Communities of the Aleutians East Borough
Multi-Jurisdictional
Multi-Hazards Mitigation Plan

January 18, 2010

Prepared for the
Communities of the Aleutians East Borough:
Akutan
Cold Bay
King Cove
False Pass
Nelson Lagoon
Sand Point

Prepared by
WHPacific
and
Bechtol Planning and Development

Acknowledgements

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Acronyms

AAC	Alaska Administrative Code
AEB	Aleutians East Borough
AEIC	Alaska Earthquake Information Center
BCA	Benefit- Cost Analysis
BCR	Benefit-Cost Review
BFE	Base Flood Elevation (100 year flood)
CFR	Code of Federal Regulations
CMP	Coastal Management Plan
DCCED	(Alaska) Department of Commerce, Community and Economic Development
DCRA	(Alaska) Division of Community and Regional Affairs
DEC	(Alaska) Department of Environmental Conservation
DHS&EM	(Alaska) Division of Homeland Security and Emergency Management
DGGS	(Alaska) Division of Geological and Geophysical Surveys
DNR	(Alaska) Department of Natural Resource
DOT&PF	(Alaska) Department of Transportation & Public Facilities
EOP	Emergency Operations Plan
FDIC	Federal Deposit Insurance Corporation
FEMA	Federal Emergency Management Agency
FHLBB	Federal Home Loan Bank Board
FIRM	Flood Insurance Rate Maps
HMP	Hazard Mitigation Plan
HMPG	Hazard Mitigation Planning Grant
MHMP	Multi-Hazard Mitigation Plan
MSL	Mean Sea Level
NFIP	National Flood Insurance Program
NTHMP	National Tsunami Hazard Mitigation Program
NOAA	National Oceanographic and Atmospheric Administration
NWS	National Weather Service
PDM	Pre Disaster Mitigation (Grant Program)
UAF	University of Alaska, Fairbanks
UAF/GI	University of Alaska Fairbanks Geophysical Institute
USACE	United States Army Corps of Engineers
USGS	U.S. Geological Survey
WCATWC	West Coast and Alaska Tsunami Warning Center
WWRC	Western Regional Climate Center

Adoption of the Communities of the Aleutians East Borough

Multi-Hazard Mitigation Plan

Whereas, the communities of the Aleutians East Borough include the City of Akutan, City of Cold Bay, City of False Pass, City of King Cove, the Tribal Village of Nelson Lagoon, and the City of Sand Point; and,

Whereas, the communities of Aleutians East Borough recognize the threat that local natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation projects before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

Whereas, an adopted Multi-Hazard Mitigation Plan is required as a condition of future grant funding for mitigation projects; and

Whereas, the Aleutians East Borough Multi-Hazard Mitigation Plan has been sent to the Alaska Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency for their review and preapproval;

Now, therefore, be it resolved, that the communities of the Aleutians East Borough hereby adopts the Aleutians East Borough Multi-Hazard Mitigation Plan as an official plan; and

Be it further resolved, that the communities of the Aleutians East Borough will submit the adopted Multi-Hazard Mitigation Plan to the Alaska Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency officials for final official approval.

_____	_____
Mayor, Aleutians East Borough	Mayor, City of Akutan
_____	_____
Mayor, City of Cold Bay	Mayor, City of False Pass
_____	_____
Mayor, City of King Cove	Tribal Village of Nelson Lagoon
_____	_____
City of Sand Point	Date

Chapter 1. Process and Methodology

Introduction and Purpose

The State of Alaska Department of Military and Veterans Affairs Division of Homeland Security and Emergency Management (DHS&EM) hired WHPacific through funding from the Federal Emergency Management Agency (FEMA) to assist 15 communities or boroughs throughout Alaska in the preparation of Local Multi-Hazard Mitigation Plans (MHMP). The purpose of an MHMP is twofold:

1. Educate residents about the risk of natural hazards in their community and what mitigation actions or projects may be undertaken to reduce the risk to human life and property.
2. After a MHMP has been approved, the community is eligible to apply for the following types of grants.
   - The **Pre-Disaster Mitigation (PDM) grant program** is federally funded through FEMA at 75% of the project costs and requires a 25% local (or State) fund match. The program is annual and nationally competitive and is intended to reduce overall risks to the population and structures of a community, while also reducing reliance on funding from actual disaster declarations. A Hazard Mitigation ***Project*** grant is only available for communities that have a FEMA/State approved and community adopted Hazard Mitigation Plan. *Approval of this plan will accomplish this requirement.* However, a Benefit Cost Analysis is also required for all potential projects; this FEMA requirement is explained in more detail in Chapter 4 of this document.

     Hazard Mitigation Projects are intended to reduce risk to life and property. Examples include:

     - Elevation of flood prone structures
     - Structural and non-structural seismic retrofits of public facilities
     - Voluntary acquisition or relocation of structures out of the floodplain
     - Natural hazard protective measures for utilities, water, and sanitary sewer systems
     - Localized storm water management and flood control projects

   - The **Hazard Mitigation Grant Program (HMGP)** is available to communities after approval of an MHMP.

     Project applications are ranked using criteria designed to ensure that the most appropriate projects are selected for funding. Projects may be of any nature that will result in protection of public or private property from natural hazards. Some types of projects that **may be eligible** include:

     - Acquisition of hazard prone property and conversion to open space;
     - Retrofitting existing buildings and facilities;
     - Elevation of flood prone structures;
     - Vegetative management/soil stabilization;

- Infrastructure protection measures;
- Stormwater management;
- Minor structural flood control projects; and
- Post-disaster code enforcement activities.

The following types of projects **are not** eligible under the HMGP:

- Retrofitting places of worship (or other projects that solely benefit religious organizations); and
- Projects in progress.

Organization of the MHMP

The following is an overview of the Aleutians East Borough (AEB) MHMP.

Chapter 1. Process and Methodology

Outlines the process used for plan development; research, public involvement, implementation, and continued public involvement. Chapter 1 also includes a general overview of each community.

Chapter 2. Risk Assessment – General Overview.

This chapter discusses, in a general way, the federal requirements for a risk assessment; identifies natural hazards profiled in the plan; and provides maps, tables and figures of each community's vulnerability to natural hazards.

Chapter 3. Risk Assessment – Hazard Specific Sections

This chapter is broken into specific sections for each profiled natural hazard; each hazard profile is required to include a general hazard description, location, extent, probability, previous occurrences, impacts, goals, and potential projects.

Chapter 4. Mitigation Strategy

In order to apply for grants the community will need to do a benefit-cost analysis, after the plan has been approved, and when applying for specific project grants. A brief discussion, written by FEMA, is included in this chapter. A Benefit-Cost Listing table summarizes potential projects, and their potential respective benefits, costs and priorities. A Mitigation Projects Table lists the same projects with potential funding sources, responsible agencies, and timelines.

Chapters 5 -10. Community Annexes

These chapters include community-specific information on risk assessments that may differ from other areas of the AEB and list potential projects each community may consider if applying for grants after plan approval.

Chapter 11. Plan Maintenance

This chapter describes the process for monitoring, evaluating, and updating the plan. The strategy for continued public involvement is also described.

Appendices

1. Public Involvement
2. FEMA Crosswalk

Federal Requirements for Plan Approval

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. Mitigation activities may be implemented prior to, during, or after an incident. However, it has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs (FEMA 386-8).

MHMP regulations are found in the Code of Federal Regulations (CFR) at 44 CFR Part 201. The AEB MHMP has been developed using the regulations to ensure compliance with federal criteria. See Table 3 and the appendices for the specific federal requirements for plans. (*The FEMA crosswalk is required to be completed prior to plan submission to FEMA for pre-approval.)*

Federal regulations specify that local mitigation plans be designed to help jurisdictions identify specific actions to reduce loss of life and property from natural hazards. Mitigation plans are not intended to help jurisdictions establish procedures to respond to disasters or to write emergency operations plans. The goal of mitigation is to decrease the need for response as opposed to increasing response capability (FEMA 386-8).

Jurisdictions in the AEB

A Multi-Jurisdiction MHMP is a plan jointly prepared by more than one jurisdiction. This plan is called the Communities of the Aleutians East Borough MHMP and includes the AEB and the Cities of Akutan, Cold Bay, False Pass, King Cove, and Sand Point and the Tribal Village of Nelson Lagoon. For these jurisdictions, Table 1 lists the classifications, years incorporated, forms of government and DCCED 2008 certified populations.

Table 1. Jurisdictions in the AEB

Jurisdiction	Classification	Year Incorporated	Form of Government	Population*
Aleutians East Borough	2nd Class Borough	1987	Strong Mayor	2,669
Akutan	2nd Class City	1979	Strong Mayor	796
Cold Bay	2nd Class City	1981	Strong Mayor	90
False Pass	2nd Class City	1990	Strong Mayor	39
King Cove	1st Class City	1949	Strong Mayor	750
Tribal Village of Nelson	Unincorporated	N/A	N/A	65

Jurisdiction	Classification	Year Incorporated	Form of Government	Population*
Lagoon				
Sand Point	1st Class City	1966	Strong Mayor	890

*DCCED 2008 Certified Population Source: http://www.commerce.state.ak.us/dca/commdb/CF_CIS.htm

The scope of this plan is natural hazards: ***earthquakes, tsunamis, volcanoes, severe weather, flooding and erosion***. Some mitigation projects for natural hazards would also mitigate impacts from manmade hazards, such as technological and economic hazards.

The AEB MHMP includes information to assist the borough, city governments, village council, and residents with planning to avoid potential future disaster losses. The plan provides risk assessment information on natural hazards that affect the AEB, descriptions of past disasters, and projects that may help the community prevent disaster losses.

Project Staff and Plan Development

WHPacific, Inc. and Bechtol Planning & Development were hired by the State of Alaska to write the plan. Mark Roberts and Ervin Petty of the Division of Homeland Security and Emergency Management (DHS&EM) provided technical assistance and reviewed drafts of this plan.

The following AEB and local community representatives contributed to the plan by providing data, reviewing the plan and providing revisions as necessary:

Aleutian East Borough Staff	Clark Corbridge, Assistant Administrator Ted Meyer, Community Dev. Coordinator Laura Tanis, Communications Manager Jeanie Burtch, Office Manager
Akutan	Hermann "Tuna" Scanlan, Administrator
Cold Bay	Dawn Lyons, City of Cold Bay Clerk Monty Martin, Cold Bay Terminal Manager
False Pass	Mayor Hoblet Melanie Hoblet, City Clerk
King Cove	Bonnie Folz, King Cove Administrative Manager Chris Babcock, Fire Department Robert Gould, Public Safety Director Joe Calver, Public Works Director
Nelson Lagoon	Justine Gundersen, Nelson Lagoon Tribal Administrator

Sand Point Paul Day, Sand Point Administrator

Plan Research

The plan was developed using existing AEB and city plans and studies, as well as outside information and research. The following list contains the most significant documents that were used in preparing this MHMP.

1. *Alaska All-Hazard Risk Mitigation Plan*. Prepared by and for DHS&EM. October 2007.
2. *Alaska Volcano Observatory website.* *http://www.avo.alaska.edu.*
3. *AEB Coastal Management Plan Update.* Prepared by Glenn Gray and Associates, for the Aleutians East Borough's Coastal Management District, 2008.
4. *AEB Emergency Operations Response Plan* Prepared by the AEB. 2006
5. *Aleutians East Borough Website*: http://www.aleutianseast.org
6. *Disaster Cost Index*. Prepared by DHS&EM. October 2007
7. *Division of Community and Regional Affairs (DCRA) Community Information*: http://www.commerce.state.ak.us/dca/commdb/CF_BOCK.htm.
8. *FEMA How to Guides:*
   - *Getting Started: Building Support For Mitigation Planning* (FEMA 386-1)
   - *Local Multi-Hazard Mitigation Planning Guidance*, July 1, 2008 (FEMA 386-87
   - *Understanding Your Risks: Identifying Hazards And Estimating Losses* (FEMA 386-2)
   - *Developing The Mitigation Plan: Identifying Mitigation Actions And Implementing Strategies* (FEMA 386-3)
   - *Bringing the Plan to Life: Implementing the Hazard Mitigation Plan* (FEMA 386-4)
   - *Using Benefit-Cost Review in Mitigation Planning* (FEMA 386-5)
   - *Multi-Jurisdictional Mitigation Planning* August 2008(FEMA 386-8)
9. *Tsunami Hazard Mapping of Alaska Coastal Communities*, Alaska GEO Survey News, Vol. 6, No. 2, Prepared by DGGS, June 2002.
10. U.S. Army Corps of Engineers Civil Works Floodplain Management Services website: http://www.poa.usace.army.mil/en/cw/fld_haz/floodplain_index.htm).
11. U.S. Army Corps of Engineers Alaska Baseline Erosion Assessments Study website: http://www.poa.usace.army.mil/AKE/Home.html).
12. *University of Alaska, Fairbanks, and Alaska Earthquake Information Center* website at: http://www.giseis.alaska.edu/Seis/
13. USGS Earthquake Probability Mapping: http://eqint.cr.usgs.gov/eqprob/2002/index.php
14. West Coast and Alaska Tsunami Warning Center, NOAA, http://wcatwc.arh.noaa.gov/

General Hazard Planning Web Sites

American Planning Association: http://www.planning.org
Association of State Floodplain Managers: http://www.floods.org

Federal Emergency Management Agency:	http://www.fema.gov/fima/planning.shtm
Community Rating System:	http://www.fema.gov/nfip/crs.htm
Flood Mitigation Assistance Program:	http://www.fema.gov/fima/planfma.shtm
Hazard Mitigation Grant Program:	http://www.fema.gov/fima/hmgp
Individual Assistance Programs:	http://www.fema.gov/rrr/inassist.shtm
Interim Final Rule:	http://www.access.gpo.govl
National Flood Insurance Program:	http://www.fema.gov/nfip
Public Assistance Program:	http://www.fema.gov/rrr/pa

Public Involvement

A copy of the draft MHMP was available for public review online on the Aleutians East Borough Website: http://www.aleutianseast.org.

The public involvement appendix includes a community newsletter that was sent to governmental agencies, community members, and businesses through usual public noticing procedures for the borough and the cities, including email and posting within each community. It also includes a copy of an article that was published in the AEB quarterly newsletter *In the Loop*. The distribution list for the newsletter also appears in the appendix.

Several meetings were held in Anchorage at the AEB Administrative offices. Public meetings were held in Sand Point, April 9, 2009, Cold Bay, November13, 2009, Nelson Lagoon, November 11, 2009, Akutan, January 2010. A site visit was conducted in King Cove, July 14 and 15, 2009, during which the contractor met with City representatives, Tribal Village representative and representative from Peter Pan Seafoods. False Pass was emailed several times, the contactor had a teleconference with the Mayor, and a teleconference was offered.

Comments and revisions received from the public governmental staff, businesses, community members and other interested parties were incorporated into the plan.

Plan Implementation

The Borough Assembly, City Councils of Akutan, Cold Bay, False Pass, King Cove, and Sand Point, and the Village Council of Nelson Lagoon will be responsible for adopting the AEB MHMP and all future updates or changes. These governing bodies have the authority to promote sound public policy regarding planning for hazards. The AEB MHMP will be assimilated into other borough and city plans and documents as they undergo periodic review.

Table 2. Aleutians East Borough Plans

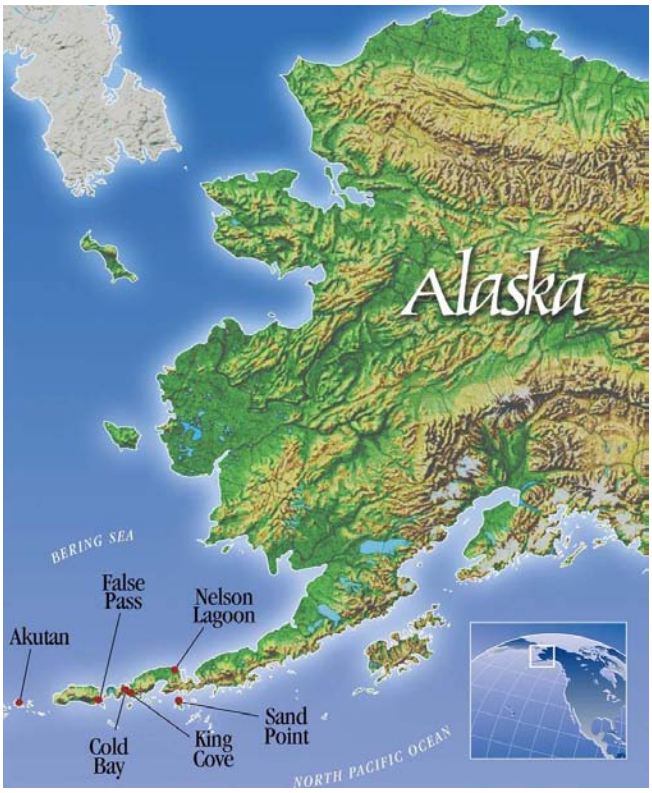
Document	Completed	Next Review
Aleutians East Borough Emergency Operations Plan	2006	As needed
AEB Coastal Management Plan (CMP)	2008	As needed

AEB Community Profile

The source for the AEB Community Profile was obtained from the Division of Community and Regional Affairs (DCRA) Community Information: http://www.commerce.state.ak.us/dca/commdb/CF_BOCK.htm.

Location

The AEB is comprised of the westernmost portion of the Alaska Peninsula and a number of Aleutian Islands. There are five incorporated cities and the Tribal Village of Nelson Lagoon within the boundaries of the borough. It lies at approximately 57.0 north latitude and 162.0 west longitude; within in the Aleutian Islands Recording District. The area encompasses 6,988 square miles of land and 8,024 square miles of water.



Communities of the AEB ***Source: AEB***

History

Archaeological evidence suggests Unanga (Aleut) tribes had inhabited the area since the last ice age. Russian fur traders seeking sea otters were the first non-Natives in the area. The 1900s brought an influx of Euro-American fishermen interested in the area's whaling, fishing, and cannery operations. During World War II, the area was a strategic military site for the Aleutian Campaign, resulting in the evacuation of many local residents to Ketchikan.

Population

According to the 2000 U.S. Census, nearly 39 percent of Borough residents are all or part Alaska Native. The median age is 37 and nearly 65 percent of the population is male. The AEB housing stock consists of 724 total housing units, 526 occupied households, 198 vacant units, and 80 units vacant due to seasonal use. A total of 306 households are owner-occupied and the average household size is 2.69.

Economy

The borough has a cash-based economy; year-round commercial fishing and fish processing dominate. Commercial fishing permits are held by 262 residents. Salmon and pacific cod processing occur at Peter Pan Seafoods in Port Moller and King Cove, Trident Seafoods in Sand

Point and Akutan, and Bering Pacific in False Pass. Transportation and other services also provide year-round employment. The borough work force consists of 2,337 total potential workers and 1,086 employed residents. Forty-one percent are unemployed and 483 adult residents are not in the labor force (not seeking work).

Transportation

Several airports are available in the AEB, and float planes can land in many communities. Marine cargo vessels also provide transportation. The State of Alaska ferry operates during the summer months. Local transportation between the communities is primarily by fishing boats or skiffs, since there are no roads.

Chapter 2. AEB Risk Assessment - Overview

Section 1. Requirements

> Section 201.6(c)(2) of the mitigation planning regulation requires local jurisdictions to provide sufficient hazard and risk information from which to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. (FEMA 386-8)

The goal of mitigation is to reduce future hazard impacts including loss of life, property damage, disruption to local and regional economies, environmental damage and disruption, and the amount of public and private funds spent to assist with recovery.

Mitigation efforts begin with a comprehensive risk assessment. The assessment measures potential losses due to a disaster event, by evaluating the vulnerability of buildings, infrastructure, and people to an existing hazard. The characteristics and potential consequences of hazards and their impacts on community assets are identified.

Federal Requirements for Risk Assessment

Federal regulations for hazard mitigation plans outlined in 44 CFR Section §201.6(c)(2) include a requirement for risk assessment. This risk assessment requirement is intended to provide information that will help the community identify and prioritize mitigation activities that will prevent or reduce losses from the identified hazards. The federal criteria for risk assessments and information on how the AEB MHMP meets those criteria are outlined in Table 3.

Table 3. Risk Assessment - Federal Requirements

Section §201.6(c)(2) Requirement	Where requirement is Addressed in AEB Multi-Jurisdictional MHMP
Identifying Hazards §201.6(c)(2)(i) The risk assessment *shall* include a description of the type . . . of all natural hazards that can affect the jurisdiction . . .	Chapter 2, identifies **earthquake, volcanoes, tsunami, severe weather, flooding and erosion** as natural hazards to be profiled in AEB MHMP.

Section §201.6(c)(2) Requirement	Where requirement is Addressed in AEB Multi-Jurisdictional MHMP
Profiling Hazards §201.6(c)(2)(i) The risk assessment *shall* include a description of the . . . location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.	Chapter 3, Risk Assessment, includes hazard-specific sections. The MHMP profiles the natural hazards that may affect the planning area. The MHMP includes **location, extent, probability, impact, and previous occurrences** for each natural hazard identified.
Assessing Vulnerability: Overview §201.6(c)(2)(i) The risk assessment *shall* include a description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.	Chapter 2, Assessing Vulnerabilities contains overall summaries of each hazard and the impacts on the community are contained in each hazard specific section in Chapter 3.
Assessing Vulnerability: Addressing Repetitive Loss Properties §201.6(c)(2)(ii) The risk assessment in all plans approved after October 1, 2008 must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.	The AEB does not participate in the NFIP, therefore, there are no repetitively damaged structures in the AEB.
Assessing Vulnerability: Identifying Structures §201.6(c)(2)(ii)(A) The plan *should* describe vulnerability in terms of the types and number of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.	Chapters 5 – 10, Community Annexes, Section 2, Risk Assessment include maps and tables which list structures in the identified hazard areas.

Section §201.6(c)(2) Requirement	Where requirement is Addressed in AEB Multi-Jurisdictional MHMP
Assessing Vulnerability: Estimating Potential Losses §201.6(c)(2)(ii)(B) The plan *should* describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.	The communities will add this recommended item during the next update cycle.

Vulnerability Assessment Methodology

A risk assessment typically consists of three components; hazards identification, vulnerability assessment, and risk analysis.

1. ***Hazards Identification*** - The first step in conducting a risk assessment is to identify and profile hazards, and their possible effects on the jurisdiction. This information can be found in Chapter 2, Section 2.

