.4 NEVADA	$35,123		18,000.00	18,000.00								
7.5 WYOMING	$27,000		9,000.00	9,000.00	9,000.00	9,000.00		18,000.00				
7.6 EARTHQUAKE PROGRAM MANAGERS	$24,000											
American Samoa, CNMI. Guam, Hawaii, Idaho, Nevada, New Mexico, Washington, Wyoming												
MONTHLY TOTALS		8,000.00	30,750.00		17,000.00	9,000.00	3,750.00		3,000.00	14,000.00	18,750.00	
QUARTER TOTALS				38,750.00				29,750.00				35,750.00

Western States Seismic Policy Council
NEHRP Earthquake Consortium and State Support
FY 2018 Cooperative Agreement Program Budget
Projected Monthly and Quarterly Costs

Apr 2019	May 2019	Jun 2019	3rd Quarter	Jul 2019	TOTAL STATES	
					30,000.00	
		3,750.00	3,750.00		15,000.00	
					15,000.00	
6,060.00			6,060.00	21,364.00	30,424.00	
17,123.00			17,123.00		35,123.00	
					27,000.00	
	24,000.00		24,000.00		24,000.00	
					176,547.00	
23,183.00	24,000.00	3,750.00		21,364.00		
			50,933.00	21,364.00	176,547.00	

Western States Seismic Policy Council
NEHRP Earthquake Consortium and State Support
FY 2018 Cooperative Agreement Program Budget
Projected Monthly and Quarterly Costs

ACTUAL TASKS / EXPENSES	Aug 2018	Sep 2018	4th Quarter	Oct 2018	Nov 2018	Dec 2018	1st Quarter	Jan 2019	Feb 2019	Mar 2019	2nd Quarter
ACTUAL MONTHLY COST - BASE PLAN											
TASK 1.0 DEVELOP SEISMIC POLICIES	**295.65**	**569.39**	**865.04**	**2,742.37**	**6,004.45**	**0.00**		**0.00**	**0.00**	**0.00**	
1.1 Develop & Encourage Adoption of Policy Recommendations	0.00	71.18		645.28	45.64						
1.2 Conduct Board Meetings	295.65	498.21		2,097.09	5,958.81						
TASK 2.0 PROVIDE FORUMS	**246.38**	**0.00**	**246.38**	**299.58**	**68.45**	**0.00**		**0.00**	**0.00**	**0.00**	
2.1 Hold WSSPC Annual Meeting (including Awards)	0.00	0.00		23.04	0.00						
2.2 Earthquake Program Managers Meeting	246.38	0.00		276.54	68.45						
TASK 3.0 PROVIDE OUTREACH/PUBLIC EDUCATION	**5,891.77**	**6,567.01**	**12,458.78**	**5,257.56**	**2,777.17**	**0.00**		**0.00**	**0.00**	**0.00**	
3.1 Website	2,343.90	1,185.28		2,930.02	1,248.48						
3.2 Quarterly Electronic Newsletter & Monthly Bulletins	2,858.00	5,097.04		2,143.18	1,528.69						
3.3 Annual Report	0.00	0.00		138.27	0.00						
3.4 Conduct Community Education and Outreach	689.87	284.69		46.09	0.00						
TASK 4.0 MAINTAIN & ENCOURAGE PARTNERSHIPS	**418.84**	**871.87**	**1,290.71**	**1,083.11**	**730.12**	**0.00**		**0.00**	**0.00**	**0.00**	
4.1 Maintain & Encourage Partnerships	418.84	871.87		1,083.11	730.12						
4.2 Affiliate Member Program	0.00	0.00		0.00	0.00						
TASK 5.0 FINANCIAL AND GRANTS MANAGEMENT	**13,359.06**	**8,705.55**	**22,064.61**	**6,516.98**	**8,190.34**	**0.00**		**0.00**	**0.00**	**0.00**	
5.1 Manage Cooperative Agreement	221.74	1,245.53		645.26	114.08						
5.2 Manage WSSPC Finances	1,897.12	1,494.64		944.84	1,186.44						
5.3 Maintain Office and Support Personnel	11,240.20	5,965.38		4,926.88	6,889.82						
TASK 6.0 OUTCOMES REPORT	**344.93**	**391.45**	**736.38**	**414.81**	**45.63**	**0.00**		0.00	0.00	0.00	
6.1 Prepare quarterly Outcomes Reports	0.00	0.00		414.81	45.63						
6.2 Prepare final Outcomes Report	344.93	391.45		0.00	**0.00**						
TOTAL BASE PLAN	20,556.63	17,105.27	37,661.90	16,314.41	17,816.16						

Western States Seismic Policy Council
NEHRP Earthquake Consortium and State Support
FY 2018 Cooperative Agreement Program Budget
Projected Monthly and Quarterly Costs

Apr 2019	May 2019	Jun 2019	3rd Quarter	Jul 2019
0.00	**0.00**	**0.00**		**0.00**
0.00	**0.00**	**0.00**		**0.00**
0.00	**0.00**	**0.00**		**0.00**
0.00	**0.00**	**0.00**		**0.00**
0.00	**0.00**	**0.00**		**0.00**
0.00	0.00	0.00		0.00

Western States Seismic Policy Council
NEHRP Earthquake Consortium and State Support
FY 2018 Cooperative Agreement Program Budget
Projected Monthly and Quarterly Costs

ACTUAL MONTHLY COST - STATE SUPPORT $176,547		Aug 2018	Sep 2018	4th Quarter	Oct 2018	Nov 2018	Dec 2018	1st Quarter	Jan 2019	Feb 2019	Mar 2019	2nd Quarter
7.1 GUAM	$30,000	49.28			1,129.20	638.85						
7.2.1 HAWAII-1 (HETAC)	$15,000	24.64			276.54	3,345.72						
7.2.2 HAWAII -2 (PSA)	$15,000	0.00	35.59		0.00	0.00						
7.3 IDAHO	$30,424	0.00			46.09	273.79						
7.4 NEVADA	$35,123	886.96			92.18	15,228.16						
7.5 WYOMING	$27,000	813.05	14,424.71		11,138.05	1,494.93						
7.6 EARTHQUAKE PROGRAM MANAGERS	$24,000	0.00			0.00	0.00						
American Samoa, CNMI. Guam, Hawaii, Idaho, Nevada, New Mexico, Washington, Wyoming												
MONTHLY TOTALS		1,773.93	14,460.30		12,682.06	20,981.45	0.00		0.00	0.00	0.00	
QUARTER TOTALS				16,234.23								0.00

Western States Seismic Policy Council
NEHRP Earthquake Consortium and State Support
FY 2018 Cooperative Agreement Program Budget
Projected Monthly and Quarterly Costs

Apr 2019	May 2019	Jun 2019	3rd Quarter	Jul 2019	TOTAL STATES
					1,817.33
					3,646.90
					35.59
					319.88
					16,207.30
					27,870.74
					0.00
					49,897.74
0.00	0.00	0.00		0.00	
			0.00	0.00	16,234.23

Section E

ADOPTED POLICY RECOMMENDATIONS

Summary of Policies

Subsection E-1

WSSPC Policy Committees

WSSPC Policy Committees

WSSPC uses policy committees – consisting of members, members' agency representatives, and affiliate members – to develop and provide initial review of WSSPC's earthquake and tsunami policy recommendations. Final review and adoption of the policy recommendations is made by WSSPC members at the Annual Business Meeting. There are three standing policy committees: Basin and Range Province Committee, Engineering, Construction, and Building Codes Committee, and Tsunami Hazard Mitigation Committee.

Key:

EM = Emergency Management representative
GS = Geological Survey representative
SSC = State Seismic Commission/Council representative

Basin and Range Province Committee

The Basin and Range Province Committee (BRPC) seeks to promote the understanding and study of seismic hazards in the Basin and Range Province (BRP) of the western U.S., and to provide advice and recommendations to policy-making bodies regarding seismic hazards and risk in that region.

Basin and Range Province
Image: USGS

Goals pursued by the BRPC include promoting scientific research and emergency management functions in the BRP, establishing post-earthquake technical information clearinghouses, establishing informal cooperative agreements between states for technical assistance in the event of a damaging earthquake anywhere within the BRP, and facilitating information dissemination regarding the latest technical research and emergency response issues in the BRP.

2018 Chair: Richard Koehler, Nevada GS

Rick Allis, Utah GS
Karen Berry, Colorado GS
Wendy Blackwell, New Mexico EM
Steven Boand, Colorado EM
Steve Bowman, Utah GS
Caleb Cage, Nevada EM
Erin Campbell, Wyoming GS
Bob Carey, Utah EM
Susan Cleverley, Idaho EM
Michael Conway, Arizona GS
John Crofts, Utah EM
Nelia Dunbar, New Mexico GS
Jim Faulds, Nevada GS
Melinda Gibson, Wyoming GS
Lucrecia Hernandez, Arizona EM
Dan Koning, New Mexico GS
John Metesh, Montana GS
Phil Pearthree, Arizona GS
Brad Richy, Idaho EM
Wendy Smith-Reeve, Arizona EM
Mike Stickney, Montana GS
Kyle Sturgill-Simon, Montana EM
Janell Woodward, Nevada EM
Seth Wittke, Wyoming GS

Engineering, Construction, and Building Codes Committee

The Engineering, Construction, and Building Codes Committee considers the need for and requirements of seismic building codes, incentives for building owners to retrofit older buildings, as well as providing infrastructure guidelines that can be put into practice.

Members:

2018 Chair: Peter McDonough, Utah SSC

Leon Berrett, Utah SSC
Rob Jackson, Colorado SSC
Chris Knight, City of Las Vegas
Keith Knudsen, USGS
Ronald L. Lynn, Nevada SSC
Mike Mahoney, Federal Emergency Management Agency
Jay Raskin, Oregon SSC
Woody Savage, U.S. Geological Survey, Emeritus
Buzz Scher, Alaska SSC
Fred Turner, California SSC
Yumei Wang, Oregon SSC
Barry Welliver, Utah SSC

Tsunami Hazard Mitigation Committee

The Tsunami Hazard Mitigation Committee focuses on developing policies based on the newest technology and science.

