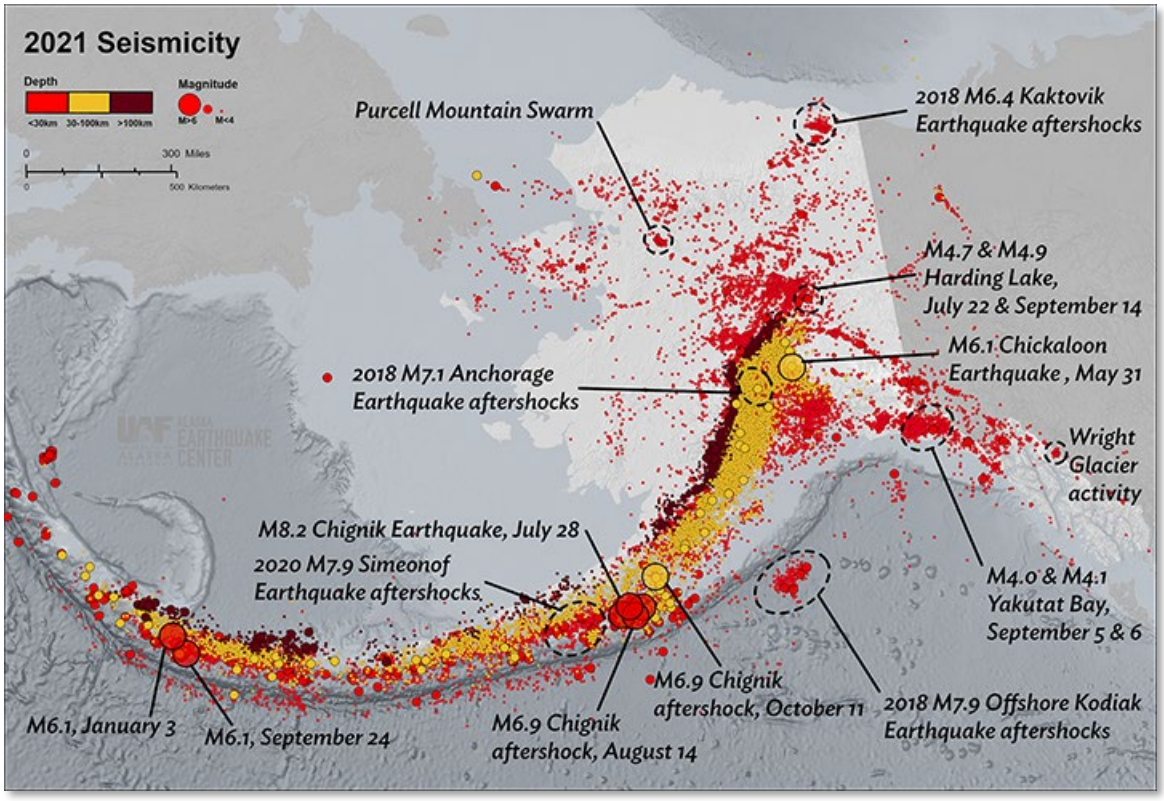
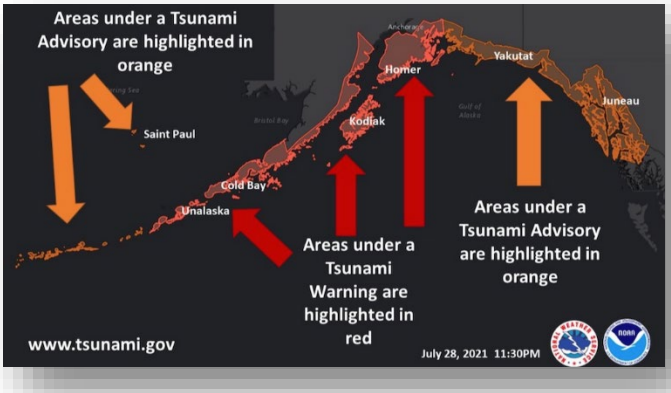
ASHSC Alaska Seismic Hazards Safety Commission





2021 Annual Report

to the Governor and State Legislature

EXECUTIVE SUMMARY

The magnitude 8.2 Chignik Earthquake that struck the Alaska Peninsula late in the evening of July 28th was the largest US earthquake in over 50 years. Aside from those awakened by a late-night tsunami warning, most Alaskans were unaware that an earthquake had occurred.

This event perfectly demonstrates many of the challenges of preparing for earthquakes in Alaska.