2. ***Vulnerability Assessment*** – The second step is to identify the jurisdiction's vulnerability, including infrastructure and property that are likely to be affected.

   Inventorying the jurisdiction's assets to determine the number of buildings and their replacement value in hazard areas can also help determine vulnerability. A jurisdiction with many high-value buildings in a high-hazard zone will be extremely vulnerable to financial devastation brought on by a disaster event.

   Identifying hazard-prone critical facilities is vital because they are necessary during response and recovery phases.

   Critical facilities include:

   - Essential facilities, which are necessary for the health and welfare of an area and are essential during response to a disaster, including hospitals, fire stations, police stations, and other emergency facilities;
   - Transportation systems such as highways, airways, and waterways;
   - Utilities, water treatment plants, communications systems, power facilities;
   - High potential loss facilities such as bulk fuel storage facilities; and
   - Hazardous materials sites

Other criteria to identify critical facilities include economic elements, areas that require special considerations, vulnerable populations, historic, cultural and natural resource areas and other jurisdiction-determined important facilities.

3. ***Risk Analysis*** – The third step is to calculate the potential losses to determine which hazards will have the greatest impact on the jurisdiction. Hazards should be considered in terms of their frequency of occurrence and potential impact on the jurisdiction. For instance, a possible hazard may pose a devastating impact on a community but have an extremely low likelihood of occurrence. Such a hazard must take lower priority than a hazard with only moderate impact but a very high likelihood of occurrence.

The description of each of the identified hazards includes a narrative and in some cases a map or figure with the following information:

- The **location** or geographical area(s) of the hazard in the community, or if the hazard is area wide.
- The **extent** (i.e. magnitude or severity) of potential hazard events, based on the criteria listed in Table 4.

Table 4 was used to rank the extent of each hazard. The criteria to determine the extent are taken from the *Alaska All-Hazard Risk Mitigation Plan, 2007.*

Table 4. Extent of Hazard Ranking

Magnitude/Severity	Criteria to Determine Extent
Catastrophic	Multiple deaths Complete shutdown of facilities for 30 or more days More than 50% of property severely damaged
Critical	Injuries and/or illnesses result in permanent disability Complete shutdown of critical facilities for at least 2 weeks More than 25% of property is severely damaged
Limited	Injuries and/or illnesses do not result in permanent disability Complete shutdown of critical facilities for more than one week More than 10% of property is severely damaged
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 more Less than 10% of property is severely damaged

- The **impact** of each hazard to the community.
- The **probability** of the likelihood that the hazard event would occur in an area.

Table 5, from the *Alaska All-Hazard Risk Mitigation Plan, 2007,* provided the criteria to categorize the probability ranking of a hazard occurring. Sources of information used determine the probability for each specific hazard in the profile sections include the *Alaska All-Hazard Risk Mitigation Plan, 2007, AEB EOP, 2006,* previous occurrences, and information from outside research, interviews with residents and experts.

Table 5. Probability Criteria Table

Probability	Criteria Used to Determine Probability
Low	Hazard is present with a low probability of occurrence within the next ten years. Event has up to 1 in 10 year's chance of occurring.
Moderate	Hazard is present with a moderate probability of occurrence within the next three years. Event has up to 1 in 3 year's chance of occurring.
High	Hazard is present with a high probability of occurrence within the calendar year. Event has up to 1 in 1 year chance of occurring.

- **Previous occurrences** of hazard events.

  The previous occurrences of natural events are described for identified natural hazards. The information was obtained from the *Alaska All-Hazard Risk Mitigation Plan, 2007*, *State Disaster Cost Index*, *AEB Emergency Operations Plan (EOP), 2006* and other state and federal agency reports, and web searches.

Section 2. Identifying Hazards

This section identifies the natural hazards likely to affect the communities in the AEB. The sources used to identify the hazards communities include *Alaska All-Hazard Risk Mitigation Plan, 2007*, *AEB EOP*, 2006, other governmental agency reports, interviews, and previous occurrences of events.

Matrices - Alaska All-Hazard Risk Mitigation Plan, 2007

The *Alaska All-Hazard Risk Mitigation Plan, 2007*, identified hazards the State considers to be present in the AEB. Table 6, taken from the *Alaska All-Hazard Risk Mitigation Plan,* October 2007, indicates the identified hazards present and their probability of occurrence. The hazards identified may differ in some instances from those the borough or communities deem relevant. These tables are included as a reference source; additional discussion will follow regarding determination of hazards present.

Table 6. Hazard and Vulnerability Matrix

Aleutians East Borough					
Flood	**Wildland Fire**	**Earthquake**	**Volcano**	**Snow Avalanche**	**Tsunami & Seiche**
N	N	Y	Y	N	Y
Severe Weather	**Ground Failure**	**Erosion**			
Y	Y	N			

Key:

Y =	Hazard is present in jurisdiction but probability unknown
Y – L =	Hazard is present with a low probability of occurrence within the next ten years. Event has up to 1 in 10 year's chance of occurring.
Y – M =	Hazard is present with a moderate probability of occurrence with the next three years. Event has up to 1 in 3 year's chance of occurring.
Y – H =	Hazard is present with a high probability of occurrence within the calendar year. Event has up to 1 in 1 year chance of occurring.
N =	Hazard is not present
U =	Unknown if the hazard occurs in the jurisdiction

Source: Alaska All-Hazard Risk Mitigation Plan, 2007

The Previous Occurrences Matrix, Table 7 is a listing of previous occurrences of declared disaster events and the extent of each event. Data for Table 10 comes from the *DHS&EM Disaster Cost Index*, including data from 1978 to the 2007 and major events such as the 1964 earthquake. It may not include events known to the communities in the AEB or from other sources that will be discussed in the sections describing specific hazards.

Table 7. Previous Occurrence of Hazards, 1978 to Present

Aleutians East Borough					
Flood	**Wildland Fire**	**Earthquake**	**Volcano**	**Avalanche**	**Tsunami & Seiche**
0	0	0	0	1-L	0
Severe Weather	**Ground Failure**	**Erosion**			
2-L	0	0			

Key:
L = Low
#= Number of previous occurrences
0 = No occurrences

Source: Alaska All-Hazard Risk Mitigation Plan, 2007

AEB Emergency Operations Plan, 2006 - Hazard Assessment

Table 8 is from the *AEB EOP, 2006;* the table is reproduced here in its entirety. This table details the AEB's assessment of hazards in the area.

Table 8. *AEB Emergency* Operation *Plan, 2007* Hazard Assessment

Hazard	Category	Severity	Points
Earthquake	History	High	20
	Vulnerability	High	50
	Maximum Threat	High	100
	Probability	High	70
		Total	**240**
Tsunami	History	High	20
	Vulnerability	High	50
	Maximum Threat	High	100
	Probability	High	70
		Total	**240**
Volcano	History	High	20
	Vulnerability	High	50
	Maximum Threat	High	100
	Probability	High	70
		Total	**240**

Hazard	Category	Severity	Points
Severe Weather	History	Moderate	10
	Vulnerability	High	50
	Maximum Threat	Moderate	50
	Probability	Moderate	35
		Total	**205**
Flood	History	Moderate	10
	Vulnerability	Low	5
	Maximum Threat	Moderate	50
	Probability	Moderate	35
		Total	**100**
Wildfire	History	Low	2
	Vulnerability	Low	5
	Maximum Threat	Low	10
	Probability	Low	7
		Total	**24**

Key:

The following categories were used to assign numerical values to threats:

HISTORY: The record of occurrences of previous events

Low	0-1 event per 100 years	2 points
Moderate	2-3 events per 100 years	10 points
High	4 + events per 100 years	20 points

VULNERABILITY: The percentage of population and property that is at risk from each hazard

Low	<1 % affected	5 points
Moderate	1-10 % affected	25 points
High	>10 % affected	50 points

MAXIMUM THREAT: The maximum percentage of population and property that could be impacted under a worst-case scenario

Low	<5 % affected	10 points
Moderate	5-25 % affected	50 points
High	>25 % affected	100 points

PROBABILITY: The number of occurrences of each hazard in the past 100 years and the factors that have contributed to increased or decreased risk for the area involved

Low	>1 chance per 100 years	7 points
Moderate	>1 events per 50 years	35 points
High	>1 events per 10 years	70 points

Source: AEB EOP, 2007

Identification of Natural Hazards Profiled in the Plan

Based on consultation with the Alaska DHS&EM, and, from the *Alaska All-Hazard Risk Mitigation Plan, 2007*; Table 8, from the *AEB EOP, 2006*, plans and reports from other governmental agencies, website searches, and interviews with community members, the hazards to be profiled are identified on Table 9.

Table 9. Hazards Identification and Decision to Profile

Hazard	Yes/No	Decision to Profile Hazard
Earthquake	Yes	The *Alaska All-Hazard Risk Mitigation Plan, 2007* designates earthquake as present in the AEB, but probability unknown. The *AEB EOP, 2006* designates earthquake activity in the communities as a high threat.
Volcano	Yes	The *Alaska All-Hazard Risk Mitigation Plan, 2007* designates volcano as present in jurisdiction but probability unknown. The *AEB EOP, 2006* designates volcanic activity in the communities as a high threat.
Tsunami	Yes	The *Alaska All-Hazard Risk Mitigation Plan, 2007* designates tsunami as present in jurisdiction but probability unknown. The *AEB EOP, 2006* designates tsunami occurrence in the communities as a high threat.
Severe Weather	Yes	The *Alaska All-Hazard Risk Mitigation Plan, 2007* designates severe weather as present in jurisdiction but probability unknown. The *AEB EOP, 2006* designates severe weather in the communities as a moderate to high threat.
Erosion	Yes	The *Alaska All-Hazard Risk Mitigation Plan, 2007* lists erosion as a hazard that not is present in the jurisdiction. The *AEB EOP, 2006* did not profile erosion. The United States Army of Engineers (USACE) indicate erosion as a threat to the Tribal Village of Nelson Lagoon, and has occurred in False Pass and King Cove.

Hazard	Yes/No	Decision to Profile Hazard
Flood	Yes	The *Alaska All-Hazard Risk Mitigation Plan, 2007* lists flooding as a hazard that not is present in the jurisdiction. The USACE designates flooding in False Pass.
Wildland Fire	No	The *Alaska All-Hazard Risk Mitigation Plan, 2007* lists wildland fire as a hazard that is not present in the jurisdiction. The *AEB EOP, 2006* designates wildland fire in the communities as a low threat. The soil conditions and heavy rainfall combine to make wildland fire hazard unlikely.
Snow Avalanche	No	The *Alaska All-Hazard Risk Mitigation Plan, 2007* lists snow avalanche as a hazard that is not present in the jurisdiction. The *AEB EOP, 2006* did not profile snow avalanche. May be considered in a future update.
Ground Failure	No	The *Alaska All-Hazard Risk Mitigation Plan, 2007* lists ground failure as a hazard that is present in the jurisdiction but probability unknown. The *AEB EOP, 2006* did not profile ground failure. May be considered in a future update.

Hazard Identification by Jurisdiction

Table 10 identifies where the natural hazards are located by jurisdiction.

Table 10. Hazard Identification by Jurisdiction

Natural Hazards Profiles	Akutan	Cold Bay	False Pass	King Cove	Nelson Lagoon	Sand Point
Earthquake	√	√	√	√	√	√
Volcano	√	√	√	√	√	√
Tsunami	√	√	√	√	√	√
Severe Weather	√	√	√	√	√	√
Flooding			√			
Erosion			√	√	√	

Key √ = Hazard is present in the jurisdiction

See Section 6. Hazards not Profiled in the Plan, for more information on the hazards not profiled in the *2009 AEB MHMP.*

Erosion in Nelson Lagoon ***Source: AEB***

Section 3. Assessing Vulnerability

Overall Summary of Vulnerability to Each Hazard

Table 11 includes an overall summary of the vulnerability of the AEB communities to each hazard. The location, extent, probability, impact, and previous occurrences of each of these hazards is contained in the profile sections.

Table 11. Overall Summary of Vulnerability by Jurisdiction

Natural Hazards Identified	Akutan	Cold Bay	False Pass	King Cove	Nelson Lagoon	Sand Point
Earthquake	H	H	H	H	H	H
Volcano	H	H	H	H	H	H
Tsunami	M	M	M	M	M	M
Severe Weather	M	M	M	M	M	M
Flooding	N/A	N/A	L	N/A	N/A	N/A
Erosion	N/A	N/A	L	L	M	N/A

Key:

N/A= Not applicable; not a hazard to the community

L= Low risk; little damage potential, minor damage to less than 5% of the jurisdiction. Hazard is present with a low probability of occurrence within the next ten years. Event has up to 1 in 10 year's chance of occurring.

M= Moderate risk; moderate damage potential, causing partial damage to 5-10% of the jurisdiction, infrequent occurrence. Hazard is present with a moderate probability of occurrence with the next three years. Event has up to 1 in 3 year's chance of occurring.

H= High risk; significant risk. Major damage potential, destructive damage to more than 10% of the jurisdiction. Hazard is present with a high probability of occurrence within the calendar year. Event has up to 1 in 1 year chance of occurring.

Chapter 3. Risk Assessment - Hazard Specific Sections

Section 1. Earthquake

Hazard Description

Approximately 11% of the world's earthquakes occur in Alaska, making it one of the most seismically active regions in the world. Three of the ten largest earthquakes in the world since 1900 have occurred here. Earthquakes of magnitude 7 or greater occur in Alaska on average about once a year; magnitude 8 earthquakes average about 14 years between events.

Most large earthquakes are caused by a sudden release of accumulated stresses between crustal plates that move against each other on the earth's surface. Some earthquakes occur along faults that lie within these plates. Dangers associated with earthquakes include ground shaking, surface faulting, ground failures, snow avalanches, seiches, and tsunamis. Each of these aspects may cause failure of manmade structures. The extent of damage depends on the magnitude of the earthquake, the geology of the area, distance from the epicenter, and structure design and construction. A main goal of an earthquake hazard reduction program is to preserve lives through economical rehabilitation of existing structures and constructing safe new structures.

Ground shaking is due to the three main classes of seismic waves generated by an earthquake. Primary waves are the first ones felt, often as a sharp jolt. Shear or secondary waves, although slower and usually having a side-to-side movement, can be very damaging because structures are more vulnerable to horizontal than vertical motion. Surface waves are the slowest, although they can carry the bulk of the energy in a large earthquake. Structural damage depends on how the characteristics of each incoming wave interact with a building's height, shape, and construction materials.

Earthquakes are usually measured in terms of their magnitude and intensity. Magnitude is related to the amount of energy released during an event while intensity refers to the effects on people and structures at a particular place. Earthquake magnitude is usually reported according to the standard Richter scale for small to moderate earthquakes.

Strike-slip faults are where each side of the fault moves horizontally. Normal faults have one side dropping down relative to the other side. Thrust (reverse) faults have one side moving up and over the fault relative to the other side.

Earthquake-induced ground failure is often the result of liquefaction, which occurs when soil (usually sand and course silt with high water content) loses strength as a result of the shaking and acts like a viscous fluid.

Liquefaction causes three types of ground failures: lateral spreads, flow failures, and loss of bearing strength. In the 1964 Alaska earthquake, over 200 bridges were destroyed or damaged due to lateral spreads. Flow failures damaged the port facilities in Seward, Valdez and Whittier.

Similar ground failures can result from loss of strength in saturated clay soils, as occurred in several major landslides that were responsible for most of the earthquake damage in Anchorage in 1964. Other types of earthquake-induced ground failures include slumps and debris slides on steep slopes (Alaska Earthquake Information Center (AEIC)).

Location

The hazards and risks associated with earthquakes are an area-wide risk for the communities in the AEB. A majority of the earthquakes in Alaska occur along the faults associated with the North American/ Pacific plate boundary in south-central Alaska and the Aleutian Islands (AEIC).

Extent

Based on information from the *Alaska All-Hazard Risk Mitigation Plan, 2007*, *AEB EOP,* 2006, AEIC, and other plans and reports, the extent of an earthquake in the AEB could be ***critical***. Table 4. Extent of Hazard Ranking, page 12, uses the following criteria to determine the extent of possible damage for a critical hazard: Injuries and/or illnesses result in permanent disability, complete shutdown of critical facilities for at least two weeks, more than 25% of property is severely damaged.

Intensity is a subjective measure of the strength of the shaking experienced in an earthquake and is based on the observed effects of ground shaking on people, buildings, and natural features. Intensity varies spatially within the disturbed region depending on the location of the observer with respect to the earthquake epicenter.

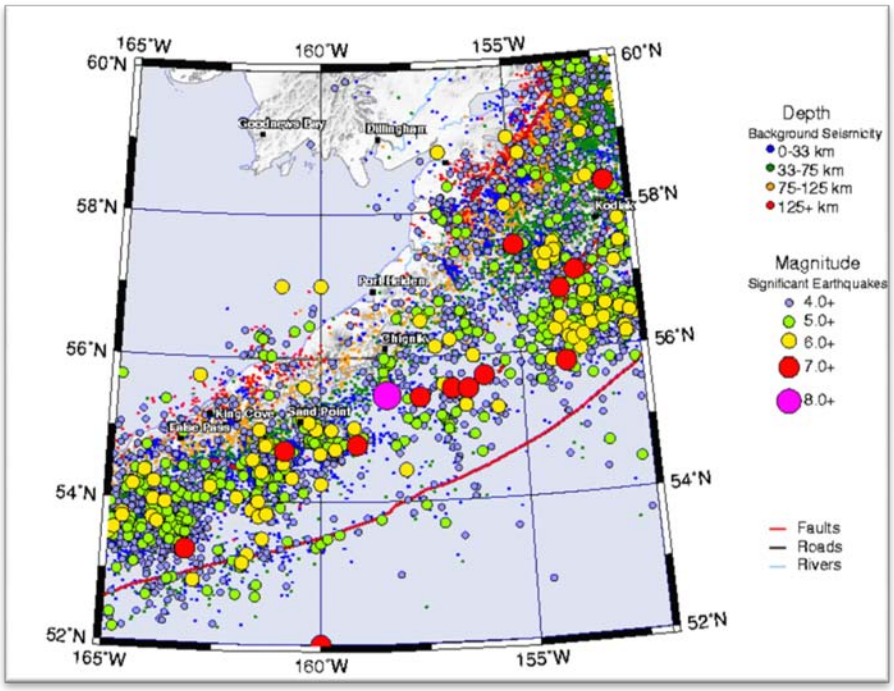
The "intensity" reported at different points generally decreases away from the earthquake epicenter. Local geologic conditions strongly influence the intensity of an earthquake; commonly, sites on soft ground or alluvium have intensities 2 to 3 units higher than sites on bedrock.

The Richter scale expresses magnitude as a decimal number. A 5.0 earthquake is a moderate event, 6.0 characterize a strong event, 7.0 is a major earthquake, and a great earthquake exceeds 8.0 (*Alaska All-Hazard Risk Mitigation Plan, 2007*).

A magnitude of 2 or less is called a microearthquake cannot be felt by people, and are recorded only on local seismographs. Events with magnitudes of about 4.5 or greater are strong enough to be recorded by seismographs all over the world. But the magnitude would have to be higher than 5 to be considered a moderate earthquake, and a large earthquake might be rated as magnitude 6 and major as 7. Great earthquakes (which occur once a year on average) have magnitudes of 8.0 or higher (e.g., British Columbia in 1700, Chile in 1960, and Alaska in 1964). The Richter Scale is logarithmic and has no upper limit, but for the study of massive earthquakes, the moment magnitude scale is used. The modified Mercalli Intensity Scale is used to describe earthquake effects on structures (AEIC).

Figure 1. Alaska Peninsula Seismicity, developed by AEIC illustrates the extent of earthquakes in regard to depth and magnitude.

Figure 1. Alaska Peninsula Seismicity



Source: ***http://www.aeic.alaska.edu/maps/aleutian_seismicity_map.html***

Previous Occurrences

The largest earthquakes in the state are caused by subduction of the Pacific plate beneath Alaska. Three of the seven largest earthquakes in the twentieth century occurred in Alaska (1957 Aleutian, 1964 Prince William Sound, and 1965 Rat Islands). Although it is generally believed that these great earthquakes are rare, with recurrence times on the order of hundreds of years for an individual segment, five great underthrusting events have occurred in Alaska since 1938 (AEIC).

In addition, both the 1986 Andreanof Islands and the 1996 Delarof Islands magnitude 8-class earthquakes reruptured sections of the 1957 zone, even though only 29 and 39 years, respectively, had passed since that the 1957 event. In a recent evaluation of the seismic potential in Alaska, researchers indicated that several subduction zone segments may be ready to rupture soon (AEIC).

