Hazard Mitigation Planning Process

Tribal Hazard Mitigation Plan for Seldovia Village Tribe

Public Meeting #1

What is Hazard Mitigation?

Hazard mitigation projects eliminate the risk or reduce potential hazard impact severity to people and property. Projects may include short- or long-term activities to reduce exposure to, or the effects of, known hazards. Hazard mitigation activities include relocating or elevating buildings, replacing insufficiently sized culverts, using alternative construction techniques, or developing, implementing, or encouraging building codes to prevent damages.

Why is a Hazard Mitigation Plan needed?

Communities must have a FEMA-approved, and community-adopted HMP to receive a project grant from FEMA's pre- and post-disaster grants identified in their Hazard Mitigation Assistance and other agencies' mitigation grant programs. The HMP will make the Seldovia Village Tribe eligible to apply for mitigation funds after the HMP is approved by FEMA and adopted by the Tribal Council. A FEMA-approved and community-adopted HMP enables Tribal governments to apply for the Hazard Mitigation Grant Program (HMGP), a disaster-related assistance program and the Pre-Disaster Mitigation (PDM) grant programs.

Tonight's meeting is a forum to present a summary of the hazard mitigation planning process and identify potential mitigation actions for SVT. The Planning Team has been working to develop a Tribal Hazard Mitigation Plan. Public comments that are received tonight will be incorporated into the Draft Hazard Mitigation Plan. No names will be used, and information will be referenced as anecdotal. The Planning Team welcomes your input. Comments can be provided during this meeting or by email or phone. Send Jennifer LeMay, PE, PMP an email at jlemay@lemayengineering.com or call her at (907) 350-6061.

The Draft Hazard Mitigation Plan will be available for public review later this week. SVT will post the Plan on its Facebook page and Website. They will also have a paper copy in their office available for review. Another public meeting will be held in August. Comments can also be received at the August meeting.

For hazards, we're interested in information related to:

- Hazard Identification,
- Profiles (characteristics),
- Previous occurrences,
- Locations,
- Extents (breadth, magnitudes, and severity),
- Impacts, and
- Recurrence probability statements.

Which hazards are applicable to Seldovia Village?

- Floods/Erosion
- Wildland/Conflagration Fires
- Tsunami/Seiche
- Earthquakes/Subsidence
- Volcanic Eruption/Ashfall
- Ground Failure/Landslide
- Severe Weather
- Changes to the Cryosphere

Plan Process

- Introductory meeting occurred via phone on May 2, 2019.
- Gathering of data occurred during May and June.
- Draft Plan available for public comment (July 10, 2019).
- Public hearing for Draft Plan (August 5, 2019).
- FEMA review and pre-approval of Draft Plan.
- Newsletter announcing Final Plan (the public may still comment).
- Seldovia Tribal Council adoption.
- Final Approval from FEMA.

After the 2019 Hazard Mitigation Plan is completed, approved, and adopted, SVT will be eligible to apply for mitigation project funds from DHS&EM and FEMA for five years until the plan requires an update in 2024.

Changes in the Cryosphere

There is no written record defining changes in the cryosphere for Seldovia Village. Visual evidence from the 2017 City of Seldovia HMP included:

- Seldovia has noticed an impact to its fishing industry from climate change.
- Shorelines are changing.
- Winters are warmer.
- Hummingbirds are more acclimated to staying north—sightings in November 2017.

In 2019, the Seldovia community observed:

- Salmon do not arrive in April anymore; their arrival is in May/June.
- Seldovia was happy to have a few 60 °F days in summer; typically, temperatures were in the 50's. Recent summers have had temperatures in the 70's and 80's.
- There is less water in wells, creeks, rivers, and waterbodies.
- At Fish Creek near the Rocky Ridge Landfill, more tolerant macroinvertebrates are appearing. SVT believes the landfill is leaching into the environment.
- Algal blooms are more problematic with warming water temperatures in Seldovia.
- The rate of growth for alders has increased. Alders grown taller and faster than cottonwoods.
- Willow is more abundant and grows faster.
- Lupine used to generally grow adjacent to roadways. More invasive weeds have crowded out the lupine. Pushki has replaced the lupine along Jakolof Road.
- Seldovia did not have ticks in the past. Now, there are ticks.

