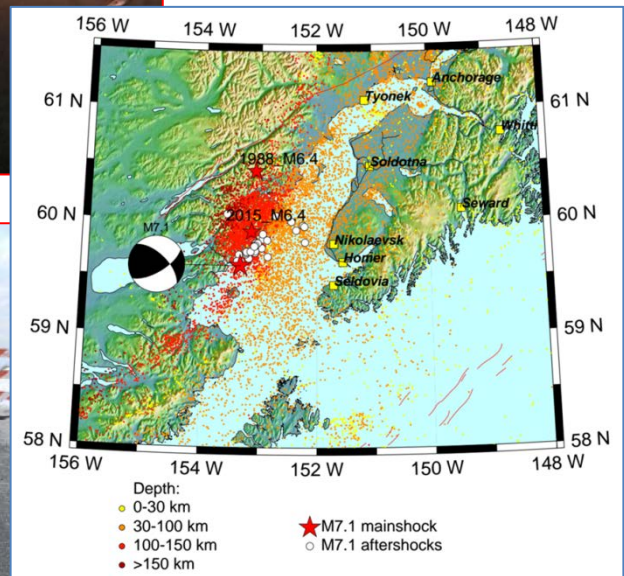


# ALASKA SEISMIC HAZARDS SAFETY COMMISSION

## ANNUAL REPORT TO THE GOVERNOR AND STATE LEGISLATURE FOR 2016



*M7.1 Iniskin Earthquake  
24 January 2016*

9 MAY 2017

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## EXECUTIVE SUMMARY

This report summarizes the Alaska Seismic Hazard Safety Commission's business, activities, and accomplishments in 2016. As an advisory body charged to recommend goals, priorities, and policies for mitigating seismic hazards, the Commission's work in 2016 continued to focus towards long-term goals to improve the safety of schools and public buildings at risk from earthquake damage; facilitate local earthquake scenario planning studies; and educate State government and public entities about the Alaska seismic environment. In particular during 2016:

- The Commission conducted seven public meetings, with no written determinations, requests for determinations, or suspected potential violations under the Ethics Act (AS 39.52), within our budget of \$10,000. In total, the members volunteered over 600 professional-hours of public service to the State in 2016.
- The Commission prepared, at the Governor's request, a report summarizing the benefits of improved earthquake monitoring and early warning in Alaska based on input from a wide range of stakeholders spanning science to engineering to risk mitigation to emergency management to public and private infrastructure.
- In response to the January 29 M7.1 Iniskin Earthquake, the largest event to hit the heavily populated Cook Inlet region since 1964, the Commission produced a briefing document for the Governor and public, as well as presentations to several State emergency planning and response groups summarizing the keys points to ponder.
- The Commission launched a new project to assess the vulnerability of the older Fairbanks North Star Borough School District buildings to significant structural damage during a design earthquake using FEMA's Rapid Visual Screening method.
- The Commission continued work on generating new policy recommendations directed to State entities providing cost effective means to help improve safety and mitigate economic loss from a future damaging earthquake. And,
- The Commission responded to several requests from entities for information regarding earthquake hazards and safety; and continued partnering with numerous other organizations and government entities focusing on the mitigation of seismic risks.

The Commission is available and would welcome the opportunity to discuss any issues within our purview at your request.

Michael West, Chair  
Laura W. Kelly, Vice-Chair

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***Abbreviations used in this report for Federal, Alaska and Other entities:***

AEC	Alaska Earthquake Center
AELS	Architects, Engineers, and Land Surveyors [ <i>Alaska State Board of</i> ]
ASHSC	Alaska Seismic Hazards Safety Commission
DFLS	Division of Fire and Life Safety
DGGS	Division of Geological & Geophysical Surveys
DHS&EM	Division of Homeland Security & Emergency Management
DMVA	Department of Military and Veterans Affairs
FEMA	Federal Emergency Management Agency
FNSB	Fairbanks North Star Borough
NEHRP	National Earthquake Hazard Reduction Program
UAF	University of Alaska Fairbanks
USCG	U.S. Coast Guard
USGS	U.S. Geological Survey
WSSPC <sup>1</sup>	Western States Seismic Policy Council

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<sup>1</sup> The Alaska DHS&EM, DGGS, and ASHSC are the three Alaska members to WSSPC

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## ALASKA SEISMIC HAZARDS SAFETY COMMISSION ANNUAL REPORT TO THE GOVERNOR & STATE LEGISLATURE FOR 2016