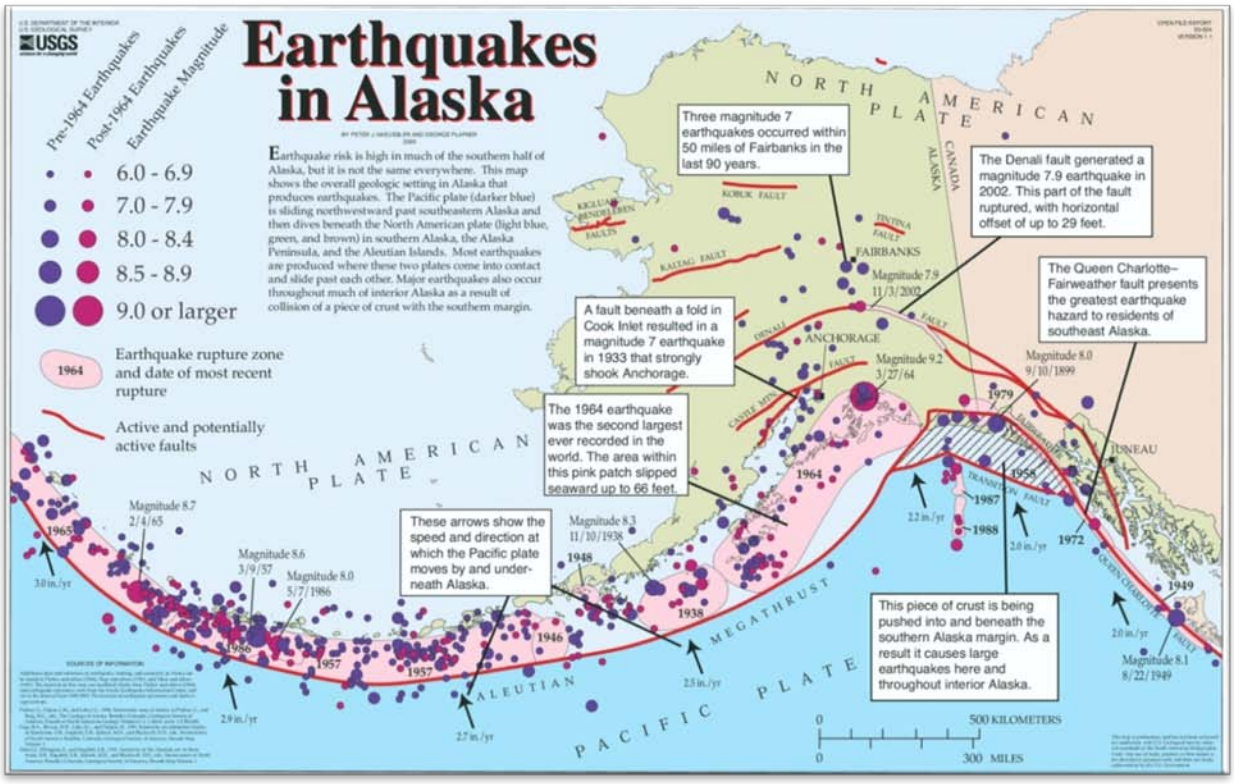
Past earthquakes have occurred on the convergent boundary between the subducting Pacific and overriding North American crustal plates (that is, the Aleutian Chain). This region, where the two plates are being forced directly into one another, is one of the world's most active seismic zones. Over one hundred earthquakes of magnitude seven or larger have occurred along this boundary in the past hundred years (AEIC).

A view of damage to a kitchen after a shallow 6.7 earthquake ***Source: AEB***

Photo courtesy of J. Dewey United States Geological Survey

Figure 2. USGS Historical Earthquake Map, illustrates the recent earthquakes as circles, superimposed on shaded areas illustrating the rupture zones of major earthquakes. Generally speaking, the magnitude of an earthquake is roughly proportional to the area involved in its faulting. Each major rupture is labeled with the earthquake's year. With the exception of the Unalaska and Shumagin seismic gaps, all portions of this plate boundary have ruptured within the past hundred years (AEIC).

Figure 2. USGS Historical Earthquake Map



Source: USGS website: http://www.aeic.alaska.edu/html_docs/images/earthquakes_in_alaska.jpg

Figure 3, from the *AEB EOP, 2006* lists earthquake epicenters greater than magnitude 6 within the AEB over the past 30 years.

Figure 3. AEB Earthquakes – 1973 to 2004

Year	Month	Day	Latitude	Longitude	Magnitude	Depth
1973	3	4	54.83	161.6	6.3	32
1973	6	11	53.69	161.59	6	30
1976	2	3	54.5	161.89	6	33
1978	3	3	55.1	164.76	6.2	33
1980	11	4	53.82	160.74	6.1	33
1982	11	21	55.4	163.18	6.2	35
1983	1	9	55.18	163.24	6.1	33
1983	4	4	52.93	159.86	6	38
1983	7	24	53.93	158.37	6.1	180
1983	8	17	55.87	161.29	7	62
1984	11	1	55.21	163.69	6.3	49
1984	12	28	56.19	163.46	7	33
1985	5	19	53.61	160.53	6.1	62
1986	5	2	55.17	163.84	6	14
1987	10	4	55.58	161.62	6	53
1987	10	6	52.96	159.97	6.3	33
1989	1	27	56.2	164.38	6.3	28
1989	5	24	56.18	164.26	6.1	18
1992	3	2	52.92	159.89	6.9	38
1992	3	5	52.9	159.62	6.4	45
1994	5	24	56.17	161.17	6.3	95
1995	12	31	53.83	160.45	6	43
1996	1	1	53.83	159.59	6.6	33
1996	7	7	58.62	157.75	6.4	10
1996	7	16	56.08	165	6.6	33
1997	12	5	54.84	162.04	7.8	33
1997	12	5	53.75	161.75	6.6	33
1997	12	6	53.97	161.91	6.6	33
1997	12	7	54.66	162.88	6.5	33
1998	6	1	52.89	160.07	6.9	43
2001	8	2	56.26	163.79	6.3	14
2003	6	16	55.49	160	6.9	174
2004	4	14	55.23	162.66	6.2	51
2004	6	10	55.68	160	6.9	188

Source: AEB EOP, 2006

Probability

It is clear based on documentation by the AEIC, *Alaska All-Hazard Risk Mitigation Plan, 2007, AEB EOP, 2006,* Division of Geological and Geophysical Surveys (DGGS), and other federal and state agencies, that the communities in the AEB have a ***high*** probability of an earthquake event.

Table 5. Probability Criteria Table, page 13, lists the following criteria for high probability: hazard is present with a high probability of occurrence within the next calendar year. Event has up to 1 in 1 year chance of occurring.

Impact

Earthquake damage would be area-wide with potential damage to critical infrastructure up to and including the complete abandonment of key facilities. Limited building damage assessors are available in the communities to determine structural integrity following earthquake damage. Priority would have to be given critical infrastructure to include: public safety facilities, health care facilities, shelters and potential shelters, and public utilities.

Due to the fact that the communities are not located on the road system, the residents in communities are aware that they need to be prepared to be isolated from the rest of the State. Emergency aid may be hampered by earthquake damage to airports and dock facilities and supplies may be delayed in arrival. Medical evacuations are also more difficult in such situations.

Earthquake Mitigation Goal and Projects

Goals

Goal 1. Obtain funding to protect existing critical infrastructure from earthquake damage.

Projects:

E-1. Identify buildings and facilities that must be able to remain operable during and following an earthquake event.

E-2. Conduct mock emergency exercises to identify response vulnerabilities.

E-3. Nonstructural mitigation projects (e.g., assessing whether heavy objects are tied down).

Assessing facilities will improve earthquake preparedness through such measures as installing bookshelf tie-downs, improving computer servers' resistance to earthquakes, and moving heavy objects to lower shelves.

Section 2. Volcanoes

Hazard Description

Alaska is home to more than 80 major volcanic centers, 41 of which have been active in the last 250 years. On average, there are one or two eruptions or reports of volcanic unrest each year. Over half of the State's population lives within 100 miles of an active volcano.

A volcano is a vent at the Earth's surface through which magma (molten rock) and associated gases erupt, and also the landform built by effusive and explosive eruptions. Although volcanoes display a wide variety of shapes, sizes, and behavior, they are commonly classified among three main types: cinder cone, composite, and shield (Alaska Volcano Observatory (AVO)).

The *Alaska All-Hazard Risk Mitigation Plan, 2007* is the primary source of the volcano hazard description section.

Types of Volcanoes

Cinder cones

A cinder cone, the simplest type of volcano, is built from particles of congealed lava ejected from a single vent. As the lava is blown into the air, it breaks into small fragments that solidify and fall around the vent to form a circular or oval cone. Most cinder cones have one or more bowl-shaped craters at the summit and are rarely more than a thousand feet above their surroundings. Cinder cones may also form as flank vents on the sides of larger composite or shield volcanoes where they often occur in clusters and produce lava flows. Cinder cones are common in western North America as well as other volcanic terrain. Some Alaskan cinder cones are found in the following locations:

- St. Michael in western Alaska along the southern Norton Sound shoreline
- Ingakslugwat Hills in western Alaska's Yukon Delta region near the Village of St. Mary's
- St. Paul Island, one of the Pribilof Islands in the Bering Sea
- Table Top-Wide Bay, a satellite vent of Makushin Volcano near Unalaska in the Aleutian Islands

Composite volcanoes

Composite volcanoes, sometimes called stratovolcanoes, are typically steep-sided, symmetrical cones of large dimension built of alternating layers of lava flows, volcanic ash, blocks, and bombs and may rise as much as 8,000 feet above their bases. Some of the most conspicuous and beautiful mountains in the world are composite volcanoes, including Mount Shasta in California, Mount Hood in Oregon, Mount St. Helens and Mount Rainier in Washington, Mount Fuji in Japan, Mount Vesuvius in Italy, and ***Shishaldin*** (located in the AEB) in Alaska (AVO).

Shishaldin Volcano, located on Unimak Island, AEB

Source: AVO

Picture Date: May 10, 1994

Image Creator: Nye, C.

Shishaldin volcano (elevation 2857 meters) is a frequently active, nearly perfectly conical stratovolcano located adjacent to the inactive Isanotski and Roundtop volcanoes on Unimak Island. Unimak is the first of the Aleutian Islands and is located over 1000 kilometers southwest of Anchorage (http://www.photovolcanica.com/VolcanoInfo/Shishaldin/Shishaldin.html).

Composite volcanoes have a principal conduit system through which magma from a reservoir deep in the Earth's crust rises to the surface repeatedly to cause eruptions. The volcano is built up by accumulating erupted material and increases in size as lava, and fragmented deposits, are added to its slopes. Stratovolcanoes tend to erupt explosively because of the viscous nature of magmas associated with these volcanoes.

Some stratovolcanoes produce enormous explosive eruptions that destroy a large part of the volcano itself, leaving a wide, roughly circular depression called a caldera. Eruptions that produce calderas are

among the most explosive and largest eruptions known. Most Alaskan volcanoes are stratovolcanoes, including Redoubt, Spurr, Iliamna, and Augustine.

Shield volcanoes

Shield volcanoes are formed by lava flowing in all directions from a central summit vent, or group of vents, or rift zones building a broad, gently sloping cone with a dome shape. They are built up slowly by the accumulation of thousands of highly fluid lava flows that spread widely over great distances, and then cool in thin layers. Some of the largest volcanoes in the world are shield volcanoes including Mauna Loa in Hawaii. In Alaska, Wrangell, Yunaska, and **Westdahl** (located in the AEB) are examples of shield volcanoes.

Volcanoes are also categorized according to the age of their eruptive activity. Active volcanoes are those that have recently erupted, are currently erupting, or show signs of unrest, such as unusual earthquake activity or significant new gas emissions. Dormant volcanoes are those that are not currently active, but could become restless or erupt again. Extinct volcanoes are those that are considered unlikely to erupt again, although this can be difficult to determine because tens of thousands of years could elapse between eruptions. There are over 80 volcanic centers in Alaska, but only 41 are considered active. (*Alaska All-Hazard Risk Mitigation Plan, 2007)*

The Alaska Volcano Observatory (AVO), which is a cooperative program of the U.S. Geological Survey (USGS), the Alaska Division of Geological & Geophysical Surveys (DNR/DGGS), and the University of Alaska Fairbanks Geophysical Institute (UAF/GI), monitor seismic activity at 23 of Alaska's active volcanoes. In addition, satellite images of all Alaskan and Russian volcanoes are analyzed daily for evidence of ash plumes and elevated surface temperatures. AVO also researches the individual history of Alaska's active volcanoes and produces hazard assessment maps for each center (*Alaska All-Hazard Risk Mitigation Plan, 2007)*.

Volcanoes in the AEB

Table 12. Volcanoes near the Communities of the AEB

Volcanoes Impacting the AEB	
Akutan	Amak
Fisher	Dutton
Isanotski	Pavlof
Shishaldin	Veniaminof
Westdahl	

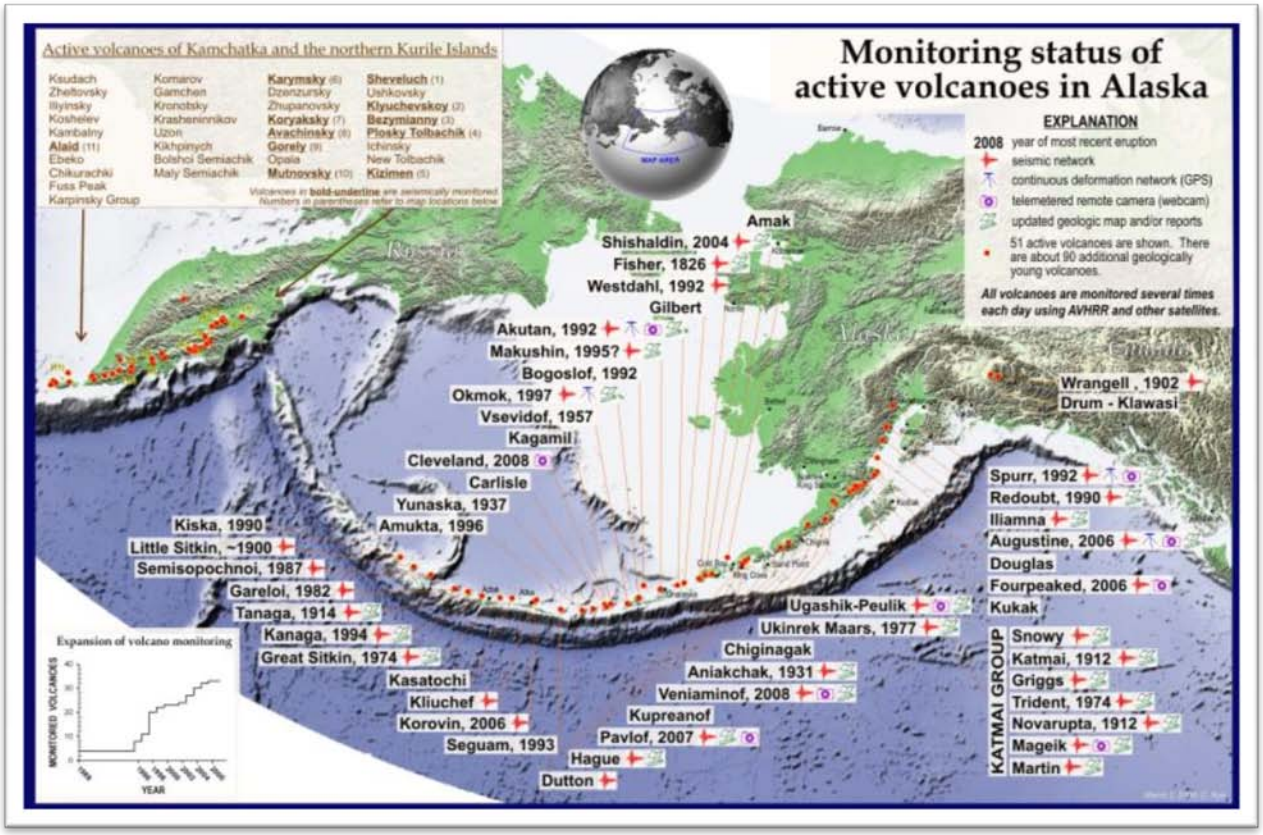
Source: AVO

Location

Most of Alaska's volcanoes are located along the 2,500- kilometer-long (1,550-mile-long) Aleutian Arc, which extends westward to Kamchatka and forms the northern portion of the Pacific "Ring of Fire"

(AVO). The entire Aleutians East Borough is at risk for a volcanic event. Figure 4 illustrates the number of actives volcanoes in and around the communities of the AEB.

Figure 4. AVO Map of Active Volcanoes in Alaska



Extent

Based on information from the *Alaska All-Hazard Risk Mitigation Plan, 2007*, *AEB EOP, 2006,* AVO and other plans and reports, the extent of a volcanic event in the communities could be ***critical***. Table 4. Extent of Hazard Ranking, page 12, uses the following criteria to determine the extent of possible damage: Injuries and/or illnesses result in permanent disability, complete shutdown of critical facilities for at least two weeks, more than 25% of property is severely damaged.

Previous Occurrences

Volcanoes near the communities that have been historically active include Akutan (1992), Fisher (1830), Shishaldin (2000), Westdahl (1991), Amak (1796), Dutton, and Pavlof (2001). Veniaminof Volcano, near the eastern boundary of the AEB, last erupted in 2004 (AVO). Since 1760,137 volcanic eruptions occurred on the Alaska Peninsula and Unimak Island. The most active volcanoes in the area are Pavlof, Shishadin and Akutan (*AEB CMP, 2008*).

Probability

Many dormant and active volcanoes are located within the AEB, and the likelihood of volcanic activity is very high. Movement of the Pacific Plate against the Aleutian Trench created the many volcanoes in the region. Of the 11 active volcanoes in or near AEB, six are located on Unimak Island (False Pass). Pogromni, Westdahl, Shishaldin, and Pavlof (King Cove) and are considered to have the highest potential for eruption (*AEB CMP, 2008*).

Based on information provided by the AVO, *AEB EOP,* 2006, *Alaska All-Hazard Risk Mitigation Plan, 2007,* DGGS, previous occurrences and other federal and state agencies, the communities have a ***high*** probability of volcanic activity.

Table 5, page 13, lists the following criteria for high probability: hazard is present with a high probability of occurrence within the next calendar year. Event has up to 1 in 1 year chance of occurring.

Impact

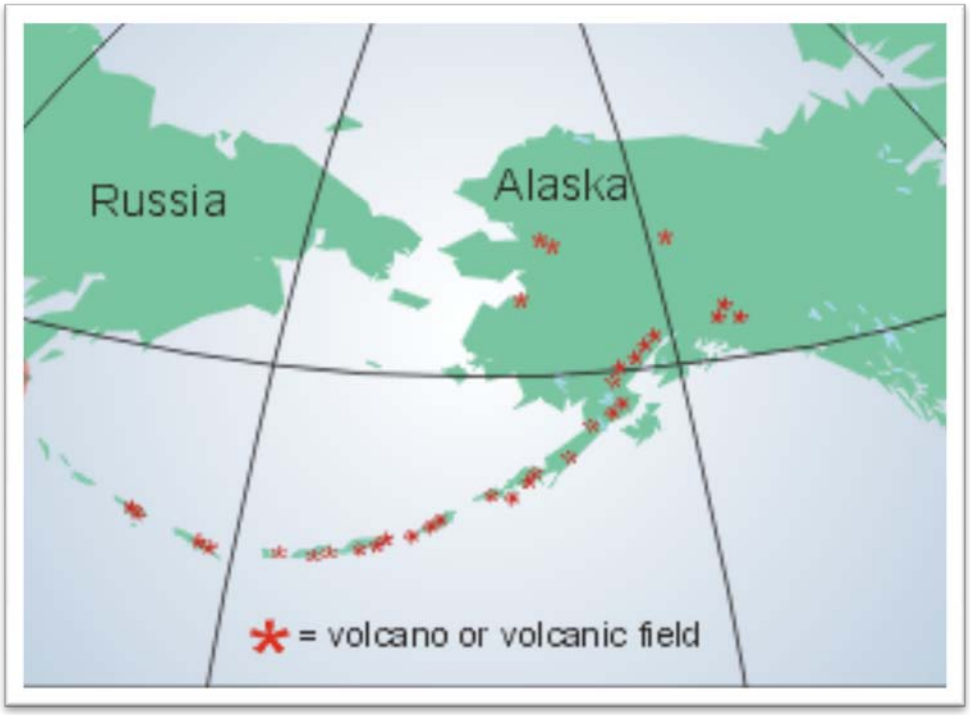
Hazards associated with volcanoes include damage from directed blasts, pyroclastic flows, ash fall, lava flow, and mudslides. Airborne ash can damage aircraft engines and sensitive electronic equipment. Ash from the 1978 eruption of Westdahl Volcano damaged a U.S. Coast Guard light station. Ashfall can choke streams and suffocate fish, and can smother low growing plants. (*AEB CMP, 2008*)

The single greatest volcanic hazard in Alaska is airborne ash, fine fragments of rock blown high into the atmosphere during explosive volcanic eruptions. Coarse particles fall near the volcano, but the fine particulates can travel downwind as an eruption cloud posing a hazard to aircraft and populations hundreds or thousands of miles away.

Ash is extremely abrasive, does not dissolve in water, and is heavy and slippery when wet. Inhaling ash can be dangerous, especially for children, the elderly and those with breathing problems. Ash can also affect machinery, such as cars and electrical generators. Volcanic ash nearly caused the greatest loss of life of any disaster event in Alaska during the 1989 eruption of Mount Redoubt when a commercial airliner, with 245 passengers and crew aboard, flew into an ash cloud and temporarily lost power to all four engines (*Alaska All-Hazard Risk Mitigation Plan, 2007)*.

Lahars (volcanic mudflows), pyroclastic flows and surges, lava flows, debris avalanches, volcanic gases, and tsunami generating landslides are also potential hazards during a volcanic eruption. The severity of each of these hazards depends on the type of eruption and distance from the volcano (*Alaska All-Hazard Risk Mitigation Plan, 2007).*

Figure 5. Volcano or Volcanic Fields in Alaska



Source: ***Alaska All-Hazard Risk Mitigation Plan, 2007***

Volcano Mitigation Goals and Projects

Goals

Goal 1. Continue to provide public education regarding volcanoes

Goal 2. Increase planning for volcanic hazards

Goal 3. Research and publish information on volcanic hazards in Alaska

Goal 4. Improve monitoring

Projects

V-1. Conduct specific outreach to the AEB aviation community regarding the hazards posed by volcanoes in the AEB (Goal 1)

V-2. Compile an integrated volcano hazard and risk assessment for the AEB with surrounding areas of the Aleutians Chain. (Goal 2)

V-3. Distribute free USGS literature on volcano hazards. (Goal 1, 3)

V-4. Continue to support publication of volcano hazard assessments for Alaska's active volcanoes. (Goal 2, 3)

V-5. Expand real time seismic monitoring to high-priority western Aleutian volcanoes. (Goal 4)

V-6. Update public emergency notification procedures and emergency planning for ash fall events. (Goal 1,2)

V-7. Evaluate vulnerability of water and electric power systems to ash falls and mitigate risks when cost effective. (Goal 2)

Section 3. Tsunami Hazard

The West Coast Alaska Tsunami Warning Center (WCATWC) was the primary source for the majority of information for this section. Further information regarding tsunamis is available on the website at: http://wcatwc.arh.noaa.gov/events/eventmap.php.

Hazard Description

The areas of Alaska most vulnerable to tsunamis are the low-lying coastal areas bordering the Pacific Ocean, particularly along the Gulf of Alaska. While volcano-generated tsunamis may be rare, they are a threat to the Aleutian Chain and parts of Cook Inlet, including Homer and Seldovia. Tsunami experts consider the coastline of the Bering Sea as having a very low vulnerability to tsunamis.