Members:

2018 Chair: Maximilian Dixon, Washington EM

Jonathan Allan, Oregon GS
Ryan Arba, California EM
Brad Avy, Oregon GS
Dan Belanger, Alaska EM
Jacinta Brown, American Samoa EM
George Cabrera, CNMI EM
Andrea Chatman, Hawaii SSC
Tim Cook, Washington EM
Leo Rustum Espia, Guam EM
Robert Ezelle, Washington EM
Corina Forson, Washington GS
Mark Ghilarducci, California EM
Angie Lane, Oregon EM
Steve Masterman, Alaska GS
Richard McCarthy, California SSC
Kevin Miller, California EM
Lealofisa Moliga-Tilei, American Samoa EM
Brent Nichols, Alaska EM
Dave Norman, Washington GS
Ann Ogata-Deal, Hawaii SSC
Andrew Phelps, Oregon EM
Kevin Richards, Hawaii EM
Althea Rizzo, Oregon EM
Buzz Scher, Alaska SSC
Mike Sutton, Alaska EM
Robert White, British Columbia EM
Rick Wilson, California GS

Subsection E-2

History of WSSPC Policy Recommendations: 1997-2018

History of WSSPC Policy Recommendations
1997-2018

Adoption Status	Title	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
PR 18-1	Earthquake and Tsunami Planning Scenarios													A 09-1	>>>>>	>>>>>	R 12-1	>>>>>	>>>>>	R 15-1	>>>>>	>>>>>	R 18-1
PR 18-2	Developing Earthquake and Tsunami Risk-Reduction Strategies							A 03-1	>>>>>	>>>>>	R 06-1	>>>>>	>>>>>	R 09-2	>>>>>	>>>>>	R 12-2	>>>>>	>>>>>	R 15-2	>>>>>	>>>>>	R 18-2
PR 18-3	Definitions of Recency of Surface Faulting for the Basin & Range Province	A 97-1	>>>>>	>>>>>	>>>>>	>>>>>	R 02-3	>>>>>	>>>>>	R 05-2	>>>>>	>>>>>	R 08-2	>>>>>	>>>>>	R 11-2	>>>>>	>>>>>	W	R 15-3	>>>>>	>>>>>	R 18-3
PR 18-4	Identification and Mitigation of Non-Ductile Concrete Buildings																			A 15-4	>>>>>	>>>>>	R 18-4
PR 17-1	Improving Tsunami Public Education, Mitigation, and Warning Procedures for Distant and Local Sources			A 99-1	>>>>>	>>>>>	R 02-1	>>>>>	>>>>>	R 05-1	>>>>>	>>>>>	R 08-1	>>>>>	>>>>>	R 11-1	>>>>>	>>>>>	R 14-1	>>>>>	>>>>>	R 17-1	>>>>>
PR 17-3	Earthquake Monitoring Networks	A 97-4	>>>>>	>>>>>	>>>>>	>>>>>	R 02-5	>>>>>	>>>>>	R 05-3	>>>>>	>>>>>	R 08-3	>>>>>	>>>>>	R 11-3	>>>>>	>>>>>	R 14-3	>>>>>	>>>>>	R 17-3	>>>>>
PR 17-4	Identification and Mitigation of Unreinforced Masonry Structures					>>>>>							A 08-4	>>>>>	>>>>>	R 11-4	>>>>>	>>>>>	R 14-4	>>>>>	>>>>>	R 17-4	>>>>>
PR 17-7	Earthquake Early Warning Systems														A 10-9	>>>>>	>>>>>	W	R 14-7	>>>>>	>>>>>	R 17-7	>>>>>
PR 17-8	Seismic Design and Construction of New Schools														A 10-7	>>>>>	>>>>>	R 13-7	>>>>>	>>>>>	W	R 17-8	>>>>>
PR 16-1	Rapid and EffectiveTsunami Identification and Response					A 01-1 & 01-2	>>>>>	>>>>>	R 04-1 & 04-2	>>>>>	>>>>>	R 07-1 & 07-2	>>>>>	>>>>>	R 10-1 & 10-2	>>>>>	>>>>>	R 13-1	>>>>>	>>>>>	R 16-1	>>>>>	>>>>>
PR 16-3	Post-Earthquake Technical Clearinghouses					A 01-3	>>>>>	>>>>>	R 04-3	>>>>>	>>>>>	R 07-3	>>>>>	>>>>>	R 10-3	>>>>>	>>>>>	R 13-3	>>>>>	>>>>>	R 16-3	>>>>>	>>>>>
PR 16-4	Seismic Provisions in the 2015 International Building Codes					A 01-4	>>>>>	>>>>>	R 04-4	>>>>>	>>>>>	R 07-4	>>>>>	>>>>>	R 10-4	>>>>>	>>>>>	R 13-4	>>>>>	>>>>>	R 16-4	>>>>>	>>>>>
PR 16-10	Joint Policy for the Evaluation and Seismic Remediation of School Buildings																	A 13-10	>>>>>	>>>>>	R 16-10	>>>>>	>>>>>
PR 16-11	Reliability of Lifeline Services																	A 13-11	>>>>>	>>>>>	R 16-11	>>>>>	>>>>>
PR 16-12	Earthquake Actuated Automatic Gas Shutoff Devices																	A 13-12	>>>>>	>>>>>	R 16-12	>>>>>	>>>>>
PR 13-6	Post-Earthquake Information Management System											A 07-6	>>>>>	>>>>>	R 10-6	>>>>>	>>>>>	R 13-6	>>>>>	>>>>>	W		

Key: A = Adopted R = Re-adopted D=Discontinued N=Not Adopted W= Withdrawn/Returned to Committee

History of WSSPC Policy Recommendations
1997-2018

Adoption Status	Title	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
D	Development of National Earthquake Hazard Risk Mitigation Priorities	A 97-3	>>>>>	>>>>>	>>>>>	>>>>>	D																
D	Developing Guidelines for Fault Trace Setbacks	A 97-2	>>>>>	>>>>>	>>>>>	>>>>>	R 02-4	>>>>>	>>>>>	D													
D	Building Safe and Strong to Reduce Vulnerability to Earthquakes through Partnerships and Code Adoption						A 02-2	>>>>>	>>>>>	D													
D	Priorities for Applied Research on Earthquake Hazards								A 04-6	>>>>>	>>>>>	D											
D	Supporting Non-technical Explanation of USGS Uncertainty Maps to Accompany Probabilistic Seismic Hazard Maps								A 04-7	>>>>>	>>>>>	D											
D	Identification and Potential Mitigation of Seismically Vulnerable School Buildings														A 10-8	>>>>>	>>>>>	D					
D	Basin and Range Province Earthquake Working Group(s)								A 04-5	>>>>>	>>>>>	R 07-5	>>>>>	>>>>>	R 10-5	>>>>>	>>>>>	D					
D	Earthquake Emergency Handbook for First Responders and Incident Commanders															A 11-5	>>>>>	>>>>>	R 14-5	>>>>>	>>>>>	D	
Proposed	To Reduce the Earthquake Vulnerabiity of Existing Public Buildings and Schools								N														
Proposed	Generic State Executive Order for Earthquake Safety for Existing State-Owned Buildings									N													

Key: A = Adopted R = Re-adopted D=Discontinued N=Not Adopted W= Withdrawn/Returned to Committee

Subsection E-3

Policy Recommendations Adopted in 2018

WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 18-1

Earthquake and Tsunami Planning Scenarios

Policy Recommendation 18-1

WSSPC strongly encourages states, provinces, territories, First Nations, tribes, and local governments to establish an active program to produce Earthquake and/or Tsunami Planning Scenarios for areas with high risk and vulnerability. WSSPC also recommends that state and federal agencies and potential private partners support the production of these Planning Scenarios through their funding resources and in-kind services.

Executive Summary

Earthquake and tsunami planning scenarios provide policy makers, stakeholders, and emergency preparedness personnel with realistic assessments of the areas and types of structures and lifelines that are at most risk of damage, and estimated human casualties. Equally important, scenarios identify areas and infrastructure that are most likely to sustain little or no damage and remain functional following an earthquake, thereby minimizing the placement of valuable response assets in areas where they may not be needed.

The cost to prepare planning scenarios, and to update them regularly, is insignificant compared to the information gained and the future savings from reduced losses to infrastructure, business economics, and human life when the information is used to develop effective seismic-safety policies. Minimizing future earthquake and tsunami damage through prior planning, loss-reduction measures, and providing information to facilitate quick recovery is critical for promoting resilient communities.

Background

The U.S. Geological Survey indicates that losses to the U.S. built environment and to the U.S. economy from natural geologic hazards amount to tens of billions of dollars every year, and the cost of these losses continues to increase. A fundamental reason for this increase is the continued development of population centers and infrastructure in areas known to have significant natural hazards. Policy makers and public agencies at all levels of government must balance the desired needs for community growth and development with concerns for ensuring the safety of the citizenry. Knowledgeable professionals must provide government decision makers, community planners, and developers with factual, timely, and unbiased scientific and engineering assessments of a community's vulnerability to geologic hazards. Planning scenarios have proven to be an effective means for communicating these risks.

Earthquake and Tsunami Planning Scenarios have been prepared for several areas in the western U.S. over the past two decades and have resulted in numerous initiatives to reduce future losses (see Appendix 1). A planning scenario describes a realistic event and the estimated resulting damage and casualties in the affected areas. A scenario may describe the fault rupture that initiates the earthquake, expected ground motion and acceleration, secondary effects triggered by the earthquake, potential extent of tsunami inundation and flow depths, anticipated emergency response activities and needs, expected structural losses to the building stock and lifelines, and human casualties, as well as areas and types of infrastructure least likely to be damaged or destroyed. The purpose of a scenario is to provide accurate information that can assist governments and developers in engineering, planning, and protecting vulnerable facilities from the destructive effects of a future earthquake; prioritizing emergency relief operations in areas likely to suffer the greatest damage; or planning and conducting emergency response training exercises.

Appendix 1: Completed earthquake and tsunami planning scenarios

Following the devastating eruption of Mount St. Helens in 1980, President Carter requested the National Security Council to consider the implications of the occurrence of a large damaging earthquake in California. The results of this analysis were presented by FEMA in 1981. One of the major conclusions was that it was unlikely that the collective emergency response capabilities of all levels of government and the private sector would be adequate to cope with a major destructive earthquake in metropolitan areas of California.

In response, the California Governor's Emergency Task Force on Earthquake Preparedness was established in February, 1981. Some 30 committees were formed to deal with improvement of the many emergency response functions that would be needed in such an earthquake emergency: e.g., communications, search and rescue, fire services, medical services, air transport, etc. Working with the Task Force, the California Geological Survey (CGS) developed the first two earthquake planning scenarios for the San Francisco Bay Area and the Greater Los Angeles Area. These two scenarios, funded by FEMA, were readily accepted, and a demand for additional scenarios covering other California metropolitan areas resulted in the production of eight more scenarios to date.

The State of Washington, through its Emergency Management Division of the Military Department, and the Earthquake Engineering Research Institute, prepared its first earthquake disaster scenario for the Seattle-Tacoma metropolitan area in 2001. This scenario described potential damage from the Seattle Fault, and predicts 1,600 deaths, 24,000 injured, police and fire departments overwhelmed, inadequate emergency and shelter services, nearly 40,000 buildings destroyed or rendered uninhabitable, $33 billion in damages and loss, more than 130 fires, and years of rebuilding and recovery. Since that time, the State released its digital Earthquake Scenario Catalog that includes 20 earthquake scenarios using sources that are consistent with the U.S. National Seismic Hazard Map. The project was a collaboration between the Federal Emergency Management Agency, the U.S. Geological Survey, the Washington State Department of Natural Resources, Western Washington University, and URS Corporation.