### INTRODUCTION

This report<sup>2</sup> summarizes the Alaska Seismic Hazards Safety Commission's (ASHSC) business, activities, and accomplishments in 2016 as related to its statutory powers and duties (AS 44.37.067) on behalf of the Governor, Legislature, local governments, as well as the public and private sectors, which include:

- *Recommending goals and priorities for mitigating seismic hazards (e.g. strong ground shaking, landslide, avalanche, liquefaction, tsunami inundation, fault displacement, and subsidence);*
- *Recommending policies including needed research, mapping, and monitoring programs;*
- *Reviewing the practices for recovery and reconstruction after a major earthquake; to recommend improvements to mitigate losses from similar future events; and,*
- *Gathering, analyzing, and disseminating information of general interest on seismic hazard mitigation to reduce the state's vulnerability to earthquakes.*

Alaska has more earthquakes than any other region of the United States and is one of the most seismically active areas of the world. During 2016 the Alaska Earthquake Center<sup>3</sup> (AEC) recorded almost 38,000 earthquakes throughout all regions of the state. Most notable was the January 24<sup>th</sup> M7.1 Iniskin Earthquake on the west side of the Cook Inlet - the largest earthquake effecting the heavily populated Southcoastal region of Alaska since 1964 - which resulted in several house fires and road damage near Kenai, as well as non-structural damage in buildings as far away as Anchorage and Kodiak (see cover).

While it is not possible to predict the time and location of the next big earthquake, the active geology of Alaska guarantees that major, potentially damaging earthquakes will continue to occur. Further, despite advancements in seismic hazards analysis and engineering, the age and structural resilience of buildings and infrastructure vary across Alaska, especially in areas of higher seismicity. Therefore, the risks to public safety and infrastructure from these future events can be greatly reduced through proper planning, design, construction, and continuing education and outreach.

### COMMISSION BUSINESS IN 2016

The following summarizes the ASHSC's business conducted in 2016, including membership, meetings, ethics act, and finances; with administrative support provided by the Alaska Department of Natural Resources, Division of Geological & Geophysical Survey (DGGS) (e.g. meeting logistics, budget, travel, website, etc.). In total, Commission members volunteered over 600 professional-hours of public service to the State in 2016

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<sup>2</sup> *The Commission's documents (e.g. annual reports, meeting agenda and minutes, strategic and operating plans, policy recommendations and white papers, etc.) are available on our website [www.seismic.alaska.gov](http://www.seismic.alaska.gov).*

<sup>3</sup> [www.aeic.alaska.edu](http://www.aeic.alaska.edu)

## MEMBERSHIP

The ASHSC began 2016 with 10 members plus one vacancy, and ended the year with nine members plus two vacancies (local government representative and representative from the Department of Veteran and Military Affairs) (Table 1).

**TABLE 1: COMMISSION MEMBERSHIP IN 2016**

COMMISSIONER / OCCUPATION / RESIDENCE	REPRESENTATION
John L. Aho, Ph.D., Sc.D. Engineering Consultant; Anchorage	Public/Restricted
Charity Carmody State Farm Insurance; Anchorage	Insurance Industry
Gary A. Carver <sup>†</sup> , Ph.D. Geologic Consultant; Kodiak	Public/Restricted
Charles (Bud) Cassidy <sup>†</sup> Kodiak Island Borough Manager; Kodiak	Local Government
Duane Dvorak <sup>§</sup> Kodiak Island Borough Resource Manager; Kodiak	Local Government
David Gibbs <sup>§</sup> Director Emergency Services, FNSB; Fairbanks	Local Government
Ann Gravier <sup>†</sup> Hazard Mitigation Officer, DHS&EM; Anchorage	Alaska Department of Military & Veterans Affairs
Michael Holman Director, Unalaska Department of Public Safety, Unalaska	Local Government
Laura W. Kelly, P.E. Civil Engineer, USCG; Juneau	Federal Agency
Robert L. Scher, P.E. Geotechnical Engineer, Consultant; Anchorage	Public/Restricted
De Anne Stevens Geologist, DGGS; Fairbanks	Alaska Department of Natural Resources
Michael West, Ph.D. Alaska State Seismologist, UAF; Fairbanks	University of Alaska

<sup>†</sup> Resigned during 2016

<sup>§</sup> Appointed in 2016

## MEETINGS

The ASHSC conducted seven public meetings in 2016; including five by teleconference (January 29, March 11, May 25, June 23, and September 29), plus two ‘in-person’ meetings at Anchorage (April 27 and November 17). However, a quorum was not present for the May 25 teleconference meeting, so discussions were limited to items not otherwise requiring motions or vote.