A tsunami is a series of long waves generated in the ocean by a sudden displacement of a large volume of water. Underwater earthquakes, landslides, volcanic eruptions, meteor impacts, or onshore ground failures can cause this displacement. Most tsunamis originate in the Pacific "Ring of Fire," the area of the Pacific bounded by the eastern coasts of Asia and Australia and the western coasts of North America and South America that is the most active seismic feature on earth.

Tsunami waves can travel at speeds averaging 450 to 600 miles per hour. As a tsunami nears the coastline, its speed diminishes, its wavelength decreases, and its height increases greatly. Unusual heights have been known to be over 100 feet high. However, waves that are 10 to 20 feet high can be very destructive and cause many deaths and injuries.

After a major earthquake or other tsunami-inducing activity occurs, a tsunami could reach the shore within a few minutes. From the source of the tsunami-generating event, waves travel outward in all directions in ripples. As these waves approach coastal areas, the time between successive wave crests varies from 5 to 90 minutes. Usually, the first wave is neither the largest in the wave series , nor the most significant. One coastal community may experience no damaging waves while an adjacent community may experience severe destruction (WCATWC).

Types of Tsunami

Seismically generated local tsunami

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. Once generated, tsunamis generally reach land 20 to 45 minutes after starting.

Landslide-generated tsunami

Submarine and subaerial landslides are associated with substantial kinetic energy and can generate large tsunamis. An earthquake usually, but not always, triggers this type of landslide and the tsunami is usually confined to the bay or lake of origin. However, one earthquake can trigger multiple landslides and corresponding tsunamis. Low tide is often a factor for submarine landslides because low tide leaves

exposes water-saturated sediments. Landslide generated tsunamis are responsible for most of the tsunamis deaths in Alaska because they occur with virtually no warning (WCATWC).

Location

Tsunami Inundation Mapping for Alaska Communities

To help mitigate the risk earthquakes and tsunamis pose to Alaskan coastal communities, the Geophysical Institute of the University of Alaska Fairbanks and the DGGS participate in the National Tsunami Hazard Mitigation Program by evaluating and mapping potential inundation of selected parts of Alaska coastlines using numerical modeling of tsunami wave dynamics. The communities for inundation modeling are selected in coordination with the DHS&EM with consideration to location, infrastructure, availability of bathymetric and topographic data, and willingness for a community to incorporate the results in a comprehensive mitigation plan (AEIC).

Figure 6, the AEIC Alaska Priority List, includes the AEB communities with the exception of the Tribal Village of Nelson Lagoon.

Figure 6. AEIC Priority List for Tsunami Communities

		Tsunami Ready Community	State's Priority (Yes / No)	Distant Tsunami Potential	Local Tsunami / Seiche Potential
	Kodiak City/Map Combined with	✓	Done	H	Y
	Woman's Bay		Done	H	Y
	US Coast Guard Station		Done	H	Y
	Homer/Map Combined with	✓	Done	H	Y
	Seldovia		Done	H	Y
1	Seward	✓	Y	H	Y
2	Sitka	✓	Y	H	Y
3	Valdez		Y	L	Y
4	Sand Point		Y	H	Y
9	Akutan		Y	M	Y
10	Yakutat		Y	H	Y
11	Ketchikan		Y	L	Y
19	Cold Bay		Y	M	Y
20	King Cove		Y	H	Y
38	Port Graham		Y	L	Y
39	Pelican		Y	L	Y
41	Anchor Point		Y	M	Y
42	Port Heiden (Bering Sea)		N	L	N
48	Nelson Lagoon (Bering Sea)		Y	L	N
49	Akhiok		Y	H	Y
50	Chignik Lagoon		Y	H	Y
51	False Pass		Y	M	Y
52	Port Protection		Y	L	Y
53	Chiniak		Y	H	Y

DISTANT SOURCE TSUNAMI HAZARD means the tsunami is generated so far away that the earthquake was not felt at all or only slightly. An estimate can be made of potential danger. Maximum runup heights would only be reached at the shoreline and the maximum distance inland only reached where the coast is low, flat, and unobstructed. ***"High"*** means possible runup to 50 foot elevation and reaching up to 1 mile inland. ***"Moderate"*** means possible runup to 35 foot elevation and inland up to 3/4 mile. ***"Low"*** means possible runup to 20 foot elevation and reaching up to 1/2 mile inland. ***NIL*** means neglible indication of a tsunami occurring. All listed communities have a **LOCAL TSUNAMI HAZARD** which means a tsunami could be generated in nearby waters and reach your community before a formal warning could be transmitted. These waves may arrive in less than one hour and have historically been the highest, up to 100 foot or more. The estimated possible height in each community is difficult to determine. Coastal residents who feel a very strong earthquake (lasting over 30 seconds or if they have difficulty standing) should move to higher ground immediately.
Source; http://www.aeic.alaska.edu/tsunami/intro.html

Extent

A tsunami in the communities of the AEB could be of a ***critical*** extent. A critical event is defined in Table 4. Extent of Hazard Ranking, page 12, as an event that causes injuries and/or illnesses, complete shutdown of critical facilities for at least two weeks and with more than 25% of property severely damaged.

The intensity or extent of a tsunami is affected by the following factors (*Alaska All-Hazard Risk Mitigation Plan, 2007)*:

Coastline configuration: Tsunamis impact long, low-lying stretches of linear coastlines, usually extending inland for relatively short distances. Concave shorelines, bays, sounds, inlets, rivers, streams, offshore canyons, and flood control channels may intensify damage. Offshore canyons can focus tsunami wave energy, and islands can filter the energy. Coastline orientation determines whether the waves strike head-on or are refracted from other parts of the coastline. Tsunami waves entering flood control channels could reach a mile or more inland, especially if it enters at high tide.

Coral reefs: Reefs surrounding islands in the western North Pacific and the South Pacific generally cause waves to break, providing some protection to the islands.

Earthquake characteristics: Several characteristics of the earthquake that generates the tsunami contribute to the intensity of the tsunami, including the area and shape of the rupture zone.

Fault movement: Strike-slip movements that occur under the ocean create little or no tsunami hazard. However, vertical movements along a fault on the seafloor displace water and create a tsunami hazard.

Magnitude and depth: Earthquakes with greater magnitude cause more intense tsunamis. Shallow-focus earthquakes also have greater capacity to cause tsunamis.

Human activity: With increased development, property damage increases, multiplying the amount of debris available to damage or destroy other structures (*Alaska All-Hazard Risk Mitigation Plan, 2007)*.

Previous occurrences

The 1946 earthquake 144 kilometers offshore of Unimak Island (False Pass) resulted in a 100-foot tsunami that toppled Scotch Cap lighthouse with a runup of 40 meters.

In 1957, a 45-foot wave occurred at the same location. Earthquakes in this region generate tsunamis as far as California and Hawaii (*AEB CMP, 2008*).

The following record of past tsunamis is from the West Coast/Alaska Tsunami Warning Center, NOAA/NWS website at http://wcatwc.arh.noaa.gov/web_tsus/pastaor_tsunamis.htm.

Past tsunamis along the U.S. West Coast, British Columbia, and Alaska. Tsunamis listed are locally generated tsunamis with high validity or with a significant effect. Also, significant tsunamis recorded in the WCATWC AOR (Alaska, British Columbia, Washington, Oregon, and California) but generated elsewhere in the Pacific are listed. Maximum runup and fatalities refer to the WCATWC AOR. Maximum runup indicates the maximum vertical wave elevation along the shore or the maximum half-height of the wave recorded on a tide gage. For further information on Alaska, British Columbia, and U.S. west coast tsunamis, see the NGDC Tsunami Catalog.

Information in this table is taken predominantly from *Tsunamis Affecting the West Coast of the United States 1806-1992* by Lander, et al., 1993, and from *Tsunami Affecting Alaska 1737-1996* by Lander, 1996.

Table 13. AEB Tsunami Previous Occurrences

Tsunami Date (yyyy mm dd)	Source Location	Max. runup (m)	Fatalities
1929 03 07	Eastern Aleutian Is., Alaska	<0.1	0
1946 04 01	Eastern Aleutian Is., Alaska	35	6
1965 07 02	Eastern Aleutian Is., Alaska	0.1	0

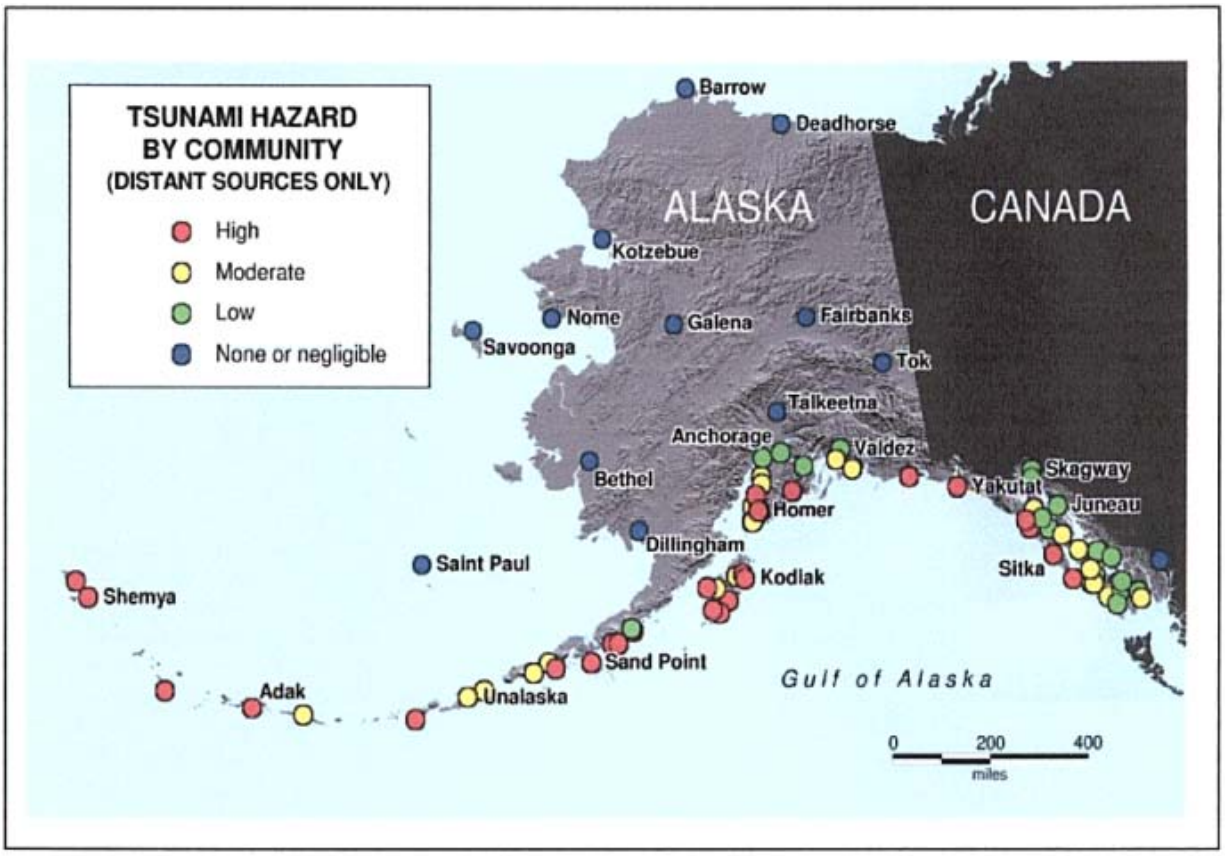
Source: WCTWC, http://wcatwc.arh.noaa.gov/web_tsus/pastaor_tsunamis.htm

Probability

Tsunamis are a great concern for the communities in the AEB. All of the AEB communities, with the exception of Nelson Lagoon which was not listed, have been rated by the AEIC to have local tsunami hazards, which means a tsunami could reach the communities before a warning could be issued (Figure 6. AEIC Priority List for Tsunami Communities).

A high distant source tsunami hazard exists for Sand Point and King Cove, moderate distant tsunami hazard exists for Akutan, Cold Bay and False Pass (Figure 6. AEIC Priority List for Tsunami Communities).

Figure 7. Tsunami Hazard by Community



Source: *Alaska All-Hazard Risk Mitigation Plan, 2007*

Alaska has the greatest earthquake and tsunami potential in the entire United States. Subduction of the Pacific plate under the North American plate along the Alaska-Aleutian megathrust zone creates a very seismically active region with high tsunami hazards for the adjacent coastal areas (AEIC).

The Alaska and Aleutian Seismic Zone that threatens Alaska has a predicted occurrence (84 percent probability between 1988 to 2008) of an earthquake with magnitude greater than 7.4 in Alaska. If an earthquake of this magnitude occurs, Alaska's coastline can be expected to flood within 15 minutes (WCATWC).

Science cannot predict when either an earthquake or a potentially resultant tsunami will occur. However, historical tsunami records and numerical models provide insights into where tsunamis are most likely to be generated, as well as future tsunami impact and flooding limits at specific coastal areas. There is an average of two destructive tsunamis per year in the Pacific basin, but Pacific-wide tsunamis are a rare phenomenon, occurring every 10 - 12 years on the average (WCATWC).

Based on information provided by the AEIC, *Alaska All-Hazard Risk Mitigation Plan, 2007, AEB CMP, 2006,* DGGS and other federal and state agencies, the AEB has a ***high*** probability of a tsunami.

Table 5, page 13, lists the following criteria for high probability: hazard is present with a high probability of occurrence within the next calendar year. Event has up to 1 in 1 year chance of occurring.

Impact

A large tsunami could create major property damage. The communities in the AEB contain many harbor facilities and on-shore structures that could be damaged or destroyed by a large tsunami. Also a tsunami would likely damage or destroy most of the electrical power and telephone communication infrastructure , water and sewer systems, and transportation infrastructure, such as roads, the airport, and marine docking facilities. (*Alaska All-Hazard Risk Mitigation Plan, 2007)*

Tsunami Mitigation Goals and Projects

Goals

Goal 1. Increased Public Education about Tsunamis and Seiches.

Goal 2. Consider pursuing Tsunami Ready Community Designation Program.

Goal 3. Develop accurate inundation maps for the AEB coastline.

Goal 4. Update AEB Emergency Operations Plan, as needed.

Mitigation Projects

T-1. Consider Pursuing Participation in the Tsunami Awareness Programs (Goal 2)

T-2. Inundation Mapping (Goal 3)

T-3. Update AEB EOP, as needed, Conduct EOP Exercises (Goal 4)

T-4. Sirens and lights in communities or other hazard warning methods (Goal 1, 4)

Section 4. Severe Weather Hazard

Hazard Description

The communities in the AEB are at greatest risk of damage from heavy rainfall and hurricane force winds.

Location

A severe weather event would create an area wide impact and could damage structures and potentially isolate the communities from the rest of the state.

High winds can occur anywhere in the borough creating a dust hazard as well, where soils are exposed. High winds occur throughout the year in the communities.

Extent

Severe weather could result in a ***limited*** extent event in the AEB Table 4. Extent of Hazard Ranking, page 12, defined limited as an event that would cause injuries and/or illnesses do not result in permanent disability; complete shutdown of critical facilities for more than one week and more than 10% of property is severely damaged.

Previous Occurrences

The Western Regional Climate Center (WWRC) records summaries for weather stations in the United States. The only two stations recorded in the AEB are Cold Bay and Sand Point. The Sand Point station records only are available through 1994, Figure 8. Monthly Climate Summary for Cold Bay 1950 to 2009, 42is the most recent climate summary for the AEB area.

Figure 8. Monthly Climate Summary for Cold Bay 1950 to 2009

COLD BAY WB AIRPORT, ALASKA (502102)													
Period of Record Monthly Climate Summary Period of Record : 3/ 2/1950 to 4/30/2009													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	32.8	32.9	34.5	38.3	44.9	50.6	55.1	56.0	52.3	44.8	39.0	34.7	43.0
Average Min. Temperature (F)	23.6	23.5	24.6	28.7	34.9	41.1	46.0	47.4	43.1	35.1	30.0	25.6	33.6
Average Total Precipitation (in.)	2.95	2.64	2.46	2.15	2.51	2.44	2.41	3.71	4.32	4.53	4.53	3.68	38.34

Source: http://www.wrcc.dri.edu/summary/Climsmak.html

State and Federal Disaster Declarations as well as Administrative Orders for weather events in the AEB (Alaska All-Hazard Risk Mitigation Plan, 2007.)

89 -83 Omega Block Disaster, January 28, 1989. The governor declared a ***statewide disaster*** to provide emergency relief to communities suffering adverse effects of a record breaking cold spell, with temperatures as low as minus eighty-five degree Fahrenheit degrees (- 85ºF) . The State conducted a wide variety of emergency actions, which included: emergency repairs to maintain and prevent damage to water, sewer and electrical systems, emergency resupply of essential fuels and food, and DOT&PF support in maintaining access to isolated communities.

00-191 Central Gulf Coast Storm: On Feb 4 2000, the Governor declared a disaster due to high impact weather events throughout an extensive area of the state. The State began responding to the incident since the beginning of December 21, 1999. The declaration was expanded on February 8 to include City of Whittier, City of Valdez, Kenai Peninsula Borough, Matanuska-Susitna Borough and the Municipality of Anchorage. On February 17, 2000, President Bill Clinton determined the event disaster warranted a major disaster declaration under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288 as amended (the Stafford Act). On March 17, 2000, the governor again expanded the disaster area and declared that a condition of disaster exists in ***Aleutians East***, Bristol Bay, Denali, Fairbanks North Star, Kodiak Island, and Lake and Peninsula Boroughs and the census areas of Dillingham, Bethel, Wade Hampton, and Southeast Fairbanks, which is of sufficient severity and magnitude to warrant a disaster declaration.

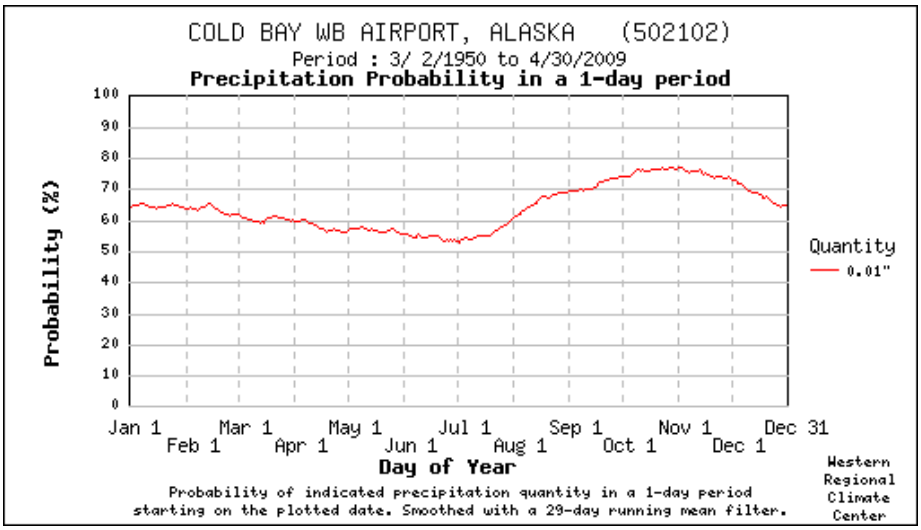
Probability

Based on information provided by the WWRC, *Alaska All-Hazard Risk Mitigation Plan, 2007, AEB CMP, 2008,* and weather history, the communities have a ***moderate*** probability of a severe weather event.

Table 5. Probability Criteria Table, page 13, lists the following criteria for moderate probability: hazard is present with a moderate probability of occurrence within the next three years. Event has up to 1 in 3 years chance of occurring.

Figure 9, from the WRCC illustrates that AEB has a 50% to 80% probability of at least a half-inch of rainfall most days.

Figure 9. Precipitation Probability in a 1-Day Period



Impact

Property damage to infrastructure, telephone lines and broken water and sewer could be expected during a severe weather event. Structures built over the last twenty years within the area are generally built to sustain high winds and heavy precipitation. The Aleutian Chain is often subjected to hurricane force winds and precipitation as remnants of tropical cyclones reflex northeasterly from the vicinity of Japan and China (*Alaska All-Hazard Risk Mitigation Plan, 2007*).

Extremely heavy rains can saturate and loosen the volcanic soils on steep slopes causing massive slides and flooding. Ice buildup on wires and cables can disable electrical distribution lines and communications systems during these storms. Numerous vessels have capsized from heavy icing on their superstructure (*AEB EOP, 2006*).

Severe Weather Mitigation Goals and Projects

Goals

Goal 1. Mitigate the effects of severe weather by instituting programs that provide early warning and preparation.

Goal 2. Educate people about the dangers of severe weather and how to prepare.

Goal 3. Develop practical measures to warn in the event of a severe weather event.

Projects

SW-1. Research and consider instituting the National Weather Service program of *"Storm Ready"*. (Goal 1, 2)

SW-2. Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, and other activities. (Goal 2)

SW-3. Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability. (Goal 3)

SW-4. Encourage weather resistant building construction materials and practices. (Goal 2)

Background information on Storm Ready

Storm Ready is a nationwide community preparedness program that uses a grassroots approach to help communities develop plans to handle all types of severe weather—from tornadoes to tsunamis. The program encourages communities to take a new, proactive approach to improving local hazardous weather operations by providing emergency managers with clear-cut guidelines on how to improve their hazardous weather operations.

To be officially Storm Ready, a community must:

1. Establish a 24-hour warning point and emergency operations center.
2. Have more than one way to receive severe weather forecasts and warnings and to alert the public.
3. Create a system that monitors local weather conditions.
4. Promote the importance of public readiness through community seminars.
5. Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.
6. Demonstrate a capability to disseminate warnings.

Specific Storm Ready guidelines, examples, and applications also may be found on the Internet at: www.nws.noaa.gov/stormready

Section 5. Community Specific Risk Assessments

Flooding

The U.S. Army Corps of Engineers (USACE) Civil Works Floodplain Management Services records indicate flooding has occurred in only one community (***False Pass***) within the AEB. Records updated 09/14/2007. (USACE website: http://www.poa.usace.army.mil/en/cw/fld_haz/floodplain_index.htm)

See Chapter 7, False Pass Annex, Section 2. Risk Assessment.

Erosion

The USACE Alaska Baseline Erosion Assessments Study indicates that erosion has occurred in ***False Pass, King Cove and Nelson Lagoon***. The study was conducted in 2007 (USACE website: http://www.poa.usace.army.mil/AKE/Home.html).