In 1996, the Nevada Bureau of Mines and Geology (NBMG) produced a detailed scenario for a Reno-Sparks-Carson City earthquake (NBMG Special Report 20) and in 2014, published the results of a HAZUS study of potential losses from multiple earthquake scenarios for thirty eight communities (NBMG OFR 14-5). The Nevada Earthquake Safety Council (NESC) in conjunction with the Federal Emergency Management Agency developed the Nevada Earthquake Risk

Mitigation Plan (2001) outlining public awareness, preparedness, emergency response, and recovery plans that will contribute towards making Nevada a seismically resilient state.

More recently, the USGS, in collaboration with the California Governor's Office of Emergency Services (CalOES) and California Geological Survey (CGS) and many community agencies and organizations, has published *The ShakeOut Scenario – Effects of a Potential M7.8 Earthquake on the San Andreas Fault in Southern California* (USGS Open File Report 2008-1150; CGS Preliminary Report 25). Under this scenario, if no additional preparedness and mitigation actions are taken, the resulting damage will cause 2,000 deaths, 50,000 injuries, and $200 billion in damage along with severe, long-lasting disruptions. In 2014, the same groups at the USGS, CGS, and CalOES also completed a similar scenario evaluating the impacts from a large statewide tsunami originating from the Alaska Subduction Zone, which was published in *The SAFRR (Science Application for Risk Reduction) Tsunami Scenario* (USGS Open File Report 2013-1170 and CGS Special Report 229). The USGS SAFRR group and its state partners continue to work on similar useful scenarios for various hazards and vulnerable regions.

Other states with earthquake potential have also prepared these types of scenarios on a formal basis. In Washington, the Cascadia Region Earthquake Workgroup (CREW), a coalition of private and public representatives, developed several scenario reports detailing the potential effects of a hypothetical magnitude 9.0 Cascadia subduction zone earthquake, as well as shallow crustal earthquakes in the forearc. In 2007, Oregon completed an initial step in quantifying structures in the state that would be susceptible to damage from an earthquake in its publication *Statewide Seismic Needs Assessment Using Rapid Visual Screening.* In 2015, the Earthquake Engineering Research Institute (EERI) and the Utah Seismic Safety Commission completed a scenario report outlining potential hazards and loss estimates from a hypothetical magnitude 7.0 earthquake on the Salt Lake City Segment of the Wasatch fault.

The ASHSC has produced a report describing a set of guidelines for developing community specific earthquake scenarios including specific data needs and resources to assist such efforts (http://seismic.alaska.gov/download/ashsc_meetings_minutes/Guide_Concept_Level_Scenario_Alaska.pdf). An earthquake planning scenario is being developed for the City of Kodiak. This scenario is a cooperative effort involving the Alaska Seismic Hazards Safety Commission (ASHSC), Alaska Division of Homeland Security & Emergency Management, city and borough government, FEMA, and U.S. Coast Guard. Additionally, the ASHSC has recently completed several studies funded by

EERI on the vulnerability of schools (Fairbanks North Star and Kenai Peninsula Boroughs) to earthquake damage based on rapid visual screening.

Hypothetical tsunami studies have been conducted for coastal communities throughout the western U.S. and other parts of the Pacific to provide guidance to local emergency management agencies in tsunami inundation assessment, evacuation planning, and public outreach. These studies have largely been funded through the National Tsunami Hazard Mitigation Program of the U.S. Department of Commerce/National Oceanic and Atmospheric Administration (NOAA) and involve collaborative efforts between state government agencies, universities, and emergency planning scientists. Tsunami inundation maps depicting both local- and distant-source tsunami inundation scenarios are now available for nearly every populated region of the California, Oregon, Hawaii, Washington, American Samoa, Guam, and CNMI coasts, as well as for over 25 coastal communities in Alaska.

The Montana Bureau of Mines and Geology estimated geometries and slip amounts for 18 Quaternary faults in Montana. The U.S. Geological Survey used these parameters to derive scenario earthquakes. EERI coordinated this effort and the resulting scenario earthquakes (plus two others for planning exercises) are available at: *https://earthquake.usgs.gov/scenarios/catalog/mt2016/*.

Appendix 2: Resources for scenario development

State emergency management agencies and geological surveys as well as the USGS have numerous maps and products which can help form the foundation for earthquake and tsunami planning and mitigation scenarios. Because these products are familiar to and vetted by many of the communities they are prepared for, scenarios based on these products will be simpler and more effective for communities, utilities, and businesses to utilize. These resources may also provide a cost savings to the scenario developers in their hazard assessments, and provide a bridge for improving collaboration between state and federal agencies working on the scenarios.

The Quaternary Fault and Fold Database for the Nation is a valuable resource for identifying credible earthquake sources and seismic zones to incorporate into realistic earthquake scenarios. Probabilistic earthquake-induced ground motions can be evaluated by region from various web sites maintained by the USGS Earthquake Hazards Program. Surficial geologic maps are available from state geological surveys, locally prepared hazard mitigation plans can provide a foundation for scenario development, and a wealth of geotechnical information can be obtained from state departments of transportation and local government engineering geologic investigation archives.

Other valuable analytical tools are available for incorporation into earthquake and tsunami planning and mitigation scenarios. HAZUS is a powerful risk assessment software program developed by FEMA for analyzing potential losses from earthquakes and tsunamis (as well as from other types of natural hazards). HAZUS combines current scientific and engineering knowledge with geographic information systems (GIS) technology to produce estimates of hazard-related damage before or after an earthquake. For HAZUS to be most effective, users should employ the latest census information and a current inventory of the built environment, including transportation and lifeline infrastructure.

Two other analytical tools are available from the USGS; these are ShakeMap and PAGER. ShakeMap combines measurements of ground shaking (actual or modeled) with information about local geology and earthquake location and magnitude to estimate shaking intensity variations within a geographic region. Produced maps are a valuable tool for emergency response, public information, loss estimation, earthquake planning and modeling, and post-earthquake engineering and scientific analyses.

PAGER (Prompt Assessment of Global Earthquakes for Response) is an automated system designed to rapidly estimate the number of people, cities, and regions that have been exposed to severe ground

shaking by an earthquake. PAGER products can be sent automatically to affected emergency responders, government agencies, and others with information as to the estimated scope of a potential disaster.

Over the past decade, NOAA has developed a suite of tsunami exercise handbooks for various sources around the Pacific. These handbooks start with earthquake and tsunami scenarios which are used to create a full set of information statements. States and communities use these handbooks and statements as background for response exercises. Past exercise handbooks are available on the NOAA website: *https://tsunami.gov/?page=exercises*.

WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 18-2

Developing Earthquake and Tsunami Risk-Reduction Strategies

Policy Recommendation 18-2

WSSPC strongly encourages states, provinces, territories, First Nations, tribes, and local governments to form public-private partnerships to develop and continually update long-term, comprehensive statewide and community-level earthquake and tsunami risk-reduction strategies as part of an all-hazards plan to reduce injury, loss of life, property damage and economic disruption from earthquakes and tsunamis.

Executive Summary

Given the high seismic activity and tsunami risk in the western states, provinces and territories, and the high risk of loss of life, property damage and economic loss due to earthquakes and related hazards, jurisdictions are encouraged to form partnerships that will develop earthquake and tsunami risk-mitigation plans and risk-reduction strategies that will benefit local communities. Mitigation policies and activities are long-term, multifaceted processes where effective coordination, collaboration and communication among partners are critical. Partnerships with the many state and regional collaborative efforts, involving emergency management and other agencies and private organizations that have been created in WSSPC states, provinces, and territories are critical in the effort to educate state and local policymakers about the importance of sound seismic and tsunami hazard policy.

Background

Mitigation of earthquake risks is a common interest among all the western states, territories, and provinces. FEMA's Report P-366 (April, 2017) *HAZUS® Estimated Annualized Earthquake Losses for the United States*, clearly shows that the western states are most at risk, with 81% (~$5 billion) of the nation's estimated annual dollar losses (~$6.1 billion) from earthquakes. Coastal states and territories in the Pacific region also have been identified as facing a high to very high tsunami hazard (Dunbar and Weaver, 2016). WSSPC, as a consortium of 13 western states, 3 Pacific territories, and a Canadian territory and province, is the ideal organization to promote the benefits of earthquake and tsunami risk-mitigation policies, to promote collaboration among its members and the federal government, and to share mitigation successes between WSSPC and other organizations. From its inception, WSSPC has strongly supported reduction of losses from seismic and tsunami events through policy recommendations and annual conferences.

The benefits of proper mitigation and planning is highlighted by cost/benefit studies that show for every FEMA dollar spent on mitigation, four dollars are saved in reduced disaster relief. In addition, FEMA grants to mitigate natural-hazard risks are expected to save lives and injuries in future events (Multihazard Mitigation Council, 2005).

It is the responsibility and duty of the geological and emergency management community to organize and disseminate key information concerning proper earthquake- and tsunami-risk mitigation. WSSPC encourages its partners to collaborate through multi-state projects and other organizations, such as the National Earthquake Hazards Reduction Program (NEHRP) and National Tsunami Hazard Mitigation Program (NTHMP), to facilitate accurate, consistent, and cost-effective mitigation practices. WSSPC partners should continue to seek potential mitigation outreach activities, mitigation plan development, or construction projects, some of which may be eligible for funding through various mitigation program grants from FEMA or the states/territories. These efforts complement FEMA's Pre-Disaster Mitigation initiatives within the 2018-2022 FEMA Strategic Plan, as well as the 2018-2023 NTHMP Strategic Plan.

Comprehensive statewide and local earthquake and tsunami hazard mitigation plans and strategies should include the following elements:

- Assessment of all earthquake and tsunami hazards to quantify and define the risk to communities;
- Assessment of infrastructure risks;
- Implementation of land-use and development policies to reduce exposure to earthquake and tsunami hazards;
- Adoption and enforcement of the International Building Codes for the seismic and tsunami design, inspection, and construction of new buildings and structures;
- Adoption of the International Existing Building Code for the maintenance and retrofit of seismically "at risk" structures;
- Support for design and construction of tsunami vertical evacuation structures where they are needed;
- Development and implementation of retrofit, redevelopment, grant, and abatement programs to help strengthen existing structures, where necessary;
- Support of continuing public-education efforts and public/private partnerships to raise awareness of seismically induced threats and build constituent support for earthquake hazard reduction programs.

Safety of communities and infrastructure can only be accomplished though diligent, informed, and coordinated efforts of regulators and stakeholders. WSSPC will continue to play a key role in that organization and communication effort.