## ETHICS ACT (AS 39.52)

The ASHSC submitted four quarterly ethics reports to the Department of Law in 2016, with no written determinations, requests for determinations, or suspected potential violations.

## FINANCES

The ASHSC’s expenditures (e.g. meeting and travel expenses, etc.) in FY15 totaled \$10,000; our allotted budget.

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## ACTIVITIES & ACCOMPLISHMENTS IN 2016

This section summarizes the ASHSC's activities and accomplishments in 2016. While these items generally involved the ASHSC as a whole, most were coordinated or implemented under one or more of the Commission's six standing committees, including: Earthquake Scenarios (*chair* Gary Carver), Education-Outreach-Partnering (Robert Scher), Hazards Identification (De Anne Stevens), Insurance (Charity Carmody), Response and Recovery (Ann Gravier), and Schools (Laura Kelly).

### EARTHQUAKE MONITORING & EARLY WARNING IN ALASKA

In early May, the Governor's office requested the Commission lead an effort to compile a summary of the benefits of improved earthquake monitoring in Alaska and potential early warning; a task all the more daunting considering the Commission was given less than six weeks to produce a final report. This request needed to address benefits at both the Alaska and national level, and was motivated in part by a 2015 U.S. congressional request to the U.S. Geological Survey (USGS) to "conduct a cost benefit analysis and spending plan for the adoption of any remaining seismic stations, including stations in final deployment, if included as part of the Survey's Advanced National Seismic System for Research." Given the breadth of stakeholders—spanning science to engineering to risk mitigation to emergency management to public and private infrastructure—there was a clear and considerable need for a document providing context for the numerous and varied potential benefits of improved earthquake monitoring in Alaska.

Ultimately, the Commission, through personal and open letter requests, was able to compile close to 70 submissions/white papers from about 50 stakeholders, including state and local government departments, public and private engineering groups, earthquake scientists, emergency response organizations, University of Alaska, etc. This high number of responses, especially considering such short notice, clearly demonstrates there is a wide range of benefits for enhanced earthquake monitoring in Alaska, spanning diverse stakeholders in Alaska and across the nation.

In our report, these submissions describing particular benefits of enhanced earthquake monitoring in Alaska were grouped into five general topics, including characterization of Alaska earthquakes (e.g. location, magnitude, etc.), assessing the hazards of an earthquake (e.g. active faults, ground shaking, earthquake-induced ground failure, etc.), infrastructure monitoring (e.g. buildings, bridges, ports, utilities, pipelines, railroad, etc.), advancing national science priorities, and earthquake early warning. Based on the total submissions, the Commission concluded:

- While the needs and specific issues also vary across the state, Alaska should have a baseline of earthquake hazards knowledge and capabilities for characterizing earthquakes that apply across all regions of Alaska.
- It is in Alaska's best interest to improve monitoring wherever practicable through the adoption of seismic stations. The USArray Transportable Array offers a proven and unparalleled opportunity to enhance earthquake monitoring and provide more consistent earthquake information.
- Nearly all of the categories in this report would be enhanced by integrating GPS capabilities. Any planning to improve capabilities should specifically address the integration of Plate Boundary Observatory (PBO) data into Alaska earthquake monitoring efforts.
- Alaska has not deeply considered the potential impact of earthquake early warning. Many potential beneficiaries remain new to the concept. A dedicated outreach, education, and planning effort will be required before it is possible to quantify the full benefits. Therefore, the discussions in this report should be considered as presumed benefits of earthquake early warning relative to public safety and industry.

- The final report (copy available on our website [www.seismic.alaska.gov](http://www.seismic.alaska.gov)) was delivered to the Governor on June 17<sup>th</sup>, and then presented by Commissioner West at the USGS's Alaska Earthquake Monitoring Working Group meeting on June 29<sup>th</sup>.

### JANUARY 24<sup>TH</sup> M7.1 INISKIN EARTHQUAKE

- Commissioner West notified all of the other commissioners immediately after the earthquake. The Commission then discussed the earthquake in detail, including known damage and response activities by others, at the January 29 meeting.
- The Commission sent a briefing of the event to the Governor on February 1<sup>st</sup>. The Commission also prepared a brief flyer summarizing the key take away “points to ponder” from the M7.1 Iniskin Earthquake (a copy is attached to this report).
- Commissioner Scher gave presentations in April to the Alaska Local Emergency Planning Committee Association and State Emergency Response Commission regarding the M7.1 Iniskin Earthquake (the event, noteworthy observations, and lessons to remember).
  - Considering public education and awareness are very cost effective and efficient means to mitigate the risks of injury during a large, damaging earthquake, the Commission submitted two commentary pieces to the Alaska Dispatch for publication; the first in February titled “*Fundamental lessons from the recent M7.1 Cook Inlet Alaska and M6.4 Taiwan earthquakes – The importance of building codes, and distance versus magnitude*”, and the second in March titled “*March 27 – Great Alaska Good Friday Earthquake Remembrance Day*”. However, the Alaska Dispatch ultimately decided not to publish either commentary.