See Chapter 7, False Pass Annex, Section 2. Risk Assessment.

See Chapter 8, King Cove Annex, Section 2. Risk Assessment.

See Chapter 9, Nelson Lagoon Annex, Section 2. Risk Assessment.

Section 6. Hazards not Profiled in the Plan

Wildland Fire

The *Alaska All-Hazard Risk Mitigation Plan, 2007* lists wildland fire as a hazard that is not present in the jurisdiction. The *AEB EOP, 2006* designates wildland fire in the communities as a low threat. The soil conditions and heavy rainfall combine to make wildland fire hazard unlikely.

The following risk assessment is from the *AEB EOP, 2006*.

> Both the history and likelihood of wildfire within the Aleutians East Borough is negligible as a stand-alone threat. Within Alaska, lightning, especially "dry-lightning," is the leading cause of wildfire. The proper combination of fuel type, fuel moisture and natural ignition sources required for "natural" wildfire will rarely converge in the Aleutians East Borough.
>
> In Alaska, vegetation, the key element in wildfire, is documented to be changing in accordance with the current climate-warming trend. Maritime climate influences, however, have a tendency to attenuate changes in the environment, especially in insular or peninsular community locations. The relative humidity regime of the maritime influence generally prevents radical changes in fuel moisture content, which in turn affects combustibility.
>
> More likely, wildfire would be the result of other critical events such as earthquakes, tsunamis and hazardous material conflagration. (*AEB EOP, 2006*)

Snow Avalanche

The *Alaska All-Hazard Risk Mitigation Plan, 2007* lists snow avalanche as a hazard that is not present in the jurisdiction. The *AEB EOP, 2006* did not profile snow avalanche. May be considered in a future addition

Ground Failure

The *Alaska All-Hazard Risk Mitigation Plan, 2007* lists ground failure as a hazard that is present in the jurisdiction but probability unknown. The *AEB EOP, 2006* did not profile ground failure. May be considered in a future addition.

Chapter 4. AEB Mitigation Strategy

Benefit-Cost Review

This chapter of the plan outlines an overall strategy to reduce vulnerability to the effects of the hazards profiled. Currently the planning effort is limited to the hazards determined to be of the most concern; earthquake, volcano, tsunami, severe weather, flooding and erosion, however the mitigation strategy will be updated as outlined in, and as additional hazard information is added and new information becomes available.

The potential projects listed on the Benefit-Cost Review Listing, Table 14. Benefit Cost Review Listing, were prioritized by using a listing of benefits and costs review method as described in the FEMA *How-To-Guide Benefit-Cost Review in Mitigation Planning* (FEMA 386-5).

Due to monetary as well as other limitations, it is often impossible to implement all mitigation actions. Therefore, the most cost-effective actions for implementation may be pursued for funding first, not only to use resources efficiently, but also to make a realistic start toward mitigating risks.

Due to the dollar value associated with both life-safety and critical facilities, the prioritization strategy represents a special emphasis on benefit-cost review because the factors of life-safety and critical facilities steered the prioritization towards projects with likely good benefit-cost ratios. (FEMA 386-6)

Potential projects will need to be evaluated using a Benefit-Cost Analysis (BCA) during the grant application process after the plan has been approved. The following criteria are used in the evaluation:

1. Extent to which benefits are maximized when compared to the costs of the projects, the Benefit Cost Ratio must be 1.0 or greater.
2. Extent the project reduces risk to life-safety.
3. Project protects critical facilities or critical Municipality functionality.
4. Hazard probability.
5. Hazard severity.

A Benefit-Cost review listing method supports the principle of benefit-cost review by using a process that demonstrates a special emphasis on maximization of benefits over costs. Potential projects that demonstrate benefits over costs and that can start immediately were given the highest priority. Projects that the costs somewhat exceed immediate benefit and that can start within five years (or before the next update) were given a description of medium priority, with a timeframe of one to five years. Projects that are very costly without known benefits, probably cannot be pursued during this plan cycle, but are important to keep as an action, were given the lowest priority and designated as long term (FEMA 386-6).

Benefit-Cost Analysis

The following section is reproduced from a document prepared by FEMA, which explains how to perform a BCA. The complete guidelines document, a BCA document and BCA technical assistance are available online http://www.fema.gov/government/grant/bca.

After the MHMP has been approved, the projects must be evaluated using a BCA during the funding cycle for disaster mitigation funds from DHS&EM and FEMA. A description of the FEMA BCA process follows. Briefly, BCA is the method by which the future benefits of a mitigation project are determined and compared to its cost. The result is a Benefit-Cost Ratio (BCR), which is derived from a project's total net benefits divided by its total cost. The BCR is a numerical expression of the cost-effectiveness of a project. Composite BCRs of 1.0 or greater have more benefits than costs, and are therefore cost-effective.

Facilitating BCA

Although the preparation of a BCA is a technical process, FEMA has developed software, written materials, and training that simplify the process of preparing BCAs. FEMA has a suite of BCA software for a range of major natural hazards: earthquake, fire (wildland/urban interface fires), flood (riverine, coastal A-Zone, coastal V-Zone), hurricane wind (and typhoon), and tornado.

Sometimes there is not enough technical data available to use the BCA software mentioned above. When this happens, or for other common, smaller-scale hazards or more localized hazards, BCAs can be done with the Frequency Damage Method (i.e., the Riverine Limited Data module), which is applicable to any natural hazard as long as a relationship can be established between how often natural hazard events occur and how much damage and losses occur as a result of the event. This approach can be used for coastal storms, windstorms, freezing, mud/landslides, severe ice storms, snow, tsunami, and volcano hazards.

Applicants and sub-applicants must use FEMA-approved methodologies and software to demonstrate the cost-effectiveness of their projects. This will ensure that the calculations and methods are standardized, facilitating the evaluation process. Alternative BCA software may also be used, but only if the FEMA Regional Office and FEMA Headquarters approve the software.

To assist applicants and sub-applicants, FEMA has prepared the *FEMA Mitigation BCA Toolkit* CD. This CD includes all of the FEMA BCA software, technical manuals, BC training courses, Data-Documentation Templates, and other supporting documentation and guidance.

The *Mitigation BCA Toolkit* is available free from FEMA Regional Offices or via the BC Helpline, via email*:* bchelpline@dhs.gov or toll free number at (866) 222-3580.

The BC Helpline is also available to provide BCA software, technical manuals, and other BCA reference materials as well as to provide technical support for BCA. For further technical assistance, applicants or sub-applicants may contact their State Mitigation Office, the FEMA Regional Office, or the BC Helpline. FEMA and the BC Helpline provide technical assistance regarding the preparation of a BCA (FEMA 386-5).

Benefit-Costs Review Listing Table

Table 14 lists the benefits (pros) and costs (cons) of some potential projects. The review method is further described in the FEMA *How-To-Guide Benefit-Cost Review in Mitigation Planning* (FEMA 386-5).

Priority Definitions in Table 14:

High = Clearly a life/safety project, or benefits clearly exceed the cost or can be implemented 0 – 1 year.

Medium = More study required to designate as a life/safety project, or benefits may exceed the cost, or can be implemented in 1 – 5 years.

Low = More study required to designate as a life/safety project, or not known if benefits exceed the costs, or long-term project, implementation will not occur for over 5 years.

Table 14. Benefit Cost Review Listing

Mitigation Projects	Benefits (pros)	Costs (cons)	Priority*
Earthquake (E)			
E-1. Identify buildings and facilities that must be able to remain operable during and following an earthquake event.	Life/Safety issue/Risk reduction Benefit to entire Borough State assistance available	Staff time	High
E-2. Conduct mock emergency exercises to identify response vulnerabilities.	Life/Safety issue/Risk reduction Benefit to entire Borough State assistance available	Staff time	High
E-3. Nonstructural mitigation projects (i.e. assessing whether heavy objects are tied down)	Life/Safety issue/Risk reduction Benefit to entire Borough State assistance available	Staff time. Would need to first assess Borough interest.	High
Volcanoes (V)			
V-1. Conduct specific outreach to the AEB aviation community regarding the hazards posed by volcanoes in the AEB	Life/Safety issue/Risk reduction Benefit to entire Borough State assistance available	Staff time, expense.	High

Mitigation Projects	Benefits (pros)	Costs (cons)	Priority*
V-2. Compile an integrated volcano hazard and risk assessment for the Aleutians East Borough with surrounding areas of the Aleutians Chain.	Life/Safety issue/Risk reduction Benefit to entire Borough State assistance available	Staff time	Medium
V-3. Distribute free USGS literature on volcano hazards.	Life/Safety issue/Risk reduction Benefit to entire Borough State assistance available	Staff time	Medium
V-4. Continue to support AVO publication of volcano hazard assessments for AEB active volcanoes.	Life/Safety issue/Risk reduction Benefit to entire Borough State assistance available	Staff time	Medium
V-5. Expand real time seismic monitoring to high-priority western Aleutian volcanoes.	Life/Safety issue/Risk reduction Benefit to entire Borough State assistance available	Staff time	Medium
Tsunami (T)			
T-1. Considering Pursuing a Tsunami Ready Community Designation	Life/Safety issue/Risk reduction Benefit to entire Borough State assistance available	Staff time	High
T-2. Inundation Mapping	Life/Safety issue/Risk reduction Benefit to entire Borough State assistance available	Expensive, at least $100,000	Medium
T-3. Update AEB Emergency Operations Plan, as needed, Conduct Emergency Operation Plan Exercises	Life/Safety issue/Risk reduction Benefit to entire Borough State assistance available	Staff time	Medium
Severe Weather (S/W)			
S/W-1. Research and consider instituting the National Weather Service program of *"Storm Ready"*.	Life/Safety issue Risk reduction Benefit to entire Borough State assistance available Done once and then evaluated every three years	Staff time	High

Mitigation Projects	Benefits (pros)	Costs (cons)	Priority*
S/W-2. Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc.	Life/Safety issue Risk reduction Benefit to entire Borough State assistance available	Staff time	High
S/W-3. Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability	Life/Safety issue Risk reduction Benefit to entire Borough State assistance available	Staff time	High
S/W-4. Encourage weather resistant building construction materials and practices.	Risk and damage reduction. Benefit to entire Borough.	May require ordinance change. Potential for increased staff time. Research into feasibility necessary. Political and public support not determined.	Medium

Mitigation Projects Table

Table 15 presents a strategy for mitigation of the natural hazards faced by the communities and includes a brief description of the projects, lead agencies, costs, potential funding sources and an estimated timeframe for each project. The final column allows for the communities to make note of specific progress on projects during the 5-year life of the plan.

Table 15. AEB Mitigation Projects

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Annual Review
Earthquake (E)					
E-1. Identify buildings and facilities that must be able to remain operable during and following an earthquake event.	Communities Borough DHS&EM FEMA	Staff Time	State Grants FEMA	>1 year	
E-2. Conduct mock emergency exercises to identify response vulnerabilities.	Communities Borough DHS&EM FEMA	>25,000	State Grants FEMA	ongoing	
E-3. Nonstructural mitigation projects (i.e. assessing whether heavy objects are tied down).	Communities Borough DHS&EM FEMA	>$25,000	FEMA PDM HMGP Local funds	>1 year	
Volcanoes (V)					
V-1. Conduct specific outreach to the AEB aviation community regarding the hazards posed by volcanoes in the communities	AVO DHS&EM FAA NWS	>$100,000	PDM FEMA	>10 years	
V-2. Compile an integrated volcano hazard and risk assessment for the AEB with surrounding areas of the Aleutians Chain.	USGS DGGS UAF/AVO	>$100,000	PDM FEMA	>10 years	
V-3. Distribute free USGS literature on volcano hazards.	AVO DGGS Communities	No cost to AEB	Federal	Ongoing	
V-4. Continue to support publication of volcano hazard assessments for Alaska's active volcanoes.	AVO DGGS	No cost to AEB	FEMA State	Ongoing	

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Annual Review
V-5. Expand real time seismic monitoring to high-priority western Aleutian volcanoes.	AVO	>$100,000	FEMA State	>5 years	
V-6. Update public emergency notification procedures and emergency planning for ash fall events.	Communities Borough DHS&EM	>$10,000	PDM HMGP	>1 year	
V-6. Evaluate vulnerability of water and electric power systems to ash falls and mitigate risks when cost effective.	Communities Borough DHS&EM	>$10,000	PDM HMGP	>1 year	
Tsunami (T)					
T-1: Consider Pursuing a Tsunami Ready Community Designation	AEB DHS&EM	Staff Time	PDM	>5 years	
T-2. Inundation Mapping	NOAA NTHMP* DHS&EM	>$150,000	NOAA - NTHMP	>5 years	
T-3. Update AEB Emergency Operations Plan, as needed, Conduct Emergency Operation Plan Exercises	AEB DHS&EM	>$20,000	State and Local Funds	Ongoing	
T-4. Siren and lights in communities and other hazardous warnings	Communities Borough DHS&EM	Not determined	PDM HMGP DHS&EM/ NOAA NTHMP	>1 year	
Severe Weather (SW)					
SW-1. Research and consider instituting the National Weather Service program of *"Storm Ready"*.	AEB	Staff Time	AEB	<1 year	
SW-2. Conduct special awareness activities, such as Winter Weather Awareness Week.	AEB DCRA DHS&EM	Staff Time	AEB DCRA DHS&EM	<1 year	

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Annual Review
SW-3. Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability	AEB	Staff Time	NOAA DHS&EM	Ongoing	
SW-4. Encourage weather resistant building construction materials and practices.	AEB	Staff Time	AEB	<1 year	

Acronyms used on this table:

HMGP	Hazard Mitigation Grant Program
NTHMP	National Tsunami Hazard Mitigation Program
NOAA	National Oceanographic and Atmospheric Administration
NWS	National Weather Service
PDM	Pre-Disaster Mitigation (Grant)

Chapter 5. Akutan Annex

Section 1. Community Overview

Section 1, Except for where otherwise noted, the Community Overview information was derived from the DCRA Community Database online at http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.htm.

Population: 796 (2008 DCCED certified)
Pronunciation: ACK-oo-tan
Incorporation Type: 2nd Class City
Census Area: Aleutians East

History

Akutan was formed in 1878 when a number of Aleut families from surrounding islands established a village at this location. The Russian Orthodox Church supported this move and constructed a church at the site. Western Fur and Trading Co. built a fur storage and trading post, and its resident agent started a cod fishing business in the village. In 1912 the Pacific Whaling Company built a processing station, which operated until 1939.

Akutan's proximity to the Bering Sea fishing grounds brought the crab and fish processing industry to the community in the late 1940s, at first through the operation of floating processors, followed in the early 1980s by construction of a shore-based processing plant owned by Trident Seafoods. (History and photo AEB website: www.aleutianseast.org)

Facilities

Water is derived from a local stream and dam; the dam was originally constructed in 1927. Water is treated and piped into all homes. Sewage is piped to a community septic tank, with effluent discharge through an ocean outfall. Refuse is collected three times a week and taken to a landfill with incinerator facility. The City recycles aluminum. The electric utility, Akutan Electric Utility, operates a diesel generator.

The Anesia Kudrin Memorial Clinic provides primary and emergency care. Akutan is classified as an isolated town, emergency services have coastal and helicopter access.

The Akutan School is located within the Aleutians East School District. The City of Akutan School teaches Kindergarten through twelfth grade; the school has ten students and two teachers.

Plans are underway for Akutan's airport, on Akun Island, and a new harbor, at the head of the bay (AEB).

Map 1. Akutan Location Map

Transportation

Boats and amphibious aircraft are the only means of transportation into Akutan. A 200 foot dock and a small boat mooring basin are available. The State Ferry operates from Kodiak bi monthly between May and October. Cargo is delivered weekly by freighter from Seattle. Steep terrain prevents Akutan from having an airstrip; a seaplane base is available and open to the public. Daily air service is provided from nearby Unalaska. High waves often limit access during winter months.

Section 2. Risk Assessment

Federal Requirement

§201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Hazards Description

Chapter 3. Risk Assessment - Hazard Specific Sections, Sections 1 through 4 include descriptions for earthquake, volcano, tsunami and severe weather. Further information regarding Akutan's risk to the identified hazards is included in this chapter. Akutan has the same hazards as the AEB as a whole – earthquake, volcano, tsunami and severe weather. In addition, riverine erosion is undercutting the community impoundment pond, drinking water source for Akutan.

The following description of the Akutan Volcano and photo are from the AVO, this article and further information about all Alaskan volcanoes may be accessed through website: http://www.avo.alaska.edu/.

The article demonstrates how significant the Akutan Volcano has been in shaping the geological composition of Unimak Island and how large an impact the Akutan Volcano has had on the community of Akutan

From Miller and others (1998):

> "Akutan volcano is a composite stratovolcano with a circular summit caldera about 2 km across and 60 to 365 m deep (Byers and Barth, 1953; Romick and others, 1990; Motyka and others, 1981) and an active intracaldera cinder cone. The caldera rim reaches a maximum altitude of 1303 m at Akutan Peak, the remnant of a pre-caldera cone now filled with a lava plug. The caldera is breached to the north. Caldera subsidence accompanied or followed eruptions from a series of rim vents. The vestige of a larger caldera, of probable late Pleistocene age and at least in part older than the cone of Akutan Peak, extends 1.5 km southwest of Akutan Peak and is terminated to the north by the younger caldera. Small glaciers fill the older crater and lie within the southwest and southeast margins of the younger caldera.
>
> "The active intracaldera cinder cone is over 200 m high, about 1 km in diameter, and located in the northeast quarter of the caldera. Three small sulfur-lined craters occupy its summit and several fumarole zones are present along its south and southwest flank (Byers and Barth, 1953). A crescent-

shaped lake along the inner southwest rim of the caldera and a hot and slightly acidic lake along the northern caldera wall were noted by Byers and Barth in 1948 but Motyka and others (1981) speculate that these lakes may have been obliterated by more recent activity. Both lakes drained to the north through a gap in the caldera wall.

"The lava flows and pyroclastic deposits of Akutan volcano are no older than Pleistocene as Romick and others (1990) report ages of 1.1 +/- 0.1 to 1.8 +/- 0.8 Ma for the oldest of these rocks. The caldera-forming eruption occurred about 5,200 years ago (Reeder, 1983) and was the source of small volume andesitic pyroclastic-flow deposits in valleys on the north, south, and east sides of the volcano (Miller and Smith, 1987; Romick and others, 1990). Young basaltic lava flows, some of which were erupted in 1929, cover the caldera floor south and north of the cinder cone and extend several hundred m downslope through the crater rim gap. Flows extruded in 1947 blanket the central portion of the northwest end of the island at Lava Point, where about 4 square kilometers of jagged as basalt occurs adjacent to several cinder cones. The entire island is mantled by an ash layer that thickens toward Akutan Peak; landslide and mud flow deposits have concentrated ejecta in the valleys north and northeast of the caldera and a maximum fill depth of 7 m occurs at Wooly Cove (Finch, 1935).

"Active hot springs occur northeast of the caldera at the head of Hot Springs Bay valley and along the shore of Hot Springs Bay; Byers and Barth (1953) and Motyka and others (1990) recorded temperatures between 67 and 84 degrees C and a pH range of 6.6 to 7. Surface waters of the hot caldera lake were 50 degrees C with a pH of 5.0 and steam issuing from fumaroles along the cinder cone base averaged 96 degrees C (Finch, 1935) (AVO)."

While severe weather would be an area-wide concern, the City Dock is particularly vulnerable to severe weather, as the dock lies in an unprotected area facing the open ocean.

Riverine erosion is affecting the community's impoundment pond, the drinking source for the community.

Location

The natural hazards of earthquake, volcano, and severe weather are area wide hazards in the community. Any part of the community is at equal risk from these hazards. The tsunami hazard has not been mapped and so the location is indeterminate at this time.

Extent

Earthquake, Volcanoes, and Tsunami

Based on information from the *Alaska All-Hazard Risk Mitigation Plan, 2007*, other plans and reports, and information from the AEIC, WCATWC, AVO, and the AEB EOP, 2006 the extent of an earthquake, volcanic eruption or a tsunami in Akutan could be ***critical***. Table 4. Extent of Hazard Ranking, page 12, uses the following criteria to determine the extent of possible damage: Injuries and/or illnesses result in

permanent disability, complete shutdown of critical facilities for at least two weeks, more than 25% of property is severely damaged.

Severe Weather

Severe weather could result in a ***limited*** extent event in Akutan. Table 4. Extent of Hazard Ranking, page 12, defined limited as an event that would cause injuries and/or illnesses do not result in permanent disability; complete shutdown of critical facilities for more than one week and more than 10% of property is severely damaged.

Erosion

Riverine Erosion could result in a ***limited*** extent event in Akutan. Table 4. Extent of Hazard Ranking, page 12, defined limited as an event that would cause injuries and/or illnesses do not result in permanent disability; complete shutdown of critical facilities for more than one week and more than 10% of property is severely damaged.

Probability

Earthquake and Volcanoes

As outlined in Chapter 3, Section 1, Earthquake and Section 2, Volcano, Akutan has a ***high*** probability of an ***earthquake and volcanic*** event. Table 5, Probability Criteria Table, page 13, lists the following criteria for high probability: hazard is present with a high probability of occurrence within the next calendar year. Event has up to 1 in 1 year chance of occurring.

Tsunami

Figure 6, the AEIC Alaska Priority List, page 37, illustrates that all of the communities in the AEB have a risk of a tsunami event. Akutan is listed as Number 9 on the priority list.

The community is designated as having a moderate potential for a distant source tsunami hazard. A ***distant source tsunami hazard*** means the tsunami is generated so far away that the earthquake was not felt at all or only slightly. An estimate can be made of potential danger. Maximum runup heights would only be reached at the shoreline and the maximum distance inland only reached where the coast is low, flat, and unobstructed. ***"Moderate"*** means possible runup to 35 foot elevation and inland up to 3/4 mile.

Akutan is also listed as having a ***local tsunami hazard*** which means a tsunami could be generated in nearby waters and reach the community before a formal warning could be transmitted. These waves may arrive in less than one hour and have historically been the highest, up to 100 foot or more. The estimated possible height in each community is difficult to determine. Coastal residents who feel a very strong earthquake (lasting over 30 seconds or if they have difficulty standing) should move to higher ground immediately.