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WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 18-3

Definitions of Recency of Surface Faulting for the Basin and Range Province

Policy Recommendation 18-3

WSSPC recommends that each state in the Basin and Range physiographic province (BRP), through consultation with state and federal geological surveys and other earthquake-hazard experts, define scientifically and societally relevant categories for recency of surface faulting (generally earthquake magnitude ≥**M** 6.5).

WSSPC further recommends that in the absence of information to the contrary, all Quaternary faults be considered to have the recency of activity documented in the USGS Quaternary fault and fold database until more adequate data can be developed.

Executive Summary

Fault recency definitions are limited to the Quaternary because this period of geologic time is considered by the scientific community to be most relevant to paleoseismic studies of earthquake faults (Machette and others, 2004). The recency class of a fault is the youngest class based on the demonstrated age of most recent surface faulting. Latest Pleistocene-Holocene faults are included within the definition of late Quaternary faults, and both latest Pleistocene-Holocene and late Quaternary faults are included in Quaternary faults.

Establishment/definition of surface-faulting recency categories are based on the ways that faults are portrayed on geologic maps and on the availability of geologic data in the BRP. Policy makers (owners, regulators, governmental agencies) should consult with state and federal geological surveys and other earthquake-hazard experts in using these recency categories and additional geologic data in developing definitions of hazardous faults to be considered in planning for development or infrastructure projects.

Examples of categories that are applicable for much of the BRP include the following:

Latest Pleistocene-Holocene fault – a fault whose movement in the past 15 ka has been large enough to break the ground surface.

Late Quaternary fault – a fault whose movement in the past 130 ka has been large enough to break the ground surface.

Quaternary fault – a fault whose movement in the past 2.6 Ma (Cohen and Gibbard, 2010) has been large enough to break the ground surface.

Background

The BRP is a large extensional to transtensional tectonic domain that contains thousands of normal-slip and a lesser number of strike-slip Quaternary faults involved in geologically recent deformation. Large earthquakes in the BRP, especially those associated with surface rupture, have occurred on faults with a wide range of recurrence intervals (time between successive surface-faulting earthquakes) and times since their most recent surface-faulting earthquakes. Many of the historic surface-faulting earthquakes in the BRP have ruptured multiple, distributed strands at the surface, which in some cases had significantly different geologic histories.

The tectonic behavior of Quaternary faults in the BRP differs from the more localized, higher slip-rate, chiefly strike-slip tectonics typical of plate boundary systems. These differences may warrant different approaches within the WSSPC region when categorizing recency of surface faulting. The examples of fault recency categories in this policy recommendation are considered appropriate for much of the BRP within the WSSPC region, and depend on whether the fault offsets, or is covered by, geologic materials of different ages. The recency categories are described in more detail below.

A **latest Pleistocene-Holocene** criterion (≤15 ka) for recency of faulting is based upon recognition of faulting in deposits known to be ≤15 kyr old that are widespread over much of the BRP. These deposits are chiefly associated with the last glacial maximum, and with large, well-dated pluvial lakes such as Lake Bonneville and Lake Lahontan. The deposits possess distinctive stratigraphy and geomorphology that can be reliably recognized by geologists without recourse to costly dating techniques. The latest Pleistocene-Holocene criterion conforms to usage in the U.S. Geological Survey Quaternary Fault and Fold Database of the United States (*http://earthquake.usgs.gov/hazards/*). However, because major historical earthquakes have occurred in the BRP on faults that do not show surficial evidence of previous latest Pleistocene-Holocene activity, the latest Pleistocene-Holocene span of 15 kyr is too short to encompass the range of average earthquake recurrence intervals on faults in the BRP.

A **late Quaternary** criterion (≤130 ka) for recency of faulting uses the onset of the Sangamon interglacial period as a datum and spans many of the average fault recurrence intervals in the BRP. All but possibly one of the historical surface-faulting earthquakes in the BRP (1887 Sonoran earthquake; Bull and Pearthree, 1988; Suter and Contreras, 2002) occurred on faults that show evidence of late Quaternary activity.

The **Quaternary** criterion (≤2.6 Ma) for recency of faulting represents the onset of a major climatic change to the current cycle of glacial/interglacial intervals, during which most of the surficial deposits and much

of the present landscape formed in the BRP. All historical surface-faulting earthquakes in the BRP occurred on faults that show evidence of Quaternary surface faulting. The Quaternary recency of activity criterion encompasses the average recurrence interval for essentially all faults that might produce future surface-faulting earthquakes (≥**M** 6.5) in the BRP.

Recency of Faulting, Fault Activity, and Seismic Hazard

The examples of recency of faulting categories in this policy recommendation are intended to fulfill the needs of a broad spectrum of users involved in evaluating and regulating/mitigating earthquake hazards in the BRP. Categories based on recency of faulting use easily obtained observational data and, as such, represent a first step toward defining fault activity or seismic hazard associated with faults. Future large, surface-rupturing earthquakes in the BRP most likely will occur on faults that display evidence of prior surface faulting during the late Quaternary (≤130 ka), and almost certainly on faults that display evidence of prior faulting in the Quaternary (≤2.6 Ma). Evaluation of fault activity and seismic hazard should consider timing of the most recent surface-faulting earthquake, and a well-constrained average recurrence interval and/or slip rate spanning multiple paleoearthquake cycles (McCalpin, 2009). Whether a fault within a particular recency category constitutes a hazard or not depends on the time frame of concern, the elapsed time since the most recent event, and the size and frequency of future earthquakes.

Appropriate recency of faulting criterion allow policy makers to develop guidelines for identifying potential surface-rupture and ground-motion sources and evaluate the seismic hazards they present to specific communities and infrastructure. Elapsed time since the most recent large earthquake and average earthquake recurrence intervals are critical parameters when determining fault activity, but those data must be evaluated in conjunction with other considerations related to type of facility, societal constraints (level of acceptable risk); and goals, costs, and benefits of risk reduction (Lund and others, 2016) when assessing seismic hazard. It is then up to policy makers in each state to decide what recency category constitutes a hazardous or active fault and what level of seismic risk is acceptable.

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WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 18-4

Identification and Mitigation of Non-Ductile Concrete Buildings

Policy Recommendation 18-4

WSSPC strongly encourages states, provinces, territories, First Nations, tribes, and local governments with moderate and high seismic hazards create programs to identify non-ductile concrete buildings and develop plans and policies that will effectively reduce these buildings' risks in their jurisdictions.

Executive Summary

Non-ductile concrete buildings represent a class of structures considered by earthquake risk managers to be particularly susceptible to significant damage and/or collapse during earthquakes, making them one of the most dangerous threats to life-safety and economic burdens for communities.

WSSPC strongly encourages jurisdictions to be proactive in reducing this threat to communities through legislatively mandated programs and/or municipally adopted ordinances.

Background

Non-ductile concrete buildings are a type of construction in which the walls and columns lack enough reinforcing steel to keep them from collapsing or being damaged beyond repair during earthquakes. These buildings can pose a great threat to life in major earthquakes because, although total collapse of these buildings is rare, just one collapse could cause hundreds of deaths. Ancillary damage due to collapse might include damage to adjacent buildings, prolonged closure of adjacent streets due to cleanup and re-build operations, and loss of work place or residence to numerous persons. In California, non-ductile concrete buildings are generally considered to have been constructed before 1980 and include archaic construction methods dating back to the early 1900s. Low ductility buildings were constructed in Oregon until the mid 1990s.

The 1971 San Fernando, California earthquake caused over $500 million in property damage in 1971 dollars (over $3 billion in 2017 dollars) and 65 deaths, due mainly to the collapse of older concrete buildings. A recent initiative by the City of Los Angeles calls for the assessment of all non-ductile concrete buildings constructed before January 13, 1977 and mandatory retrofitting within 30 years. Santa Monica, California, currently has a non-ductile concrete building ordinance.

The failure of these building types in the 1971 San Fernando, California earthquake directly resulted in significant changes to the building codes and standards for concrete buildings. Consequently, construction standards for concrete buildings since the late 1970's have been dramatically improved helping to provide adequate collapse resistance in earthquakes.

Due to the high costs of retrofits and the infrequent occurrence of collapse, it is difficult to justify the cost-effectiveness of retrofits unless the structure is in an area of high seismicity, where the probability of failure is much higher.

This building type is a noteworthy concern since many are of significant size and contain large numbers of occupants. The Mexico City earthquake (1985), Northridge earthquake (1994), and the Great Hanshin (Kobe) earthquake (1995) in Japan, as well as the more recent Christchurch New Zealand earthquake (2011), and Mexico City earthquake (2017) all underscore the vulnerability of non-ductile reinforced concrete structures and the need to mitigate the life safety and infrastructure hazards they pose.

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Subsection E-4

Policy Recommendations Adopted in 2017

WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 17-1

Improving Tsunami Public Education and Warning Procedures for Distant and Local Sources

Policy Recommendation 17-1

WSSPC recommends expanding the efforts by NOAA, the USGS, FEMA, and WSSPC members to enhance public education programs about potential impacts from local tsunamis and the need to evacuate threatened areas immediately after strong or sustained ground shaking; prioritizing those efforts, which have an immediate and direct impact on life-safety for locally-generated tsunamis, over deep-sea tsunami detection systems that have no benefit for local warnings. WSSPC also recommends robust, effective, and fully maintained implementation of the tsunami detection system by NOAA, as long as it is not at the expense of community-level tsunami preparedness, mitigation, and recovery planning.

Executive Summary

In the case of locally generated tsunamis, the time before impact is so brief that the most effective means for protecting the public is not through warning systems, but through sustained community outreach and education. The efforts of the U.S. Geological Survey (USGS) and National Oceanic and Atmospheric Administration (NOAA) to maintain the current array of the nation's seismic monitoring system, coastal tide gauges, and the deep-ocean tsunami detection system (DART) are vital to improve response and reduce loss of life from distant tsunamis. Buoys, sirens, and loudspeakers, etc., are meaningless if the general public does not know what to do in the critical few minutes following an earthquake that generates a deadly and damaging tsunami.

Effective community outreach and education requires sustained commitment by state and local governments partnering with the federal government through the National Tsunami Hazard Mitigation Program (NTHMP) to implement robust, long-term education programs reinforced by exercises and training, and subsequently measured and evaluated using social science surveys. The Tsunami Warning and Education Act (TWEA) provides the framework for the NTHMP collaboration and supports the full national effort to reduce loss of life from tsunamis. For this reason, continued support of the NTHMP by NOAA and/or reauthorization of TWEA is important.