Changes in the Cryosphere, continued.

- Spruce pollen comes off the trees in sheets in 2019.
- There is more spruce pollen in Kachemak Bay. One resident commented that she has lived in Seldovia for 57 years and has never seen so much spruce pollen. She also noted that cottonwood is everywhere.
- One resident stated that he has not needed to plow his driveway the last three winters. Snow has shifted to rain instead.
- Seldovia had a 56 °F day in February 2019.

Earthquakes

Alaska earthquake statistics include:
Alaska is home to the second-largest earthquake ever recorded (1964 Great Alaska Earthquake, M 9.2);
Alaska has 11% of the world's recorded earthquakes;
Three of the eight largest earthquakes in the world were in Alaska; and
Seven of the ten largest earthquakes in the U.S. were in Alaska.

Seldovia was forever changed by the 1964 Great Alaska Earthquake. The immediate damage from the tsunami devastated the small boat harbor, but the most lasting damage was related to co-seismic subsidence, which resulted in much of the community, which had been built on boardwalks, being inundated by high tides.

The 2016 Risk Map Study presented Hazus Earthquake Results for Magnitudes 7.1 and 9.2 earthquakes in the Kenai Peninsula Borough. The City of Seldovia had 335 improved parcels, valued at $89,984,700. After a M 7.1 earthquake, the total loss ratio was 0.34% ($310,314 in total damage). After a M 9.2 earthquake, the total loss ratio was 5.15% ($4,632,983 in total damage). Additionally, the study determined that only about 40% of the buildings in the City of Seldovia were built according to modern building codes. It is important to note that only the waterfront was rebuilt after the 1964 Earthquake. The 2016 Risk Map Study did not include impacts to Seldovia Village.

Floods/Erosion

Riverine flooding has not historically had much impact in areas that are heavily used. It's possible extreme flooding could damage or remove the bridge across Barabara Creek, severing connectivity to the City. This area might have some additional vulnerability beyond extreme rain events driving floods because it can form slush floods when heavy rain falls or when the river is iced over with snow on the ice. Such floods have happened historically in the Seldovia area (on the Seldovia River in ~2002, and on Barabara Creek a few years after that.) These floods can bring water levels dramatically higher than usual, but they are slow moving and typically not destructive. The concern here would be if they mobilized logs along the river, and the logs destroyed the bridge and severed the road.

Barabara Creek Bridge also is downstream of a steep gorge that could produce a landslide that has the potential to dam the river, and the breach of the landslide dam could create a violent flood. Additionally, nuisance flooding from unexpected extreme high tides can occur in Seldovia. The most extreme event was in 2002 when a tide forecast as 23 feet came in as 25.5 feet. An extreme high tide combined, resulting in flooding.

Floods/Erosion, continued.

Red Mountain/Rocky River is a traditional community subsistence gathering place. Jakolof Bay Road leads to Kachemak Bay State Park and is the only road to Red Mountain. The road has washed out, culverts are not maintained, and people carry their bikes and walk around the road to obtain access to Red Mountain. Four-wheelers can still access Red Mountain at the current time.

Flooding could isolate Seldovia Village from the City of Seldovia if the road connecting the two was affected, rendering the residents of both communities to be self-reliant. Flooding on Jakolof Road depends on how much rain there is; flash flooding occurs, and the depth of ponding can range from 0 to 2 feet very quickly. Flooding also affects subsistence fishing. Flooding can prevent fish from spawning at Jakolof Creek.

The bluffs from Barabara Point to Seldovia Point are eroding. They've been eaten up a lot in the past few years. Erosion related to slumping is a concern. This can happen as a result of adding water to already saturated areas, particularly those with soils with a high clay content. This can result in slumping and erosion of bluff areas.

Ground Failure

The primary ground failure hazard in the Seldovia area is landslides.

The area along Wadsworth Creek has areas of active ground deformation, and evidence of previous landslides. These past failures extend very near to where homes are built, but no one has directly built one there. The place where the road crosses Wadsworth could be cut by a slide.

The Seldovia Village includes a section of coast between Barabara Creek and Wodsworth Creek where there's ongoing erosion of soft bluffs, and houses on top of the bluff. This is clearly an area of concern. The area along the coast between Wadsworth and Barabara Creeks is also prone to landslides, and especially if erosion increases, potential failures that could affect one or several homes and potentially bits of road. Also, McDonald's Spit has a history of shifting beaches, causing issues for homeowners there. Both these areas will likely become more of an issue when sea level rise outpaces uplift (decades in the future) and as storm waves become more intense (likely already happening.)