Severe Weather

Based on information in Chapter 3, Section 4, Severe Weather, Akutan has a ***moderate*** probability of a severe weather event. Table 5. Probability Criteria Table, page 13, lists the following criteria for moderate probability: hazard is present with a moderate probability of occurrence within the next three years. Event has up to 1 in 3 years chance of occurring.

Erosion

Based on information from local residents, Akutan has a ***moderate*** probability of an erosion event. Table 5. Probability Criteria Table, page 13, lists the following criteria for moderate probability: hazard is present with a moderate probability of occurrence within the next three years. Event has up to 1 in 3 years chance of occurring.

Previous Occurrences

In addition to the previous occurrences of earthquake, volcanoes, tsunami and severe weather hazards that are described in Chapter 3 the following information is specific to Akutan.

The AVO has recorded 46 volcanic eruptions near the community of Akutan from 1765 to 1992 (AVO).

Tsunami Shelter - The community tsunami shelter was knocked over by a storm with 80 mph gusts in the fall of 2007. The 20-foot by 20-foot structure was built in 1989. The generator, radio equipment, and satellite telephone were damaged beyond repair.

Impact

The impact of floods, earthquake, tsunami and severe weather hazards are the same as outlined in Chapter 3.

Akutan is unique in that the only means of transportation into the community is by boats and amphibious aircraft. The community must be able to exist without outside help in case of a natural hazard event for a longer period of time.

Additionally, these specific impacts are notable:

City Dock - Frequent and severe winter storms continuously damage dock pilings from boats tying up to load and offload passengers, freight, and commercial fish products. As the dock lies in an unprotected area facing the open ocean, offloading during rough weather is hazardous due to the tremendous vertical drop motion of the boat caused by huge swells.

Dam Erosion - The sand bottom of the impoundment pond is eroding away by the river current. As a result, dam water is leaking outside the impoundment, which in winter with less river flow, reduces water pressure. This dam supplies the community's drinking water.

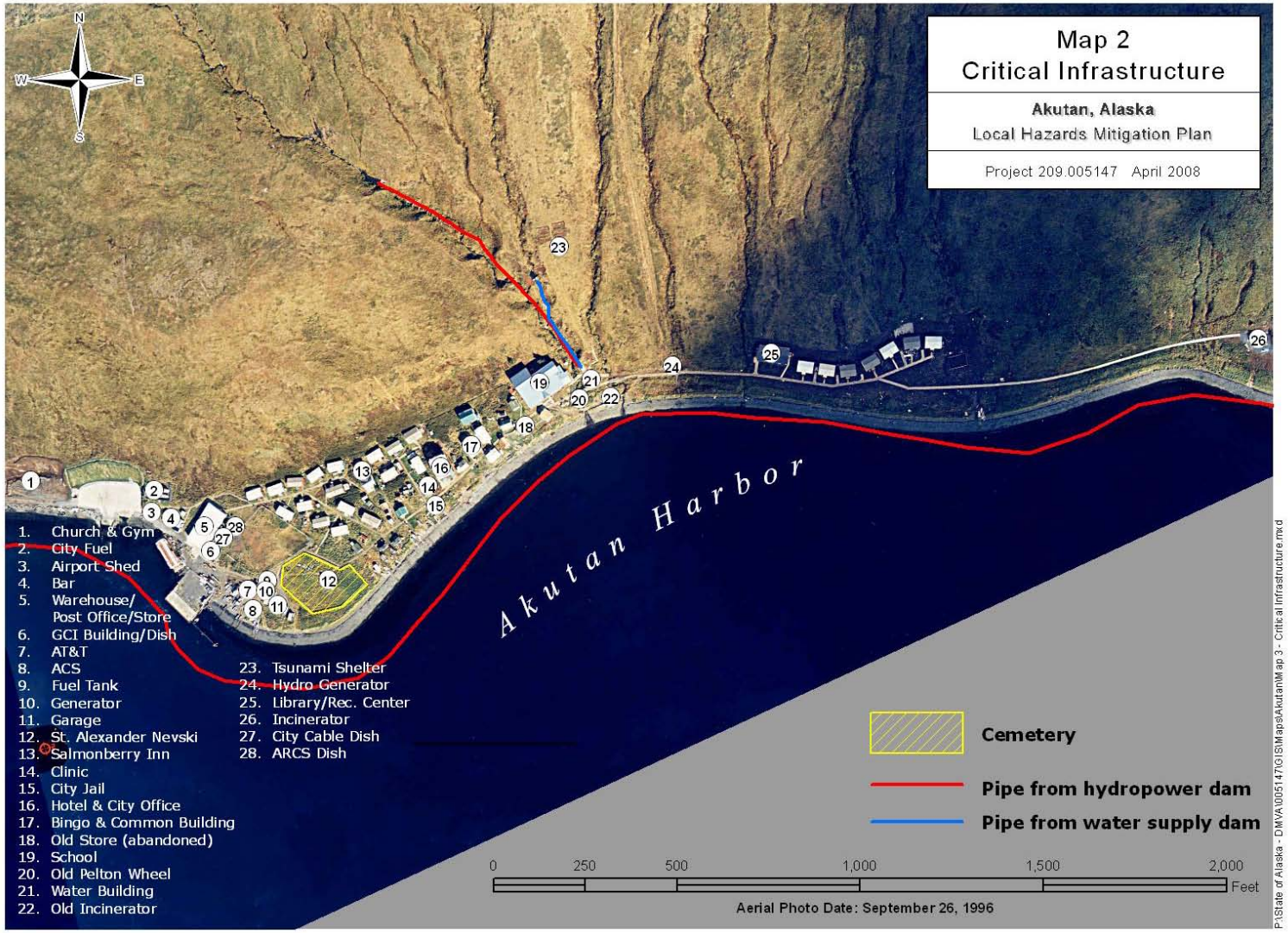
The arctic pipe running from the impoundment to the water treatment plant is damaged every year by the weight of snowfall. Thawing also shifts the pipe bracing and then breaks the pipe.

Structures in Akutan Hazard

Map 2. Akutan Critical Infrastructure, and Table 16. Akutan Hazard Asset Matrix, lists critical facilities and other structures and their vulnerability to natural hazards in Akutan.

Potential replacement values of city owned critical facilities and other structures will be added in a future addition.

Map 2. Akutan Critical Infrastructure



Akutan Hazard Asset Matrix

Table 16, contains a list of facilities, business and infrastructure shown on Map 2. Akutan Critical Infrastructure, and their vulnerability to identified natural hazards and whether, based on its location, each asset has a low, moderate or high vulnerability to specific natural hazards. If it is not identified as a hazard in the jurisdiction the column is marked with a N/A. DHS&EM directed that until inundation maps are competed, that the tsunami areas not be designated on hazard asset matrices.

Table 16. Akutan Hazard Asset Matrix

Akutan Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
Map 1 – Akutan						
1. Church & Gym	H	H	NOT MAPPED	M	N/A	N/A
2. City Fuel	H	H		M	N/A	N/A
3. Airport Shed	H	H		M	N/A	N/A
4. Bar	H	H		M	N/A	N/A
5. Warehouse/Post Office/Store	H	H		M	N/A	N/A
6. GCI Building Dish	H	H		M	N/A	N/A
7. AT&T	H	H		M	N/A	N/A
8. ACS	H	H		M	N/A	N/A
9. Fuel Tank	H	H		M	N/A	N/A
10. Generator	H	H		M	N/A	N/A
11. Garage	H	H		M	N/A	N/A
12. St. Alexander Nevski	H	H		M	N/A	N/A
13. Salmonberry Inn	H	H		M	N/A	N/A
14. Clinic	H	H		M	N/A	N/A
15. City Jail	H	H		M	N/A	N/A

Akutan Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
16. Hotel & City Office	H	H		M	N/A	N/A
17. Bingo & City Office	H	H		M	N/A	N/A
18. Old Store (abandoned)	H	H		M	N/A	N/A
19. School	H	H		M	N/A	N/A
20. Old Pelton Wheel	H	H	NOT MAPPED	M	N/A	N/A
21. Water Building	H	H		M	N/A	N/A
22. Old Incinerator	H	H		M	N/A	N/A
23. Tsunami Shelter	H	H		M	N/A	N/A
24. Hydro Generator	H	H		M	N/A	N/A
25. Library/Rec. Center	H	H		M	N/A	N/A
26. Incinerator	H	H		M	N/A	N/A
27. City Cable Dish	H	H		M	N/A	N/A
28. ARCS Dish	H	H		M	N/A	N/A

Section 3. Akutan Mitigation Projects

Federal Requirement

§201.6(c)(3)(iv): *For multi-jurisdictional plans, there* ***must*** *be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Table 17 presents a strategy for mitigation of the natural hazards faced by the communities and includes a brief description of the projects, lead agencies, costs, potential funding sources and an estimated timeframe for each project. The final column allows for the communities to make note of specific progress on projects during the 5-year life of the plan.

Table 17. Akutan Mitigation Projects

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Annual Review
Identify buildings and facilities that must be able to remain operable during and following an earthquake event in the City of Akutan	DHS&EM	Staff Time	PDM State Grants	1 year	
Consider participation in the Tsunami Awareness Programs for the residents of the City of Akutan	Akutan DHS&EM	Staff Time	DHS&EM	Ongoing	
Conduct special awareness activities, such as Winter Weather Awareness Week in Akutan	Akutan	Staff Time	Borough	Ongoing	
Update, as needed, emergency notification procedures and emergency planning for ash fall events	Akutan AVO Borough DHS&EM	N/A	PDM HMGP	Ongoing	
Siren and lights in communities and other hazardous warnings	Akutan Borough DHS&EM	N/A	PDM HMGP DHS&EM/ NOAA NTHMP	>1 year	
City Dock improvement feasibility study	Akutan Borough	>$50,000	To be determined	1-5 years	

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Annual Review
Tsunami Shelter replacement	Akutan Borough DHS&EM	>1 million	State and Federal grants	1-5 years	
Water source and transmission line protection	Akutan Borough DHS&EM	To be determined	VSW ANTHC FEMA	1-5 years	

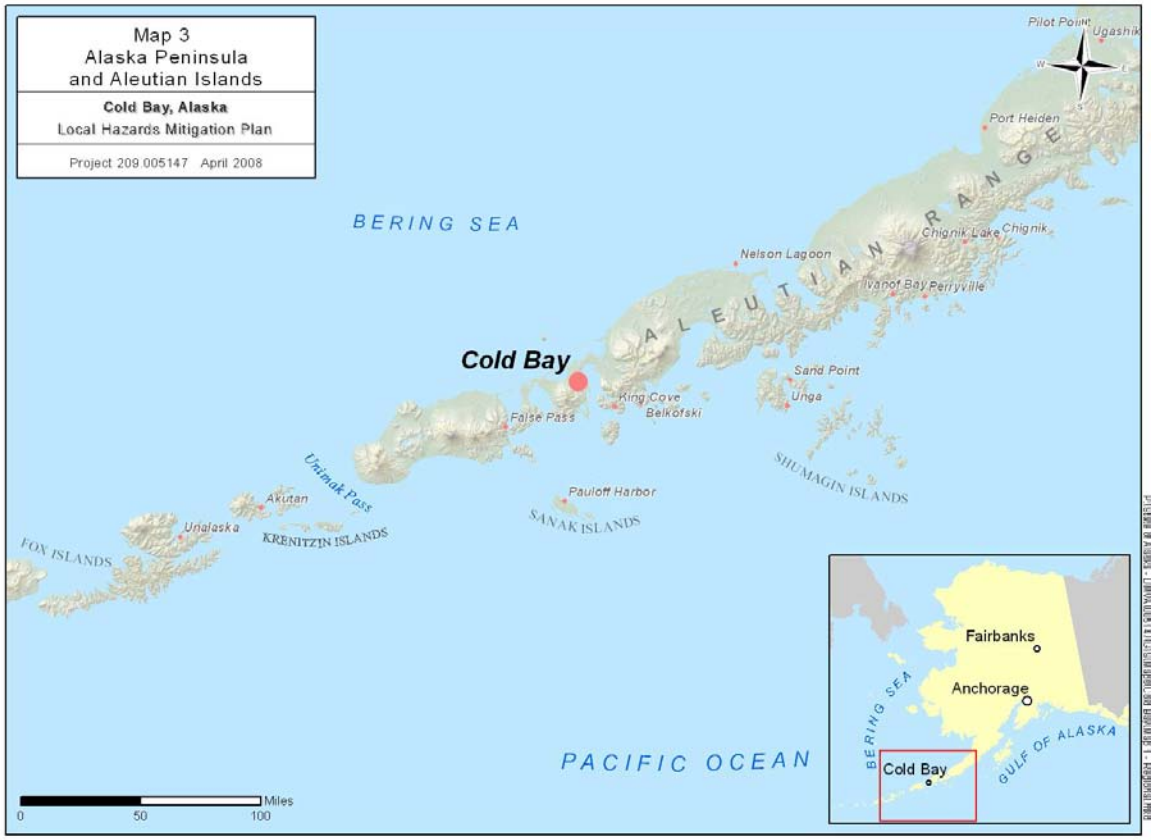
Chapter 6. Cold Bay Annex

Section 1. Community Overview

Section 1, Community Overview information is derived from the DCRA Community Database online at http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.htm.

Current Population: 90 (2008 DCCED certified population)
Incorporation Type: 2nd Class City
Census Area: Aleutians East

Map 3. Cold Bay Location Map



History

Archaeological evidence indicates the area around Cold Bay was once inhabited by a large Native population, as long ago as the last ice age. European hunters and trappers also occupied the area throughout the 19th century. Izembeck Lagoon was named in 1827 by Count Feodor Kutke, after Karl Izembeck, a surgeon aboard the sloop "Moller." During World War II, Cold Bay was the site of the

strategic air base Fort Randall. At that time, the airport was the largest in the state, with a 10,000 foot runway. The city was incorporated in 1982.

Culture

Cold Bay serves the fishing industry and houses a number of federal offices with services focused on Aleutian transportation and wildlife protection. Subsistence and recreational fishing and hunting are a part of the local culture. Up to 70,000 Canada geese migrate through Cold Bay in the fall. Izembeck Lagoon offers the world's largest eelgrass beds, feeding grounds for more than 100,000 brant during their spring and fall migrations.

Facilities

Water is derived from a ground source. It is pumped from two wells, stored and piped to 64 percent of households. A few homes have individual wells and septic systems. The sewage treatment plant can process up to 45,000 gallons a day and services 70 percent of community households. Residents transport their own refuse to the landfill, located 1.5 miles north of the City. The electric utility, G&K, Inc., operates a diesel generator.

The Anna Livingston Memorial Clinic and Peter Pan Seafood's Port Moller Medical Clinic are qualified emergency care centers. Cold Bay is classified as an isolated village; emergency services have limited marine access. Cold Bay Airport is an all weather airport, with jet service (AEB).

The Cold Bay kindergarten through twelfth grade School is located within the Aleutians East School District. Cold Bay School has 10 students and 2 teachers; the school district is home to seven schools with 267 students and 35 teachers.

Transportation

A State-owned 10,415-foot-long by 150-foot-wide paved and lighted runway with a 5,126-foot-long by 150-foot-wide paved crosswind runway, an FAA Flight Service Station, and a seaplane base are available. Cold Bay is a regional transportation center and provides scheduled flights to surrounding communities. Marine cargo services are available monthly from Seattle, but not from Anchorage. The State Ferry operates monthly from Kodiak between May and October. There are approximately 40 miles of local gravel roads.

Section 2. Risk Assessment

Federal Requirement

§201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Hazards Description

Chapter 3. Risk Assessment - Hazard Specific Sections, Sections 1 through 4 include descriptions for earthquake, volcano, tsunami and severe weather. Further information regarding Cold Bay's risk to the identified hazards is included in this chapter.

Location

The natural hazards of earthquake, volcano, and severe weather are area wide hazards in the community. Any part of the community is at equal risk from these hazards. The tsunami hazard has not been mapped, so the location is indeterminate at this time.

Extent

Earthquake, Volcanoes and Tsunami

Based on information from the *Alaska All-Hazard Risk Mitigation Plan, 2007*, other plans and reports, and information from the AEIC, WCATWC, AVO, and the AEB EOP, 2006 the extent of an earthquake, volcanic eruption or a tsunami in Cold Bay could be ***critical***. Table 4. Extent of Hazard Ranking, page 12, uses the following criteria to determine the extent of possible damage: Injuries and/or illnesses result in permanent disability, complete shutdown of critical facilities for at least two weeks, more than 25% of property is severely damaged.

Severe Weather

Severe weather could result in a ***limited*** extent event in Cold Bay. Table 4. Extent of Hazard Ranking, page 12, defined limited as an event that would cause injuries and/or illnesses that do not result in permanent disability; complete shutdown of critical facilities for more than one week and more than 10% of property is severely damaged.

Probability

Earthquake and Volcanoes

As outlined in Chapter 3, Section 1, Earthquake and Section 2, Volcano, Cold Bay has a ***high*** probability of an earthquake or volcanic event. Table 5. Probability Criteria Table, page 13, lists the following

criteria for high probability: hazard is present with a high probability of occurrence within the next calendar year. Event has up to 1 in 1 year chance of occurring.

Tsunami

Figure 6 the AEIC Alaska Priority List, page 36, illustrates that all of the communities in the AEB have a risk of a tsunami event. Cold Bay is listed as Number 19 on the priority list.

The community is designated as having a moderate potential for a distant source tsunami hazard. A ***distant source tsunami hazard*** means the tsunami is generated so far away that the earthquake was not felt at all or only slightly. An estimate can be made of potential danger. Maximum runup heights would only be reached at the shoreline and the maximum distance inland only reached where the coast is low, flat, and unobstructed. ***"Moderate"*** means possible runup to 35 foot elevation and inland up to 3/4 mile.

Cold Bay is also listed as having a ***local tsunami hazard*** which means a tsunami could be generated in nearby waters and reach the community before a formal warning could be transmitted. These waves may arrive in less than one hour and have historically been the highest, up to 100 feet or more. The estimated possible height in each community is difficult to determine. Coastal residents who feel a very strong earthquake (lasting over 30 seconds or if they have difficulty standing) should move to higher ground immediately.

Severe Weather

Based on information in Chapter 3, Section 4, Severe Weather, Cold Bay has a ***moderate*** probability of a severe weather event. Table 5. Probability Criteria Table, page 13, lists the following criteria for moderate probability: hazard is present with a moderate probability of occurrence within the next three years. Event has up to 1 in 3 years chance of occurring.

Previous Occurrences

Previous occurrences of earthquake, volcanoes, tsunami and severe weather hazards are described in Chapter 3.

Impact

The impacts to the profiled natural hazards are the same as outlined in Chapter 3; however, Cold Bay has an all-weather airport on which scheduled jets fly in and out of the community. In interviews with the Borough planner, residents describe the following impacts of severe weather:

- City Dock – Frequent and severe winter storms continuously break dock pilings from boats tying up to load and offload passengers, freight, and commercial fish products. As the dock lies in an unprotected area facing the open ocean, offloading medevacs and passengers during rough weather is hazardous due to the tremendous vertical drop motion of the boat caused by huge swells. Medevac patients have been soaked as well during off loading on to the dock.

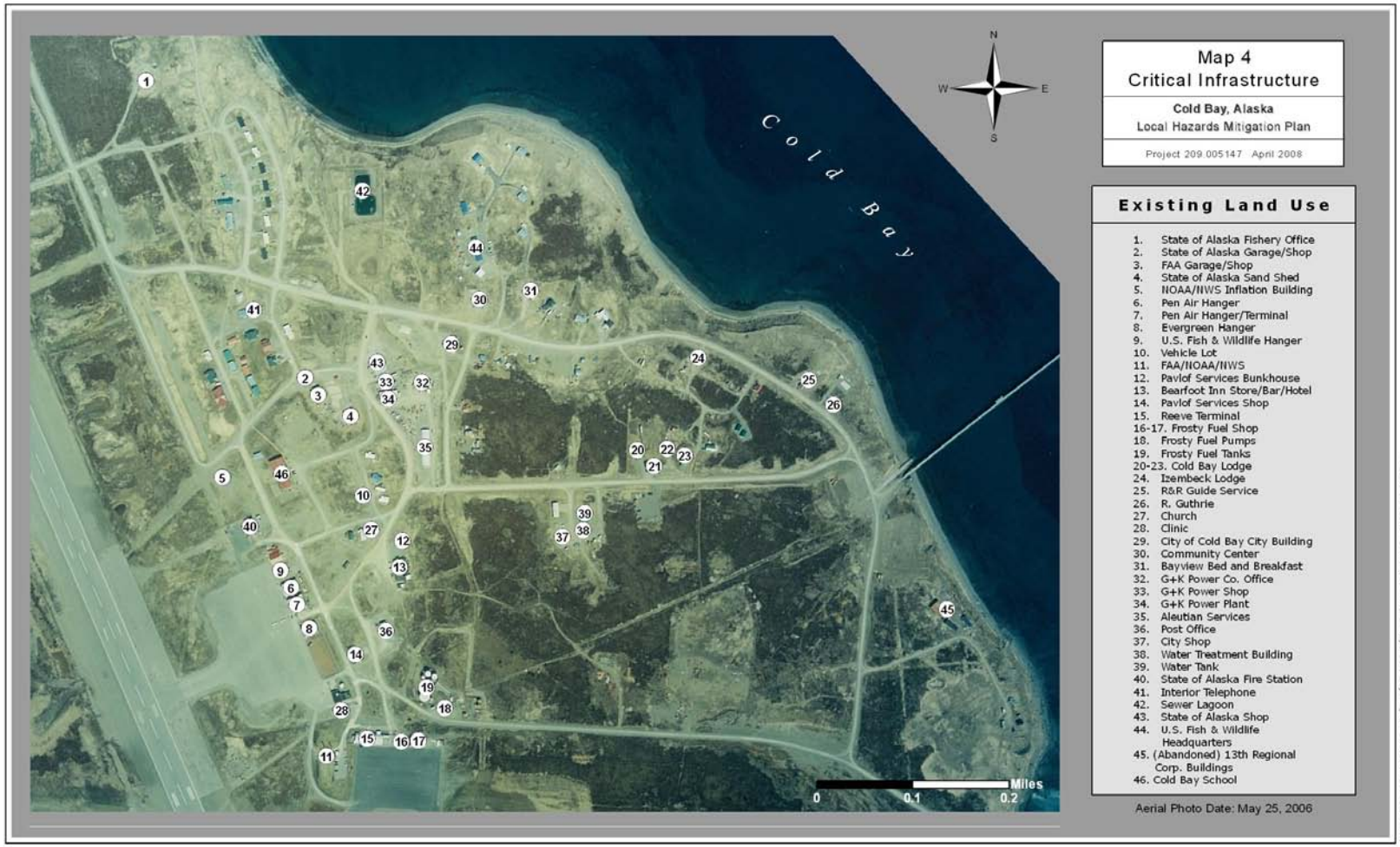
- Flying Debris – Because of winds up to 90 mph, debris flying from abandoned structures is a safety problem (includes aluminum roof slats and asbestos).
- Health Clinic Roof – Winds of only 35 to 45 mph lift the clinic roof off the structure. Annual severe winter storms have broken the wooden 2 by 4 frame that connects the roof to the clinic. As a result, the roof is now only attached to the ceiling panel at the building edges. During 35 to 45 mph winds, the middle section is continuously pulled up a few inches and then slammed back down with a high crashing sound. The roof leaks as a result and the crashing sound is unbearable to both patients and staff. This problem has been affecting this building for eight years. With common gusts of wind up to 90 mph, residents fear that sooner or later all or part of the roof will be torn away, damaging the structure permanently, potentially harming patients and staff, as well as damaging tens of thousands of dollars worth of medical machines, instruments, supplies, and medicine.
- Health Clinic Arctic Entries – Storm water leaks into both the front and back arctic entryways of the clinic. When temperatures fall below freezing, the water freezes and the slick ice inside the entryways becomes a safety issue for both patients and staff. Cold Bay is the medical and air transportation hub of the region which makes the need for clinic roof and entryway repairs all that more critical.