Background

Tsunamis are among the most destructive and deadly hazard, not only to nearby coastal areas, but occasionally to regions thousands of miles from the source. According to the 2011 WSSPC paper titled: ***Tsunami Hazard Mitigation and Preparedness: A Perspective from State and Territory Tsunami Programs in the High Tsunami Risk Pacific Region***, eight significant tsunamis since 1946 have killed 392 people and caused over $1,600,000,000 in damages to WSSPC member states and territories. The 1946 and 1964 Alaskan earthquakes produced tsunamis that caused damage and/or loss of life in Hawaii, American Samoa and along the coasts of British Columbia, Washington, Oregon and California. The Pacific Tsunami Warning Center at Ford Island, Hawaii, and the National Tsunami Warning Center at Palmer, Alaska, were established as a result of these destructive tsunamis and because of the need to warn coastal populations of tsunamis from distant sources.

Pacific States, Provinces and Territories must also plan for locally generated near-shore tsunamis that provide little or no time to issue a general public warning of a destructive tsunami. Recent events in Japan (2011), Chile (2010), American Samoa (2009), and Sumatra (2004) validate findings that a well-educated and trained public is the most effective way to avoid catastrophic loss of life from a local tsunami. The 2013 Uniform California Earthquake Rupture Forecast (UCERF3) estimates a ten percent probability of a M 8.0 or greater earthquake somewhere along the Cascadia Subduction Zone (Cascadia Megathrust) in the next 30 years (Frankel and Petersen, 2013). During the past century, the Alaska-Aleutian Subduction Zone had a M 8.0 or greater earthquake on the average of every 16 years, four of which produced destructive tsunamis.

Therefore, it is vitally important to continually educate coastal residents, businesses, and visitors about the importance of immediate evacuation to high ground upon cessation of strong or sustained ground shaking. In areas where no high ground is nearby, vertical evacuation in approved engineered structures may be the only option to survive a tsunami impact. Members of coastal maritime communities exposed to tsunami hazards must also understand how to best protect life and property. Through the use of scientifically researched and developed tsunami inundation models, maps, and other products, community evacuation plans and guidance must be developed showing evacuation routing and safe zones both on land and at sea, and these plans should be exercised on a continual basis.

Currently, Congress only measures the TsunamiReady program and the Deep-ocean Assessment and Reporting of Tsunamis (DART) system. What should also be measured and acknowledged is community-level tsunami preparedness, mitigation, response, and recovery planning. These efforts are essential for making at-risk communities more resilient.

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WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 17-3

Earthquake Monitoring Networks

Policy Recommendation 17-3

WSSPC supports the continued expansion and modernization of earthquake monitoring networks as envisioned and articulated by the Advanced National Seismic System (ANSS), with emphasis on expanded strong-motion monitoring in areas prone to large earthquakes and in urban areas, including selected engineered structures; increased regional broadband seismograph instrumentation; increased geodetic instrumentation; and earthquake early warning capabilities. The resulting data will provide better understanding of future ground shaking potential, tsunami generation potential, more rapid information for emergency response, and insights for the improved design of more earthquake and tsunami-resistant construction.

Executive Summary

Earthquake monitoring and tsunami warning are essential to provide accurate and timely data and information on earthquakes and tsunamis that can damage buildings and infrastructure. Reliable and optimally useful monitoring must employ modern methods and technologies in conjunction with comprehensive regional coverage. Current challenges include obtaining funding to replace outdated, inadequate, analog weak-motion instrumentation with digital systems that include broadband and strong-motion sensors, and improving the operational efficiency and reliability of seismic networks. An important issue affecting many areas is the lack of sufficient and uniform geographic coverage in areas of relatively high earthquake hazard. Large and damaging earthquakes are not limited to the west coast. Of the thirty-one M>7 earthquakes that occurred in the lower 48 states during the past six decades, five occurred in the western states (nineteen occurred in California, five in the central and eastern U.S., and two in Washington). Yet many areas in the western states remain inadequately covered by modern instrumentation, as do large regions of Alaska. Support for the continuing expansion of the nation's monitoring networks will be crucial in the coming decades for refinement of seismic hazard maps and emergency planning, for acquisition of data for earthquake engineering research, and to implement earthquake early warning.

Background

Earthquake monitoring networks are essential both to respond effectively to earthquakes where and when they occur and to characterize future earthquake hazards. The earthquake parameters produced by modern seismic networks, when combined with historic earthquake catalogs and the paleoseismic record, are essential input for refining the National Seismic Hazard Map. Automated processing of earthquake information by seismic networks in the United States provides near-real-time information on earthquake locations, magnitudes, and patterns of moderate and damaging ground shaking. In the last decade, seismologists have expanded the capabilities of the seismic monitoring systems throughout the nation to routinely produce ShakeMaps for quakes with M>3.5, fault rupture orientations, fault slip distributions and aftershock probabilities for quakes with M>6. ShakeMap has become a valuable tool to assist emergency responders in identifying the likely extent of earthquake damage. Strong-motion data (now increasingly available in real-time) can be correlated with documentation and evaluation of the performance of the built environment, leading to understanding the causes of earthquake damage and the occurrence of good structural and non-structural performance.

Since the 1960s, the U.S. Geological Survey (USGS) has operated, supported and coordinated local seismic networks to detect micro-earthquakes, including aftershocks of larger earthquakes. Seismologists have used data from these early seismograph networks to delineate the spatial relationships between earthquake hypocenters and active faults. Modern earthquake monitoring networks provide fundamental earthquake data in the form of catalogs specifying hypocenter location, time of occurrence, and magnitude, along with compiled recordings of strong earthquake shaking in urban areas and in the vicinity of surfacefault ruptures. These data find uses in diverse applications ranging from earthquake hazard analysis to disaster response. Seismic networks throughout the U.S. have provided fundamental data for the U.S. Geological Survey's National Seismic Hazard Mapping Project, which is generating ever-advancing state-of-the-art earthquake hazard maps for the U.S. The availability of earthquake monitoring network data has led to new and innovative research that has advanced the science of seismology through an improved understanding of the physics of earthquake occurrence and development of modern ground motion prediction equations.

For the western states, modern monitoring of regional earthquake activity is crucial for better understanding earthquakes and their associated hazards. The largest proportion of the Nation's seismic hazard is in the western states, which are all exposed to large and damaging earthquakes. Eleven of the thirty-four earthquakes M6.5 or greater in the lower 48 states since 1900 have occurred in the Basin & Range Province, including the M7.2 1959 Hebgen Lake, Montana; M6.9 1983 Borah Peak, Idaho; M6.8 1915 Pleasant Valley, Nevada; M6.8 1932 Cedar Mountain, Nevada; and M7.1 1954 Fairview Peak, Nevada earthquakes. Yet the Rocky Mountain region remains the largest seismically active region of the lower 48 states without sufficient modern instrumentation to fully locate and characterize earthquakes to meet ANSS standards. In particular, many areas of the

southwest (Rio Grande Rift, southern Colorado Plateau) and the northern Rocky Mountains are inadequately instrumented. Similar deficiencies exist in many large, active seismic regions of Alaska.

The advent of digital instrumentation since 1990 has revolutionized seismology. High-fidelity earthquake data transmitted in real-time via terrestrial and satellite communication links are essential for all aspects of seismology. Digital dataloggers coupled with broadband and strong-motion sensors have the capability to record the full spectrum of earthquake-related ground motions—everything from the high frequencies of nearby earthquakes to the low-frequency, rolling motion of distant earthquakes. Most importantly, digital instruments have dynamic range sufficient to detect tiny earthquakes and remain on-scale for major, nearby earthquakes. Additionally, all three axes of ground motion (up-down, north-south, and east-west) are recorded (as opposed to only the vertical direction of ground motion recorded by older seismographs). High-quality recordings by even a few broadband seismographs from earthquakes with magnitudes as small as 3.5 allow computations that uniquely characterize the type of faulting, amount of energy released, and the stress field responsible for the quake. Likewise, high-quality strong-motion recordings in the urban environment are necessary to understand how seismic shaking can cause damage to buildings and other structures. This information is rapidly posted to the Internet, and data centers provide ready access to the information for rapid response and recovery as well as long-term research.

The vision of the next generation of national earthquake monitoring, the Advanced National Seismic System (ANSS), was issued in 1999 by the U.S. Geological Survey. Its design and partial implementation has been developed in consultation with earthquake specialists in academia and the States together with the engineering community. The mission of the Advanced National Seismic System (ANSS) is to provide accurate and timely data and information on earthquakes and their effects on buildings and structures, employing modern monitoring methods and technologies.

Since the ANSS was established by Congress in 2000, the USGS has fostered the organization of regional seismic networks developed through incorporation of local efforts into regional systems. ANSS regions are established for California, the Pacific Northwest, Alaska, Hawaii, the Intermountain region, the Central U.S. (including the Southeast), and the Northeast. The ANSS has deployed more than 2990 modern monitoring stations throughout the U.S. since its inception, with many installed in urban areas with the highest earthquake hazard.

Automated processing and distribution of earthquake information by regional seismic networks and the USGS National Earthquake Information Center provides near-real-time information to the public about earthquake location, magnitude, fault orientation, slip distribution, and aftershock probabilities. Together with other

parties, the USGS has developed ShakeMap, an analytical methodology that creates maps of the predicted severity of ground shaking computed from observed peak ground motions recorded by modern instrumentation and from the computed earthquake magnitude. ShakeMaps are posted to the Internet within minutes following earthquakes and also are distributed to emergency responders and other users through technologies like CISN Display and ShakeCast. The initial maps are automatically revised as new seismic data become available. In areas with a relatively dense distribution of strong-motion sensors, ShakeMap can help emergency managers immediately identify areas that have been exposed to strong shaking before damage reports are available. ShakeMap is being used in conjunction with earthquake loss modeling to make preliminary estimates of casualties and earthquake damage costs, such as through the USGS Prompt Assessment of Global Earthquakes for Response (PAGER) system.

ANSS instrumentation of engineered buildings and other structures to monitor their responses to earthquake ground motion remains less developed. Because of limited funding, a comparatively small number (~168) of structures have been instrumented so far. This type of monitoring is very important to the establishment of better building code requirements and design practices to achieve improved earthquake resistance in both new construction and retrofitted structures. Following damaging earthquakes, real-time monitoring of the response of lifelines and buildings is also valuable in emergency response.

ANSS funding to date is a fraction of the planned and requested capitalization needed to build out the system. In terms of the number of stations, ANSS is only 42% complete, with more than 4,100 stations still needed to meet the ANSS requirements. In a disturbing turn of events, three ANSS member networks were cut from funding during the 2015 reauthorization. Citing lack of funding, the Montana Regional Seismograph Network, a 10-year cooperating ANSS network, lost all USGS support for operation and maintenance.

WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 17-4

Identification and Mitigation of Unreinforced Masonry Structures

Policy Recommendation 17-4

Unreinforced masonry bearing-wall structures represent one of the greatest life-safety threats and economic burdens to the public during damaging earthquakes. WSSPC recommends that each state, province or territory adopt a program to identify the extent of risk that unreinforced masonry structures represent in their communities and develop recommendations that will effectively address the reduction of this risk.

