City of Homer
All-Hazard
Mitigation Plan

2016 Update

Table of Contents

Chapter I – Introduction

A. Purpose of the Plan:

The purpose of the All-Hazard Mitigation Plan is to fulfill the FEMA requirement under The Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Act), Section 322, Mitigation Planning enacted by Section 104 of the Disaster Mitigation Act of 2000 (DMA) (P.L. 106-390). In accordance with FEMA directives, the City of Homer All-Hazard Mitigation Plan originally adopted in July of 2004 must be updated and revised to reflect the current situation as determined by a review of the mitigation efforts completed under the existing plan and a review of events that have occurred since adoption of the first plan. This plan will identify hazards; establish community goals and objectives and develop mitigation strategies and activities that are appropriate for the City of Homer.

The Disaster Mitigation Act of 2000 (DMA 2000), Section 322 (a-d), as implemented through 44 CFR Part 201.6 requires that local governments, as a condition of receiving federal disaster mitigation funds, have a mitigation plan that describes the process for identifying hazards, risks and vulnerabilities, identifying and prioritizing mitigation actions, encouraging development of local mitigation and providing technical support for those efforts. Although only required to address natural hazards such as earthquake, severe storms, etc., it is the intent of the City of Homer to address, to the fullest extent possible, all-hazards that might reasonably be expected to strike the greater Homer area including natural, technological, and man-made hazards.

The purpose of this plan is to produce a program of activities through actions and projects that will best deal with the City of Homer's hazard vulnerabilities, while meeting other community needs. This plan will accomplish the following objectives consistent with FEMA planning process guidelines:

- Describe the planning process to include public involvement;
- Conduct an assessment of the potential risks;
- Determine what facilities, or portions of infrastructure, are vulnerable to a disaster;
- Develop a mitigation strategy, where possible, to reduce potential losses and target resources;
- Describe how each entity will periodically evaluate, monitor, maintain and update the plan; and,
- Describe the process for implementing the plan after adoption by the local governing body of the community and receiving FEMA approval.

B. Methodology

The City of Homer All-Hazards Mitigation Plan 2015 Update was developed as a multi-jurisdictional plan in cooperation with the Kenai Peninsula Borough. On *insert date*, the Homer City Council adopted by Ordinance *insert ordinance number* the City of Homer All-Hazards Mitigation Plan 2015 Update. This plan becomes an Annex of the Kenai Peninsula Hazard Mitigation Plan. This plan must also be approved by the State of Alaska Division of Homeland Security, Emergency Management, and the Federal Emergency Management Agency (FEMA).

The approach used for the review and update of the City of Homer All-Hazard Mitigation Plan consisted of the following tasks:

1. Coordinate with other agencies and organizations
2. Solicit public involvement
3. Conduct hazard area inventory
4. Review and analyze previous and future mitigation activities
5. Describe the update and review process and schedule for plan maintenance
6. Coordinating the Plan with the KPB and State Hazard Mitigation Plan
7. Submitting to the State Hazard Mitigation Officer for Review
8. Submitting to FEMA Region 10 for Review and Approval
9. Adoption of the Plan following the public hearing process

This All Hazard Local Mitigation Plan Revision contains a list of potential goals and activities with a brief rationale or explanation of how each project or group of projects contributes to the overall mitigation strategy outlined in the plan.

This plan summarizes the activities above to assess the effects of hazards in the City of Homer: flooding, earthquake, wildfire etc. and recommends mitigation strategies and activities.

The mitigation plan will be evaluated and updated every five years. In addition, the plan will be reviewed annually by the City of Homer Director of Emergency Services (Emergency Manager) and as appropriate when a disaster occurs that significantly affects Homer, whether or not it receives a Presidential Declaration.

> **Years 1 & 3** Funding streams will be discussed, and which mitigation action should be implemented within the coming year. All departments and/or organization that are responsible for mitigation action will be invited to attend.
>
> **Years 2 & 4** The City will determine whether there are components of the plan's Risk Assessment that can be updated. The previous year's disasters (if any) will be assessed and, if needed, produce better maps to aid in future hazard mitigation. Continue public outreach.
>
> **Year 5** A full update of the all- hazards mitigation plan will be completed. The committee will convene and if needed assign plan update tasks.

Routine maintenance of the plan will include updating historical hazard information, completing hazard analysis and adding projects as new funding sources become available, or taking projects off the list when they are accomplished.

C. Homer – Background

The following information was obtained from the Department of Commerce, Community, and Economic Development Community Database online at this website: http://www.commerce.state.ak.us/ as of April 24, 2015.

General Location

Homer is located on the north shore of Kachemak Bay on the southwestern edge of the Kenai Peninsula. The Homer Spit, a 4.5-mile long gravel bar, extends from the Homer shoreline into Kachemak Bay. Homer is 227 road miles south of Anchorage, at the southern-most point of the Sterling Highway. It lies approximately 59.6425° and -151.54833°. (Section 19, Township 6 South, Range 13 West, Seward Meridian. Homer is located in the Homer Recording District. The area encompasses 10.6 square miles of land and 14.9 square miles of water. The city limits extends easterly approximately 4.5 miles, northward along Skyline Drive and to the west just beyond Roger's Loop. The City of Homer abuts Kachemak City to the east and is a part of the Kenai Peninsula Borough.

Climate

Homer lies in the Gulf Coast Maritime Climate Zone. The Minimum Daily Temperature during Winter is -1° F and the Maximum Daily Temperature during Summer is 76° F. The Maximum Daily Precipitation totals 1.1" with a Total Annual Precipitation of 24.1 inches, including 55 inches of snow.

History

The Homer area has been home to Kenaitze Indians for thousands of years. In 1895, the U.S. Geological Survey arrived to study coal and gold resources. Prospectors bound for Hope and Sunrise disembarked at the Homer Spit. The community was named for Homer Pennock, a gold mining company promoter who arrived in 1896 and built living quarters for his crew of 50 on the Spit. Their plans were to mine the beach sands along Cook Inlet, from Homer to Ninilchik. The Homer post office opened shortly thereafter. In 1899, Cook Inlet Coal Fields Company built a town and dock on the Spit, a coal mine at Homer's Bluff Point, and a 7-mile long railroad, which carried the coal to the end of the Spit. Various coal mining operations continued until World War I, and settlers continued to trickle into the area, some to homestead in the 1930s and 1940s, other to work in the canneries built to process Cook Inlet fish. Coal provided fuel for homes, and there is still an estimated 400 million tons of coal deposits near Homer. The City government was incorporated in March 1964. After the Good Friday earthquake in 1964, the Homer Spit subsided approximately 4 to 6 feet. Since then several buildings were relocated to reduce the effects of hazards with particular emphasis on new and existing buildings and infrastructure.

Culture

While commercial fishing has long been the mainstay of the Homer economy, tourism has become increasingly important. Homer is known as an arts community and is also a gateway community in relation to more remote destinations, such as Kachemak Bay State Park and Lake Clark National Park and Preserve. The Homer Jackpot Halibut Derby attracts summer recreational fisherman and the Kachemak Bay Shorebird Festival attracts spring time birders.

Population and Economy

The Alaska State Department of Labor estimates the 2014 population of Homer at 5,099. Homer is incorporated as a first-class city. It is primarily a fishing, fish processing, trade and service center, and enjoys a considerable seasonal visitor industry. The Homer Spit has two deep water docking facilities: the Deep Water Dock and the newer Pioneer Dock which is home to the U.S. Coast Guard Cutter Hickory and is the home berth of the Alaska Marine Highways Ferry Tustumena. Homer is home to the Islands and Ocean Visitor Center, an interagency facility and important meeting place.

Figure 1: Resident Workers by Industry (2014)

Estimated resident per capita income for 2014 was $33,469 and the unemployment rate was 8.8% according to the Alaska State Department of Commerce 2014 Audit Report.

Facilities

Over 90% of homes are fully plumbed. Water is supplied by a dam and 35-acre reservoir at Bridge Creek, is treated, and stored in a 500,000-gallon tank and a newly constructed 1,000,000-gallon tank, and piped to the majority of homes in the City. The newly completed water treatment plant can treat 2 million gallons of water per day, with the potential for another one million gallons per day when needed due to population growth. Other residents use individual wells or have water delivered to home tanks. City sewage is piped to a deep-shaft sewer treatment plant; capacity is 880,000 gallons per day. Refuse is collected by one of two private trash collection services, and hauled to an updated Borough Class 1 Monofill landfill at mile 169.3 Sterling Highway.

Homer Electric Association is a member-owned electric cooperative that provides power to the western Kenai Peninsula, including Sterling, Soldotna, Kenai, Nikiski, Kasilof, Ninilchick, Homer and south Kachemak Bay. HEA facts:

- 22,892 member-owners
- 33,341 meter locations
- 2,407 total miles of energized line
- 3,166 square-mile service area on the southern Kenai Peninsula

The City is the major property owner on the Spit and operates the port and harbor facilities which include:

- **Small Boat Harbor**: which has 920 reserved stalls, plus 6000 linear feet of transient mooring.
- **Fish Dock and Ice Plant:** The Fish Dock operates for a 9-month season. The dock has eight cranes and the Ice Plant has a 200 ton ice storage capacity.
- **Deep Water Dock**: 245 linear feet with a 40 foot depth.
- **Pioneer Dock:** 469 linear feet with a 40 foot depth that serves the Alaska Marine Highway system.

KEY LOCATIONS

- Corporate office in Homer
- Central Peninsula Service Center in Kenai
- Nikiski Generation Plant
- Bradley Lake Hydroelectric Plant (owned by the State of Alaska)
- Bernice Lake Power Plant (Nikiski)
- Soldotna Power Plan

Transportation

Homer is accessible by the Sterling Highway to Anchorage, Fairbanks, Canada and the lower 48 states. It is often referred to as "The End of the Road", because it lies at the terminus of the Sterling Highway. The State owns and operates the Homer Airport, with a 6,700 ft asphalt runway, and a seaplane base at Beluga Lake. The City is served by several scheduled and chartered aircraft services. There are four additional private landing strips in the Homer vicinity. The Alaska Marine Highway and local ferry services provide water transportation. The Deep Water Dock was constructed in 1990 and can accommodate vessels up to 800 ft, displacing 65,000 tons. The Pioneer Dock, constructed in 2001-2002 can accept vessels up to 750 ft and displacing 80,000 tons. The Small Boat Harbor has 920 reserved boat slips (up to 85 ft boats); 6,000+ linear feet of transient moorage; 48.7 acre boat basin; two tidal grids; and a five lane load and launch ramp.

Chapter II – Planning Process

A. Planning Process

The City of Homer began the 2015 All-Hazard Mitigation Plan Update process in April with a preliminary committee meeting held on April 3, 2015, and conducted the first of several public meetings regarding the plan update on April 17, 2015 (attendance included only one member of the public, 2 media representatives, and 3 committee members). The Committee will meet monthly through the completion of the update. In August 2015, committee member who is also on the Homer City Council member, Catriona Reynolds provided the public an update and timeline for public review. The Homer All-Hazard Mitigation Plan Update Committee included:

- Robert Painter, Director of Emergency Services
- Dotti Harness-Foster, Planning Technician
- Catriona Reynolds, Homer City Council
- Glenn Radeke, Support Services Director, South Peninsula Hospital
- Charlie Pierce, Enstar Natural Gas
- Joe Gallagher, Homer Electric Association
- Terry Rensel, Program Director, KBBI Homer Public Radio
- Scott Nelsen, State of Alaska Division of Homeland Security and Emergency Management, Hazard Mitigation Planner

Ex Officio members of the committee included:

- Beth Wythe, Mayor
- Katie Koester, City Manager
- Mark Robl, Police Chief
- Rick Abboud, City Planner
- Zhiyong Li, Finance Director
- Anne Dixon, Library Director
- Byran Hawkins, Port & Harbor Director/Harbormaster
- Carey Meyer, Public Works Director
- Jo Johnson, City Clerk

Other city staff, community stake-holders, and content experts provided support and review services of the draft documents and provided helpful feedback to the committee, including, but not limited to:

- Alaska Department of Transportation
- Kenai Peninsula Office of Emergency Management
- Alaska Division of Homeland Security and Emergency Management
- Homer City Council
- National Tsunami Warning Center
- Alaska Volcano Observatory
- National Weather Service

B. Opportunity for Public Involvement

Public involvement was on full-alert in March of 2015 when the South Peninsula Hospital conducted a full-scale emergency preparedness exercise. The 3-day evacuation of a large facility to an alternative site was titled "Rock and a Hard Place." The exercise was designed to test and evaluate the City's and South Peninsula Hospital's response to overwhelming catastrophic events. The City of Homer along with eleven other Federal, State, and Local agencies, plus 50-75 mock victims participated in the 3-day exercise. The mock scenario involved heavy rains that saturated the ground resulting in a landslide that threatened the hospital which initiated the need for an alternate care site. The mock rains also closed the Sterling Highway.

In order to enlist public comment on the draft City of Homer All-Hazard Mitigation Plan 2016 Update/Revision, an initial Town Hall meeting was advertised and conducted on April 17, 2015 in the City of Homer Council Chambers from 6:00 PM until 7:30 PM. Links to the draft plan were posted as a Key Topic on the Fire Department and on the State's Emergency Management Library.

Two public hearings were advertised in the local newspapers. This plan was available on the City's website and at the Homer Public Library. Feedback was accepted by email, fax, in person, or by phone.

On January 11, 2016, the Homer City Council introduced a resolution for adoption and held a public hearing on January 25, 2016 and adopted the Plan by resolution.

Chapter III– Hazard Profiles

The City of Homer participates in the National Flood Insurance Program (NFIP). The function of the NFIP is to provide flood insurance at a reasonable cost to homes and businesses located in floodplains. The program is based upon mapping areas of flood risk, and requiring local implementation to reduce flood damage primarily through requiring the elevation of structures above the base (100-year) flood elevation (BFE). In 2009 the City of Homer adopted higher regulatory standards which require that all new structures be elevated one foot or more above the best flood elevation (BFE+1).

A. Hazard Identification **Matrix** – City of Homer

Flood	**Wildland Fire**	**Earthquake**	**Volcano**	**Snow Avalanche**	**Tsunami**
Y-M	Y-H	Y-M	Y-M	Y-M	Y-M
Weather	**Landslides**	**Erosion**	**Drought**	**Technological**	**Economic**
Y-H	Y-M	Y-H	N	Y-L	Y-M
Biologic	**Man-Made**				
Y-M	Y-L				

Hazard Identification:

- Y: Hazard is present in jurisdiction but probability unknown
- N: Hazard is not present
- U: Unknown if the hazard occurs in the jurisdiction

Risk:

- L : Hazard is present with a low probability of occurrence
- M : Hazard is present with a moderate probability of occurrence
- H: Hazard is present with a high probability of occurrence

Emergency Management Specialist rate hazards based on the following criteria for probability (Table 1) and impact (Table 2).

Table 1: Hazard Probability Criteria	
Probability	**Criteria**
4 - Certain	▫ Event is probable within the calendar year. ▪ Event has up to 1 in 1 year chance of occurring (1/1=100 percent). ▪ Probability is greater than 33 percent per year. ▪ Event is Certain.
3 - Likely	▫ Event is probable within the next three years. ▪ Event has up to 1 in 3 years chance of occurring (1/3=33 percent). ▪ Probability is greater than 20per cent but less than or equal to 33 percent per year. ▪ Event is Likely.
2 - Credible	▫ Event is probable within the next five years. ▪ Event has up to 1 in 5 years chance of occurring (1/5=20 percent). ▪ Probability is greater than 10 percent but less than or equal to 20 percent per year. ▪ Event is Credible.
1 - Plausible	▫ Event is possible within the next ten years. ▪ Event has up to 1 in 10 years chance of occurring (1/10=10 percent). ▪ History of events is less than or equal to 10 percent likely per year. ▪ Event is Plausible.

Table 2: Hazard Impact Criteria	
Impact	**Criteria**
4 - Catastrophic	▫ Multiple deaths. ▪ Complete shutdown of facilities for 30 or more days. ▪ More than 50 percent of property is severely damaged.
3 - Critical	▫ Injuries and/or illnesses result in permanent disability. ▪ Complete shutdown of critical facilities for at least two weeks. ▪ More than 25 percent of property is severely damaged.
2 - Limited	▫ Injuries and/or illnesses do not result in permanent disability. ▪ Complete shutdown of critical facilities for more than one week. ▪ More than 10 percent of property is severely damaged.
1 - Negligible	▫ Injuries and/or illnesses are treatable with first aid. ▪ Minor quality of life lost. ▪ Shutdown of critical facilities and services for 24 hours or less. ▪ Less than 10 percent of property is severely damaged.