Ground Failure, continued.

New lidar elevation data was collected by Chugachmiut covering the lands owned by Port Graham and Nanwalek Native Corporations. This data shows some signs of ground failure at the head of Seldovia Bay near the Sounding Board on the ridge across from the inner part of Seldovia Bay. This data also shows evidence that there were small glaciers in the area during the Little Ice Age (~200 years ago). The fact that there used to be glaciers suggests that alpine permafrost is a possibility. Melting alpine permafrost, or extreme rain events, could lead to a failure at the head of Seldovia Bay. If there was a failure, it would likely destroy some homes along the bay, and might produce a locally-damaging tsunami (though the water is quite shallow, so it would be limited). This would not affect Seldovia Village locally.

Down in saltwater adjacent to beaches around Seldovia, peat deposits formed in freshwater marshes are eroding out in what is now the intertidal. In one area where specific measurements have been gathered, radiocarbon dating shows that freshwater peats growing about 1,500 years ago are now 4.5 meters below MHHW. This age is reasonably well-aligned with a previous subduction zone earthquake (the most recent earthquakes occurred about 1,500, 800, and 50 years ago). There is no similar evidence of subsidence in the earthquake that followed, about 800 years ago, and though there was over a meter of subsidence in 1964, about half of that has already been reversed. Thus, this may be evidence that Seldovia has in the past, and might in the future, experience subsidence much greater than 1964.

Ground Failure, continued.

The 1964 Great Alaska Earthquake also caused extensive subsidence. The subsidence zone covered about 110,000 square miles, including the north and west parts of Prince William Sound, the west part of the Chugach Mountains, most of Kenai Peninsula, and almost all the Kodiak Island group. In some areas, subsidence exceeded seven feet. Part of the Seward area is about 3.5 feet lower than before the earthquake, and portions of Whittier subsided more than five feet. The Village of Portage, at the head of Turnagain Arm of Cook Inlet, subsided six feet, partly due to tectonic subsidence and partly due to sediment compaction during the earthquake.

A similar subsidence event would, especially in combination with an earthquake and tsunami, be one of the most disruptive disasters for Seldovia.

Ground Failure, continued.

There are two sections of the Jakolof Bay Road between McDonald's Spit and Jakolof that could be destroyed by a landslide. Landsliding during an earthquake could be particularly problematic since many of these areas could go all at once. Prolonged heavy rain could also lead to a similar event.

Also, the community is concerned with potential breaks developing in the road connecting the Village to the City, losing the bridge at Barabara Creek, or the bridge over the slough in a future ground failure hazard event. In 2001/2002, the State of Alaska installed cones where culverts were placed. Rocks occasionally fell on the school bus as it collected children and transported them to school. The children are no longer collected by a school bus.

In Homer, the Clinic is located near a spring or runoff area and is surrounded by wet soils with ditching. Debris flow in Homer in the vicinity of Skyline Drive could be caused by ground failure/land slides. The City of Homer adopted local ordinances to define ‘Steep Slope’ and require engineering approval for any development of steep slopes without Homer (HCC 21.44.050).

Tsunami and Seiche

Though volcano-generated tsunamis are rarer than earthquake-generated tsunamis, they are a threat to the Aleutian Chain and parts of Cook Inlet. Augustine Volcano has a history of producing large landslides during eruptions, most recently in 1883, when waves damaged Nanwalek (then English Bay).

In Alaska, landslide-generated tsunamis on deltas formed by glacial rivers are responsible for most of the tsunami hazard. Most of the destruction and death from tsunamis like this occurred in the minutes following the 1964 earthquake, when deltas in Valdez, Whittier, and Seward failed and produced locally-destructive tsunamis.