Executive Summary

Unreinforced masonry is recognized by the Federal Emergency Management Agency as one of the structural building types most prone to failure during an earthquake. A review of the U.S. Geological Survey Hazards Program website listing earthquakes that generated 1,000 or more deaths since 1900 shows that unreinforced walls are a significant contributing factor in losses in both the financial sector and human lives.

WSSPC strongly believes that jurisdictions must be proactive to address this threat to their citizens. Legislatively mandated programs and/or local municipally adopted ordinances have proved effective at addressing this risk.

Background

During earthquakes, unreinforced masonry (URM) structures are vulnerable to catastrophic collapse and represent a significant life safety threat, as occurred in the 2008 Wells, Nevada earthquake. Unreinforced masonry structures are made from brick, hollow clay tile, stone, concrete block, or adobe materials that are not strengthened by the addition of steel or other reinforcement. Common building examples include older industrial complexes, schools, mercantile establishments, and private residences.

Also of concern are components of these structures such as walls, unsupported parapets, and fireplace chimneys, which can fall on sidewalk pedestrians or people trying to exit a building. The masonry usually is held together with weak mortar and is unable to resist lateral forces. Wall and roof anchorage tends to be inadequate, allowing floors and roofs to separate from the walls and collapse. Historically, this type of building damage has been a major contributing factor to loss of life in earthquakes throughout the world.

WSSPC recognizes that there is a societal cost to the inventory and retrofit or replacement of unreinforced masonry buildings, but in areas of high seismicity, failure to address this issue will have expensive and lethal consequences. In order to minimize the cost and make programs more politically acceptable, the three-stage approach of identifying the population of hazardous buildings, analyzing the risk presented by these buildings, and prioritizing the retrofitting of those buildings deemed to be a hazard is recommended.

It is recognized that resistance by owners and users of URM structures is to be expected when dealing with retroactive building ordinances. However, as can be seen by those jurisdictions that have adopted fire sprinklers retroactively, versus those that have not, even minimal remediation can yield discernible life-saving results. The International Existing Building Code Appendix Chapter 1, the American Society of Civil Engineers National Standard ASCE 41-13 “Seismic Evaluation and Retrofit of Existing Buildings” and retrofit concepts described in FEMA publications for unreinforced masonry structures are available; however, this in no way negates the need for local engineering analysis and design.

WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 17-7

Earthquake Early Warning Systems

Policy Recommendation 17-7

WSSPC recommends the research, development, and implementation of earthquake early warning systems in those states or regions with high seismic risk and a seismic network that can, or can be enhanced to, support an early warning capability. These national and regional-specific systems should include outreach, education, training, management, and ongoing maintenance of the systems.

Executive Summary

An earthquake early warning is issued very rapidly following the initiation of an earthquake and provides alerts to people and communities that have not yet experienced ground shaking from the earthquake. Earthquake early warnings are possible because earthquakes produce differing types of waves that travel at different speeds. The faster P waves travel at about 6.5 kilometers per second and are first to arrive at seismic monitoring stations. These P waves contain important information about the size and location of the earthquake. Slower moving S waves (3.5 km per second) arrive after the P waves and cause more intense shaking capable of damage to buildings and infrastructure.

Based on information from the earlier arriving P waves, the expected shaking intensity can be estimated through rapid analysis and alerts can be issued to communities and facilities likely to be impacted by the earthquake. These alerts can be transmitted through high speed telecommunications systems so communities that are distant from the earthquake epicenter but vulnerable to strong motion damage may receive advanced warning prior to the arrival of damaging S waves. Alert times vary from almost no warning in the area nearest the epicenter to 60-80 seconds in areas at some distance from the epicenter. As implied in this description, earthquake early warnings are of greatest benefit to regions distant from the epicenter that may be impacted by ground motions generated by large earthquakes.

Background

A nationwide earthquake early warning system was implemented in Japan on October 1, 2007. The system is based on Japan's extensive and dense seismologic and strong-motion networks that were enhanced following the January 17, 1995 Hanshin-Awaji (Kobe) earthquake. In Japan's earthquake early warning system, warnings are received through computers, cell phones, the media and signaling devices installed in homes, critical facilities and businesses. Early warnings are used to slow or stop high speed trains (*Shinkansen*), alert drivers of motor vehicles, control elevators (to prevent people being trapped), regulate industrial processes, and notify people at home or work that they should move away from hazards and protect themselves. Limited systems are in place in Mexico, Turkey, Italy, and Greece, and Taiwan.

The United States has monitored scientific and technological developments in other nations, and although it has not yet implemented a fully operational earthquake early warning (EEW) system, the United States Geological Survey (USGS) has supported the development and trial operation of EEW with university partners and the State of California since 2006. Those efforts have resulted in a demonstration system called ShakeAlert that began sending test notifications to selected users in January 2012. While that system has demonstrated the feasibility of earthquake early warning in California, the system is still being tested for reliability and robustness

An EEW system for the U.S. West Coast is being developed within the current operations of the Advanced National Seismic System (ANSS) regional seismic networks: California Integrated Seismic Network (CISN), and the Pacific Northwest Seismic Network (PNSN). This enables USGS/ANSS and its network partners to leverage their substantial investment in sensor networks, data processing centers, and software for earthquake monitoring, and takes advantage of the considerable expertise and experience of current personnel, reducing the cost of implementing EEW by using existing capabilities and facilities.

The California Office of Emergency Services (Cal OES) plans to carry out the provisions of California Senate Bill 438 by developing an Earthquake Early Warning Program business plan including specific cost estimates for each component of the program and a funding plan, identification of funding sources, an outline of the roles and responsibilities of various program participants, and the expected time schedule for completing the system. The business plan will be

developed through consultation with program participants, state agencies, departments, boards and commissions, private businesses, postsecondary educational institutions, and subject matter experts. It is anticipated that the plan will be submitted by February 1, 2018 and be used to advise the Director of Cal OES on implementation of the program.

Funding is a key constraint on the timeline for implementation of the California Earthquake Early Warning System and warning systems in other high risk areas of the country. In addition, policy, management structure, user applications, cybersecurity, and public education and training will impact the implementation of earthquake early warning. Although earthquake early warning systems should not be imposed at the expense of hazard education and preparedness activities, and other mitigation programs, earthquake early warning systems have the potential to save lives and reduce financial losses. Those states that have urban populations and infrastructure vulnerable to major earthquakes as well as modern digital seismic networks may consider earthquake early warning as another useful tool for addressing the earthquake hazard. Earthquakes are often described as hazards without warnings, but seismic-network-based early warning systems could provide an alert with sufficient time to implement life safety actions, infrastructure protection, and rapid mitigation of potential damage and disruption.

WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 17-8

Seismic Design and Construction of New Schools

Policy Recommendation 17-8

WSSPC recommends that each member state, province, and territory establish and fund an active program to improve the seismic safety of new schools by selectively increasing the current design and construction requirements for buildings and non-structural components, providing rigorous plan reviews and inspections and by establishing minimum regional seismic design categories for new schools. WSSPC also recommends that appropriate responsible local and federal entities provide dedicated financial support for the establishment of a program that improves the seismic safety of new schools.

Executive Summary

School facilities, in addition to caring for our children, are often used as public assembly areas as well as areas of refuge or impromptu command centers during natural disasters and other emergencies. The use of schools in this fashion is commonplace throughout most of America, particularly so in rural areas. Current building codes and design standards identify schools with an occupant load greater than 250 as an intermediate priority risk category. School facilities that are designed and built under these criteria are constructed to ensure that the structure has enhanced earthquake resistance but are not specifically designed to remain functional (i.e. safe and habitable) after a design level seismic event. Additionally, in most instances there are no special seismic performance requirements for utilities such as water, electrical, sewer, and HVAC (Heating Ventilation and Air Conditioning). This presents an obvious problem where school facilities are pre-designated as emergency shelters or command centers before disasters occur. Increasing the school's design category to that of an essential facility would be more consistent with its actual use, assure the safety of our children, and enhance the resiliency of the community.

Background

WSSPC supports rigorous plan reviews and inspections of new school building construction to ensure code compliance.

Currently schools are designed using the International Building Code Risk Category III unless they are pre-designated to be emergency earthquake shelters, operations centers or are otherwise required for emergency response in which case they are required to comply with Risk Category IV code provisions. The code requires the use of Risk Category IV for school buildings that have been pre-designated as emergency facilities.

WSSPC encourages schools to be designed and constructed to a minimum Seismic Design Category (SDC) at or above the minimum code requirement. The minimum Seismic Design Category for schools is recommended to be SDC D for moderate and high seismicity regions. For schools in low seismicity regions SDC C is recommended for schools where SDC B would otherwise apply and in very low seismicity regions SDC B is recommended where SDC A would otherwise be allowed.

Although Risk Category III building code requirements for schools apply only to school facilities with an occupant load greater than 250 persons, WSSPC encourages the use of Risk Category III or higher design provisions for smaller schools as well.

Nonstructural components of buildings are categorized as architectural elements (such as interior partition walls, non-load bearing exterior curtain walls, ceilings, windows, parapets and canopies); as mechanical, electrical, and plumbing (MEP) components (such as HVAC units, ducts, diffusers, conduits, lighting fixtures and pipes); or as furniture, fixtures, and equipment (FF&E) and other building contents. Of particular concern in schools are those components that are overhead falling hazards or whose failure may impede egress. Individual School Districts and private operators should also be made aware of FEMA E-74 that addresses mitigating non-structural hazards from building contents and components. Post disaster assessments have identified that many common injuries and some types of damage can be prevented by properly designing for or otherwise mitigating non-structural hazards. There is also the additional benefit that school children would be better protected while attending classes.

In low and moderate seismicity regions the incorporation of enhanced nonstructural design provisions beyond building code requirements for new schools can reduce injuries to students and help sustain operability during those smaller earthquakes that are characteristic of these regions. Of particular concern are those components that are overhead falling hazards or whose failure may impede egress. These enhancements would provide for design and construction of seismic restraints for selected nonstructural components regardless of certain building code exceptions that might otherwise be applicable.

Improvements to the seismic safety of new schools can only be achieved if the appropriate responsible local, state, and federal entities provide the dedicated financial support for the establishment and implementation of such programs.

Reference

FEMA E-74, *Reducing the Risks of Nonstructural Earthquake Damage—A Practical Guide, Fourth Edition,* Federal Emergency Management Agency, December, 2012.

Subsection E-5

Policy Recommendations Adopted in 2016

WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 16-1

Rapid and Effective Tsunami Identification and Response

Policy Recommendation 16-1

WSSPC recommends that each coastal state, province, and territory emergency management agency work with coastal jurisdictions to develop evacuation plans for both ***near-*** and ***distant-***source tsunamis, and supplement these emergency plans with a preparedness education campaign focusing on instructions to evacuate based on ground shaking, that ensures all populated coastal areas in the WSSPC coastal states, territories and provinces are guided by at least one type of system, appropriate to local conditions. Strong coordination should also occur between and among federal partners, such as the U.S. Geological Survey, National Oceanic and Atmospheric Administration, etc. and state/academic institutions developing earthquake early warning system technologies, expanding upon the WSSPC Policy Recommendation on Earthquake Early Warning, to ensure appropriate community response to both earthquake and tsunami alerts.