Table 3 assigns numerical ratings to each risk factor. Each factor is a part of the whole risk, which is represented by the number 1, (.45 + .30 + .15 + .10 = 1.0).

Table 3: Priority Risk Index Values

.45 Probability	.30 Impact	.15 Warning Time	.10 Duration
4 - Certain	4 - Catastrophic	4 - under 6 Hours	4 - under 1 Week
3 - Likely	3 - Critical	3 - 6-12 Hours	3 - over 1 Week
2 - Credible	2 - Limited	2 - 12-24 Hours	2 - under 1 Day
1 - Plausible	1 - Negligible	1 - 24+ Hours	1 - under 6 Hours

The community rates each risk factor by degree, such as "Certain" or "Catastrophic". The ratings are multiplied by the risk factors:

Example: Probability = 4-Certain, Impact=3-Critical, Warning Time=2-12-24 Hours, Duration=4-over 1 Week.

(4x0.45) + (3x0.30) + (2x0.15) + (4x0.10) = 1.8+0.9+0.3 = 3.0

The planning team rated each factor using data from prior disasters, and used the results to assign relative importance to each hazard.

Table 4: Risk Priority Index

Hazard	Probability	Impact	Warning Time	Duration	Priority Risk Index
Earthquake	4 Certain	2 Limited	4 < 6 Hours	1 < 6 Hours	3.1
Erosion	4 Certain	1 Negligible	1 24+ Hours	4 > One Week	2.65
Flooding	1 Plausible	2 Limited	2 12-24 Hours	3 < One Week	1.65
Volcano	2 Credible	2 Limited	1 24+ Hours	1 < 6 Hours	1.75
Weather	2 Credible	2 Limited	1 24+ Hours	3 < One Week	1.95
Wildfires	3 Likely	3 Critical	2 12-24 Hours	4 >One Week	2.95
Landslides	1 Plausible	2 Limited	4 <6 Hours	3 < One Week	1.95
Tsunami	2 Credible	1 Negligible	4 <6 Hours	1 <6 Hours	1.9
Technological	1 Plausible	1 Negligible	4- < 6 Hours	1-< 6 Hours	1.45
Economic	2 Credible	2 Limited	1- 24+ Hours	4- > One Week	2.05
Biological	2 Credible	3 Critical	2 -12-24 Hours	4- > One Week	2.5
Man-Made	1 Plausible	2 Limited	4-<6 Hours	3- <One Week	1.95

B. Flood: **Profile of Hazard Events**

Flooding is a natural event and damages occur when humans interfere with the natural process by altering the waterway, developing watersheds, and/or building inappropriately within the floodplain. This flooding threatens life, safety and health; causes extensive property loss; and results in substantial damage.

Homer participates in the NFIP which is a source of reasonably priced flood insurance for property owners that build to floodplain standards. In 2013 the City adopted updated Flood Insurance Rate Maps. The flood maps are based on a 100 year chance event and do not include tsunamis because the relatively short period of record.

Flooding in Homer can be broken into a number of categories including: rainfall-runoff floods, snowmelt floods, ground-water flooding, and stream/creek flash floods. Homer also experiences coastal flooding from storm surge but this will be discussed in the Weather section.

Homer has experienced floods on several occasions in the last 15 years. Major events occurred in 2002, 2007 and 2013, resulting in numerous bridges being washed out on the Kenai Peninsula and isolating Homer for several weeks while temporary repairs were made. Two of these events were declared disasters and resulted in disruptions to the economy by preventing the flow of goods and materials south of Ninilchik except by barge or airplane.

Photo shows damage to East End Road following the 2002 flooding event.

There continue to be local events caused by ground water saturation, snow-melt, water runoff and local topography.

On October 26, 2013 the National Weather Service issued a flood watch for areas around Western Prince William Sound due to a slow moving system which brought heavy rainfall to the mainland. Seward, Homer, and other areas of the Kenai Peninsula received over 5 inches of rain which caused widespread flooding, landslides, and road washouts. Seward, Homer, Kenai, Anchor Point, and the Tyonek area all reported damages. Disaster Declarations were received from the Kenai Peninsula Borough on October 29, 2013. (13-F-243, KPB Flood Disaster declared by G. Parnell on Nov. 18, 2013 then FEMA declared January 16, 2014 (DR-4161).

Rainfall-Runoff Floods

A typical rainfall event occurs in mid to late summer and early fall. The rainfall intensity, duration, distribution and geomorphic characteristics of the watershed all play a role in determining the magnitude of the flood. Runoff flooding is the most common type of flood.

In November 2007 heavy rains, above freezing temperatures and melting snow caused small stream flood advisory for the southern Kenai Peninsula. The National Weather Service reported 1.64 inches of rain in a 24-hr period, which led to overflowing culverts that sent water over the roadways.

Snowmelt Floods

Snowmelt floods usually occur in the spring or early summer. The depths of the snowpack and spring weather patterns influence the magnitude of river and stream flooding. The Sterling Highway between Homer and Anchor Point is subject to snowmelt flooding each spring.

Ground-water Floods

Ground-water flooding occurs when water accumulates and saturates the soil. The water-table rises and floods low-lying areas, including homes, septic tanks, and other facilities. Ground-water flooding can also occur in basements of structures along streams or in low-lying areas. Areas along Kachemak Drive are subject to ground water flooding.

Flash Floods

These floods are characterized by a rapid rise in water. They are often caused by heavy rain on small stream basins, ice jam formation or by dam failure. They are usually swift moving and debris filled, causing them to be very powerful and destructive. Steep coastal areas in general are subject to flash floods. Debris slides are often associated with heavy rains. The 2002 events resulted in several flash floods which closed roads and washed away bridges. Several small creeks and streams in the Homer area produced substantial debris laden flows during this time.

Homer Participation in the National Flood Program

City	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Reg-Emer Date	Tribal
Homer	05/19/1981	06/16/1999	11/6/2013	06/02/2003	No

Homer NFIP Insurance as of 5/31/2015

Total Premium	No. of Policies	Total Coverage	Ttl Claims Since 1978	Ttl paid Since 1978
$15,899	12	$2,854,600	0	0

Homer Repetitive Loss

Total Payments	Losses	Properties	As of Date
0	0	0	5/27/2015

Extent

The extent of coastal flooding is limited to the Homer Spit and East End Road areas. Flooding from excessive precipitation is largely limited to roads and structures located along stream drainages.

Impact

Impacts to the community are "Limited" with minor injuries and/or illnesses not resulting in permanent disability, complete shutdown of critical facilities for more than one week, and more than 10 percent of property severely damaged (Table 2). Flooding events, even for those properties unaffected directly, will suffer due to road closures, impacts to public safety (access and response capabilities), limited availability of perishable commodities, and isolation.

Probability

Recorded historical flooding information indicates Homer experiences flooding every 10 years, and that trend is expected to continue. Therefore, the probability of continued flooding is “Plausible” (Table 1).

Probability	Impact	Warning Time	Duration	Calculated Risk
1 x .45	**2 x .30**	**2 x .15**	**3 x .10**	**1.65**

C. Wildland Fires

Wildland fires occur in every state in the country and Alaska is no exception. Each year, between 600 and 800 wildland fires, mostly between March and October, burn across Alaska causing extensive damage.

Fire is recognized as a critical feature of the natural history of many ecosystems. It is essential to maintain the biodiversity and long-term ecological health of the land. In Alaska, the natural fire regime is characterized by a return interval of 50 to 200 years, depending on the vegetation type, topography and location. The role of wildland fire as an essential ecological process and natural change agent has been incorporated into the fire management planning process and the full range of fire management activities is exercised in Alaska to help achieve ecosystem sustainability, including its interrelated ecological, economic, and social consequences on firefighter and public safety and welfare, natural and cultural resources threatened, and the other values to be protected dictate the appropriate management response to the fire. Firefighter and public safety is always the first and overriding priority for all fire management activities.

Hazard Analysis/Characteristics

Fires can be divided into the following categories:

Structure fires – originate in and burn a building, shelter or other structure. These may subsequently spread to adjacent wildlands.

Prescribed fires - ignited under predetermined conditions to meet specific objectives, to mitigate risks to people and their communities, and/or to restore and maintain healthy, diverse ecological systems.

Wildland fire - any non-structure fire, other than prescribed fire, that occurs in the wildland.

Wildland Fire Use - a wildland fire functioning in its natural ecological role and fulfilling land management objectives.

Wildland-Urban Interface Fires - fires that burn within the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. The potential exists in areas of wildland-urban interface for extremely dangerous and complex fire burning conditions which pose a tremendous threat to public and firefighter safety.

Fuel, weather, and topography influence wildland fire behavior. Wildland fire behavior can be erratic and extreme causing fire-whirls and firestorms that can endanger the lives of the firefighters trying to suppress the blaze. Fuel determines how much energy the fire releases, how quickly the fire spreads and how much effort is needed to contain the fire. Weather is the most variable factor. Temperature and humidity also affect fire behavior. High temperatures and low humidity encourage fire activity while low temperatures and high humidity help retard fire behavior. Wind affects the speed and direction of a fire. Topography directs the movement of air, which can also affect fire behavior. When the terrain funnels air, like what happens in a canyon, it can lead to faster spreading. Fire can also travel up slope quicker than it goes down.

Wildland fire risk is increasing in Alaska due to the spruce bark beetle infestation. The beetles lay eggs under the bark of a tree. When the larvae emerge, they eat the tree's phloem, which is what the tree uses to transport nutrients from its roots to its needles. If enough phloem is lost, the tree will die. The dead trees dry out and become highly flammable.

Homer like other areas of the Kenai Peninsula has been dramatically affected by the beetle-kill. The vast majority of wildland fires on the Kenai Peninsula are the result of human activities with open burning being the most prevalent. Lightning caused fire, though they do occur, are infrequent, especially on the south Kenai Peninsula. The 2005 Tracy Avenue Fire, and the 2009 mile 17 East End Road Fire were especially threatening to property and had potential loss of life. In May of 2014 a human caused fire started along the Funny River Road in the central Kenai Peninsula. Over its course, this fire grew to almost 200,000 acres of Black Spruce, mixed hardwoods and Spruce and old beetle kill and grass. Though located outside Homer City Limits, these recent fires demonstrate the potential for rapid fire spread given the weather conditions, topography and the availability of local and state wildfire fighting crews.

Wildland Fire Management in Alaska

In Homer, wildland fire management is the responsibility of Division of Forestry and the City of Homer, Homer Volunteer Fire Department.

The Alaska Division of Forestry has statutory authority of all wildlands within the state of Alaska. The City of Homer provides wildland fire protection under terms of a Cooperative Agreement and Annual Operating Plan with the Division of Forestry (DOF).

These two agencies, along with other mutual-aid fire departments, work together to fight wildfires in and around Homer.

<u>Location</u>

Wildland fires have not been documented within the boundaries of Homer; however, wildland fires have occurred in the vicinity.

Extent

During the summer, the entire community is vulnerable to wildland fire as most of the structures are constructed of wood and other flammable materials. Standing timber and other natural fuels interface with the community. The entire South Zone of the Kenai Peninsula is subject to wildfire conflagration. Perhaps with the exception of portions of the Homer Spit, the entire Homer community could be considered an "interface" zone. History has demonstrated that fire brands can be carried by local winds up to ½ mile, jumping man-made fire lines and spreading fire across large areas. Most areas of homer are immediately adjacent to wildland areas and could be threatened by uncontrolled fire.

Impact

Based on past wildland fire events and the criteria identified in Table 2, the impacts could be "Critical" with injuries, critical facilities shut down for more than two weeks, and more than 25 percent severely damaged property and infrastructure. Additionally, airborne smoke and ash have driven those with sensitive respiratory systems to temporarily relocate during past wildfires.

Without mitigation or preparation efforts, the impacts of a wildland interface fire in Homer could grow into an emergency or disaster. In addition to impacting people, wildland fires may severely impact livestock and pets. Such situations may require emergency life support, evacuation, and alternative shelter.

Indirect impacts of wildland fires can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams, thus increasing flood potential, harming aquatic life, and degrading water quality.

Probability

Recorded wildland fires within 10 years and 50 miles of Homer have an average recurrence rate of approximately 2.5 to 3 years (Figure 1). Therefore it is "Likely" a wildland fire will occur within 50 miles of McGrath, as the probability is greater than 20 percent but less than or equal to 33 percent likely each year.

Probability	Magnitude	Warning Time	Duration	Priority
3 x .45	**3** x .30	**2** x .15	**4** x .10	**2.95**

Figure 3 Alaska Fire Management Options, 2012

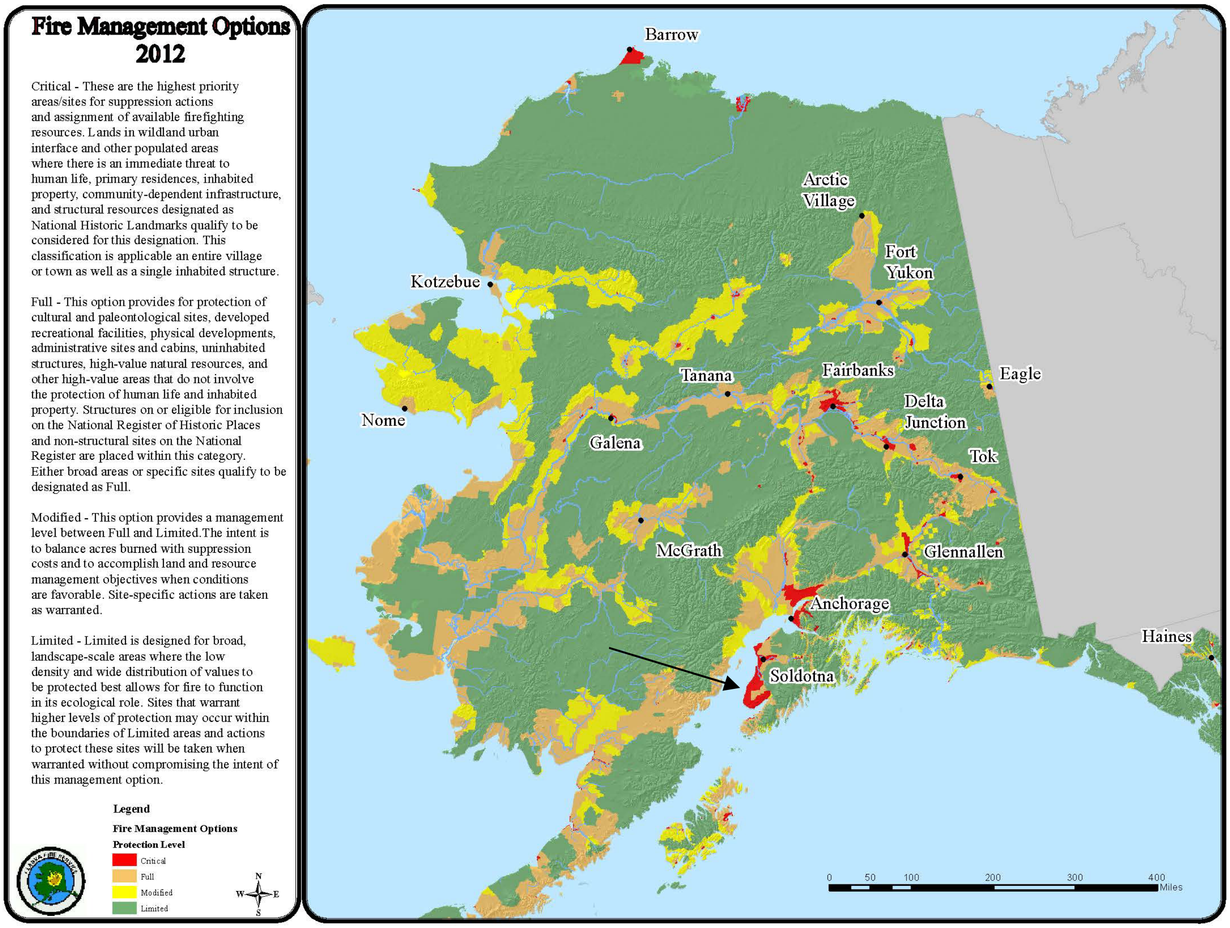


Figure 3 Source: Alaska Interagency Coordination Center 2015

According to the Alaska Interagency Coordination Center, Homer is located in a Critical Management Option area of the state (Figure 3). "Critical Management Option" is the highest management level, intending to minimize loss of life and burned acreage in developed areas.