### POLICY RECOMMENDATIONS

The Commission began work to update and re-adopt two existing policy recommendations.

- **REGULATIONS FOR ALASKA REGISTERED CIVIL ENGINEERS PERTAINING TO KNOWLEDGE OF EARTHQUAKE HAZARDS:** *Despite being the most seismically active, and one of the highest ranked of the United States in terms of seismic risk, current Alaska statutes and regulations do not assure that all engineers registered to prepare and seal structural designs in Alaska have knowledge of either seismic engineering or earthquake hazards unique to the state. As such, the ASHSC recommends the Alaska State Board of Registration for Architects, Engineers, and Land Surveyors (AELS Board) adopt amendments to Alaska Administrative Code 12 ACC 36 for civil engineers pertaining to earthquakes.*
  - In February 2012 the Commission submitted a position paper to the AELS Board detailing the need for, and providing specific, cost effective recommendations to implement this policy recommendation. The AELS Board responded in July 2014, stating that our recommendations were not needed considering the new state regulations pertaining to a specific structural engineering license. The Commission does not agree that change alone addresses our previous concerns, and thus plans to update and resubmit recommendations for the AELS Board's further consideration.
- **ALASKA POST-EARTHQUAKE TECHNICAL INFORMATION CLEARINGHOUSE:** *In the aftermath of recent worldwide damaging earthquakes, pre-established web-based sites have proven to serve as efficient and cost-effective clearinghouses to consolidate and disseminate technical information in a timely manner, and to coordinate the efforts of various response groups. The ASHSC recommends that the Department of Natural Resources create a web-based template to provide a single-site*

*clearinghouse that can be activated immediately after a damaging earthquake for the purpose of compiling and sharing information in real-time, for coordinating reconnaissance investigation activities, and for archiving the produced technical data.*

- The Commission prepared a position paper supporting and recommending implementation of this policy recommendation in 2012, but work for implementation was deferred considering the role that pre-established out-of-state web sites. However, in the aftermath of the M7.1 Iniskin Earthquake, it became clear that despite its large magnitude, the out-of-state entities did not launch a clearinghouse website as the damage was limited. Therefore, the Commission still considers there is a need for an in-state web-based clearinghouse service to collect and archive observations, photographs, and reports specific to significant Alaska earthquakes that may not otherwise attract national attention. The Commissioner has begun discussions with the DGGs to explore the possibility of establishing a framework for launching a web-based clearinghouse.

## **LONG-TERM PROJECTS**

- Identification and Mitigation Prioritization of Seismically Vulnerable Schools:
  - Initiated a project<sup>4</sup> using FEMA's recently revised *Rapid Visual Screening* method to assess the vulnerability of 10 schools and associated additions, totaling 20 structures, located on Fairbanks North Star Borough School District campuses. The study identified the relative susceptibility of the 20 buildings to significant structural damage during a design earthquake. The results of this project will provide the district with an effective framework for prioritizing future projects to mitigate the risk of building collapse. A copy of the final report is available on the Commission's website.
- Kodiak Scenario Earthquake Study:
  - Continued work on a scenario earthquake study for eastern Kodiak Island.
- Advocate for Alaska Earthquake Research:
  - Continued work on an informational report summarizing the known earthquake sources and seismicity across the state.
- Earthquake Hazards Mitigation:
  - The Commission responded to a request from the village of Noatak Director of Community Planning for advice regarding earthquake hazards in that region, as those may apply to the relocation of their fuel tank farm and power plant, and for renovations to the former school building for community use. The Commission provided a letter outlining the general steps they could follow to qualify the relative risk and significance of the earthquake hazards around Noatak. The letter also summarized sources of existing information, such as geology and geotechnical conditions, historic earthquakes databases, and resources for qualifying potential types and magnitudes of earthquake damage.

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<sup>4</sup> To be completed under a \$25,000 grant obtained by the Commission from the Federal Emergency Management Agency (FEMA) National Earthquake Hazard Reduction Program (NEHRP), and administered through the Earthquake Engineering Research Institute. This project is similar to the two RVS projects the Commission completed in 2015 for the Matanuska-Susitna and Kenai Peninsula school districts.