Executive Summary

Coastal jurisdictions should develop emergency response plans which incorporate both ***near-source tsunamis***, where there may be only minutes to evacuate, and ***distant-source tsunamis***, where there may be hours to evacuate. For near-source tsunamis, a robust education and preparedness campaign should focus on the importance of "natural" warnings, such as earthquake ground shaking felt at the coast as precursor to an incoming tsunami. For distant-source tsunamis, emergency response plans should use redundant alert and warning notification and communication systems (standardized across the nation) which, in addition to standard evacuation and re-entry protocols, could include evacuation instructions via: 1) EAS to television and radio broadcast participants; 2) implementation of cell phone notification capabilities; 3) social media; 4) phone trees; 5) NOAA weather radios; 6) satellite and cable television; 7) door to door notification; 8) possibly beach-front sirens, if these devices are cost effective and could augment rapid dissemination of time sensitive tsunami alerts; and/or 9) aircraft (e.g. Civil Air Patrol) on-board notification systems, especially for remote coastlines, as available during emergencies. These warning and notification systems should be tested on a consistent basis (e.g. annually) for confirmation of performance and improved efficiency during an event. WSSPC will work with its federal partners (USGS, NOAA, FEMA, etc.) and the National

Tsunami Hazard Mitigation Program to help maintain a coordinated, consistent and effective, top-to-bottom earthquake and tsunami warning system and public preparedness strategy.

Background

Tsunamis have caused considerable damage and over 440,000 casualties worldwide over the last 150 years. Recent events such as the 2004 Indian Ocean and 2011 Tōhoku tsunamis are a sobering reminder of the magnitude of the problem coastal communities will face. For example, the 2011 Tōhoku tsunami killed ~15,800 people, while the economic impact is estimated to be ~$235 billion, making it the most expensive disaster in history. Tsunamis most often are created by the rapid uplift of the sea floor offshore the coast during subduction zone earthquakes, and by localized landslides triggered in response to the earthquake shaking. Tsunamis not only affect nearby coastlines within minutes following an earthquake, but can travel long distances and impact distant shorelines within several to as many as 15 hours after the event. As a result, a clear and immediate distinction must be made between educational outreach campaigns directed at ***near-*** and ***distant-***source tsunamis; effective public education and communication is paramount both preceding as well as following an event.

Not all earthquakes produce tsunami. Unnecessary evacuations are costly not only in terms of human risk and lost commerce, but also in the public's negative reaction to the next earthquake experienced on the coast. To eliminate unnecessary coastal evacuations, efforts directed at ongoing education are crucial to inform coastal residents and visitors of the procedures to evacuate coastal areas. For example, for a near-source tsunami, upon feeling strong or prolonged ground shaking, residents and visitors should instinctively move rapidly to high ground or inland and not wait for official notices. In contrast, a distant earthquake and tsunami can be detected by a tsunami warning system, which can determine quickly if evacuation is necessary. The warning system should include: 1) earthquake and tsunami detection by a modern seismic network and Tsunami Warning Center (e.g. the National or Pacific Tsunami Warning Centers); 2) tsunami warning transmissions from the Tsunami Warning Centers to state and local emergency operations personnel; and, 3) direct notification and support to the coastal inhabitants and visitors, through the use of various broadcast media, as well as other locally appropriate measures (such as social media, coastal sirens, reverse 911, phone tree, etc.) to initiate emergency response plans.

Distant Tsunamis

Distant tsunamis are caused by undersea earthquakes far from the affected coast. The public would not necessarily feel the earthquake and there will generally be time for an official warning and evacuation to safe areas. Tsunami preparedness and response plans for a distant tsunami should include plans, whether in “Warning” or “Advisory,” in order to help reduce over or under evacuation

of coastal areas. Evacuation strategies, both on-shore evacuation and offshore maritime evacuation, should also consider evaluation of tidal and/or weather-related conditions. The use of redundant warning systems would increase the immediacy and the coverage of the evacuation notification and could include one or more of the following:

- EAS to television and radio broadcast participants;
- Automated telephone notification systems (e.g. reverse-911) and implementation of cell phone notification capabilities. Adherence to planned implementation of the Integrated Public Alert and Warning System (WEA; IPAWS), resulting in specific alerts received by the public on their cell phones.
- Social media;
- Phone trees;
- NOAA weather radios;
- Satellite and cable television;
- Door to door notification;
- Beach-front sirens; and,
- Notification via aircraft (e.g. Civil Air Patrol) on-board notification systems, for remote coastlines as available during emergencies.

These warning and notification systems should be tested on a consistent basis (e.g. annually) for confirmation of performance and improved efficiency during an event. Only with multiple systems can the best and most immediate coverage be obtained, thereby potentially minimizing the number of injuries and loss of life from a distant tsunami. Education programs should emphasize that tsunami evacuees should only return to coastal areas in accordance with local plans and directions, which differ from cancellation of tsunami alerts by the Tsunami Warning Centers.

Near-source Tsunamis

A near-source tsunami will most likely be triggered by a major earthquake on a nearby subduction zone, such as the Cascadia subduction zone (CSZ) or Aleutian subduction zone. The earthquake would be characterized by several minutes of strong ground shaking and a tsunami would arrive at the shore within 10-30 minutes after the start of the earthquake. In the case of a near-source tsunami, the only effective warning system is the realization by the public that when strong or prolonged ground shaking is felt (in some cases when any shaking is felt), they must instinctively move rapidly away from the shoreline to reach high ground and safety. In the case of a near-source event, a Tsunami Warning Center will not be able to broadcast the message in time for the public to respond, and as such would mainly be providing a warning to other distant localities. For a near-source

tsunami, continued education is crucial to inform coastal residents and visitors of procedures to evacuate coastal areas upon feeling strong or prolonged ground shaking and not wait for official notices. Evacuation drills in at risk communities where residents practice evacuating to safe ground will help improve the muscle memory of the public during a real event.

Earthquake Early Warning

A new public alerting system is being developed to provide advance notification of earthquake shaking once an earthquake begins; for more information see WSSPC Policy Recommendation on Earthquake Early Warning. This technology allows people to take protective action and communities to secure critical infrastructure before damaging shaking arrives. An earthquake early warning is issued very rapidly following the initiation of an earthquake and provides alerts to people and communities that have not yet experienced ground shaking from the earthquake. Earthquake early warnings are possible because earthquakes produce differing types of waves that travel at different speeds. The faster P waves travel at about 6.5 kilometers per second and are first to arrive at seismic monitoring stations. These P waves contain important information about the size and location of the earthquake. Slower moving S waves (3.5 km per second) arrive after the P waves and cause more intense shaking capable of damage to buildings and infrastructure. WSSPC will work with its federal partners (USGS, NOAA, FEMA, etc.) and the National Tsunami Hazard Mitigation Program, including state/academic institutions, to help maintain a coordinated, consistent and effective, top-to-bottom earthquake and tsunami warning system and public preparedness strategy.

Education and Outreach

Placement of tsunami warning signs is an important aspect of educating the public about how to reach safety upon receipt of a warning. Signs are a proven education tool in recent tsunamis and should be implemented as determined appropriate by local authorities, with possible assistance from the National Tsunami Hazard Mitigation Program (NTHMP) in order to maintain continuity between coastal jurisdictions and states. Coastal jurisdictions should be encouraged to adopt standardized tsunami signs.
(See also: *http://www.dot.ca.gov/hq/traffops/engineering/control-devices/tsunami.htm*)

Regular and frequent testing of warning systems is essential to identify mitigation strategies for a more resilient and effective system. It is important to know that the system will work as intended should public safety officials ever need to send an alert or warning to a large region of the United

States. Only frequent, rigorous testing can provide an appropriate diagnosis of the system's performance.

Communities are encouraged to run notification and response exercises and public evacuation drills in order to ensure the evacuation plans are appropriate and well understood by the coastal population. The state and federal NTHMP partners should offer assistance to these communities in developing and running these exercises and drills.

Federal, state, and academic institutions involved in warning system development as well as public education and outreach should collaborate to ensure that when alerts (earthquake, tsunami) are issued, the appropriate response occurs.

WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 16-3

Post-Earthquake Technical Clearinghouses

Policy Recommendation 16-3

WSSPC recommends that each member state, province, and territory establish a plan for a post-earthquake technical clearinghouse to be activated if possible within 24 hours after each major earthquake within its jurisdiction. WSSPC also recommends that multijurisdictional agreements between and among WSSPC members and Federal agencies be in place that would allow for the establishment of a single comprehensive technical clearinghouse in the event of a large earthquake.

Executive Summary

Post-earthquake technical clearinghouses for earthquake and related hazards (tsunamis, landslides, etc.) have been an important component of emergency response, recovery, and mitigation following large earthquakes. A technical clearinghouse, either established in a physical location or web based (virtual), can serve to coordinate real-time and post-earthquake hazard investigations to provide timely hazards observations for state and federal emergency managers, scientific communities, and the public. This information is then used to improve assessments of earthquake hazards, earthquake engineering, mitigation strategies, economic losses, and emergency response to damaging earthquakes. The clearinghouse also serves to integrate, manage, disseminate and archive information so that it is available to decision makers.

Multijurisdictional cooperation is especially important in the event of a large earthquake that affects multiple states. Previously established Memoranda of Agreements (MOA) between and among WSSPC members and Federal agencies would allow for the establishment of a single comprehensive technical clearinghouse for such an event.

Background

Post-earthquake technical clearinghouses have been an important component of emergency response, recovery, and mitigation following large earthquakes. Seismologists deploy instruments that measure aftershocks and investigate the mechanics of earthquakes. Geologists and geotechnical engineers document ground failures, including fault displacements, fissures, landslides, rock falls, and liquefaction. Geodesists investigate ground deformation and related strain. Structural engineers evaluate the effects of the earthquake on various types of buildings, bridges, dams, utilities, and other structures. Social scientists study direct and indirect impacts to people and businesses. Scientists and engineers also collect inundation and damage information if a tsunami is generated. This information is then used to improve our assessments of earthquake hazards, earthquake engineering, mitigation strategies for nonstructural hazards, and emergency response to damaging earthquakes.

The data collected in the days immediately following a major earthquake can be critical during emergency response and recovery. Scientists and engineers can determine the likelihood that landslides will move (from rain or aftershocks), and can assess the susceptibility of structures to collapse. Some data are perishable and must be collected as soon as possible, before erosion or bulldozers eliminate the evidence or before aftershocks die out.