D. Weather

Weather is the result of four main features: the sun, the planet's atmosphere, moisture, and the structure of the planet. Certain combinations can result in severe weather events that have the potential to become a disaster.

In Homer, 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 result in power outages across vast areas of Homer and the surrounding communities. Heavy snow contributes to the availability of water for the Bradley Lake Hydroelectric Plant, and for keeping the Bridge Creek watershed supplied, but can also cause avalanches or collapse roofs of buildings throughout the area when accumulations are too heavy. A quick thaw can lead to erosion and flooding along creeks and area streams.

Winter Storms

Winter storms originate as mid-latitude depressions or cyclonic weather systems. High winds, heavy snow, and cold temperatures usually accompany them. To develop, they require:

- Cold air - Subfreezing temperatures (below 32ºF) in the clouds and/or near the ground to make snow and/or ice.
- Moisture - The air must contain moisture in order to form clouds and precipitation.
- Lift - A mechanism to raise the moist air to form the clouds and cause precipitation. Lift may be provided by any or all of the following:
- The flow of air up a mountainside.
- Fronts, where warm air collides with cold air and rises over the dome of cold air.
- Upper-level low pressure troughs.

Each year the Seward Highway between Anchorage and the Kenai Peninsula is closed for intervals due to either avalanche or avalanche control efforts.

Heavy Snow

Heavy snow, generally more than 12 inches of accumulation in less than 24 hours, can immobilize a community by bringing transportation to a halt. Until the snow can be removed, airports and major roadways are impacted, even closed completely, stopping the flow of supplies and disrupting emergency and medical services. Accumulations of snow can cause roofs to collapse and knock down trees and power lines. Heavy snow can also damage light aircraft and sink small boats. In the mountains, heavy snow can lead to avalanches. A quick thaw after a heavy snow can cause substantial flooding, especially along small streams and in urban areas. The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts on cities and towns.

Injuries and deaths related to heavy snow usually occur as a result of vehicle accidents. Casualties also occur due to overexertion while shoveling snow and hypothermia caused by overexposure to the cold weather.

Record heavy snow occurred in Anchorage on March 17, 2002 when two to three feet of snow fell in less than 24 hours over portions of the city. Ted Stevens International Airport recorded a storm total of 28.7 inches, and an observer near Lake Hood measured over 33 inches. The city of Anchorage was essentially shut down during the storm, which fortunately occurred on a

Sunday morning when a minimal number of businesses were open. Both military bases, universities, and many businesses remained closed the following day, and Anchorage schools remained closed for two days. It took four days for snow plows to reach all areas of the city. This snowfall also impacted Homer and the Kenai Peninsula and resulted in airport closures, travel delays, and delays of transportation of foodstuffs and other commodities.

Ice Storms

The term ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. They can be the most devastating of winter weather phenomena and are often the cause of automobile accidents, power outages and personal injury. Ice storms result from the accumulation of freezing rain, which is rain that becomes super-cooled and freezes upon impact with cold surfaces. Freezing rain most commonly occurs in a narrow band within a winter storm that is also producing heavy amounts of snow and sleet in other locations.

Freezing rain develops as falling snow encounters a layer of warm air in the atmosphere deep enough for the snow to completely melt and become rain. As the rain continues to fall, it passes through a thin layer of cold air just above the earth's surface and cools to a temperature below freezing. The drops themselves do not freeze, but rather they become super-cooled. When these super-cooled drops strike the frozen ground, power lines, tree branches, etc., they instantly freeze.

The atmospheric conditions that can lead to ice storms occur most frequently in Southwestern Alaska along the Alaska Peninsula and around Cook Inlet. Brief instances of freezing rain occur frequently along the southern coast of Alaska, but these events generally produce very light precipitation with less than ¼ inch of ice accumulation.

High Winds

In Alaska, high winds (winds in excess of 60 mph) occur rather frequently over the coastal areas along the Bering Sea and the Gulf of Alaska because of coastal storms. High winds, especially across the coast, can also combine with loose snow to produce blinding blizzard conditions and dangerous wind chill temperatures.

They can reach hurricane force and have the potential to seriously damage port facilities, the fishing industry and community infrastructure (especially above ground utility lines).

In the spring of 2003, strong winds across the Kenai Peninsula resulted in wide-spread power outages, downed trees, and structural damage and fanned the flames of a 150 acre wildfire in Anchor Point.

On December 12, 2011 a Kenai Peninsula Windstorm was declared by Governor Parnell, followed by FEMA's declaration on February 2, 2012 (DR-4054). In November, 2011, a series of major windstorms caused widespread power outages threatening life and property. Power was disrupted to 17,300 homes and businesses. Local utilities, Homer Electric Association (HEA) and Chugach Electric employed several work crews to restore power to the area. Public Infrastructure, commercial property, and personal property damages were reported in the metropolitan areas and throughout the borough. DHS&EM received local declarations from the Kenai Peninsula Borough (KPB) requesting state disaster assistance to cover immediate response, public and individual costs and from the City of Seward through the KPB requesting State assistance.

Coastal Storms

From the fall through the spring, low pressure cyclones either develop in the Bering Sea or Gulf of Alaska or are brought to the region by wind systems in the upper atmosphere that tend to steer storms in the north Pacific Ocean toward Alaska. When these storms impact the shoreline, they often bring wide swathes of high winds and occasionally cause coastal flooding and erosion.

Homer has an extensive history of storm damage, especially in the coastal areas along the Homer Spit and adjacent properties. In August of 1989 the U.S. Army Corp of Engineers published a *Storm Damage Reduction Draft Interim Feasibility Report with Engineering Design and Environmental Assessment* for the Homer Spit.

Over the years attempts have been made to reduce the impacts of coastal storms and subsequent erosion with varying degrees of success and some notable failures. In 1982 significant damage to the sheet pile reinforcement along the Spit prompted the installation of a concrete slab revetment. In a storm in 1984 those repairs were mostly washed away, again resulting in significant damage to the State Highway leading to the end of the Homer Spit. In the 1990's a major project along the western edge of the Spit Road involved the placement of significant large rock revetments. Again in 2014, ADOT reinforced the western edge of Homer Spit Road.

Above: In the fall of 2015, the City had this camp host building removed from the west side of the Homer Spit. Previous attempts to reduce the impact of coastal storms were not successful.

Storm Surge

Storm surges, or coastal floods, occur when the sea is driven inland above the high-tide level onto land that is normally dry. Often, heavy surf conditions driven by high winds accompany a storm surge adding to the destructive force of the flooding waters. The conditions that cause coastal floods also can cause significant shoreline erosion as the flood waters undercut roads and other structures. Storm surge is a leading cause of property damage in Alaska.

Communities that are situated on low-lying coastal lands with gradually sloping bathymetry near the shore and exposure to strong winds with a long fetch over the water are particularly susceptible to coastal flooding.

The Homer Spit has a moderate exposure to coastal flooding due to the consistent effects of erosion and the extraordinary tidal range in the region. A storm surge and high water levels resulted in flooding on the Homer Spit in November of 2002.

Climatic Factors

Current weather patterns are influenced by short term climate fluctuations, such as the El Nino/La Nina Southern Oscillation (ENSO). Long term changes in atmospheric composition and sea temperatures will exert a greater influence. The Governor appointed Alaska Climate, Ecosystems & Human Health Work Group is determining pending impacts to human health and regional ecosystems from long term changes in the Earth's climate.

Thrashed gabions baskets and utilities are damaged by coastal storms.

Location

The entire Homer area is vulnerable to the effects of severe weather. Winter snows may accumulate up to 3 feet per storm while wind speeds reach as high as 60 mph.

Extent

Homer experiences the severe weather events:

- Heavy Rain
- Heavy Snow
- Freezing Rain and Ice Storms
- Extreme Cold
- Winter Storms
- Drifting Snow

Impact

The Homer area is most vulnerable to high winds during the winter season. Winds may sweep up loose snow and produce blinding blizzards and dangerous wind chills. Additionally, high winds may damage community facilities and infrastructure.

For years, private property owners on the west side of the Homer Spit have attempted to stabilize their shorelines. The typical stabilization methods are rock revetments and gabion baskets that are backfilled with stones and harbor dredge material. The aftermath of storms leaves gabion baskets destroyed and metal debris on the beach with utility service lines exposed to the harsh environment. With intense wave action and freeze/thaw conditions utility companies question the safety of offering utilities in such high hazard areas.

Probability

Based on the event history and the criteria from Table 1, it is "Credible" a severe storm may occur in the next five years. The probability is greater than 10 percent but less than 20 percent per year.

Probability	Impact	Warning Time	Duration	Calculated Risk
2 x .45	**2 x .30**	**1 x .15**	**3 x .10**	**1.95**

E: Landslides

Ground failure can occur in many ways. Types of ground failure in Alaska include landslides, land subsidence, and failures related to seasonally frozen ground and permafrost.

Landslides usually occur in steep areas but not always. They can occur as ground failure of river bluffs, cut-and-fill failures associated with road and building excavations, collapse of mine-waste piles, and slope failures associated with open-pit mines and quarries. Underwater landslides usually involve areas of low relief and slope gradients in lakes and reservoirs or in offshore marine setting.

Looking up from the beach, chunks of land slough downward toward the shoreline.

Landslides can occur naturally or be triggered by human activities. They occur naturally when inherent weaknesses in the rock or soil combine with one or more triggering events such as heavy rain, snowmelt, changes in groundwater level, and seismic or volcanic activity. They can be caused by long-term climate change that results in increased precipitation, ground saturation and a rise in groundwater level, which reduces the shear strength and increases the weight of the soil. Erosion that removes material from the base of a slope can also cause naturally triggered landslides.

Human activities that trigger landslides are usually associated with construction such as grading that removes material from the base, loads material at the top, or otherwise alters a slope. Changing drainage patterns, groundwater level, slope and surface water, for example the addition of water to a slope from agricultural or landscape irrigation, roof downspouts, septic-tank effluent, or broken water or sewer lines can also cause landslides.

The City of Homer has adopted local ordinances to define Steep Slope, and to require engineering approval for any development of steep slopes within Homer (HCC 21.44.050).

The majority of town rests on a bench of land bordered on the north with steep slopes and gullies. South Peninsula Hospital is situated immediately below such a steep slope and will be subject to landslide damage should one occur. Homer is currently addressing steep slope development to mitigate future impacts from construction in these potentially unstable areas.

In October, 2013 heavy rains caused a 16-foot tall mudslide that roared down Bear Creek Drive, (3 miles east on East End Road). Uphill, Bear Creek canyon is narrow and when heavy rains saturated the soils the steep canyon “let go” sending trees and debris down Bear Creek which jammed a culvert on the uphill side of East End Road. A Disaster Declaration was declared for several rain soaked areas in the Kenai Peninsula Borough. The road crew cleared the mudslide off the roadway allowing traffic to proceed, followed by culvert and debris clean up.

In April of 2015 a landslide occurred along a stretch of Kachemak Drive, near the Homer Airport. The slide resulted in Kachemak Drive being close about a half-mile from Homer Spit Road to the top of the hill by the old airport. Rainy conditions and wet soils caused the slope below the road to slide into Mud Bay. The slide took a 100-foot section of the east bound lane of Kachemak Drive pushing clumps of spruce and alder trees into Mud Bay. Within two-weeks ADOT had repaired the roadway and Kachemak Drive was reopened.

The secondary effects of landslides can also be very destructive. Landslide dams cause damage upstream due to flooding and downstream due to a flood which may develop as a result of a sudden mudslide.

Location

Landslide prone areas are the hillside bordering the City, the vicinities of the South Peninsula Hospital, and Homer Airport.

Extent

The City of Homer may experience landslides from excessive precipitation, frost heaving, or a rapid spring thaw. Additionally Homer may experience earthquake generated slides and liquefaction.

Impact

The City of Homer will experience a “Limited” impact, primarily upon the local hospital, public works, water and sewer service, and roads.

Probability

Referencing their local history and Table 1, it is “Plausible” that the City of Homer will experience a landslide within the next ten years.

Probability	Impact	Warning Time	Duration	Calculated Risk
1 x .45	**2 x .30**	**4 x .15**	**3 x .10**	**1.95**

F. Coastal Erosion in Homer

Erosion is a process that involves the wearing away and movement of land. Coastal erosion along Kachemak Bay is a natural phenomenon which includes four principal processes that include wave action, rain and wind, high tides, and the freeze-thaw liquefaction of soils.

In 2005 the Kachemak Bay Research Reserve completed a study of erosion rates in Homer. The study provided an estimate of coastal bluff erosion rates based on a series of aerial surveys from 1951 to 2003. The result, the average erosion rates along Homer's shoreline is approximately 0.3-1.2 meters per year.

Homer confronts coastal erosion seasonally, usually with winter storms, especially along the Spit and along Ocean Drive Loop, a residential housing area. A seawall was constructed in 2002 in an attempt to protect residential structures from continued erosion. The initial construction consisted of the installation of 20, 22, and 24 foot long resin reinforced fiberglass sheet pilings, generally installed 10 ft below beach level and 10 – 14 ft above. All construction occurred above the mean high tide line. The piling was installed by trenching. The top of the wall is at elevation 30' (mean high tide = 17.3).

Even before the seawall was completed it was damaged by a moderate storm. The City and property owners have annually attempted to replace missing anchor bolts that attach the wood timbers to the wall and replace bent/missing metal plates that were designed to protect timer joints.

In addition, portions of the Sterling Highway along the Spit had to be reconstructed when undercut by several strong winter storms in 1998-1999.

Photo: Homer's seawall.

West of the Homer Spit, erosion threatens the Sterling Highway where steep bluffs are creeping close to the Sterling Highway. Redirecting portions of the Sterling Highway inland and other mitigation methods are projects that the State of Alaska, DOT&PF and FEMA are considering.

Protective measures such as seawalls, or revetments, can actually lead to increased erosion. This is because shoreline structures eliminate the natural wave run-up and sand deposition and can increase reflected wave action. The increased wave action can scour in front of and behind structures and prevent the settlement of suspended sediment.

Factors Influencing the Erosion Process

Extent

When undeveloped coastlines undergo erosion, it does not present a problem because there is nothing to be damaged. However, pressure to develop and protect properties along the Kachemak Bay is increasing. There are a variety of natural and human-induced factors that influence the erosion process. For example, shoreline orientation, beach composition and exposure to prevailing winds, open ocean swells, and waves all influence erosion rates. Natural factors may include:

- Shoreline type
- Geomorphology of the coast
- Nature of the coastal topography
- Elevation of coastal dunes and bluffs
- Shoreline exposure to wind and waves

Human factors include: Information from *Erosion Responses for Property Owners, pg 2, 12.*

- Shoreline stabilization structures that change the power and direction of waves and of sediment transport.
- Density of development
- Development encroaching into the high hazard zones.
- Altered drainages
- Added water to soil
- Cleared lands
- Change of absorption rate of land surface

Climatic factors such as sea-level rise, increased storm activity, and land subsidence exacerbate coastal erosion in Alaska. According to the National Oceanic and Atmospheric Administration (NOAA), global average sea levels rose a total of 7.7 inches between 1870 and 2004.

Impact

The primary impact from erosion is the loss of developable land and anything on it. Utility companies reburying utilities that are exposed by ocean waves. The impact to infrastructure is expensive and ongoing and includes the Sterling Highway and Homer Spit Road.

Probability

Given the event history, it is "Certain" the City of Homer will experience further erosion of its land. Additional events are probable within the calendar year with a 1 in 1 year chance of occurring (1/1=100 percent) and the event history is greater than 33 percent likely per year.