1. Earthquake hazards are ever-present. Alaska is the most seismically active state in the US and has the potential to produce great (M>8) earthquakes regardless of recent earthquake activity.
2. Alaska is huge and mostly empty. Monitoring for and responding to earthquakes requires a sophisticated seismic monitoring network and a well-prepared emergency management agency.
3. Alaska earthquakes can generate locally devastating tsunamis and severely impact locations throughout the Pacific. While the Chignik earthquake only generated a small tsunami (<1 foot), many Alaskans received a tsunami warning and dozens of communities evacuated to high ground. Even though some evacuees may see this as a "false alarm," the earthquake and tsunami scientists, local governments, and emergency response personnel consider this an unparalleled learning opportunity.
4. Earthquake-resilient construction is crucial. This significant event resulted in little damage to nearby communities thanks to sound engineering and construction practices for the few buildings in that area.

Elsewhere in 2021, the Alaska Earthquake Center (AEC) recorded 49,120 seismic events throughout the state.

The largest earthquake was the magnitude 8.2 event that occurred on July 28th southwest of Kodiak Island. It was followed by about 1,300 aftershocks including two magnitude 6.9 events on August 14 and October 11. Other active areas include earthquake sequences near Harding Lake in interior Alaska in July-September and near Yakutat Bay in September. The largest earthquake in mainland Alaska was the M6.1 Chickaloon earthquake on May 31, widely felt in Southcentral Alaska. The AEC continues to monitor ongoing activity within the 2018 M7.1 Anchorage, 2018 M6.4 Kaktovik, 2018 M7.9 Offshore Kodiak aftershock sequences, Purcell Mountains earthquake swarm, and Wright Glacier cluster northeast of Juneau. New research continues to explore the unexplained earthquake clusters on the North Slope and in the Brooks Range. These regions are critical to Alaska's oil and gas economy and can now be more thoroughly studied thanks to AEC's expanded seismic sensor network in the region.

The Alaska Seismic Hazards Safety Commission (ASHSC) has continued to meet remotely this year due to the ongoing COVID pandemic. We have turned this limitation to our advantage by leveraging unused travel funds to support several partners in enhancing their seismic education programs.

Our Commission has continued to move forward on several fronts this year in our mission to improve seismic safety in Alaska. A few of our accomplishments include:

- Holding an emergency meeting immediately following the Chignik Earthquake to foster communication and publish educational material.
- Publishing a policy recommendation on improving the seismic resilience of critical infrastructure.
- Promoting and participating in a conference on Seismic Resilience of Arctic Infrastructure and Social Systems.
- Joining in a FEMA-led working group on supporting school seismic retrofits.

I am proud of what our Commission has accomplished in 2021 and welcome the opportunity to further discuss our activities.

Sterling Strait, Chair
Barrett Salisbury, Vice-Chair

***Cover Photos**: 2021 Alaska Seismic Activity map from the Alaska Earthquake Center; Tsunami warning map for the 7/28/21 Chignik Earthquake from the National Tsunami Warning Center; Tabletop earthquake shake table donated to UAA College of Engineering – photo by S. Strait.*

ALASKA SEISMIC HAZARDS SAFETY COMMISSION
ANNUAL REPORT TO THE GOVERNOR & STATE LEGISLATURE FOR 2021

INTRODUCTION

This report[1] summarizes the Alaska Seismic Hazards Safety Commission's business, activities, and accomplishments in 2021 as related to its statutory powers and duties (AS 44.37.067) on behalf of the Governor, Legislature, local governments, and 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 and 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. The value of a community built with seismic safety in mind cannot be overstated.

The next significant earthquake and potential tsunami could happen any minute and we must continue to improve our seismic safety. The risks to public safety and infrastructure from future events can be greatly reduced through proper planning, design, construction, and continued education and outreach.

COMMISSION BUSINESS

This annual report summarizes the ASHSC's business conducted this year, including membership, meetings, ethics act, and finances; with administrative support provided by the Alaska Department of Natural Resources (DNR), Division of Geological & Geophysical Surveys (DGGS) (e.g. meeting logistics, budget, travel, website, etc.).

[1] *The Commission's documents (e.g. annual reports, meeting agendas and minutes, strategic and operating plans, policy recommendations and white papers, etc.) are available on our website https://seismic.alaska.gov/.*

MEMBERSHIP

The ASHSC membership represents a broad cross-section of Alaskan professionals which allows for a unique perspective on seismic hazards. We have representatives from the scientific sector who study earthquake hazards, engineers who design our infrastructure to minimize earthquake risk, government representatives who respond to earthquake disasters, and an insurance representative who helps ensure financial security following an earthquake.

2021 saw four new members join our commission and the resignation of four existing members.