Structures in Cold Bay Hazard Areas

Table 18. Cold Bay Hazard Asset Matrix, and Map 4. Cold Bay Critical Infrastructure, list critical facilities and other structures and their vulnerability to natural hazards in Cold Bay.

Potential replacement values of city owned critical facilities and other structures will be added in a future addition.

Map 4. Cold Bay Critical Infrastructure



Cold Bay Hazard Asset Matrix

Table 18 contains a list of facilities, business and infrastructure shown on Map 4. Cold Bay Critical Infrastructure, and their vulnerability to identified natural hazards and whether, based on its location, each asset has a low, moderate or high vulnerability to specific natural hazards. If it is not identified as a hazard in the jurisdiction the column is marked with a N/A. DHS&EM directed that until inundation maps are competed, that the tsunami areas not be designated on hazard asset matrices.

Table 18. Cold Bay Hazard Asset Matrix

Cold Bay Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
Map 4 – Cold Bay						
1. State of AK Fishery Office	H	H	NOT MAPPED	M	N/A	N/A
2. State of AK Garage/Shop	H	H		M	N/A	N/A
3. FAA Garage/Shop	H	H		M	N/A	N/A
4. State of AK Sand Shed	H	H		M	N/A	N/A
5. NOAA/NWS Building	H	H		M	N/A	N/A
6. Penn Air Hanger	H	H		M	N/A	N/A
7. Penn Air Hanger/Terminal	H	H		M	N/A	N/A
8. Evergreen Hanger	H	H		M	N/A	N/A
9. USFW. Hanger	H	H		M	N/A	N/A
10. Vehicle Lot	H	H		M	N/A	N/A
11. FAA/NOAA/NWS	H	H		M	N/A	N/A
12. Pavlof Services Bunkhouse	H	H		M	N/A	N/A
13. Bearfoot Inn	H	H		M	N/A	N/A

Cold Bay Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
14. Pavlof Services Shop	H	H		M	N/A	N/A
15. Reeve Terminal	H	H		M	N/A	N/A
16. Frosty Fuel Shop	H	H		M	N/A	N/A
17. Frosty Fuel Shop	H	H		M	N/A	N/A
18. Frosty Fuel Pumps	H	H		M	N/A	N/A
19. Frosty Fuel Tanks	H	H	NOT MAPPED	M	N/A	N/A
20 23. Cold Bay Lodge	H	H		M	N/A	N/A
24. Izembeck Lodge	H	H		M	N/A	N/A
25. R&R Guide Service	H	H		M	N/A	N/A
26. R. Guide	H	H		M	N/A	N/A
27. Church	H	H		M	N/A	N/A
28. Clinic	H	H		M	N/A	N/A
29. City of Cold Bay City Building	H	H		M	N/A	N/A
30. Community Center	H	H		M	N/A	N/A
31. Bayview B&B	H	H		M	N/A	N/A
32. G&K Power Co. Office	H	H		M	N/A	N/A
33. G&K Power Shop	H	H		M	N/A	N/A
34. G&K Power Plant	H	H		M	N/A	N/A

Cold Bay Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
35. Aleutians Services	H	H		M	N/A	N/A
36. Post Office	H	H		M	N/A	N/A
37. City Shop	H	H		M	N/A	N/A
38. Water Treatment Plant	H	H	NOT MAPPED	M	N/A	N/A
39. Water Tank	H	H		M	N/A	N/A
40. State of Alaska Fire Station	H	H		M	N/A	N/A
41. Interior Telephone	H	H		M	N/A	N/A
42. Sewer Lagoon	H	H		M	N/A	N/A
43. State of Alaska Shop	H	H		M	N/A	N/A
44. USFW Headquarters	H	H		M	N/A	N/A
45. Abandoned (Corps Buildings)	H	H		M	N/A	N/A
46 Cold Bay School	H	H		M	N/A	N/A

Section 3. Cold Bay Mitigation Projects

> ***Federal Requirement***
>
> ***§201.6(c)(3)(iv):*** *For multi-jurisdictional plans, there* ***must*** *be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Table 19 presents a strategy for mitigation of the natural hazards faced by the communities and includes a brief description of the projects, lead agencies, costs, potential funding sources and an estimated timeframe for each project. The final column allows for the communities to make note of specific progress on projects during the 5-year life of the plan.

Table 19. Cold Bay Mitigation Projects

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Annual Review
Identify buildings and facilities that must be able to remain operable during and following an earthquake event in the City of Cold Bay	DHS&EM	N/A	PDM State Grants	1 year	
Consider Participation in the Tsunami Awareness Programs for the residents of the City of Cold Bay	Cold Bay DHS&EM	N/A	DHS&EM	Ongoing	
Conduct special awareness activities, such as Winter Weather Awareness Week in Cold Bay.	Community DHS&EM	N/A	City Budget	Ongoing	
Update, as needed, emergency notification procedures and emergency planning for ash fall events	Cold Bay AVO DHS&EM	N/A	PDM HMGP	Ongoing	
Health Clinic improvements – roof and entryways	Cold Bay DHS&EM	Not determined	PDM HMGP DHS&EM	1-5 years	
Siren and lights in communities and other hazardous warnings	Cold Bay DHS&EM	Not determined	PDM HMGP DHS&EM/ NOAA NTHMP	>1 year	

Chapter 7. False Pass Annex

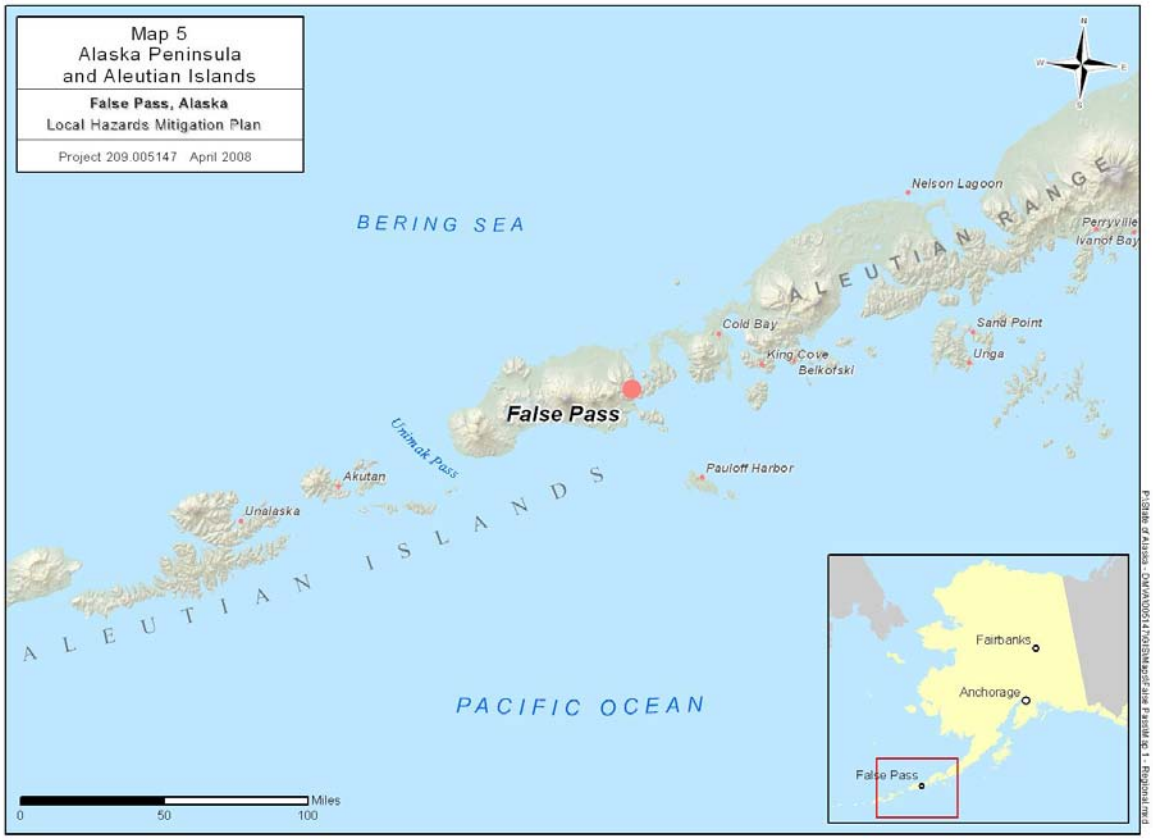
Section 1. Community Overview

Section 1, Community Overview information is derived from the DCRA Community Database online at http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.htm. The section was reviewed and updated by the AEB Administration.

Community Overview

Current Population:	54 (2006 DCCED certified population)
Incorporation Type:	2nd Class City
Census Area:	Aleutians East

Map 5. False Pass Location Map



History

The Aleut name for the community is "Isanax," which means "The Pass." Shallow waters and the narrowness of the channel caused the village and strait to be called False Pass, but it is indeed a major throughway between the North Pacific and the Bering Sea for all but the largest vessels.

Originally homesteaded by William Gardner in the early 1900s, the village began to grow when P.E. Harris established the first seafood cannery in False Pass in 1917. Many of the original buildings came from a cannery that was abandoned in Morzhovoi Bay, about 30 miles away. Natives immigrated from Morzhovoi, Sanak Island and Ikatan when the cannery was built. A post office was established in 1921. The cannery operated continuously, except for 1973 - 1976, when two hard winters depleted fish resources. It was eventually purchased by Peter Pan Seafoods and dominated the economy of the town for decades.

In 1981, most of the plant was consumed in a huge fire, although some buildings and facilities remain. Peter Pan still plays a vital role in the community with its private dock, fuel sales, and store. For more than 20 years the False Pass Tribal Council governed the community. Now a second class city, False Pass incorporated in 1990 (History and photo, AEB website: www.aleutianseast.org).

Facilities

Water is derived from a nearby spring and reservoir, is treated and stored and piped to 70 percent of all households. Residents use individual septic tanks for sewage disposal; the City operates a septic sludge tanker and sludge disposal site. The City collects refuse twice a week. The electric utility, False Pass Electric Association, operates a diesel generator. There are two diesel fuel tanks containing 30,000 gallons.

False Pass, kindergarten through 6th grade school is located within the Aleutians East School District. The False Pass School has 11 students and 2 teachers.

The False Pass Health Clinic provides emergency services to the community. False Pass is classified as an isolated village; emergency services have coastal and air access. Volunteer health aides staff the clinic.

Transportation

False Pass can only be accessed by air and water. The State owns a 2,100-foot-long by 80-foot-wide gravel airstrip and a seaplane base which are available to the public. Mail and passenger flights arrive three times per week. A dock and boat ramp are available and a boat haul-out and a storage facility are under construction. Cargo barges are available from Seattle. The State Ferry operates once a month between May and October from Kodiak.

Section 2. Risk Assessment

> ***Federal Requirement***
>
> ***§201.6(c)(2)(iii):*** *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Hazard Description

Earthquake, Volcano, Tsunami and Severe Weather

False Pass is at risk, as described in Chapter 3, Risk Assessment, (for the entre AEB) for the natural hazards of earthquake, volcano, tsunami, and severe weather.

Flooding

The U.S. Army Corps of Engineers (USACE) records indicate flooding has occurred in only one community (False Pass) within the Aleutians East Borough. (USACE website: http://www.poa.usace.army.mil/en/cw/fld_haz/floodplain_index.htm).

Floods in False Pass are a result of the 100-year discharge for the unnamed creek known locally as Round Top Creek (USACE).

The City of False Pass does not participate in the National Flood Insurance Program, nor does the AEB; therefore there are zero repetitive loss properties in False Pass.

Erosion

According to the USACE Community Assessment Erosion Study (hereafter referred to as USACE Erosion Study) coastline erosion has occurred in False Pass (USACE, www.poa.usace.army.mil/AKE/Home.html).

Coastal erosion is the wearing away of coastal land. It is commonly used to describe the horizontal retreat of the shoreline along the ocean, or the vertical down cutting along the shores of the Great Lakes. Erosion is considered a function of larger processes of shoreline change, which includes erosion and accretion. Erosion results when more sediment is lost along a particular shoreline than is redeposited by the water body. Accretion results when more sediment is deposited along a particular shoreline than is lost. When these two processes are balanced, the shoreline is said to be stable. In assessing the erosion hazard in a community or state, it is important to realize that there is a temporal, or time aspect associated with the average rate at which a shoreline is either eroding or accreting. Over a long-term period (years), a shoreline is considered eroding, accreting or stable. When evaluating coastal erosion in a community or state, the focus should be on the long-term erosion situation. However, in the short-term, it is important to understand that storms can erode a shoreline that is, over the long-term, classified as accreting, and vice versa.

Further information on coastal erosion can be found in FEMA-55, Coastal Construction Manual, FEMA's Multihazard Identification and Risk Assessment, Evaluation of Erosion Hazards published by The Heinz Center, and Coastal Erosion Mapping and Management, a special edition of the Journal of Coastal Research (FEMA, 386-2).

Location

Earthquake, Volcano, Tsunami and Severe Weather

The natural hazards of earthquake, volcano, and severe weather affect the entire community. Any part of the community is at equal risk from these hazards. The tsunami hazard has not been mapped, so the location is indeterminate at this time.

Flooding

The 100-year discharge for the unnamed creek known locally as Round Top Creek is estimated to be approximately 1,000 cubic ft. per second. With this discharge, water would not overtop the creek banks, although bank-full conditions are expected at the two roadway entrances to the creek bed adjacent to the new subdivision. Due to seepage, floodwaters would inundate parts of the floodplain containing this subdivision (USACE, Floodplain Management).

Erosion

Coastal erosion along Bechevin Bay is the primary cause of erosion problems in False Pass. Conditions causing erosion include: high tides, storm surges, wind and wave action, and beach and bank traffic. The area of greatest erosion concern is approximately 1,500 feet north of the community, and is approximately 1,000 feet long and 5 feet high (USACE, Erosion Survey).

Extent

Earthquake, Volcano and Tsunami

Based on information from the *Alaska All-Hazard Risk Mitigation Plan, 2007*, other plans and reports, and information from the AEIC, WCATWC, AVO, and the AEB EOP, 2006 the extent of an earthquake, volcanic eruption or a tsunami in False Pass could be critical. Table 4. Extent of Hazard Ranking, page 12, uses the following criteria to determine the extent of possible damage: Injuries and/or illnesses result in permanent disability, complete shutdown of critical facilities for at least two weeks, more than 25% of property is severely damaged.

Severe Weather

Based on information from the *Alaska All-Hazard Risk Mitigation Plan, 2007*, other plans and reports, and the AEB EOP, 2006 severe weather could result in a ***limited*** extent event in False Pass. Table 4. Extent of Hazard Ranking, page 12, defined limited as an event that would cause injuries and/or illnesses

do not result in permanent disability; complete shutdown of critical facilities for more than one week and more than 10% of property is severely damaged.

Flooding

Based on information from the USACE, Floodplain Management, flooding could result in a ***limited*** extent event in False Pass. Table 4. Extent of Hazard Ranking, page 12, defined limited as an event that would cause injuries and/or illnesses do not result in permanent disability; complete shutdown of critical facilities for more than one week and more than 10% of property is severely damaged.

Erosion

Based on information from the USACE Erosion Study *erosion* could result in a ***limited*** extent event in False Pass. Table 4. Extent of Hazard Ranking, page 12, defined limited as an event that would cause injuries and/or illnesses do not result in permanent disability; complete shutdown of critical facilities for more than one week and more than 10% of property is severely damaged.

Probability

Earthquake and Volcano

As outlined in Chapter 3, Section 1, Earthquake and Section 2, Volcano, False Pass has a ***high*** probability of an earthquake and volcanic event. Table 5, Probability Criteria Table, page 13, lists the following criteria for high probability: hazard is present with a high probability of occurrence within the next calendar year. Event has up to 1 in 1 year chance of occurring.

Tsunami

Chapter 3, Section 3, Tsunami, Figure 6, the AEIC Alaska Priority List, illustrates that all of the communities in the AEB have a risk of a tsunami event. False Pass is listed as Number 51 on the priority list.

The community is designated as having a moderate potential for a distant source tsunami hazard. A ***distant source tsunami hazard*** means the tsunami is generated so far away that the earthquake was not felt at all or only slightly. An estimate can be made of potential danger. Maximum runup heights would only be reached at the shoreline and the maximum distance inland only reached where the coast is low, flat, and unobstructed. ***"Moderate"*** means possible runup to 35 foot elevation and inland up to 3/4 mile.

False Pass is also listed as having a ***local tsunami hazard*** which means a tsunami could be generated in nearby waters and reach the community before a formal warning could be transmitted. These waves may arrive in less than one hour and have historically been the highest, up to 100 foot or more. The estimated possible height in each community is difficult to determine. Coastal residents who feel a very strong earthquake (lasting over 30 seconds or if they have difficulty standing) should move to higher ground immediately.

Severe Weather

Based on information in Chapter 3, Section 4, Severe Weather, False Pass has a ***moderate*** probability of a severe weather event. Table 5. Probability Criteria Table, page 13, lists the following criteria for moderate probability: hazard is present with a moderate probability of occurrence within the next three years. Event has up to 1 in 3 years chance of occurring.

Flooding

Based on the *AEB EOP, 2006* and the USACE Floodplain Management report, False Pass has a ***low*** probability of flooding. Table 5. Probability Criteria Table, page 12, lists the following criteria for low probability: hazard is present with a low probability of occurrence with the next ten years. Event has a 1 in 10 years chance of occurring.

Erosion

Based on information from the USACE, Erosion Assessment Survey, False Pass has a ***low*** probability of erosion. Table 5. Probability Criteria Table, page 12, lists the following criteria for low probability: hazard is present with a low probability of occurrence with the next ten years. Event has a 1 in 10 years chance of occurring.

Previous Occurrences

In addition to the previous occurrences of earthquake, volcanoes, tsunami and severe weather hazards that are described in Chapter 3, the following information is specific to False Pass.

A 1946 earthquake 144 kilometers offshore of on Unimak Island resulted in a 100-foot tsunami that toppled Scotch Cap lighthouse with a run up of 40 meters.

In 1957, a 45-foot wave occurred at the same location. Earthquakes in this region generated tsunamis as far as California and Hawaii (*AEB CMP, 2008*).

The Alaska Earthquake Information Center located a strong earthquake that occurred on Sunday, November 20, 2005 at 3:53 AM local time in the Unimak Island region of Alaska. The AEIC located nearly 100 aftershocks through the end of the month. The largest aftershock, magnitude M5.6, occurred on November 22 at 6:09 AM local time.

Flooding

The highest remembered flows in Round Top Creek occurred in the fall of 1963, December 1984, and November 1985. The flood of 1963 eroded through the middle of the newly constructed runway, but no reports of water entering the community were recorded.

In 1985, the area west of the community was inundated with approximately 6 in. of water, caused by seepage from the main channel of the creek. This area has been chosen as the site for a new subdivision of houses (USACE, Floodplain Management).

Erosion

In October 2005, approximately 100 linear feet of shoreline along Unimak Drive (also called Beach Drive) eroded; in December 2006, an additional 300 lineal feet of shoreline was lost to erosion. The community has reported that during winter months when the tide is at its highest, tide elevations can reach up to the roadway. Additionally, the community reports that Roundtop Creek, which periodically overflows, is another area of erosion concern. During a 1963 flood a section of the airfield runway reportedly eroded. After a site visit in 1986, the Corps of Engineers reported that the bridge connecting the airfield to the community was eroding out at least twice a year (USACE Erosion Assessment Survey).

Impact

The impacts from an occurrence of earthquakes, volcano, tsunami or severe weather are outlined in Chapter 3, Sections 1, 2, 3 and 4.

Flooding

Based on information from the USACE it appears that flooding in False Pass could impact the newly constructed runway, but as noted in previous occurrences, there are no reports of water entering the community. The area west of the community was inundated with about six inches of water and is the site of a new subdivision of homes. This could cause a problem for the homes in the future. However, the USACE makes no recommendation on whether this should be a concern (USACE, Floodplain Management).

Erosion

Coastline erosion threatens Unimak Drive, the boat launch, boat storage and repair structures, and electrical lines. Most of these community sites and structures are 100 to 500 feet from the eroding coastline, with the exception of approximately 100 linear feet of Unimak Drive that is less than 10 feet from the coastline. Unimak Drive is the only connection between the industrial part of town, the new False Pass harbor (presently under construction), and the residential portion of the community. There is also concern for a home located between Unimak Drive and the beach. A steep hill along the upland side of Unimak Drive could hinder relocation.

City Dock, September 2007 (USACE)

The City of False Pass installed concrete blocks and gravel in areas of concern along Unimak Drive. The city reports that to date the measure has been effective in preventing erosion (USACE, Erosion Assessment Survey).