Probability	Impact	Warning Time	Duration	Calculated Risk
4 x .45	**1 x .30**	**1 x .15**	**4 x .10**	**2.65**

G. Earthquake

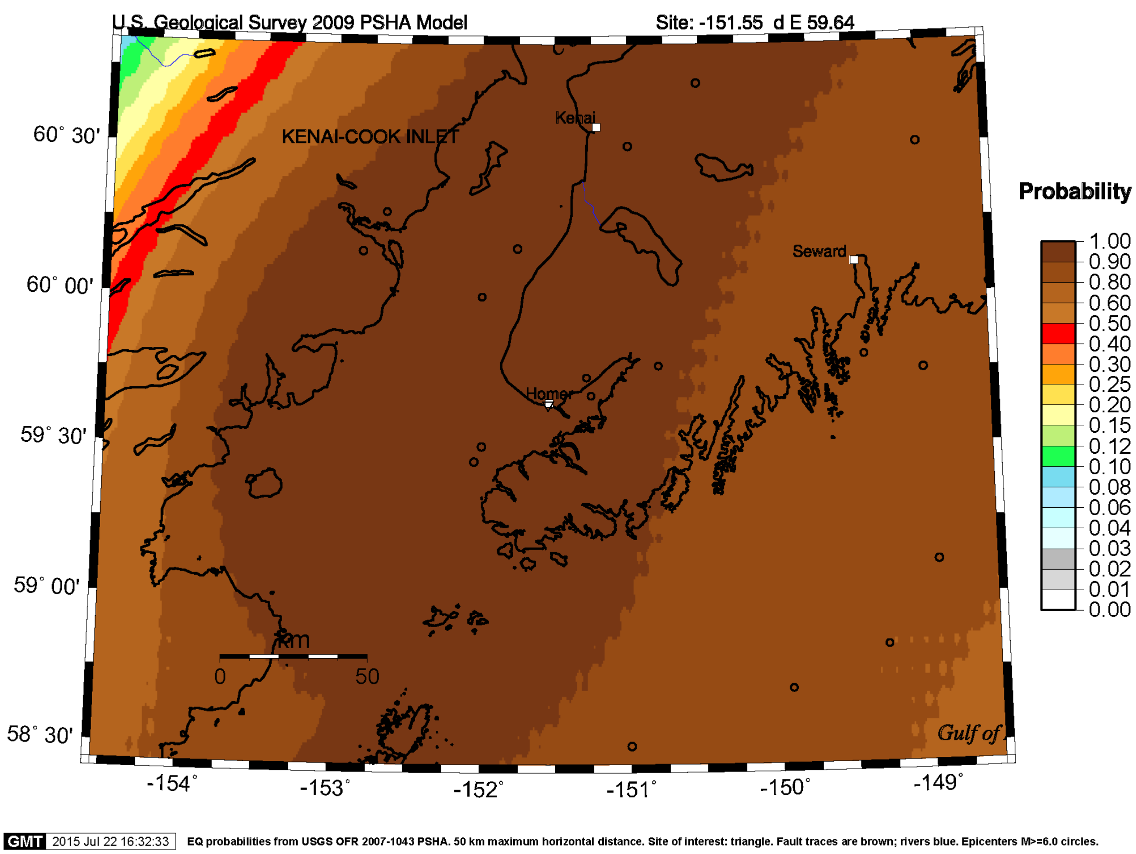
Seismic hazards in Alaska come from several sources. The largest earthquakes in the state are caused by subduction of the Pacific plate beneath Alaska. Three of the seven largest earthquakes in the 20th century occurred in Alaska (1957 Aleutian, 1964 Prince William Sound, and 1965 Rat Islands). Another type of hazard comes from the smaller magnitude 6.8 to 8.0 earthquakes, which occur in many regions of central and south-central Alaska. These events, while smaller, occur at more frequent intervals, and in locations that cannot always be predicted. On average, Alaska has a magnitude 7.0 or larger earthquake about every two years. Similar in size to recent California earthquakes, these events could cause major damage if they occurred in a populated or strategically sensitive area. A third hazard exists from the many smaller events that often occur near populated areas. While these events are too small to cause widespread damage, they are relatively common and thus pose a continuous threat to urban areas. Alaska Earthquake Information Center (AEIC) personnel locate and report about 22,000 earthquakes each year, and advise federal and state officials of each major earthquake's location and size within 30 minutes. (AEIC, 2015)

Location

The entire geographic area of Alaska is prone to the effects of an earthquake. Figure 4 was generated using the U.S. Geologic Survey (USGS) Earthquake Mapping model and indicates an 80 to 100 percent probability of a 5.0 magnitude or greater earthquake occurring within 20 years and 50 kilometers of Homer.

Figure 4 Homer Earthquake Probabilities

Probability of earthquake with M > 5.0 within 20 years & 50 km



The Department of Geological and Geophysical Survey (DGGS) Map of Alaska's Quaternary Faults depicts Alaska's known earthquake fault locations (Figure 5).

ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

ALASKA'S QUATERNARY FAULTS

MISCELLANEOUS PUBLICATION 141
Koehler and others, 2012
SHEET 1 OF 1
Report and digital data accompanies sheet

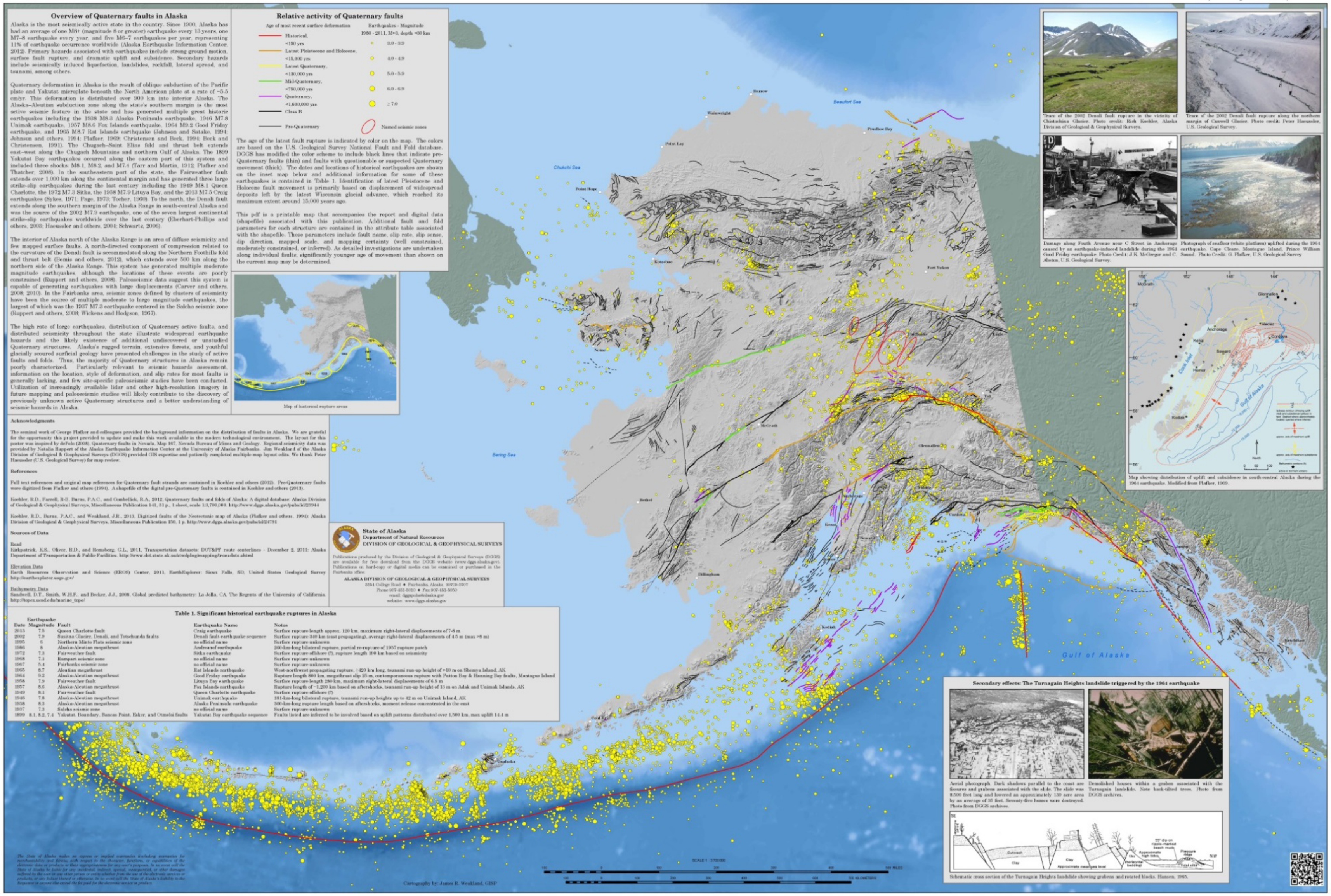
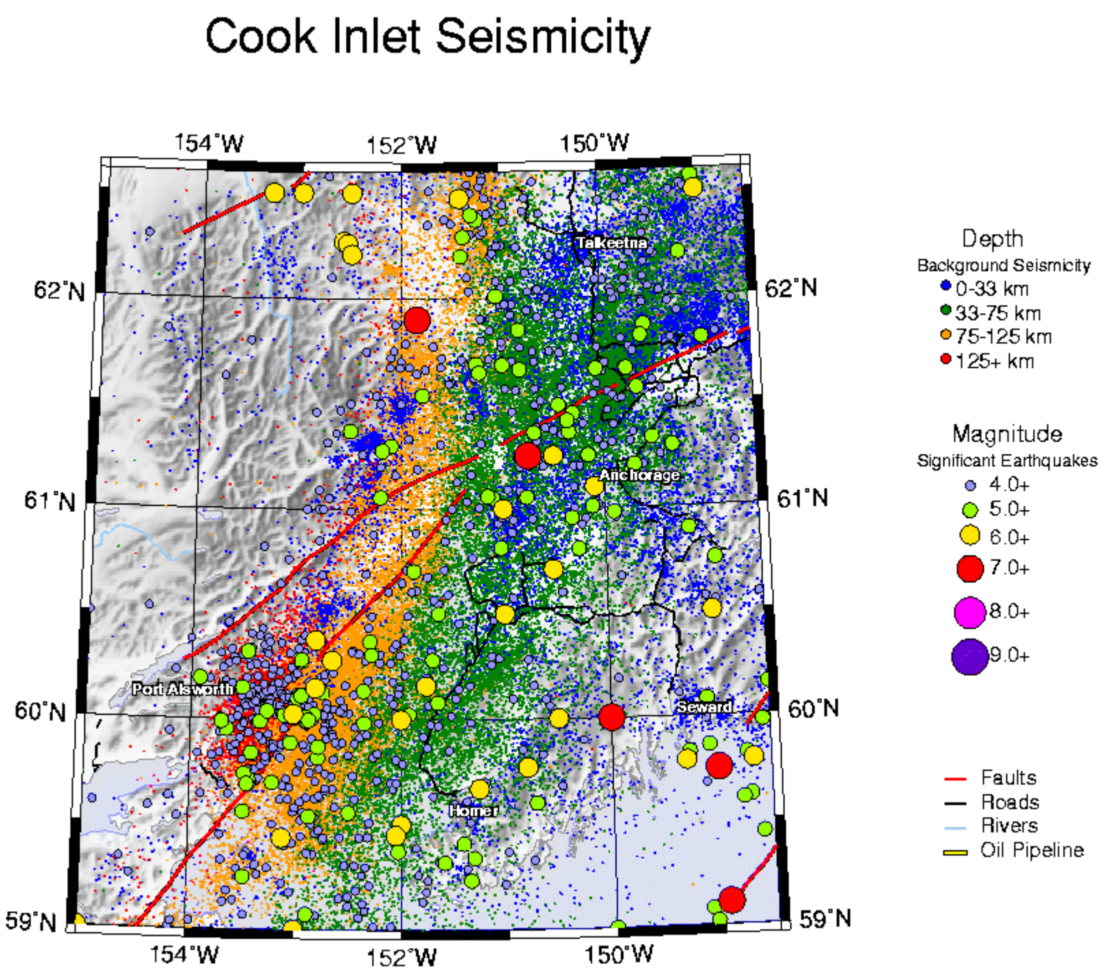


Figure 6 shows recent earthquakes of M 4.0 or greater from 1903 to present near Homer, Alaska. No damage resulted from these earthquakes.

Figure 6 Homer Earthquake History



Extent

Alaskans experience approximately 5,000 earthquakes annually, including 1,000 measuring above magnitude 3.5. Alaska is vulnerable to three types of earthquakes:

1. **Subduction zone earthquakes** begin with one crustal plate moving beneath another plate. This is the case in Southcentral Alaska and along the Aleutian Islands, where the Pacific Plate dives beneath the North American Plate. The Good Friday Earthquake in Alaska resulted from movement along the Aleutian Megathrust subduction zone.
2. **Transform fault earthquakes** originate from crustal plates sliding by each other. A popular example is the San Andreas Fault in California. A transform fault exists just offshore of southeastern Alaska, where the North American Plate and the Pacific Plate slide past each other on the Fairweather - Queen Charlotte Fault.
3. **Intraplate earthquakes** occur within a tectonic plate, occasionally at great distance from the plate boundaries. These types of earthquakes may have magnitudes of 7.0 and greater. Shallow earthquakes in the Fairbanks area are an example of intraplate earthquakes.

Impact

Homer is located in a region of high seismicity. Although nearby earthquakes will be felt in the City, only "Limited" impact is expected due to prior history and seismic retrofits. However, no facilities are seismically reinforced for a high magnitude event and the soil structure in the area tends to be very weak. Therefore, the impact of a high magnitude earthquake could be "Critical" with injury, illness, death, complete shutdown of critical facilities for at least two weeks, and more than 25 percent severely damaged property.

Probability

Considering Figures 1, 2, and 3, it is "Certain" an earthquake M 5.0 or greater may occur within 100 kilometers of Homer within the next 10 years (Table 1). Referencing Figure 1, earthquake modeling or Shake Map indicates an 80 to100 percent probability of a 5.0 magnitude or greater earthquake occurring within 20 years near Homer.

This 2009 Shake Map incorporates current seismicity in its development and is the most current map available for this area. Peter Haeussler, USGS, Alaska Region, explained factors influencing probability in earthquake hazard mapping in 2009:

> The occurrence of various small earthquakes does not change earthquake probabilities. In fact, in the most dramatic case, the probability of an earthquake on the Denali fault was/is the same the day before the 2002 earthquake as the day afterward. Those are time-independent probabilities. The things that change the hazard maps is changing the number of active faults or changing their slip rate.

Probability	Impact	Warning Time	Duration	Calculated Risk
4 x .45	**2** x .30	**4** x .15	**1** x .10	**3.1**

H. Tsunamis

Tsunamis are traveling gravity waves in water, generated by a sudden vertical displacement of the water surface. They are typically generated by uplift or drop in the ocean floor, seismic activity, volcanic activity, meteor impact, or landslides (above or under sea in origin).

Most tsunamis are small and are only detected by instruments. Tsunami damage is a direct result of three factors: inundation (extent the water goes over the land), wave impact on structures and coastal erosion.

In 2003, Homer became the first community in Alaska to receive both a Tsunami and Storm Ready Community Designation from the National Weather Service and DHS&EM. That designation has been reviewed and updated every 4 year since then, most recently in 2015.

Types of Tsunamis

Tele-tsunami

Tele-tsunami is the term for a tsunami observed at places 1,000 kilometers from their source. In many cases, tele-tsunamis can allow for sufficient warning time and evacuation. No part of Alaska is expected to have significant damage due to a tele-tsunami. There is a slight risk in the western Aleutians and some parts of Southeast Alaska.

Most tele-tsunamis that have reached Alaska have not caused damage. In fact, most tele-tsunamis have had their largest recorded amplitude (in Alaska) at Massacre Bay, Attu Island. The amplitude is usually under 1 foot.

Risk is even less for communities within Kachemak Bay including Homer.

Magnitude	***Height (ft)***
-2 to –1	<1.0 to 2.5
-1 to 0	2.5 to 4.9
0 to 1	4.9 to 9.9
1 to 2	9.9 to 19.7
2 to 3	19.7 to 34.2
3 to 4	34.2 to 79.0
4 to 5	79 to >105.0

Volcanic Tsunamis

There has been at least one confirmed volcanically triggered tsunami in Alaska. In 1883, a debris flow from the Saint Augustine volcano reportedly triggered a tsunami that inundated Port Graham (across Kachemak Bay from Homer) with waves 30 feet high, although geologic evidence is inconclusive to substantiate the wave height claim. Other volcanic events may have caused tsunamis but there is not enough evidence to report that conclusively. Many volcanoes have the potential to generate tsunamis.