- Commissioner Gravier prepared an abbreviated summary of the types of Federal grants communities and other entities (e.g. school districts, public utilities, etc.) could pursue to fund their projects aimed at mitigating the effects of earthquakes.

## **BRIEFINGS**

- In November, Amanda Siok (Risk Analyst, FEMA Region X) gave a presentation to the Commission on FEMA's "Risk Mapping" program in Alaska, with emphasis on the process (or lack thereof) for developing the earthquake scenarios modeled in their hazards analysis.

## **PARTNERING & OUTREACH**

- Commissioner Scher was interviewed by the Vancouver Sun newspaper, in British Columbia, as part of a series pertaining to earthquake preparedness, in regards to how other regions and communities deal with older infrastructure (i.e. buildings) in high seismic areas.
- Commissioner Aho continued to represent the ASHSC on the DMVA's *Alaska Partnership for Infrastructure Protection* organization.
- Commissioner Gravier represented the ASHSC during WSSPC's 2016 annual meeting in Long Beach, California. Commissioner Gravier continued to participate on the WSSPC Tsunami Hazards Mitigation Committee, and Commissioner Scher continued to participate on the WSSPC Engineering, Construction and Building Codes Committee.
- Commissioner Kelly continued to participate in the Earthquake Engineering Research Institutes' *School Seismic Safety Initiative* to create a nation-wide program to inventory the seismic vulnerability of schools.

## **MISCELLANEOUS**

- The Commission provided two amendments to the Department of Public Safety, Division of Fire and Life Safety (DFLS) pertaining to the State's proposed adoption of the 2012 International Building Code. The first amendment recommended that the construction documents (e.g. design reports, plans and specifications) for public buildings (including schools) located in high seismic regions receive a third-party review to assure conformance with the structural seismic design provisions in the code. The second amendment recommended special inspections be required for public buildings (including schools) constructed in high seismic regions, to assure construction of the structure conforms to the structural seismic design provisions in the plans and code. Note that while no State entity currently requires or performs either of these functions (including the DFLS), the DFLS ultimately defeated these two amendments.

## 2016 M7.1 Iniskin, Alaska, Earthquake: Points to Ponder

### ***Magnitude alone does not determine whether an earthquake is fatal***

- ✦ The Iniskin earthquake occurred 78 miles below the surface. Depth effectively adds a buffer between the earthquake and people, lessening the potential impact of the shaking.
- ✦ Smaller earthquakes located at the surface can be far more damaging. The 2011 earthquake in Christchurch, New Zealand, killed 153 people even though the magnitude was 6.3. It was shallow and happened under the city center.

### ***Earthquake-resilient construction saves lives***

- ✦ The population affected by the Iniskin earthquake generally reside in structures built in accordance with seismic building codes or using construction techniques that are resistant to earthquake shaking, and no lives were lost.
- ✦ Compare this to the February 6, 2016, magnitude 6.4 Taiwan earthquake, where poor construction techniques and the lack of enforced seismic building codes led to the collapse of an apartment building that killed 115 people.

### ***Local geology can dramatically enhance shaking***

- ✦ Although Anchorage and Mat-Su were more than 150 miles from the Iniskin earthquake, the shaking was stronger and lasted longer than predicted. Cook Inlet, which is underlain by very thick deposits of silt, sand, and gravel, “rang like a bell” and focused shaking in the direction of Anchorage.

### ***Gas lines can be a damage multiplier***

- ✦ Natural gas lines in Southcentral Alaska have long been recognized as a significant earthquake risk.
- ✦ The Iniskin earthquake illustrates the need for proactive efforts to mitigate this risk.

### ***About the Earthquake***

*Date and Time:* January 24, 2016, 1:30:30 am

*Location:* N 59.658°, W 153.452° (Iniskin Peninsula, 60 miles west of Homer)

*Area of Effect:* Moderate to strong shaking felt from Dillingham to Kodiak, the Kenai Peninsula, Anchorage, and the Mat-Su Valley

*Fatalities:* 0

*Damage:* Gas leaks in Kenai resulted in one house fire and evacuation of residents from about 20 homes. The earthquake damaged Kalifornsky Beach Road and caused power outages affecting more than 10,000 homes across Southcentral Alaska. Goods were knocked from shelves in Anchorage, some home foundations were damaged, and Romig Middle School gym and library were damaged and had to be closed off.



*House fire in Kenai caused by leaks from earthquake-damaged gas lines. (Photo credit: Kenai Fire Department)*