Landslides that come from mountains can also produce destructive tsunamis. Perhaps the most famous such tsunami happened in Lituya Bay in 1958, when an earthquake broke loose a large mass of rock on a mountainside above the bay. The wave washed over 1,700 feet up over a nearby mountain, and destroyed several boats sheltering in the bay. A similar landslide and tsunami happened in 1967 in Grewingk Lake, near the SVT planning area. The most recent example of a tsunami like this in Alaska occurred on Taan Fiord, Icy Bay, in 2015, which reached over 630 feet up a mountainside. Fortunately, nowhere within SVT's planning area has the combination of steep slopes and deep (>150 feet) water required to produce this sort of tsunami.

Tsunami and Seiche, continued.

Waterfront buildings were rebuilt in Seldovia at the elevation of the harbor after the 1964 Great Alaska Earthquake. If a tsunami should occur, the City will be impacted as well as the two SVT buildings located within City limits.

Approximately 75 to 100 of SVT's summer population reside at McDonald Spit. McDonald Spit could likely be underwater should a tsunami occur without adequate warning. The winter population is approximately five people.

The City is posting tsunami evacuation route signs in 2019. Evacuation maps are available in the Harbormaster's Office. Evacuation routes will be published in phone books. The Alaska Geophysical Institute Sea Grant has a 30-minute video on tsunamis called *Ocean Fury in Alaska*. Survivors of the 1964 Great Alaska Earthquake and tsunami are interviewed, and the Institute shows what to do if another hazard event of that magnitude occurs again. The Seldovia Library has plans to show this video once a week for educational purposes and to schools.

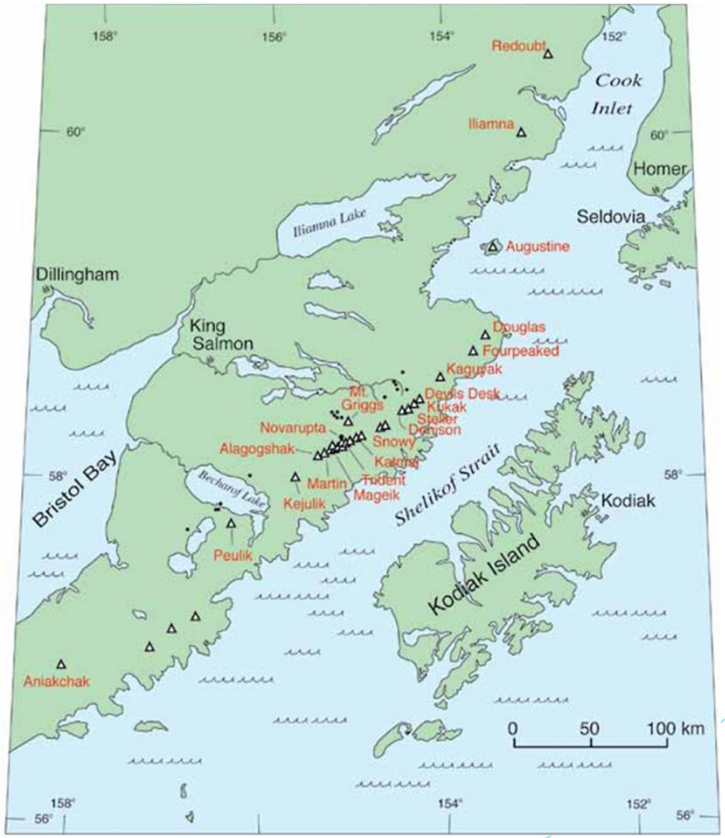
Volcanic Ashfall

Seldovia has been impacted by volcanic ashfall events, the only local volcanic hazard other than tsunamis. These ashfall events followed eruptions of Mt. Augustine and Redoubt volcanoes. Larger eruptions occurred in the geologic past, leaving dramatic layers of ash in the soil around Seldovia. The ash fall from the 1912 eruption was significantly greater (100s of times more ash produced by the eruption with Kodiak receiving 100 times as much ashfall than Seldovia) than the 2005 and 2009 eruptions of Redoubt, Spurr, and Augustine Volcanoes. Fourteen earthquakes of M 6 to 7 were associated with this event. Prehistorically in Seldovia, there has been about one giant ashfall every 1,000 years. Most ash comes from Augustine Volcano, but one is from an unknown source somewhere in the Katmai region. None were as large as 1912 was in Kodiak, but this isn't out of the realm of possibility.