Seismically-Generated Local Tsunamis

Most seismically-generated local tsunamis have occurred along the Aleutian Arc. Other locations include the back arc area in the Bering Sea and the eastern boundary of the Aleutian Arc plate. They generally reach land 20 to 45 minutes after starting.

Landslide-Generated Tsunamis

Submarine and subaerial landslides can generate large tsunamis. Subaerial landslides have more kinetic energy associated with them so they trigger larger tsunamis. An earthquake usually, but not always, triggers this type of landslide and they are usually confined to the bay or lake of origin. One earthquake can trigger multiple landslides and landslide-generated tsunamis. Low tide is a factor for submarine landslides because low tide leaves part of the water-saturated sediments exposed without the support of the water.

Landslide –generated tsunamis are responsible for most of the tsunami deaths in Alaska because they allow virtually no warning time.

There is some historical evidence of a landslide generated tsunami impacting the Homer area when a large landslide near the Grewingk Glacier across from Homer impacted the glacier lake sending large quantities of water across Kachemak Bay.

Tsunamis generated by landslides in lakes occur more in Alaska than any other part of the U.S. They are associated with the collapse of deltas in glacial lakes having great depths. They may also be associated with delta deposits from rapidly flowing streams and rivers carrying glacial debris.

Historical Tsunamis

1964 Earthquake Tsunami

The 1964 earthquake triggered several tsunamis, one major tectonic tsunami and about 20 local submarine and sub aerial landslide tsunamis. The major tsunami hit between 20 and 45 minutes after the earthquake. The locally generated tsunamis struck between two and five minutes after being created and caused most of the deaths and damage. Tsunamis caused more than 90% of the deaths – 106 Alaskans and 16 Californian and Oregonian residents were killed.

Extent

Based on tsunami inundation mapping (Figure 7), very limited areas of the Homer coast line would be potentially damaged by tsunami, with no critical infrastructure immediately threatened.

Impact

The impact to Homer proper would be "Negligible" with less than 10 percent severely damaged property. However, the Homer spit may experience "Catastrophic" damage, with more than 50% severely damaged property and many serious injuries (Table 2).

Probability

Referencing the local earthquake history and Table 1, it is "Credible" an earthquake generated tsunami could impact the Homer community.

Probability	Impact	Warning Time	Duration	Calculated Risk
2 x .45	**1** x .30	**4** x .15	**1** x .10	**1.9**

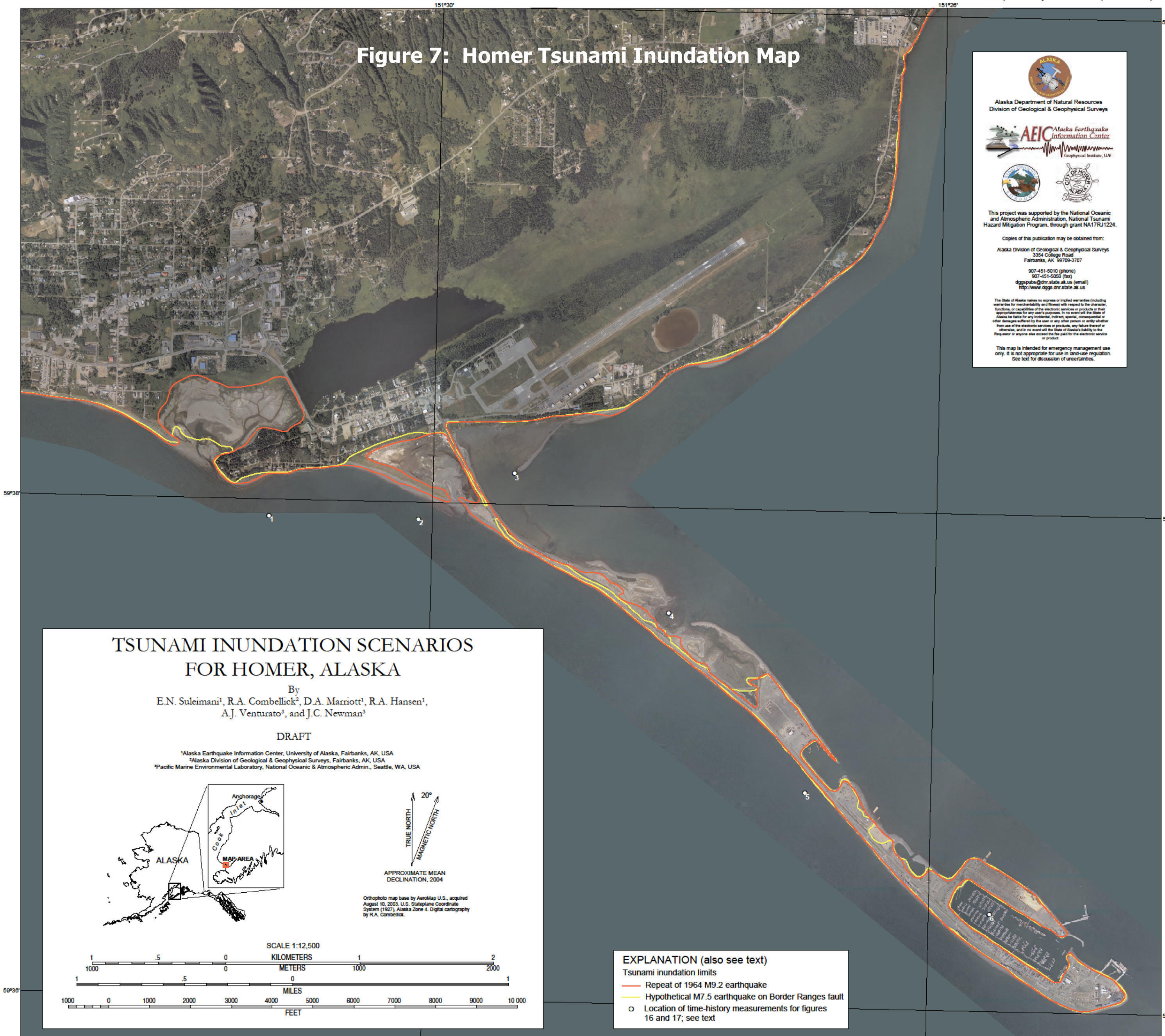


Figure 7: Homer Tsunami Inundation Map
151°30'
151°26'
59°40'
59°38'
59°36'
Alaska Department of Natural Resources
Division of Geological & Geophysical Surveys
AEIC Alaska Earthquake Information Center
Geophysical Institute, UAF
This project was supported by the National Oceanic and Atmospheric Administration, National Tsunami Hazard Mitigation Program, through grant NA17RJ1224.
Copies of this publication may be obtained from:
Alaska Division of Geological & Geophysical Surveys
3354 College Road
Fairbanks, AK 99709-3707
907-451-5010 (phone)
907-451-5050 (fax)
dggspubs@dnr.state.ak.us (email)
http://www.dggs.dnr.state.ak.us
This map is intended for emergency management use only. It is not appropriate for use in land-use regulation. See text for discussion of uncertainties.
TSUNAMI INUNDATION SCENARIOS
FOR HOMER, ALASKA
By
E.N. Suleimani[1], R.A. Combellick[2], D.A. Marriott[1], R.A. Hansen[1],
A.J. Venturato[3], and J.C. Newman[3]
DRAFT
[1]Alaska Earthquake Information Center, University of Alaska, Fairbanks, AK, USA
[2]Alaska Division of Geological & Geophysical Surveys, Fairbanks, AK, USA
[3]Pacific Marine Environmental Laboratory, National Oceanic & Atmospheric Admin., Seattle, WA, USA
Anchorage
Cook Inlet
ALASKA
MAP AREA
20°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2004
Orthophoto map base by AeroMap U.S., acquired August 10, 2003. U.S. Stateplane Coordinate System (1927), Alaska Zone 4. Digital cartography by R.A. Combellick.
SCALE 1:12,500
KILOMETERS
METERS
MILES
FEET
EXPLANATION (also see text)
Tsunami inundation limits
Repeat of 1964 M9.2 earthquake
Hypothetical M7.5 earthquake on Border Ranges fault
Location of time-history measurements for figures 16 and 17; see text

I. Volcanoes

Alaska is home to over 50 active volcanoes stretching across the entire southern portion of the State from the Wrangell Mountains to the far Western Aleutians. An average of 1-2 eruptions per year occurs in Alaska. In 1912, the largest eruption of the 20th century occurred at Novarupta and Mount Katmai, located in what is now Katmai National Park and Preserve on the Alaska Peninsula.

Homer has been impacted by volcanic ash events, Mt. Spurr in 1992, Mt. Augustine in 1986 and Mt. Redoubt in 1989-90.

Volcanic Hazards

As stated, other than the disruption of air traffic into and out of Alaska, the only danger from Cook Inlet Volcano in Homer is ash fall.

Volcanic Ash

Volcanic ash is fine fragments of solidified lava ejected into the air by an explosion or rising hot air. The fragments range in size, with the larger falling nearer the source. Ash is a problem because the weight of the ash can cause structural collapses. Further away, the primary hazard to humans is decreased visibility and inhaling the fine ash. Ash will also interfere with the operation of mechanical equipment including aircraft. In Alaska, this is a major problem as many of the major flight routes are near historically active volcanoes. Ash accumulation may also interfere with the distribution of electricity due to shorting of transformers and other electrically components (ash can conduct electricity).

Historic Volcanic Activity

The largest volcanic eruption of the 20th century occurred at Novarupta Volcano in June 1912. Ash fell on Kodiak, darkening the city. It became hard to breathe because of the ash and sulfur dioxide gas. The water became undrinkable and unable to support aquatic life. Roofs collapsed under the weight of the ash. Some buildings were destroyed by ash avalanches while others burned after being struck by lightning from the ash cloud. Similar conditions could be found all over the area. Some villages ended up being abandoned, including Katmai and Savonoski villages. The ash and acid rain also negatively affected animal and plant life. Large animals were blinded and many starved because their food was eliminated.

Figure 8: Novarupta ash fall compared to that from recent Alaskan eruptions.

Figure 8 shows ash fall from this eruption was significantly greater than the recent eruptions of Redoubt, Spurr and Augustine Volcanoes. Fourteen earthquakes of magnitude 6 to 7 were associated with this event. At least 10 Alaskan volcanoes are capable of this type of event.

Hazard Identification and Assessment

The responsibility for hazard identification and assessment for the active volcanic centers of Alaska falls to the Alaska Volcano Observatory (AVO) and its constituent organizations (USGS, DNR/DGGS, and UAF/GI). The AVO publishes a report that describes volcanic history and the hazards they pose and the likely effects of future eruptions on populations, facilities, and ecosystems.

AVO has the primary responsibility to monitor all of Alaska's potentially active volcanoes and to issue timely warnings of activity to authorities and the public. During episodes of volcanic unrest or eruption, AVO is also the agency responsible for characterizing the immediate hazards and describing likely scenarios for an evolving volcanic crisis. AVO uses a 4-color Level of Concern Color Code to succinctly portray its interpretations of the state of activity and likely course of unrest at a given volcano.

Basic information about vulnerable assets and populations are identified in these assessments. However, Department of Commerce, Community and Economic Development (DCCED) and other State agencies could work with AVO map data to integrate quantitative, current information regarding communities and other at-risk elements to improve our analysis of vulnerability.

Extent

The entire Kenai Peninsula is subject to volcanic ash fallout. Referencing Figure 9, there are three active volcanoes within 150 miles of the City of Homer.

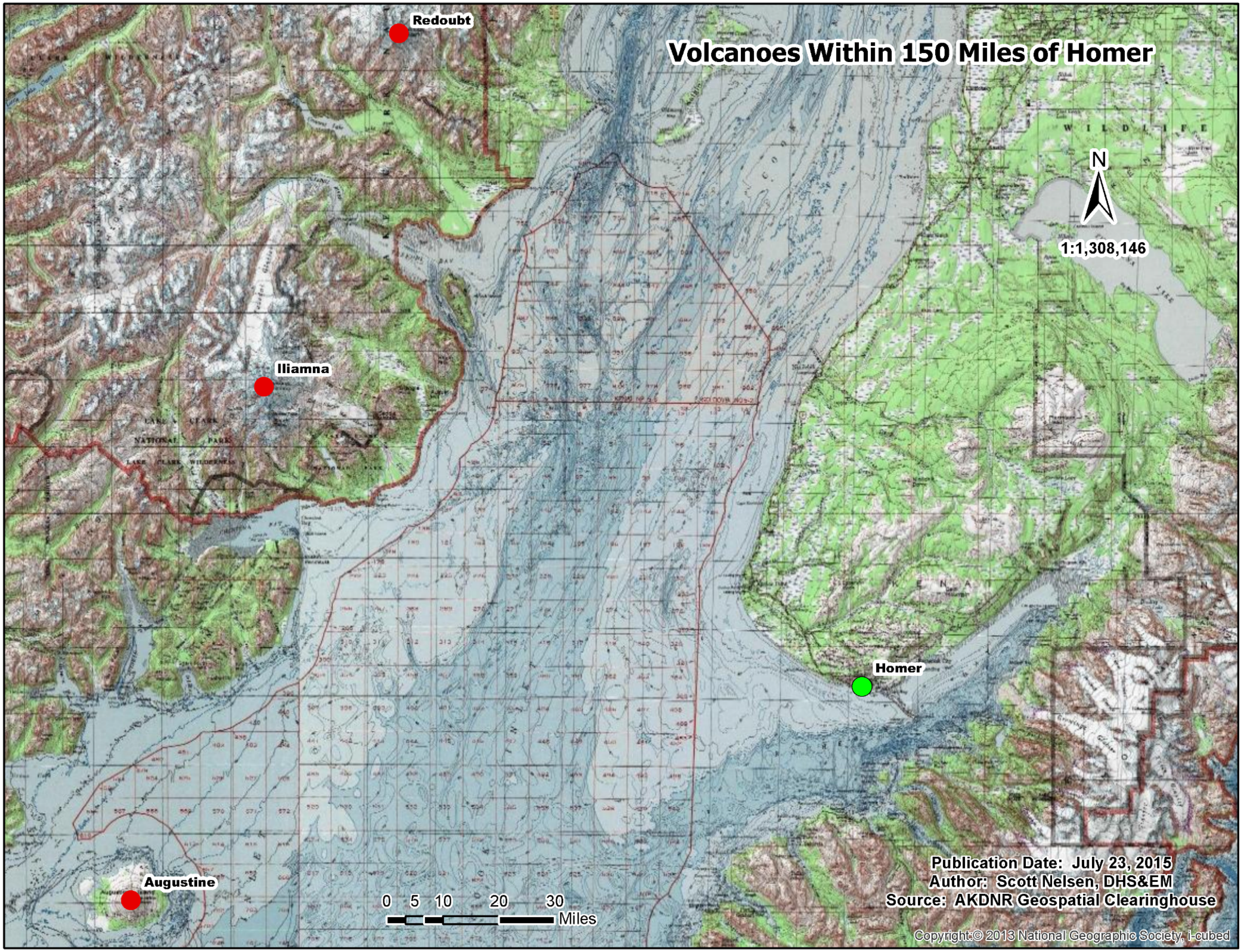
Impact

Volcanic ash is a public health hazard. Therefore, volcanic eruptions may require the greater Homer area to evacuate. The total impact would be "Negligible", with minor injuries treatable with first aid, shutdown of critical facilities and services for 24 hours or less, and less than 10 percent severely damaged property.

Probability

Referencing the local volcanic eruption history and Table 1, it is "Credible" an ash fallout event could impact the Homer community.

Probability	Impact	Warning Time	Duration	Calculated Risk
2 x .45	**1** x .30	**1** x .15	**4** x .10	**1.75**


Volcanoes Within 150 Miles of Homer
Redoubt
Iliamna
Augustine
Homer
N
1:1,308,146
0 5 10 20 30
Miles
Publication Date: July 23, 2015
Author: Scott Nelsen, DHS&EM
Source: AKDNR Geospatial Clearinghouse
Copyright:© 2013 National Geographic Society, i-cubed

J. Man-Made/Technological Disasters

The potential for man-made or technological disasters, while less than for natural disaster, for Homer is none-the-less of increasing potential, especially as the population grows more dependent on technology in daily activities. Man-made disasters include, but are not limited to:

1. Hazardous Material Incidents. Hazardous Materials are routinely transported across the Kenai Peninsula by ship, barge, vehicle, and rail (only on the Eastern Kenai Peninsula). Quantities of hazardous materials primarily include fuels and gases for local use and distribution, but also occasionally include explosives for shipment out of the Port of Homer, or other materials being shipped overseas. Hazardous materials are stored in terminals, when present for distribution, or in processing facilities for use locally (ammonia used in the ice houses). Hazardous materials are used every day across the entire Kenai Peninsula, including households and pose little danger unless released by spill or accident. As the ability to control hazardous materials in limited throughout the entire Kenai Peninsula (no Level A response team), we must rely on the State of Alaska Hazardous Materials Response Team from Anchorage to respond to local events requiring technician level support. Local responders are trained and certified for initial response at the Operations Level only. There is a Hazardous Materials Decontamination Trailer, provided by the Kenai Peninsula Borough, available locally through the fire department.