TABLE 1: COMMISSION MEMBERSHIP

COMMISSIONER / OCCUPATION / RESIDENCE	REPRESENTATION
Barrett Salisbury Ph.D. Geologist, DGGS; Fairbanks	Alaska Department of Natural Resources
Natalia Ruppert, Ph.D. Seismologist, UAF; Fairbanks	University of Alaska
Bryan Fisher § DMVA, DHS&EM; Anchorage	Alaska Department of Military & Veterans Affairs
Paul Nelson † DMVA, DHS&EM; Anchorage	Alaska Department of Military & Veterans Affairs
Laura W. Kelly, P.E. Civil Engineer, USCG; Juneau	Federal Agency
Sam Bass § Assembly Member, Skagway, Alaska	Local Government
David Gibbs† Director Emergency Services, FNSB; Fairbanks	Local Government
Thomas Bergey § Mat-Su School Board; Wasilla	Local Government
Mike Devine † State Farm; Wasilla	Insurance Industry
Nick Murray § AK DOT Bridge Engineer, Juneau	Public/Restricted
Garret Gladsjo † Engineering Consultant, Juneau	Public/Restricted
Dan Neufer, PE Geotechnical Engineer, Palmer	Public/Restricted
Sterling Strait Structural Engineer, Alyeska Pipeline; Anchorage	Public/Restricted

† Resigned this year § Appointed this year

MEETINGS

The ASHSC conducted six meetings in 2021, including five public meetings (February 17, April 28, July 7, September 23, & November 18) and one emergency meeting (July 29) following the M8.2 Chignik Earthquake.

ETHICS ACT (AS 39.52)

The ASHSC submitted quarterly ethics reports to the Department of Law in 2021, with no written determinations, requests for determinations, or suspected potential violations.

FINANCES

The ASHSC's expenditures in 2021 (SFY21) totaled $8,941.35 out of an annual budget of $10,000.

Once again, COVID restrictions limited our ability to travel and hold in-person meetings. We worked with several partners to identify alternate applications for our budget to continue supporting our mission.

ACTIVITIES & ACCOMPLISHMENTS

This section summarizes our activities and accomplishments during the last year.

These accomplishments include activities addressed by the full Commission along with the actions of working groups and individual commissioners working on related business.

- **M8.2 Chignik Earthquake Emergency Response**

  An impromptu meeting was convened by the Commission within 24 hours of the M8.2 earthquake. Commissioners briefed the group on the seismologic and geologic imlications of the event, tsunami potential and the performance of tsunami warning system, and preliminary damage reports. As a result of this meeting, the Commission published a brief document summarizing the background and impact of the earthquake[2].

- **Seismic Resilience of Arctic Infrastructure and Social Systems**

  Our Commission promoted and attended a three-day workshop held in Anchorage on September 20 – 22 that dealt with seismic resilience of arctic infrastructure and social systems[3].

  This event was part of an ongoing research project jointly sponsored by UAF and the University of New Hampshire (UNH). Workshop participants included representatives from Native Alaskan Tribes along with individuals from Russia, Iceland, Japan, and Greenland.

  Commissioner Strait presented at the workshop and participated in discussions alongside Commissioners Bass, Murray, and Salisbury.

[2] http://seismic.alaska.gov/download/ashsc_meetings_minutes/sig_eq_2021_Chignik_July28.pdf
[3] https://sites.google.com/view/1st-arctic-seismic-resiliency/home

Following the workshop, Dr. Majid Ghayoomi of UNH attended a Commission meeting to provide a briefing on the workshop and future research plans.

- **School Seismic Retrofit Support Group**

  A support group was organized by FEMA Region X to share lessons learned and promote Building Resilient Infrastructure and Communities (BRIC) grants for seismically retrofitting schools.

  Commissioner Kelly presented on Commission activities including rapid visual screening (RVS) work, the successful retrofit of Kodiak High School, and lessons learned from the 2018 Anchorage Earthquake. Commissioner Salisbury also attended and participated in the discussion.