A major factor in determining ashfall is wind direction. Kodiak was located directly downwind of the main eruption of Mt. Novarupta, which is why it was so deeply buried. The same could happen in Seldovia if there was a large eruption at Mt. Augustine during a strong westerly. Additionally, if there is a large ashfall, wind could blow and redistribute ashfall several times which would be a prolonged hazard.

Volcanic Ashfall, continued.

A few years ago, AVO worked with Ground Truth Trekking and the City of Seldovia to document the largest ashfalls that have impacted Seldovia over the past 7,000 years. They identified about one event per 1,000 years (all larger than historic events in this area, though none leaving as thick a deposit as fell on Kodiak in 1912.) All but one of the events evaluated came from Augustine. None came from Redoubt. One came from an as-yet unidentified volcano that is probably somewhere in the Douglas/Katmai region.



Severe Weather

In Seldovia Village, there is potential for weather disasters. Wind-driven waves from intense storms produce coastal flooding and erosion. High winds, common on the Kenai Peninsula, can topple trees, damage roofs and windows, and result in power outages. Heavy snow can cause power outages or collapse roofs of buildings. Storms can cut off air and/or boat travel across Kachemak Bay, isolating Seldovia for the duration of the storm. In early November of 2012, a series of snow events lead to widespread tree damage between 500 and 1,000 feet, breaking power lines and blocking access to the Seldovia water supply dam. If such conditions occurred at lower elevations, they could have much greater human impact. Extreme weather is most prevalent during the winter with any combination of cold temperatures, strong winds, storm surge, and heavy snow.

Winters in Seldovia from 2014-2018 have been milder. One resident commented that he has not needed to plow his driveway the last three winters.

Westerly winds can sometimes produce poorly-forecast extreme snow events when they are combined with a northerly in the upper inlet and lake effect that creates a narrow band of intense snowfall that's steered into Seldovia by the westerly.

Severe Weather, continued.

Interruptions to electricity, communications, and fuel supply during or after severe weather events are one of the most important aspects of a weather emergency in Seldovia Village. Residents stated during the July 1, 2019, public meeting that they used to be able to rely on City power. Frequent power outages are now common. In Seldovia Village, there is no alternate power option other than what individual households have chosen. Now, backup generation is necessary, particularly in the southeast portion of Seldovia Village. Additionally, power outages have repeatedly caused losses of vaccinations in all three SVT clinics. The clinic in Homer has a backup generator that has proven itself not to be entirely reliable. Seldovia and Anchor Point do not have backup generators in their clinics.

Residents commented how severe weather has consisted of large rain storms lasting several weeks and hurricane-force winds that knock down old stands of trees and buildings and blow off roofs. Local knowledge indicates that Seldovia Village is receiving stronger windstorms than in the past. Storms that flatten many trees are one of the most likely widespread disasters now. A 2019 windstorm knocked down many trees and somewhere impacted around 10 structures and did damage, though nothing all that severe. In 2012, Seldovia Village had one event where heavy snow led to a great many trees falling, leading to temporarily impassable roads and other minor effects.

Tundra-Wildland/Conflagration Fire

- Wildland fire, which consumes natural vegetation.
- Community fire conflagration, which propagates among structures and infrastructure.

In 2004, SVT planted a mixed forest of native and non-native species as a fire prevention measure that was funded by the Division of Forestry. Species planted included lodgepole pine, Siberian larch, white spruce seedling, and willows at the Mile 2 area of Jakolof Road. This mixed forest greatly exceeded natural spruce growth. Siberian Larch are deciduous trees that don't shed their needles like spruce and are more resilient to fire than spruce. The mixed forest of alders, devils club, berry bushes, and Siberian larch offer protection from fire. Additional plantings have occurred since.

Contractors for SNA clear cut at Mile 2 of Jakolof Road. Additional clear cuts out of Jakolof should be done.

Spruce Bark Beetle likely won't take over Seldovia Village like the rest of the Kenai Peninsula Borough due to the prevailing wind (from the southeast) and cooler temperatures, but the potential is there.

Planting the mixed forest, making clear cuts, and installing fire breaks have made fire not the hazard it used to be. These fire prevention measures should be continued.

Vulnerability of the SVT

Population

- 2010 U.S. Census was 165.
- 2017 DCCED was 180.

Houses and Critical Infrastructure

- 206 single-family residential structures ($25,050,000).
- Critical facilities and infrastructure have been identified.