2. Radiological Incident. A radiological incident is one in which potentially dangerous radioactive materials have been released, either accidentally, or on purpose. The release may be in the form of a cloud or plume that could affect the health and safety of anyone in its path. Radiological materials are used in healthcare settings and in industrial applications for materials testing purposes. Though limited in use in Homer, these materials could still be found in incidental use, or be used in the creation of a so called "Dirty" bomb.

3. Bombings. Bombings are the purposeful detonation of explosive materials for criminal purposes, including terrorism. Even the threat of a bomb can disrupt businesses and schools as they are required to evacuate. Various types of explosive devices can be easily manufactured through instructions readily available on the internet.

4. Civil Disturbance. In most instances, civil disturbances are peaceful but may require some response. In some cases, civil disturbances can escalate to rioting and looting, resulting in property damage, injury and loss of life.

5. Power Failure. A power failure can be isolated to a specific critical business, or wide-spread. While power can fail due to many natural causes, human error is often attributed to this disaster. Loss of power, for any reason, can disrupt commerce, and be life-threatening.

Chapter IV– Risk Analysis

A risk analysis is divided into six steps:

4.1. Asset Inventory
4.2. Risk Analysis Methodology
4.3. Data Limitations
4.4. Risk Assessment Summaries
4.5. NFIP and Repetitive Loss Properties
4.6. Land Use and Development Trends

Asset Inventory

Population

Population data for Homer was obtained from the 2010 U.S. Census and the State of Alaska Department of Labor (AKDOL) 2014 Certified Figures. The U.S. Census compares Homer's population for 2010 and 2013. (Table 4-1).

Table 4-1 Estimated Population and Housing Inventory

Population		Residential Buildings	
2010 Census	**AKDOL 2013**	**Total Building Count**	**Total Value of Buildings**
5,020	5,100	2,692	$706,380,800

Source: U.S. Census 2010, listed the median housing value at $262,400.

Estimated replacement values for residential structures were obtained from the 2010 U.S. Census, (Table 4-1). A total of 2,692 single-family residential buildings were considered in this analysis. The value was determined using the median value provided by the U.S. Census. Table 4-1 does not include estimates for special materials, shipping, or labor.

Community Assets

Critical Facilities: Table 4-2 is a list of critical facilities in the City of Homer. Losing these facilities would seriously impact not only the quality of life in Homer but also the sustainability and survivability of Homer residents.

Table 4-2: Critical Facilities	Economy	Flood	Wild fire	Weather	Land slides	Erosion	Earthquake	Tsunami	Volcano	Manmade	Tech	Biologic
Airport	x		x	x			x		x	x	x	x
Banking	x			x			x		x	x	x	x
Churches	x			x			x		x	x	x	x
City Hall	x			x			x		x	x	x	x
Fire Dept.	x	x	x	x			x		x	x	x	x
Fuel System	x	x		x		x	x	x	x	x	x	x
Groceries	x	x		x			x		x	x	x	x
HEA	x	x	x	x	x	x	x	x	x	x	x	x
Landfill	x		x	x			x		x	x	x	x
Library	x			x			x		x	x	x	x
Police Dept	x			x			x		x	x	x	x
Port & Harbor	x	x		x		x	x	x	x	x	x	x
Post Office	x			x			x		x	x	x	x
Public Works	x	x	x	x	x	x	x	x	x	x	x	x
Reservoir		x	x	x	x	x	x		x	x	x	x
Roads		x	x	x	x	x	x	x	x	x	x	
Schools	x		x	x			x		x	x	x	x
Senior Ctr	x			x			x		x	x	x	x
Sewer System	x	x	x	x			x		x	x	x	x
SP Hospital	x	x		x	x		x		x	x	x	x
Telephone	x	x	x	x	x		x	x	x	x	x	x
Water System	x	x	x	x	x	x	x	x	x	x	x	x

4.3 Data Limitations: Vulnerability Overview: Reviewed every 5 years.

The entire City of Homer and the Kenai Peninsula experience floods, earthquakes, and wildfires. Any one of these hazards could impact any part of Homer or isolate it from the rest of the State.

Other hazards are tsunamis, landslides, and erosion. The "Homer bench" is created by bluffs, some steeper than others, but all bluffs have the potential to create landslides.

Table 4-3 Vulnerability Overview for Homer

Hazard	Percent of Geographic area	Percent of Population	Percent of Building Stock	Percent of Community Facilities and Utilities
Earthquake	**100%**	**100%**	**100%**	**100%**
Erosion	**10%**	**10%**	**10%**	**5%**
Flood	**10%**	**10%**	**10%**	**10%**
Landslides	**10%**	**10%**	**10%**	**10%**
Tsunami	**10%**	**10%**	**5%**	**5%**
Weather	**100%**	**100%**	**100%**	**100%**
Wildland Fire	**100%**	**100%**	**100%**	**100%**

Risk Analysis Methodology

The planning team referenced the State's Critical Facility Inventory and local knowledge to inventory their critical facilities and evaluate their vulnerability to each hazard (Table 4-4).

Table 4-4 Critical Infrastructure in Alaska

Fire Stations	Airports	Cemeteries
Police Stations	Schools	Stores
Emergency Operations Centers	Telecommunications Structures & Facilities	Service Maintenance Facilities
Hospitals, Clinics, & Assisted Living Facilities	Satellite Facilities	Critical Bridges
Water & Waste Water Treatment Facilities	Public restrooms	Radio Transmission Facilities
Fuel Storage Facilities	Harbors / Docks / Ports	Reservoirs & Water Supply Lines
	Landfills & Incinerators	Community Freezer Facilities
	Power Generation Facilities	
	Oil & Gas Pipeline Structures & Facilities	

Table 4-4 Source: State of Alaska Hazard Mitigation Plan, 2013

Replacement structure and contents value estimates were provided by the U.S. Census and the planning team. They conducted an exposure analysis for each physical asset located within a hazard area. A similar analysis was used to evaluate the proportion of the population at risk. However, the analysis simply represents the number of people at risk; no casualty estimates were prepared.

Data Limitations

The vulnerability estimates provided herein use the best data currently available, and are designed to approximate risk. Results are limited to the exposure of the built environment. It is beyond the scope of this Hazard Mitigation Plan to estimate the range of injuries, or the value of improvements and the contents. The Homer Spit is a classic example where a variety of land uses have evolved over time that include fish processing, the port and harbor, the marine highway terminal and fuel storage. Only the new Harbor Master Office is included in the Table 6 and 7. The Harbor Master Office is included in the category of "City Main Buildings."

Facility Replacement Values

Tables 4-5 and Table 4-6 estimate the total replacement value of dwellings, critical facilities, and infrastructure. Structure values were obtained during the asset data inventory during the summer of 2015. The estimated structure and content values are grouped by HAZUS-MH occupancy classification (Table 4-6). HAZUS-MH is a geographic information system which models **M**ulti **H**azards: flooding, hurricanes, coastal surge and earthquakes. HAZUS also calculates the potential losses in terms of economic losses and structural damage.

Table 4-5 HAZUS Building Occupancy Classes

Occupancy Class	Description	Contents Value %
Residential		
Single Family Dwelling	House	50
Mobile Home	Mobile Home	50
Multi Family Dwelling	Apartment / Condominium	50
Temporary Lodging	Hotel / Motel / Hostel	50
Institutional Dormitory	Group Housing (military, college, jails)	50
Nursing Home	Nursing Home	50

Cont. Table 4-5 HAZUS Building Occupancy Classes

Commercial	Description	Content Value %
Retail Trade	Store	100
Wholesale Trade	Warehouse	100
Personal and Repair Services	Service Station / Shop	100
Professional / Technical Services	Offices	100
Banks	Banks	100
Hospital/Medical Office / Clinic	Medical Facilities	150
Hospital	Medical Facilities	150
Entertainment & Recreation	Restaurants / Bars	100
Theaters	Theaters	100
Industrial		
Heavy	Factory	150
Light	Factory	150
Construction	Office	100
Agriculture		
Agriculture	Agriculture	100
Religion / Non-Profit		
Church / Non-Profit	Church / Non-Profit	100
Government		
General Services	Office	100
Emergency Response	Police / Fire Station / EOC	150
Education		
Schools and University	K-12 and KPC	100

Table 4-6 Facility and Content Value Estimates

Type	Total Count	Estimated Value	HAZUS Contents Value (%) by Occupancy Class	Estimated Value of Contents
Residential	2692	$706,380,800	50%	$353,190,400
Hospital	1	$49,000,000	150%	$73,500,000
City Main Buildings	6	$19,350,497	100%	$19,350,497
Educational	5	$80,657,700	50%	$40,328,850
Natural Gas	94 miles	$20,000,000	NA	NA
Homer Electric		$2,663,028	$22,681,363	$25,344,391
Total	**2704**	**$875,388,997**	NA	**$511,714,138**

The facility values in tables 4-6 and 4-7 are not intended to be considered the actual total value of facilities in Homer. Due to the magnitude of the task of tabulating every discrete commercial, industrial, agricultural, religious, non-profit, governmental and educational facility these tables serve as a reference point for what the total value of Homer facilities might be.

The *Residential, City Main Buildings* and *Education* property values are based on the Kenai Peninsula Borough assessed values. The *City's Main Buildings* include: City Hall, Police Station, Fire Hall, Library, Harbor and Public Works. The *Education* buildings include: Homer High, West Homer, Paul Banks Elementary, Homer Middle School and the Kachemak Bay Campus of Kenai Peninsula College.
The *Natural Gas* and *Homer Electric* values were provided by the utilities companies. The *Natural Gas* estimate includes a 22.5 miles of an underground trunk line, 85 miles of distribution lines with approximately 1,400 new service lines. The *Homer Electric* values include the land, structures, substations, electrical facilities and their fleet. The *Hospital* value was provided by South Peninsula Hospital.

Other major facilities include, but are not limited to, Islands and Ocean Visitor Center, Pratt Museum, Safeway, Ulmer's Drug and Hardware, Spenard Builders Supply, many medical and dental offices, retail stores, art galleries, gas stations, non-profit agencies, boat yards, and numerous other buildings. A realistic estimate of the actual functional value of facilities is much more than the total value indicated in Table 4-7.

The functional value is calculated by adding the structure value to the contents value. The functional value is the sum of structure and content value.

Table 4-7 Facility Functional Value Estimates

Type of Structure (Occupancy Class)	Total Count	Estimated Value of Infrastructure	Estimated Value of Contents	Functional Value
Residential	2692	$706,380,800	$353,190,400	$1,059,571,200
Hospital	1	$49,000,000	$73,500,000	$122,500,000
City Main Buildings	6	$19,350,497	$19,350,497	$38,700,994
Educational	5	$80,657,700	$40,328,850	$120,986,550
Natural Gas	94 miles	$20,000,000	$0	$20,000,000
Homer Electric		$2,663,028	$22,681,363	$25,344,391
Total	**2704**	**$878,052,025**	**$509,051,110**	**$1,387,103,135**

4.4 Risk Assessment Summaries

Earthquake:

The City of Homer and surrounding area may experience mild to significant earthquake movement sufficient to damage infrastructure. Although all structures are exposed to earthquakes, buildings constructed of wood exhibit more flexibility than those composed of unreinforced masonry, (URM).

The entire population, residential structures and critical facilities are vulnerable to an earthquake. All 5,100 people in 2,692 residences plus the community facilities for a total functional value of $1.317 Billion are all vulnerable. Table 4-7.

Erosion:

In 2004, the City contracted with the Kachemak Bay Research Reserve (KBRR) to conduct a coastal erosion study. KBRR acquired historical aerial photos, and drew a line at the top of the bluff for each photograph set. Then, the researchers calculated the average rate of erosion for each part of the Homer shoreline.

Parcels along the shoreline where the erosion rates are highest are certainly vulnerable especially when high tides and high winds coincided. In all, about 10% of the population is vulnerable to erosion, 261 residential structures are vulnerable. Table 4-3.

Flood: Parcels along the shoreline are certainly vulnerable to flooding, especially when weather conditions create high velocity wave, high tides and high winds. In all, about 10% of the population is vulnerable to flooding, 261 residential structures valued are vulnerable. Table 4-3.

Subsidence:

About 10 percent of Homer's population is vulnerable to subsidence. This represents 510 people, and 261 residential structures are vulnerable. Table 4-8.

Severe Weather:

The entire population of Homer, residential structures and community facilities are vulnerable to severe weather. The total functional value of the structures in Homer is $1.317 Billion. Table 4-7.

Wildland Fire:

The entire population of Homer, residential structures and community facilities are vulnerable to wildland fires. The total functional value of the structures in Homer is represented on Table 4-7.

Economic and Development Trends

The City has several zoning districts ranging from Conservation to Commercial-Industrial zones. In 2003 the City received the right to regulate development in the Bridge Creek Watershed Protection District (BCWPD) which surrounds the City's water supply. In 2010 the City adopted the 2008 Homer's Comprehensive Plan which also includes the 2010 Homer Spit Comprehensive Plan.

To reduce the effects of fire hazards, all new and the remodel of existing commercial and commercial residential buildings must be certified by the State Fire Marshal Office per Homer City Code (HCC) 21.70. To reduce the effects of flood and tsunami hazards, all new projects in the Flood zone must be elevated one foot or more above the Base Flood Elevation (BFE), HCC 21.41. The chart below shows the building trends from 2010 to 2014.

Zoning Permits Analysis 2010-2014

Year	Residential Zoning Permits		Commercial Zoning Permits		Total
	New Construction	Additions/Remodels/Accessory	New Construction	Additions/Remodels/Accessory	
2010	26	16	3	1	46
2011	28	12	5	1	46
2012	23	14	1	4	42
2013	36	14	11	3	64
2014	37	10	10	5	62

Alaska Risk MAP Program

The City of Homer is a participant in the Risk MAP Study of the Homer Spit which includes:

- A detailed coastal flood hazard analysis including storm surge (coastal hydrology) and overland wave height analysis (coastal hydraulics) near Beluga Lake and Beluga Slough
- A regulatory Flood Insurance Study (FIS) Report document for the Community. A FIS contains flood information for a community and is developed in conjunction with the Flood Insurance Rate Maps (FIRM). The FIS, also known as a flood elevation study, frequently contains a narrative of the community's flood history and explains the engineering methods used to develop the FIRM. The study also contains flood profiles for studied flooding sources and may be used to determine Base Flood Elevations for some areas.
- Preparation of a regulatory Flood Insurance Rate Map (FIRM) map for all panels within the Community which identifies the Community's flood zones, base flood elevations, and floodplain boundaries. This map is used to determine areas requiring flood insurance for properties with federally-backed mortgages.

Table 4-8 estimates damage values from the vulnerability assessment, and the population affected by each hazard.