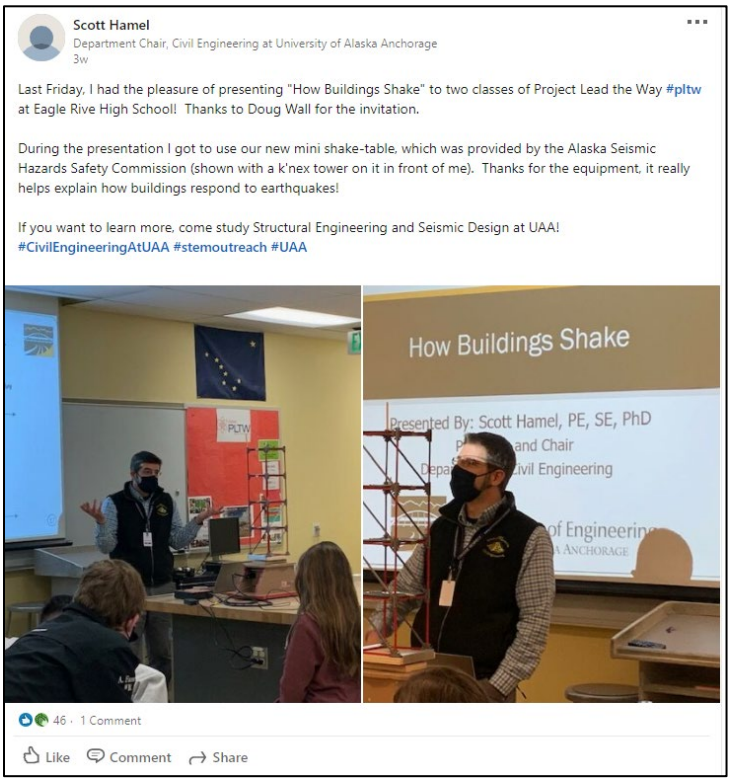
  This support group includes representatives from the Anchorage and MatSu School Districts along with AK DHS&EM.

- **Supporting UAA College of Engineering**

  Our Commission partnered with Dr. Scott Hamel with the UAA College of Engineering to promote seismic education and increase awareness of seismic hazards in Alaska.

  We provided UAA with a table-top earthquake shake table designed for classroom education. Dr. Hamel has put this device to use giving classroom demonstrations at local high schools.

  In addition, we worked with the UAA Engineering and Industry Building (EIB) to design and build an interactive display on earthquake risks and impacts. An earthquake shake table demonstrates the impact of seismic forces on an example building and a steel bridge is instrumented to show vibrations. This display is installed in the third-floor lobby of the EIB as a daily reminder to engineering students of the seismic hazards present in Alaska.



- **EERI Report on 2018 Anchorage Earthquake**

  The Earthquake Engineering Research Institute (EERI) published their final report[4] on the 2018 M7.1 Anchorage Earthquake in July.

  Our Commission invited one of the authors of this report to present their findings at our September meeting. The results and recommendations from this report provide many opportunities for future improvement.

- **Barry Arm Tsunami Monitoring**

  Commissioners Rupert and Salisbury participate in the multi-agency task force studying the potential for a significant tsunami hazard generated by a landslide in the Barry Arm of Prince William Sound. Such a tsunami would be dangerous to watercraft in the Sound along with the community of Whittier.

  Multiple instruments have been set up to monitor the unstable hillside to understand the potential risk and to serve as an early warning in case a landslide occurs.

  AK DGGS has set up a website[5] to provide ongoing updates on this topic.

- **RVS Surveys**

  Commission Fisher has been working with James Benzschawel (AK DHS&EM Earthquake Program Manager) to continue Rapid Visual Screening (RVS) work initiated by this Commission.

  Preliminary screening for multiple Anchorage Fire Department facilities was completed in 2020 with additional detailed screening surveys completed this year.

  Planning is underway for an RVS study of the Bartlett Regional Hospital in Juneau.

- **Seismic Retrofit Grant Funding**

  AK DHS&EM has successfully aided multiple Alaska communities and organizations to secure over $8 million in grant funding for seismic retrofit design and construction.

  Our Commission congratulated the department on their success and worked to promote these awards so that others can follow.

POLICY RECOMMENDATIONS

- **PR 2021-1 Resilient Critical Infrastructure –** A policy recommendation (PR 2021-1) was published to point the way forward on improving the seismic resilience of critical infrastructure in Alaska. This included several specific recommended actions including
  - Compile a database of seismic site response data for Alaska,

[4] *http://www.learningfromearthquakes.org/2018-11-30-anchorage-alaska/images/2018_11_30_Anchorage_Alaska/pdf/EERI-LFE-2018-Anchorage-Earthquake-Report-Final-web.pdf*
[5] *https://dggs.alaska.gov/hazards/barry-arm-landslide.html*

- Promote awareness of resources available to infrastructure owners to aid them in improving seismic safety
- Establish a state-funded grant program for seismic retrofits of critical facilities

PARTNERING & OUTREACH

- **USGS Alaska Liquefaction Modeling**

  Our Commission has coordinated with a USGS study that is modeling liquefaction risks in Alaska. Their work includes a field drilling program to provide site specific seismic criteria at multiple locations around the state.

  We will coordinate with them to aid in their research and use DGGS to increase awareness of their work and results.

- **NETAP Training**

  Our Commission supports AK DHS&EM in selecting and promoting training through the National Earthquake Technical Assistance Program (NETAP).

  This program provides training to the public free-of-charge on a variety of seismic safety topics ranging from seismic safety for schools to post-earthquake safety assessment.