Data collected through clearinghouses help us to be better prepared for future large earthquakes. In addition, data on strong ground motion and damage to buildings helps to calibrate loss-estimation models, such as the Federal Emergency Management Agency's (FEMA) HAZUS program, and can be an important component of a Governor's or the President's disaster declaration as well as provide useful information for response, recovery and hazard mitigation.

A technical clearinghouse, either physical or web based (virtual), can serve to coordinate post-earthquake investigations and to share resources and information among investigators. The clearinghouse also serves to integrate and disseminate information so that it is available to decision makers and the media.

Post-earthquake technical clearinghouses were successfully implemented following the Landers, California (1992); Northridge, California (1994); Nisqually, Washington (2001); Wells, Nevada (2008); and Napa, California (2014) earthquakes. A clearinghouse provides a place for scientists and engineers to report on their findings each day. In some post-earthquake situations, a

clearinghouse may serve as one of the chief mechanisms for relaying critical information from scientists and engineers investigating the earthquake to emergency managers.

Only California, Utah, and Nevada have developed plans for post-earthquake technical clearinghouses; California and Hawaii have created clearinghouses for real-time tsunami observation and post-event information collection. Few WSSPC members have the resources to fully staff and operate a clearinghouse. Opportunities exist for members to collaborate with one another and to coordinate with the U. S. Geological Survey (USGS), FEMA, Earthquake Engineering Research Institute (EERI), university researchers, and other groups. The National Earthquake Hazards Reduction Program (NEHRP) agencies (USGS, FEMA, National Institute for Standards and Technology, and National Science Foundation) developed *The Plan to Coordinate Post-Earthquake Investigations* in 2003 (USGS Circular 1242) that includes provisions for cooperating with states to establish post-earthquake technical clearinghouses. Under this plan, the NEHRP agencies can step in and take the lead if WSSPC members are not prepared to establish a clearinghouse.

State and federal partners through the National Tsunami Hazard Mitigation Program have also developed post-tsunami protocols to guide post-tsunami science surveys (Wilson et al., 2015). These include pre- and post-field coordination recommendations which could also be applied to earthquake clearinghouses.

Multijurisdictional cooperation is especially important in the event of a large earthquake that affects multiple WSSPC members. Previously established Memoranda of Agreements (MOA) between and among WSSPC members and Federal agencies would allow for the establishment of a single comprehensive technical clearinghouse for such an event.

Reference

Wilson, R., Wood, N., Kong, L., Shulters, M., Richards, K., Dunbar, P., Tamura, G., and Young, E., 2016, A protocol for coordinating post-tsunami field reconnaissance efforts in the USA: Natural Hazards 75, p. 2153-2165; doi 10.1007/s11069-014-1418-7, 2015.

WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 16-4

Seismic Provisions in the 2015 International Building Codes

Policy Recommendation 16-4

WSSPC endorses the prompt adoption and enforcement of the seismic provisions of the 2015 *International Existing Building Code*, the 2015 *International Building Code*, and the 2015 *International Residential Code* (and the 2015 National Building Code of Canada, where applicable) as minimum standards by states, territories, provinces and/or local jurisdictions. Further, WSSPC discourages modifications or amendments that would weaken the Code or its required inspections. WSSPC also encourages Code organizations to continue the development and refinement of building codes and consensus standards to remain substantially equivalent to the National Earthquake Hazards Reduction Program (NEHRP) Recommended Seismic Provisions for New Buildings and Other Structures (FEMA 1050) and encourage authorities having jurisdictions to focus on seismic education, purpose, incentives, lifelines and the business/industry and residential sectors.

Executive Summary

The *International Existing Building Code*, the *International Building Code* and the *International Residential Code* identify the minimum standards for the protection of life, limb and property. These consensus documents, which are supported by every major construction organization in the United States, provide the means for local jurisdictions, states and territories to protect their citizens, safeguard the economic vitality of their communities and provide for a sustainable environment. Amending seismic provisions out of the Code that are essential to the structural integrity of buildings compromises the effectiveness of the document and the safety of the community. Coinciding with Code adoptions is the need for appropriate training so the seismic resistant provisions may be consistently enforced and maintained. It is only through the adoption of the unamended code or applying more stringent provisions to the International Code that a community has a legitimate expectation to be resilient in the event of disaster for its citizens, businesses and homes.

Background

Some states and many jurisdictions have not adopted the International Building Code, potentially leaving their citizens at continued risk. States should be encouraged to remove obstacles that hinder adoption, and to motivate local jurisdictions to diligently update existing codes. It is recognized that some jurisdictions that have adopted the International Codes have drastically modified or omitted the seismic provisions of the Codes. This action not only jeopardizes their structures by not providing for earthquake resistant structures, but provides a false sense of security to their communities. Once adopted, the Codes must be uniformly and consistently enforced if they are to be effective. This will necessitate the training of building inspectors to some required standards for certification. Partnerships with the homeowners, residents, builders, insurers, owners, elected officials, scientific groups, and others with focused concerns on lifelines and public safety will be required to overcome any lack of commitment to meet the desired outcomes.

WESTERN STATES SEISMIC POLICY COUNCIL
POLICY RECOMMENDATION 16-10

Joint Policy for the Evaluation and Seismic Remediation of School Buildings

Policy Recommendation 16-10

The Western States Seismic Policy Council, with the support of the Earthquake Engineering Research Institute, recommends that each member state, province and territory establish as a goal that all school buildings be seismically resilient. Seismically vulnerable school buildings should be retrofitted or replaced by new earthquake resilient school buildings as an important part of a nationwide school earthquake resiliency goal.

Executive Summary

Our elementary and secondary school buildings contain the future of our country. Parents send their children to school every day with the belief that their children will be safe. However, many of the schools located in WSSPC's states, provinces and territories are older structures vulnerable to severe damage and even collapse in future earthquakes. This policy recommendation provides needed support for efforts to evaluate and remediate these hazards.

Background

The 1933 Long Beach, California M6.4 earthquake is best known for collapsing or severely damaging thousands of unreinforced masonry (URM) buildings, including over 230 school buildings. Fortunately, schools were not in session at the time of the earthquake. Had that been the case, thousands of children would have been injured or killed.

The outcry from this poor performance of school buildings directly led to the State of California passing the Field Act which mandated earthquake resistant construction requirements for future school buildings, and the Garrison Act which established the requirements for the seismic safety of existing school buildings.

Schools are increasingly used to shelter students in place during all hazards, including flood and hurricane as well as earthquakes. In addition, schools are often used as refuge zones for citizens within their communities. Thus school building resilience is a key to protecting the local population under diverse hazardous conditions.

There have been notable efforts by some WSSPC member states, including Idaho, Washington, Oregon, California, Alaska and Utah, to identify at-risk school buildings and to begin the process of addressing the risk they present.

WESTERN STATES SEISMIC POLICY COUNCIL
Policy Recommendation 16-11

Reliability of Lifeline Services

Policy Recommendation 16-11

WSSPC encourages utility regulatory bodies and utility service providers to implement best practices and seismic design in the construction and maintenance of their infrastructure in order to assure satisfactory performance in future earthquakes.

Executive Summary

Lifelines form a critical segment of the nation's infrastructure. Disruption can significantly affect the resiliency of a community. Use of existing guidelines as well as development of new guidelines can serve as an effective method of identifying and reducing risk.

Background

Lifeline infrastructure including, but not limited to, electricity, gas, telecommunications, water, and waste water are critical to a community's wellbeing. Some lifelines are still being constructed using old methods and technologies that are known to be inadequate by seismic experts.

Much of the nation's existing infrastructure has not been designed to perform satisfactorily under extreme conditions produced by major earthquakes, including severe ground shaking, earthquake-induced tsunamis, fault rupture, large landslides and liquefaction. Lifelines should be designed to provide reliable performance under expected earthquake loading conditions to ensure that the region can withstand future earthquake damage without crippling consequences. Critical infrastructure requires system and component vulnerability studies in order to understand potential damages and operational consequences. Mitigation of infrastructure with a high likelihood of failure with extreme loss-of-service consequences should be addressed. This policy recommendation is a reinvigorated effort to follow through on resolving infrastructure liabilities originally identified in FEMA 271 "Plan for Developing and Adopting Seismic Design Guidelines and Standards for Lifelines" (1995).

WESTERN STATES SEISMIC POLICY COUNCIL
Policy Recommendation 16-12

Earthquake Actuated Automatic Gas Shutoff Devices

Policy Recommendation 16-12

WSSPC recommends that each state, province or territory that is considering implementing requirements for installing earthquake-actuated automatic gas shutoff devices in industrial, commercial and/or residential applications assure that shutoff valves meet the provisions of the most currently available revision of ANSI/ASCE/SEI Standard 25 (Earthquake-Actuated Automatic Gas Shutoff Devices) and be installed in conformance with the manufacturer's installation instructions. The cost versus benefit of turning gas on after an event or the analysis of false activation is left to the authority having jurisdiction. The policy only advocates that if a decision is made to proceed with earthquake actuated automatic gas shutoff devices that the current standard be utilized.

Executive Summary

Natural gas piping and appliances may be damaged during earthquakes, causing gas leaks. These leaks, if ignited, can result in fires and explosions that may jeopardize personal safety as well as resulting in significant damage to structures.

Fires and explosions may be more destructive to buildings than the earthquake itself. The ability to manually shut off a gas valve after an earthquake may be difficult or impossible due to debris or ground movement. Risk of gas related damage is further exacerbated if structures are unoccupied, thus placing the burden of shutting off gas service upon utilities or government agencies. Several types of devices or systems are available to automatically shut off gas flow within structures if leakage occurs. These include excess flow valves and methane detectors connected to solenoid valves. Hybrid detection systems are available that can combine vibration sensing, excess gas flow and the presence of methane to cause valve closure. Earthquake actuated automated gas shutoff valves rely on ground motion to initiate closure. The reliability of automatic gas shutoff valves has been greatly improved with the adoption of ANSI/ASCE/SEI Standard 25.

Background

The number of post-earthquake fire ignitions related to natural gas can be expected to be between 20% and 50% of the total post-earthquake fire ignitions. (California Seismic Safety Commission, 2002).

While the installation of excess flow valves is currently mandated by Federal Code on new or replacement natural gas service lines serving single family residences, these valves alone may not detect leakage within structures caused by damaged or overturned appliances or equipment. The value of these may be enhanced by the addition of an automatic gas shutoff valve. Earthquake-activated automatic gas shutoff devices are relatively inexpensive and a proven method to prevent the loss of gas, resultant fires and possible community conflagrations that might result from an errant spark. However, these valves may close in situations where no gas leakage has occurred, leading to increased gas system restoration time since operators must visit each customer where gas service has been interrupted.

Reference

California Seismic Safety Commission, 2002, *Improving Natural Gas Safety in Earthquakes*