		Residential Structures				Community Facilities				Total	
Hazard	**Pop.**	**No.**	**Structure Value**	**Contents Value**	**Functional Value**	**No.**	**Structure Value**	**Contents Value**	**Functional Value**	**No.**	**Functional Value**
Earthquake	5100	2,692	$706,380,800	$353,190,400	$1,059,571,200	72	$135,256,597	$149,343,646	$284,600,243	2,764	$1,344,171,443
Erosion	510	269	$70,638,080	$35,319,040	$105,957,120	8	$13,525,660	$14,934,365	$28,460,024	276	$134,417,144
Flooding	510	269	$70,638,080	$35,319,040	$105,957,120	8	$13,525,660	$14,934,365	$28,460,024	276	$134,417,144
Climate Change	510	269	$70,638,080	$35,319,040	$105,957,120	8	$13,525,660	$14,934,365	$28,460,024	276	$134,417,144
Subsidence	510	269	$70,638,080	$35,319,040	$105,957,120	8	$13,525,660	$14,934,365	$28,460,024	276	$134,417,144
Severe Weather	5100	2,692	$706,380,800	$353,190,400	$1,059,571,200	72	$135,256,597	$149,343,646	$284,600,243	2,764	$1,344,171,443

V. Mitigation Goals, Objectives and Action Items

A. Flood Goals

The City of Homer adopted new Flood Insurance Rate Maps that became effective on November 6, 2013. These maps resolved inconsistent flood elevations on the Homer Spit. The flood maps are based on a 100 year chance event and do not include tsunamis because the relatively short period of record. The City also updated the Flood Prone Areas code (HCC 21.41) on September 15, 2009. (Ord. 09-38) which require all structures in a flood zone to be elevated to the Base Flood Elevation, plus 1 foot (BFE-1). Parties most responsible for implementation are in **bold.**

1. **Participation in National Flood Insurance Program (NFIP)(Priority-High).**

Objective 1.1: Maintain the City of Homer's participation in the NFIP so that low cost flood insurance is available to residents.

Action 1.1.1 Identify and analyze compliance with the NFIP.

Responsible Parties: City of Homer, Planning Department, NFIP, FEMA.

Status/Timeline: Ongoing.

2. **Update the Flood Hazard Maps and map the City's watershed and drainage patterns. (Priority-High, Funding Dependent)**

In addition to the 2013 maps, FEMA has restudied and resubmitted Preliminary Flood Insurance Maps of the Beluga Slough and Beluga Lake. These 2016 draft maps aim to resolve inconsistent elevations in the Old Towne and Beluga Slough areas. A thorough study of the Beluga Lake area is still needed.

The City of Homer 2010 Comprehensive Plan provides a timeframe for priorities. For example, Chapter 4, Land Use, Goal 3 "Encourage high quality buildings and site design that complements Homer's beautiful natural setting." It recommends developing specific policies regarding site development such as grading.

In addition, Chapter 4, Land Use, Goal 2, Object C states, "Develop and apply in all districts new standards addressing environmental issues including the management of storm water. . . ." This resulted in the 2011 adoption of Homer Ordinance 10-54 which describes thresholds and requirements for fill, drainage, stormwater and development on steep slopes: Storm Water Plans HCC 21.50.020(d) and Fill Standards HCC 21.50.150.

Objective 2.1: Obtain updated flood plain maps to include all current city limits, the Bridge Creek Watershed, Beluga Slough and Beluga Lake.

Action 2.1.1 Encourage FEMA to restudy and remap the city with emphasis on the Beluga Lake area.

Status/Timeline: Ongoing. Dependent of FEMA funding.

Objective 2.2: Map the watershed and drainage patterns.

Action 2.2.1 Acquire funds to develop a watershed and drainage management plan that identifies important natural water storage, low features critical to flood function and predicts future flood hazards.

Status/Timeline: Mapping watershed and drainage patterns is funding dependent. Updating the City's flood maps is expected in 2016.

Action 2.2.2. Encourage the utilization of green infrastructure mapping as a means to identify and retain natural drainage channels and important wetlands, which serve drainage functions (Homer Comprehensive Plan, page 10.5).

Responsible Parties: City of Homer, Alaska Department of Community and Economic Development, **FEMA**, Federal Insurance and Mitigation Administration, KPB.

Status/Timeline: Ongoing, especially during spring and fall clearing.

3. **Review flood events to determine mitigation strategies. (Priority-Medium)**

Objective 3.1: Coordinate fact finding between the Planning Office, Public Works, the Kenai Peninsula Borough and the State of Alaska DOT to map areas that experienced flooding.

Objective 3.2: Identify with the goal of reducing the effects of hazards on high risk facilities and infrastructure.

Action 3.2.1 Develop overlay map of existing infrastructure (drainages, culvert size, storm drains).

Action 3.2.2 Identify actions and projects to reduce the effects of hazards on new buildings and infrastructure.

Action 3.2.3 Establish an annual inspection of all stormwater management (pubic and private) and order maintenance as needed. Ongoing CRS Credit for Stormwater Management.

Action 3.2.4 Require maintenance logs on private and public stormwater plans. Ongoing.

Action 3.2.5 Require an engineer's stamp of inspection to certify that existing Stormwater Plans meet City standards prior to issuing additional zoning permits on the property.

Objective 3.3: Eliminate the long-term risk to people and infrastructure by exploring the willing acquisition of privately owned parcels in high hazard areas.

Action 3.3.1 Seek funding opportunities to acquire privately owned parcels from willing land owners whose property is threatened by coastal erosion.

Action 3.3.2 Seek support from State of Alaska and local utilities companies to help in the volunteer acquisition of privately owned parcels that are threatened by coastal erosion.

Responsible Parties: City of Homer, State of Alaska, KPBOEM.

Status/Timeline: Ongoing.

4. Manage development in flood hazard areas (Priority-Medium)

Ensure, through adequate planning and zoning oversight that all development meets the intent of HCC 21.41, Flood Prone Areas. In the future, the City may participate in the Community Rating System (CRS) which is a part of the National Flood Insurance Program (NFIP). The CRS identifies and analyzes a comprehensive range of specific mitigation actions and project to reduce the effects of flood hazard, with particular emphasis on new and existing buildings and infrastructure.

In the last five years the City has taken a more proactive role to ensure that prior to renewing property leases of City owned land on the Homer Spit, the leaseholders are required to be in compliance with the current zoning and flood mitigation standards. On both public and private projects, this includes anchoring fuel tanks to prevent floatation.

Objective 4.1: Review Chapter 21.41 to ensure up-to-date requirements are being addressed.

Action 4.1.1 Require developers/land owners to provide documentation of compliance with existing Flood Damage Prevention requirements if the project is located within a flood hazard area as defined by City Code.

Action 4.1.2 As of 2015, FEMA has provided Draft Flood Insurance Rate Maps (FIRMS) that will update all coastal areas in Homer, except for the Homer Spit which was updated in 2013. These maps are expected to be officially adopted in 2016.

Responsible Parties: City of Homer, Planning and Zoning Office.

Status/Timeline: Ongoing. The Floodplain map update is expected in 2016.

Objective 4.2: Assure that flood loss reduction measures minimize the need for rescue and relief efforts associated with flooding, and to assure that flood loss reduction measures are consistent with retaining natural flood function.

Action 4.2.1 Acquire land in high hazard areas such as the Bridge Creek Watershed area, the Homer Spit, and Kachemak Bay shoreline. Acquiring land in these areas will help reduce the effects of floods and reduce erosion and sedimentation. Aligns with the CRS 420. KPB Mit. Plan pg 2-71.

Action 4.2.2 Identify less hazard prone areas for development. Suitability study and map 2008.

Action 4.2.3 Create and maintain buffers and building setbacks from wetlands, creeks, shorelines and drainages. KPB Hazard Mit. Plan p2-68. Landscape Suitability Map pg 49. Floodplain Management Higher Regulatory Standards, p3. 2010 Homer Comprehensive Plan; Chapter 4 Land Use, pages 4-11, Obj. B: Implementation Strategies. HCC 21.44.

Action 4.2.4 In the flood hazard areas and along the bluff, consider "relocatable structures" on skids or pilings versus permanent foundation structures. Coastal Bluff Erosion Study, pg 11, 19.

Action 4.2.5. Require the anchoring of fuel tanks, manufactured homes, and accessory structures to resist flotation, collapse and lateral movement due to the effects of wind and water loads per HCC 21.41

Action 4.2.6 Preserve open space and/or relocate structures out of high risk areas. 2010 Comp. Plan. CRS 420. Landscape Suitability Map pg 51.

Action 4.2.7 Provide a means to regulate clearing, filling, grading, dredging, and other development which may impact flood, drainage and erosion damage. Floodplain Management Higher Regulatory Standards p31, 59. Landscape Suitability Map pg 31, 33. HMP pg 18.

Action 4.2.8 Minimize adverse impacts of alterations of ground and surface waters and natural flow patterns**.** KPB HMP p 2-71. Landscape Suitability Map 45. Floodplain Management Higher Regulatory Standards p 13, 31 & 59

Action 4.2.9 Maintain requirements for stormwater control and mitigation through the enforcement of HCC 21.74 Development Activity Plan and HCC 21.75 Stormwater Plan. Landscape Suitability Map pg 16 &52.

Ac**tion 4.2.10** Integrate hazard identification, ecosystem protection, protection of community infrastructure and shoreline management into zoning and subdivision ordinances. Coastal Bluff Erosion Study . Floodplain Management Higher Regulatory Standards p 4 & 5.

Responsible Parties: City of Homer, Planning Office

Status/Timeline: Ongoing.

B. Wildfire Goals

There are two phases to addressing the wildfire issue in Homer. The first and foremost revolves around public education (Item A). The second phase focuses on specific mitigation strategies found within the International Urban-Wildland Interface Code™. This code utilizes three mitigation strategies: creation and management of defensible spaces around threatened structures; wildfire fuel management; and encouraging fire-resistive construction techniques.

1. Create Defensible space.

Objective 1.1: Cooperate with the Division of Forestry in the “Fire Wise” campaign. Creating “defensible space” is one of many ways to reduce the effects of fire hazard on existing buildings. This involves limiting fuels immediately adjacent to at-risk structures. This strategy was proven during the Mansfield/Hutler Road Fires in which only one structure was lost. The Mansfield Road neighborhood had worked with the fire department in the development of defensible space in the year preceding the fire event. Additional lessons were learned as fire crews and home owners were able to immediately return to the fire area once the fire front had passed and were able to extinguish any remaining fires around their buildings.

Action 1.1.1: Encourage home owners and property owners to remove dead or diseased trees to create “defensible space”.

Action 1.1.2: Encourage home and business owners to complete a Fire Wise assessment of their home and/or business.

Action 1.1.3 Educate home owners in wildfire resistive construction techniques and strategies to limit their exposure to wildfire.

Action 1.1.4 Provide interested residents with Fire Wise informational packets and brochures.

Status/Timeline: Ongoing, especially during spring and fall clearing.

Responsible Parties: City of Homer, Alaska Division of Forestry, KPB.

2. Control and direct open burning within the City limits of Homer. (Priority-High)

Objective 2.1 Limit the number, size and location of burn piles within City Limits. Homer City Code requires that residents obtain an Open Burning Permit anytime during the year for all fires other than “warming fires” (those less than 2 feet in diameter used for cooking or warming). State regulations require residents outside of Homer to have a Burn Permit during the “fire season” of May 1 through the end of September each year.

Action 2.1.1: Issue burn permits to Homer residents who wish to dispose of organic materials. Direct non-residents to the Division of Forestry Website to obtain an open burning permit during the statutory fire season.

Status/Timeline: Ongoing, focus in spring and fall.

Responsible Parties: Homer Volunteer Fire Department, Alaska Div. of Forestry.

3. Establish alternative methods of disposal for slash, brush, and organic debris so that residents do not have to use open burning. (Priority-High)

Objective 3.1: Explore alternative methods of debris disposal other then open burning.

Action 3.1.1 Encourage use of composting, chipping, or grinding as an alternative to burning of woody debris.

Responsible Parties: KPB**,** City of Homer.
Status/Timeline: Ongoing, to coincide with debris removal.

4. Prohibit open burning during high-risk periods. (Priority-High)

Objective 4.1: In cooperation with the Division of Forestry, suspend burn permits and open burning during high fire danger conditions or when other factors will contribute to high fire danger.

Action 4.1.1 Maintain open lines of communication between the Division of Forestry, National Weather Service, and the Homer Volunteer Fire Department to determine when fire conditions warrant suspension of burn permits or open burning in general.

Action 4.1.2 When conditions warrant suspension of burn permits or open burning in Homer, disseminate that information in the form of press-releases to the local radio and print media.

Action 4.1.3 When open burning is prohibited, or burn permits are suspended ensure that the Homer Police Department Dispatch center is notified so that they can advise persons that call in to activate their individual permit that a temporary suspension has been placed on open burning.

Action 4.1.4 Complete a daily assessment of fire danger during closures or suspensions by 10:00 AM each day to determine the need to continue the closure or resend the closure.

Responsible Parties: Homer Volunteer Fire Department, Alaska Division of Forestry, National Weather Service, KPB-OEM.
Status/Timeline: Ongoing, coincides with high fire danger periods.

5. Develop wildfire fuel load reduction projects such trimming branches and thinning, especially around critical infrastructure and identified "safe zone" and potential emergency shelters. (Priority-High, Funding Dependent).

Objective 5.1: Review current fuel loads surrounding infrastructure and safety zone/shelter locations identified in the Community Wildfire Protection Plan.

Action 5.1.1 Develop list of know shelters (from Emergency Plan), safe zones, and critical infrastructure.

Action 5.1.2 Review wildfire fuel load and develop mapping of area in need of fuels management activities.

Action 5.1.3 Develop and implement fuel reduction plan.

Responsible Parties: Homer Volunteer Fire Department, Alaska Division of Forestry, Kachemak City, KPB.

Status/Timeline: Ongoing.

Objective 5.2: Continue collaborative effort between the Community Wildfire Protection Plan and the City of Homer.

Action 5.2.1 Attend local planning meetings when conducted.

Action 5.2.2 Review drafts of the CWPP when available and provide feedback to DOF as appropriate.

Responsible Parties: Homer Volunteer Fire Department, CWPP Stakeholders.

Status/Timeline: Ongoing.

Objective 5.3: Support emergency services by assisting them with proper premise identification/addressing.

Action 5.3.1. Inform property owners of the legal requirement to display their individual house numbers, visible from the street, or from the end of their driveways, if the house is not visible from the street.

Action 5.3.2. Inform the public of the Kenai Peninsula Borough Office of Emergency Managements program to provide, low-cost reflective house numbers, installed on their property.

Responsible Parties: Homer Volunteer Fire Department, KPB OEM.

C. Earthquake Goals

1. **Protect existing critical infrastructure from earthquake damage. (Priority-Medium, Funding Dependent)**

   Objective 1.1: Reduce the effects of earthquake hazards on existing critical buildings and infrastructure owned by the City of Homer.

   > **Action 1.1.1** Identify buildings and facilities that must be able to remain operable during and following a hazard event.
   >
   > **Action 1.1.2** Contract a structural engineering firm to assess the identified buildings and facilities to determine their structural integrity and strategy to improve their earthquake resistance.

   Objective 1.2 Perform those steps identified above to protect critical infrastructure from earthquake damage and to preserve functionality.

   > **Action 1.2.1** Identify priorities and budget to retrofit existing infrastructure to existing earthquake resistive construction standards.
   >
   > **Action 1.2.2** Develop a Request for Proposals to submit for design and construction of the retrofitting requirements.
   >
   > **Responsible Parties:** City of Homer, KPB, FEMA Mitigation Programs.

2. **Building Code Adoption-Seismic Requirement-New Construction (Priority-Low)**

   While the State of Alaska has adopted the International Building, Fire and Mechanical Codes that include seismic requirements, there is no State-wide building code for single family, duplex and triplex residential construction. There are no adopted seismic codes for these most vulnerable occupancies.

   Objective 2.1: Encourage practices of the International Residential Building code, including all 1 and 2 family residential occupancies. (State of Alaska adopted Building Code covers residential occupancies greater than 3-plex).

   > **Action 2.1.1** Reference the International Residential Code (**Current** Edition) for seismic and wind load requirements.
   >
   > **Action 2.1.2** Identify projects that reduce the effects of hazards on new buildings and infrastructure.
   >
   > **Responsible Parties:** City of Homer, Planning Department, Public Works Department, Homer Volunteer Fire Department.
   > **Status/Timeline:** Ongoing

3. **Existing Buildings – Non-Structural Mitigation Program (Priority-Medium, Funding Dependent)**

   Experience demonstrates (Nisqually Earthquake, February 28, 2001) that mitigation programs which emphasizing tie-downs and strapping of book shelves and computers is an effective and economical way to reduce property damage and loss of life during earthquake events.

   Objective 3.1: Provide technical advice and information to those individuals, businesses and institutions requesting non-structural mitigation program guidance.

   Action 3.1.1 Compile list of available non-structural mitigation resources available to the public.

   Responsible Parties: City of Homer, KPBOEM, FEMA.

   Status/Timeline: Ongoing.

D. Tsunami Goals

1. **Tsunami**
2. **Ready Community Designation (Priority-High)**

   Objective 1.1: Continue to meet the requirements for a Tsunami Ready Community Certification.

   Action 1.1.1: Continue to participate in the NWS/WC&ATWC Tsunami Ready Program**.**

   Action 1.1.2: Maintain regular tsunami warning siren drills that citizens can learn to recognize and expect.

   Responsible Parties: City of Homer, ADHSEM, West Coast/Alaska Tsunami Warning Center, KPBOEM.

3. **Tsunami Evacuation Route Signage (Priority-High)**

   Objective 2.1: Maintain evacuation route signs and Tsunami Warning System**.**

   Action 2.1.1: Continue to monitor the tsunami evacuation signs on the Homer Spit to Kachemak Drive, East to the junction with East End Road. This route directs people away from the Beluga Slough crossing which is located in the projected tsunami inundation zone.

   Responsible Parties: City of Homer, Department of Transportation, ADHSEM, KPBOEM.

   Status/Timeline: Ongoing, prior to summer tourist season.

4. **Encourage City of Homer, Planning & Zoning Office to incorporate high risk areas in land use planning and zoning. (Priority-Medium)**

   In 2005 the City of Homer adopted the Tsunami Hazard Map. Local tsunamis should always be considered before beginning any construction in the coastal areas.

   Objective 3.1: Reduce the vulnerability of infrastructure and improvements in high risk areas.

   Action 3.1.1: Reduce susceptibility to damage and disruption by incorporating the Tsunami Hazard and the Flood Insurance Rate Maps into the City Planning and Zoning process.

   Action 3.1.2: New development in tsunami hazard areas to meet the same standards required in the Coastal High Hazard areas per HCC 21.41.CRS Tsunami Credits pg 18.

   Action 3.1.3: Require the anchoring of fuel tanks, manufactured home, accessory structures and recreational vehicles to be anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads per HCC 21.41.

   Action 3.1.4: Maintain compliance with the NFIP.

   Responsible Parties: City of Homer, KPB, FEMA, NFIP.

   Status/Timeline: Ongoing. When City Spit leases come up for renewal, all fuel tanks are required to be anchored. Mobile units require anchoring devices to resist flotation (Snug Harbor lease renewal, 2011).

E. Volcanic Ash

Fresh volcanic ash may be harsh, acidic, gritty and smell like sulfur. Heavy ash-fall may reduce sunlight, causing a sudden demand and possibly brownout of electrical power. Ash can clog watercourses, sewage plants, and all kinds of machinery.

Objective 1.1: Protect equipment and personnel from the effects of ash.

Action 1.1.1 Do not operate non-essential equipment.

Action 1.1.2 Protect office equipment such as copiers and personal computers.

Action 1.1.3 Allow employees to get home before an ash-fall occurs.

Action 1.1.4 Limit outdoor activity.

Action 1.1.5 Close doors, windows and vents.

Action 1.1.6 Do not run exhaust-circulating fans.

Action 1.1.7 Check and change (when needed) oil, oil filter and air filters.

Action 1.1.8 Wear respirator and eye protection during ash cleanup.

Action 1.1.9 Establish a communication system to alert employees

Action 1.1.10 Establish an email alert or a call-in voice recording.

Status/timeline: Event driven.

F. Technological Hazards

Technological hazards are manmade activities such as the manufacture, transportation, storage. The use of hazardous materials and our reliance on technology.

Objective 1.1: Reduce the community's risk of exposure to hazardous materials.

Action 1.1.1 Install security systems where hazard materials are stored .

Objective 1.2: Protect the community's water supply.

Action 1.2.1 Install security measure at the city water treatment plant.

Action 1.2.2 Secure all remote pump facilities.

Objective 1.3: Ensure that the city has reliable communication:

Action 1.3.1 Create redundant/back-up capability for landline telephone system.

Action 1.3.2 Develop off-site backup information technology system.

Action 1.3.3 Prepare for utility disruption.

Action 1.3.4 Secure vital records and other important document.

Objective 1.4: Protect the community's ability to operate in case of technological disruptions.

Action 1.4.1 Encourage local businesses to have adequate cash on hand for emergencies.

Action 1.4.2 Encourage local businesses to establish a regular, off-site, computer back-up system.

Action 1.4.3 Encourage local businesses to participate in the State's Continuity of Business program through the Department of Homeland Security and Emergency Management.

Responsible Parties: City of Homer, local businesses, ADHSEM, KPBOEM.

Status/Timeline: Ongoing

G. Biological, Chemical and Hazardous Materials

Liquid or solid contaminants may pose a threat to the community and can easily spread. Biological hazards include both man-made threats (bio-terrorism) and naturally occurring diseases (pandemics). Homer's Planning and Zoning (HCC) 21.59 has requirements that apply to smoke, gases, pollution, hazardous material, and material storage.

Objective 1.1: Reduce the community's vulnerability to biological, chemical and hazardous material incidents.

Action 1.1.1: Safely store biological, chemical and hazardous materials per HCC 21.59.010(f).

Action 1.1.2: Continue to require Fire Marshal certification for all commercial buildings per HCC 21.70.

Action 1.1.3: Monitor, in cooperation with the Department of Health, Public Health Center, spikes in illness that may indicate the spread of a natural or man-made pathogen among the population.

Action 1.1.3: Continue participation and leadership in the Community Based Emergency Planning Committee established by Public Health.

Responsible Parties: City of Homer**,** Alaska Department of Public Health, KPB-OEM, State Fire Marshal's Office and South Peninsula Hospital.

Status/Timeline: Ongoing

H. Assessing Risk

The first step to long-term mitigation is to understand which economies are at risk and how to reduce those risks through public and private investments. Ways to quantify economic risks include:

- Monitor long-term supply and demand trends,
- Measure the diversity of end-product markets,
- Measure the size and diversity of base industries,
- Measure the growth rates in employment, income and gross sales,
- Monitor the relative dependence on imports,
- Assess the skill levels in the workforce,
- Reduce the cost and dependency of transportation and energy.

Objectives and strategies

Public infrastructure, sensible regulations, public-private partnerships, efficient and coordinated service delivery, industry advocacy, marketing, economic analysis, and the dissemination of timely information all represent legitimate venues for government to promote economic development.
The following objectives define and direct the development of mitigation strategies: KPB Hazard Mitigation Plan.

Objective 1.1: Reduce the susceptibility to damage and disruption by avoiding hazardous, uneconomic and unwise development in known hazard areas.

Objective 1.2: Reduce unnecessary economic losses and promote positive economic development by incorporating hazard assessment and mitigation into land use and development decisions.

Chapter VI – Implementation & Maintenance Procedures

The City of Homer will implement this plan by using mitigation actions within our Comprehensive Plan, the Capital Improvement Plan, and other plans to pursue our mitigation goals. Priority is given to the best mitigation strategy that maximizes the benefit to the community. We will consider projects that show they are cost effective by ensuring that for every dollar spent we will reduce loss of life or property damage.

The City's 2010 Comprehensive Plan provides a timeframe for priorities. As of this update, the Homer Advisory Planning Commission is reviewing the timelines for reseeding a site that has been impacted. This furthers the goals and objectives of the Homer Comprehensive Plan (Chapter 4, Goal 2: Maintain the quality of Homer's natural environment and scenic beauty, and Objective B: Establish development standards and require development practices that protect environmental function.

We will use the following criteria to prioritize all community projects:

1. Lifesaving or personal safety issues
2. Projects will be coordinated with all community plans.

The 2010 City of Homer Local All-Hazard Mitigation Plan mitigation strategy was incorporated into the following planning mechanisms:

1. Homer Comprehensive Plan(2007-2010). With each decision made by the Homer Advisory Planning Commission a summary of how the project relates to Homer's Comprehensive Plan is provided along with a recommendation to support or deny the request.
2. Homer Capital Improvement Plan.

Some examples are:

A. Tsunami – In 2005 the City adopted the Tsunami Hazard Map. The City continues to work with the KPB on the TsumaniReady Community Certification which includes weekly sirens and evacuation route signs.
B. Wildfire – The City continues to educate and encourage "defensible space" and is negotiated with the KPB to reduce fuels especially in the Bridge Creek Watershed Area.
C. Earthquake – In 1995 the fire hall renovation included an engineering study to retrofit the existing building to current earthquake standards. The study was conducted by USKH Engineering of Anchorage.
D. Flood - In 2013 the City adopted updated Flood Insurance Rate Maps. At the same time the City updated the Flood Prone Areas code (HCC 21.41).

B. Maintenance

The City of Homer All-Hazard Mitigation Plan will be reviewed annually and will be updated at a minimum of every five years or 90 days after a Presidential declared disaster. The Director of Emergency Services will be responsible for ensuring that reviews are completed, and the general public will be notified of opportunities to review the plan by use of newspaper, radio, or flyers. Public involvement is essential to ensure that the mitigation goals, objectives and action items are addressing the community's need.

Appendix A
Glossary of Terms

Community Rating System (CRS) – The Community Rating System is a voluntary program that each municipality or county government can choose to participate in. The activities that are undertaken through CRS are awarded point. A community's points can earn people in their community a discount on their flood insurance premiums.

Critical Infrastructure – Facilities that are deemed highly important to the health and welfare of the population and that are especially crucial during and after a hazard event. Critical facilities include, but are not limited to: shelters, hospitals, and fire stations.

Development – means any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, storage of equipment or materials, or any other activity which results in the removal of substantial amounts of vegetation or in the alteration of nature site characteristics located within the area of special flood hazard or coastal high hazard area. HCC 21.41.030.

Disaster Mitigation Act – DMA 2000 (Public Law 106-390) is the latest legislation of 2000 (DMA 2000) to improve the planning process. It was signed into law on October 10, 2000. This legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur.

Federal Disaster Declaration – The formal action by the President to make a State eligible for major disaster or emergency assistance under the Robert T. Stafford Relief and Emergency Assistance Act, Public Law 93-288, as amended. Same meaning as a Presidential Disaster Declaration.

Federal Emergency Management Agency (FEMA) – A federal agency created in 1979 to provide a single point of accountability for all federal activities related to hazard mitigation, preparedness, response, and recovery.

Flood Hazard Area – The land covered by a flood having a 1% chance of occurring in any given year. See 100-Year Flood.

Flood Insurance Rate Map or FIRM – an official map of the City issued by the Federal Insurance Administrator which delineates both the special hazard areas and the risk premium zones. HCC 21.41

Flood Insurance Study – Flood Insurance Study (FIS) is the official report provided by the Federal Insurance Administration that includes the flood profiles and the water surface elevations for the estimated 100-Year Base Flood.

Flood Zones – Zones on the FIRM in which a Flood Insurance Study has established the risk premium insurance rates.

Hydrology – The science of the behavior of water in the atmosphere, on the earth's surface, and underground.

Infrastructure – The public services of a community that have a direct impact to the quality of life. Infrastructure refers to communications technology such as phone lines or internet access, vital services such as public water supply and sewer treatment facilities, and includes an area's transportation system, regional dams or bridges, etc..

Inundation – The maximum horizontal distance covered by flood waters, including those generated by Tsunami.

Liquefaction – The phenomenon that occurs when ground shaking causes loose soils to lose strength and act like a thick or viscous fluid. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength.

Mitigation Plan – A systematic evaluation of the nature and extent of vulnerability to the effects of natural or man-made hazards typically present in the area and includes a description of actions to minimize future vulnerability to those hazards.

One Hundred (100) Year Flood –(also called "regulatory flood," "base flood" or "special flood hazard area") (see "base flood") means a flood of a magnitude which can be expected to occur on an average of once every 100 years. It is possible for this size flood to occur during any year, and possibly in successive years. It would have a one percent chance of being equaled or exceeded in any year. Statistical analysis of available stream flow or storm records, or analysis of rainfall and runoff characteristics of the watershed, or topography and storm characteristics are used to determine the extent and depth of the 100-year flood.

Riverine Flooding – Flooding related to or caused by a river, stream, or tributary overflowing its banks due to excessive rainfall, snowmelt or ice.

Run-Up – The maximum vertical height of a tsunami in relation to sea level.

State Disaster Declaration – A disaster emergency shall be declared by executive order or proclamation of the Governor upon finding that a disaster has occurred or that the occurrence or threat of a disaster is imminent. Along with other provisions, this declaration allows the Governor to utilize all available resources of the State as reasonably necessary, direct and compel the evacuation of all or part of the population from any stricken or threatened area if necessary, prescribe routes, modes of transportation and destinations in connection with evacuation and control ingress and egress from disaster areas. It is required before a Presidential Disaster Declaration can be requested.

Storm Surge – Rise in the water surface above normal water level on open coast due to the action of wind stress and atmospheric pressure on the water surface.

Subsidence – Sinking of the land surface, usually due to withdrawals of underground water, oil, or minerals.

Substantial Damage – means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

Substantial Improvement –means any repair, reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage," regardless of the actual repair work performed. For the purposes of this definition "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term does not, however, include either:

1. Any project for improvement of a structure to correct violations that have been previously cited based on State or local health, sanitary, or safety code specifications which are the minimum necessary to assure safe living conditions; or

2. Any alteration of a "historic structure" listed on the National Register of Historic Places or a State Inventory of Historic Places; provided, that the alteration will not preclude the structure's continued designation as a "historic structure. See HCC 21.41.030.

Vulnerability – Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an assets construction, contents, and the economic value of its functions. The vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power – if an electrical substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Other, indirect effects can be much more widespread and damaging than direct ones.

Vulnerability Assessment – The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.

Watershed – means any area of land that water flows or drains under or across ground on its way to a lake, pond, river, stream, or wetland. A watershed can be delineated on a topographical map by connecting the high points of the contour lines surrounding any water body. HCC 21.03

Wetlands – Areas that are inundated or saturated frequently and for long enough to support vegetative or aquatic life requiring saturated or seasonally saturated soil conditions for growth and reproduction.

Works Cited

South Peninsula Hospital. *Rock and a Hard Plan: After-Action Report/Improvement Plan,* 2015

FEMA. *Community Rating System (CRS)*, 2013.

Foster, Rick A. *Erosion Responses for Property Owners*. Kachemak Bay Research Reserve Coastal Training Program, 2006.

FEMA. *Higher Regulatory Standards*, 2006.

Scheer, David, and Allegra Bukojemsky. *Landscape Suitability Map.* Rep. Homer: Homer Soil and Water Conservation District, 2008.

Smith, Orson P. *Coastal Erosion Responses for Alaska*. University of Alaska Fairbanks: Alaska Sea Grant College Program, 2006.

CITY OF HOMER
HOMER, ALASKA

Reynolds

RESOLUTION 16-xxx

A RESOLUTION OF THE CITY COUNCIL OF HOMER, ALASKA, ADOPTING THE CITY OF HOMER ALL HAZARDS MITIGATION PLAN 2015 UPDATE AND REVISION AND AUTHORIZING THE CITY MANAGER TO FORWARD THE DOCUMENT TO THE KENAI PENINSULA BOROUGH, THE FEDERAL EMERGENCY MANAGEMENT AGENCY, THE ALASKA DIVISION OF HOMELAND SECURITY, AND OTHER ORGANIZATIONS AS APPROPRIATE.

WHEREAS, The Homer City Council recognizes the threat that natural and human generated hazards pose to its residents, their property, public infrastructure, and the health and safety of the community at large; and

WHEREAS, Planning for and implementing actions that avoid or mitigate the impacts of hazards before disasters occur reduces the potential for harm to people and property and saves taxpayer dollars; and

WHEREAS, An adopted All Hazards Mitigation Plan is required as a condition for future grant funding to the City for hazard mitigation projects; and

WHEREAS, The City has provided notice of the draft plan revision and opportunities to comment to its local partners in disaster mitigation, has participated jointly in the planning process with the Borough and other units of government, and held a hearing to solicit comments from the public.

NOW, THEREFORE, BE IT RESOLVED that the Homer City Council hereby approves and adopts the All Hazards Mitigation Plan 2016 Update.

BE IT FURTHER RESOLVED that the Council authorizes the City Manager to forward the Plan to the Kenai Peninsula Borough, the Federal Emergency Management Agency, the State Division of Emergency Management, and other organizations as appropriate.

PASSED AND ADOPTED by the Homer City Council this ______ day of __________, 2016 .

CITY OF HOMER

____
MARY E. WYTHE, MAYOR

ATTEST:

____
JO JOHNSON, MMC, CITY CLERK

Fiscal Note: N/A