Edge of Beach Road to tide line, October 2007 (USACE)

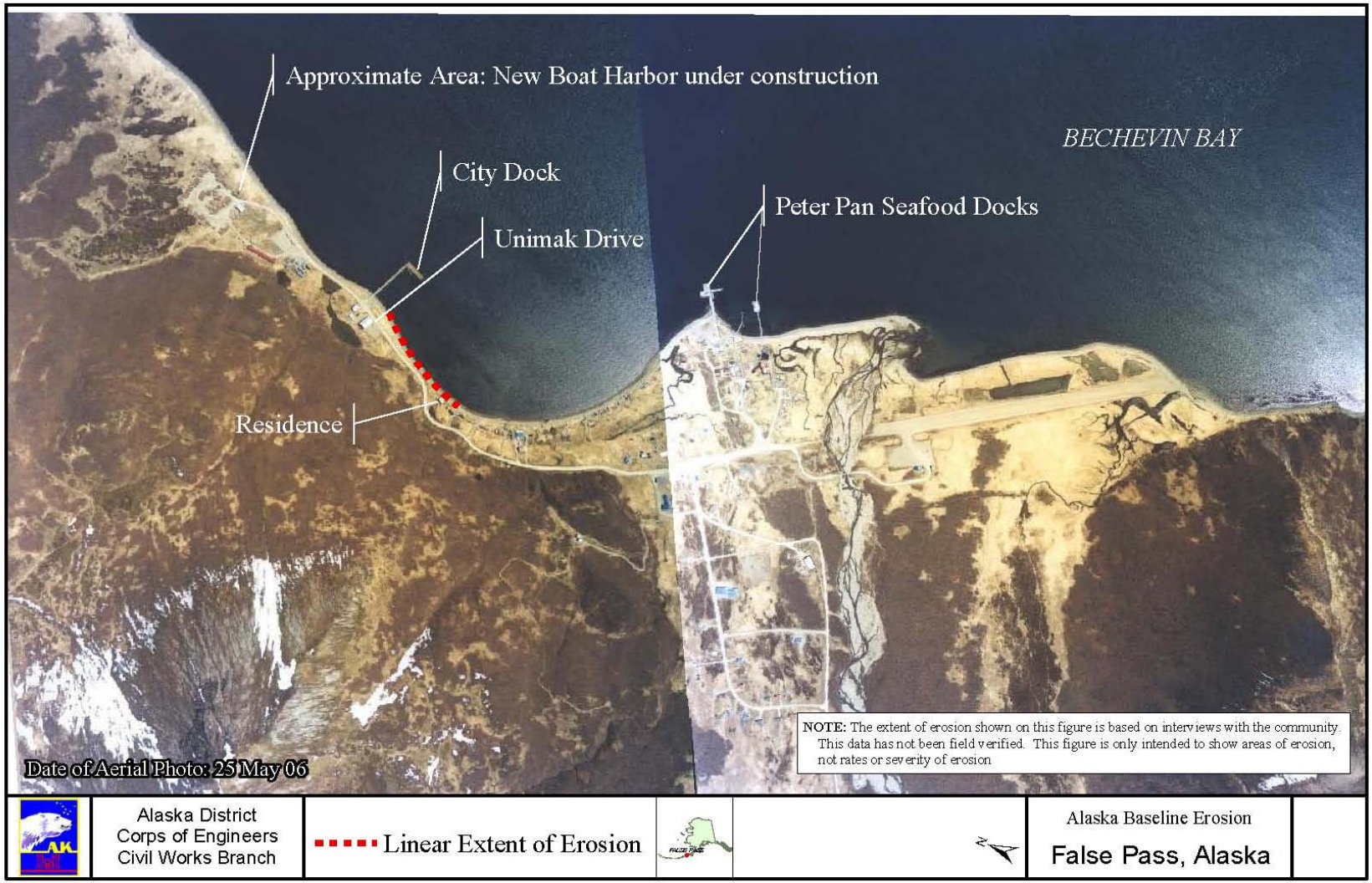
Tide line to Edge of Beach Road, October 2007 (USACE)

Structures in False Pass Hazard Areas

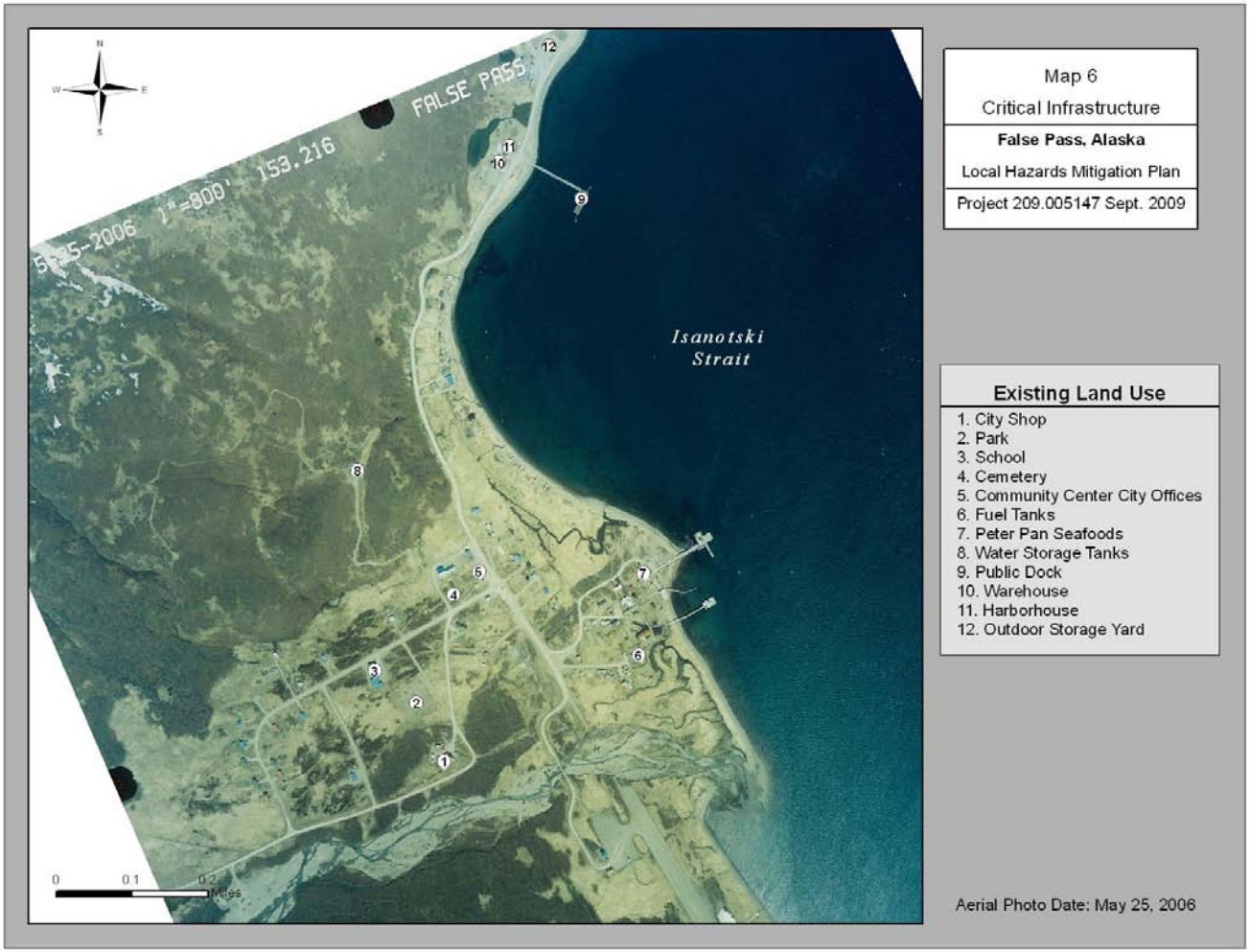
Table 20. False Pass Hazard Asset Matrix was developed using Figure 10. USACE Alaska Baseline Erosion Map of False Pass. Map 6. False Pass Critical Infrastructure, lists critical facilities and other structures and their vulnerability to natural hazards in False Pass.

Potential replacement values of city owned critical facilities and other structures will be added in a future addition. .

Figure 10. USACE Alaska Baseline Erosion Map of False Pass



Map 6. False Pass Critical Infrastructure



Source: The Stadium Group, *Overall Economic Development Plan 1999*, "False Pass Community Map," July 1999, http://www.commerce.state.ak.us/dca/plans/FalsePassEconDev1999.pdf.

False Pass Hazard Asset Matrix

Table 20 contains a list of facilities, business and infrastructure shown on Figure 10. USACE Alaska Baseline Erosion Map of False Pass and Map 6. False Pass Critical Infrastructure, and their vulnerability to identified natural hazards and whether, based on its location, each asset has a low, moderate or high vulnerability to specific natural hazards. If it is not identified as a hazard in the jurisdiction the column is marked with a N/A. DHS&EM directed that until inundation maps are competed, that the tsunami areas not be designated on hazard asset matrices.

Table 20. False Pass Hazard Asset Matrix

False Pass Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
Map 6. False Pass						
1. City Shop	H	H	NOT MAPPED	M	L	N/A
2. Park	H	H		M	N/A	N/A
3. School	H	H		M	N/A	N/A
4. Cemetery	H	H		M	N/A	N/A
5. Community Center/City Shops	H	H		M	N/A	N/A
6. Fuel Tanks	H	H		M	N/A	N/A
7. Peter Pan Seafoods	H	H		M	N/A	L
8. Water Storage Tanks	H	H		M	N/A	N/A
9. Public Dock	H	H		M	N/A	L
10. Warehouse	H	H		M	N/A	L
11. Harborhouse	H	H		M	N/A	L
12. Outdoor Storage Yard	H	H		M	N/A	L

Section 3. False Pass Mitigation Projects

Federal Requirement

§201.6(c)(3)(iv): *For multi-jurisdictional plans, there* ***must*** *be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Table 21 presents a strategy for mitigation of the natural hazards faced by the communities and includes a brief description of the projects, lead agencies, costs, potential funding sources and an estimated timeframe for each project. The final column allows for the communities to make note of specific progress on projects during the 5-year life of the plan.

Table 21. False Pass Mitigation Projects

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Annual Review
Identify buildings and facilities that must be able to remain operable during and following an earthquake event in the City of False Pass	DHS&EM	N/A	PDM State Grants	1 year	
Consider Participation in the Tsunami Awareness Programs for the residents of the City of False Pass	False Pass DHS&EM	N/A	DHS&EM	Ongoing	
Conduct special awareness activities, such as Winter Weather Awareness Week in False Pass	False Pass	N/A	City Budget	Ongoing	
Consider benefits of joining the NFIP	False Pass DCRA	N/A	City Budget	>3 years	
Continue to monitor the concrete blocks and gravel Unimak Drive, and report to the USACE any erosion issues.	False Pass	N/A	Staff Time	Ongoing	

Chapter 8. King Cove Annex

Section 1. Community Overview

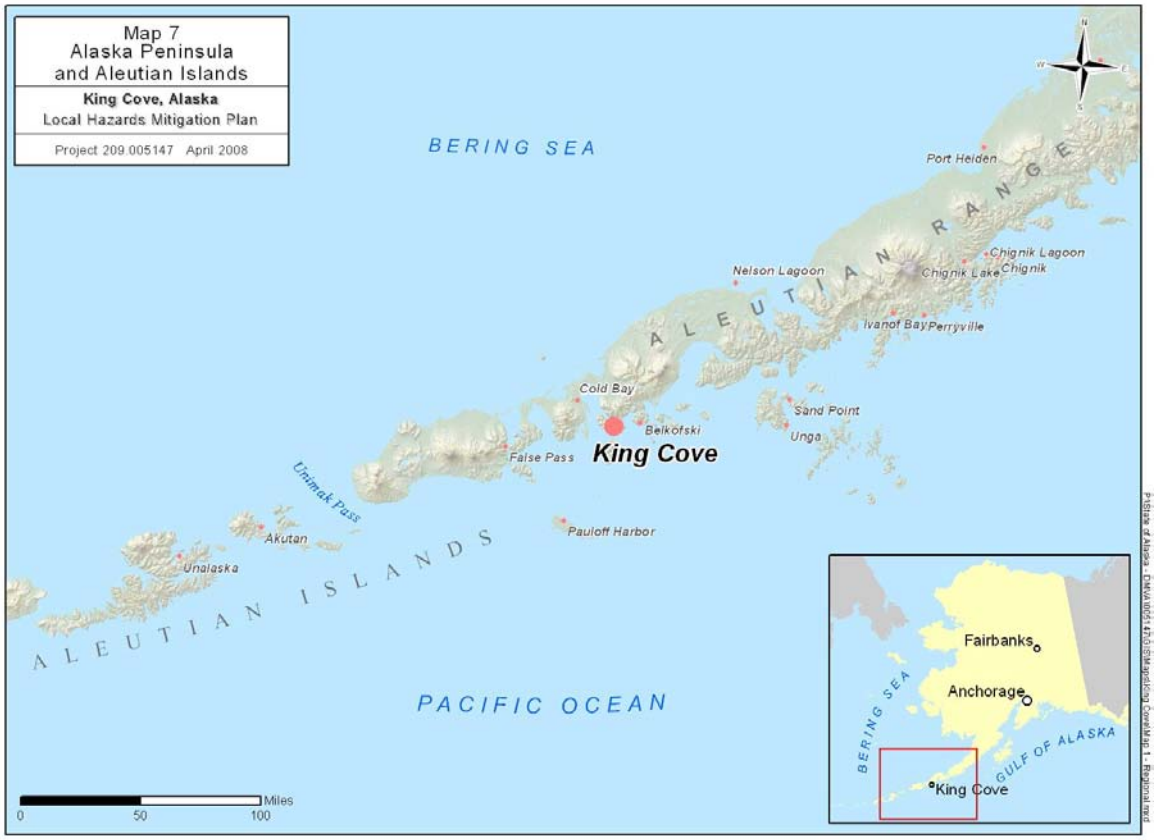
Section 1, Community Overview information is derived from the DCRA Community Database online at http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.htm. The section was reviewed and updated by representatives of the City of King Cove in Anchorage.

Current Population: 807 (2006 DCCED certified population)
Other Names: Agdaagux
Incorporation Type: 1st Class City

History

King Cove was founded as a salmon cannery location in 1911. Early settlers were Scandinavian, European and Unangan (Aleut) fishermen. The cannery operated continuously between 1911 and 1976, when it was partially destroyed by fire. The adoption of the 200-mile fisheries limited spurred rebuilding.

Map 7. King Cove Location Map



Facilities

Water is derived from Ram Creek sheet pile dam and a well field at Delta Creek. Water is piped to all community residents. Sewage is piped from all households and facilities to central septic tanks. Two lift stations and tanks provide primary and secondary treatment of waste, with discharge through an outfall line. The City collects refuse twice a week; aluminum is recycled. The electric utility, owned and operated by the City, utilizes hydroelectric power with diesel generator back-up. The King Cove Medical Clinic is a qualified emergency care center. Emergency services have limited marine and air access; King Cove is classified as an isolated town/sub-region. The clinic is staffed by paid health aides.

The King Cove School teaches preschool through twelfth grade. The school has 92 students and 13 teachers and is located in the Aleutians East School District. The district is home to 7 schools, 35 teachers and 267 students.

Transportation

Access to King Cove is only possible via air and sea. The community has a State-owned 3,360-foot-long by 115-foot-wide gravel runway.

The State Ferry operates once a month between May and October. The ferry and some marine cargo services use one of the three docks owned by the City.

Peter Pan Seafoods owns three docks that are also used by some cargo services.

A deep water dock is operated by the City. The North Harbor provides moorage for 90 boats, and is ice free year-round.

A new harbor and breakwater is under construction; upon completion, the Babe Newman Harbor will be operated by the City and provide moorage for 60-foot and 150-foot fishing vessels.

Section 2. Risk Assessment

> ***Federal Requirement***
>
> ***§201.6(c)(2)(iii):*** *For multi-jurisdictional plans, the risk assessment* ***must*** *assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Hazard Description

King Cove is at risk for the natural hazards of earthquake, volcano, tsunami, severe weather and erosion. See Chapter 3, Sections 1, 2, 3, and 4 for hazard descriptions of earthquakes, volcanoes, tsunamis and severe weather.

The USACE conducted an *Alaska Baseline Erosion Assessments Study* in 2007. According to the study the main erosion problem in King Cove is coastal erosion. Causes and contributing factors to coastal erosion are storm surge, high winds and waves.

Location

The natural hazards of earthquake, volcano, and severe weather are area wide hazards in the community. Any part of the community is at equal risk from these hazards. The tsunami hazard has not been mapped, so the location is indeterminate at this time.

The USACE Erosion Survey states that the road along Gould's Lagoon connects residents living in old Ram and new Ram subdivisions (about 2/3 of the residents) with those living on the spit, near the Peter Pan Seafood plant. Residents on the spit also use the road to evacuate in the event of a tsunami threat. This road is the only infrastructure threatened.

Extent

Earthquake, Volcanoes and Tsunami

Based on information from the *Alaska All-Hazard Risk Mitigation Plan, 2007*, other plans and reports, and information from the AEIC, WCATWC, AVO, and the AEB EOP, 2006 the extent of an earthquake, volcanic eruption or a tsunami in King Cove could be ***critical***. Table 4. Extent of Hazard Ranking, page 11, uses the following criteria to determine the extent of possible damage: Injuries and/or illnesses result in permanent disability, complete shutdown of critical facilities for at least two weeks, more than 25% of property is severely damaged.

Severe Weather

Severe weather could result in a ***limited*** extent event in King Cove. Table 4. Extent of Hazard Ranking, page 11, defined limited as an event that would cause injuries and/or illnesses that do not result in permanent disability; complete shutdown of critical facilities for more than one week and more than 10% of property would be severely damaged.

Erosion

The USACE Erosion Study states the following: "Approximately ½ mile of road along Gould's Lagoon is armored to protect it from coastal erosion. The city plans to place additional large armor rock to further stabilize this road during summer 2008. The main road to the small boat harbor has washed out during high tides in the past. The road was repaired and part was relocated approximately 20 feet inland. The main road is currently not a problem and the road along Gould's Lagoon is not at serious risk from erosion or in imminent risk of failure. According to the city manager, King Cove roads have been or will be upgraded to a 50-year flood design standard. The city plans to pave all roads during summer 2008."

Based on the information above and community input, erosion could result in a ***limited*** extent event in King Cove. Table 4. Extent of Hazard Ranking, page 11, defined limited as an event that would cause injuries and/or illnesses that do not result in permanent disability; complete shutdown of critical facilities for more than one week and more than 10% of property would be severely damaged.

Probability

Earthquake and Volcano

As outlined in Chapter 3, Section 1, Earthquake and Section 2, Volcano, King Cove has a ***high*** probability of an ***earthquake*** or ***volcanic*** event. Table 5, Probability Criteria Table, page 13, lists the following criteria for high probability: hazard is present with a high probability of occurrence within the next calendar year. Event has up to 1 in 1 year chance of occurring.

Tsunami

Chapter 3, Figure 6, the AEIC Alaska Priority List, on page 36, indicates that all of the communities in the AEB have a risk of a tsunami event. King Cove is listed as Number 20 on the priority list.

The community is designated as having a moderate potential for a distant source tsunami hazard. A ***distant source tsunami hazard*** means the tsunami is generated so far away that the earthquake was not felt at all or only slightly. An estimate can be made of potential danger. Maximum runup heights would only be reached at the shoreline and the maximum distance inland only reached where the coast is low, flat, and unobstructed. ***"Moderate"*** means possible runup to 35-foot elevation and inland up to 3/4 mile.

King Cove is also listed as having a ***local tsunami hazard*** which means a tsunami could be generated in nearby waters and reach the community before a formal warning could be transmitted. These waves

may arrive in less than one hour and have historically been the highest, up to 100 feet or more. The estimated possible height in each community is difficult to determine. Coastal residents who feel a very strong earthquake (lasting over 30 seconds or if they have difficulty standing) should move to higher ground immediately.

Severe Weather

Based on information in Chapter 3, Section 4, Severe Weather, King Cove has a ***moderate*** probability of a severe weather event. Table 5. Probability Criteria Table, page 12, lists the following criteria for moderate probability: hazard is present with a moderate probability of occurrence within the next three years. Event has up to 1 in 3 years chance of occurring.

Erosion

Based on the USACE Erosion Study and community input, King Cove has a ***low*** probability of an erosion event. Table 5. Probability Criteria Table, page 13, lists the following criteria for low probability: hazard is present with a low probability of occurrence within the next ten years. Event has up to 1 in 10 years chance of occurring.

Previous Occurrences

In addition to the previous occurrences of earthquake, volcanoes, tsunami and severe weather hazards that are described in Chapter 3 the following information is specific to King Cove.

In the USACE Erosion Study, the city manager reported that high wind and waves occur several times per year, but they have not resulted in any structural damage to buildings. During a February 2007 storm, water lapped over boardwalks and spray occasionally hit the front row of homes, but no threats to structures were identified.

Impact

In addition to the impacts from earthquake, volcano, tsunami and severe weather that are discussed in Chapter 3, impacts from erosion in King Cove would occur mostly on the road along the shoreline. Approximately ½ mile of road along Gould's Lagoon is armored to protect it from coastal erosion. The city placed additional large armor rock to further stabilize this road during summer 2008. The main road to the small boat harbor has washed out during high tides in the past. The road was repaired and part was relocated approximately 20 feet inland. The main road is currently not a problem and the road along Gould's Lagoon is not at serious risk from erosion or in imminent risk of failure. According to the city manager, King Cove roads have been or will be upgraded to a 50-year flood design standard (USACE Erosion Study).

Structures in King Cove Hazard Areas

Table 22. King Cove Hazard Asset Matrix and Map 8. King Cove Critical Infrastructure, and Map 9. King Cove Critical Infrastructure, continued list critical facilities and other structures and their vulnerability to natural hazards in King Cove.

Potential replacement values of city owned critical facilities and other structures will be added in a future addition.

Map 8. King Cove Critical Infrastructure

Map 9. King Cove Critical Infrastructure, continued

King Cove Hazard Asset Matrix

Table 22 contains a list of facilities, business and infrastructure shown on Map 8. King Cove Critical Infrastructure, and Map 9. King Cove Critical Infrastructure, continued, and their vulnerability to identified natural hazards and whether, based on its location, each asset has a low, moderate or high vulnerability to specific natural hazards. If it is not identified as a hazard in the jurisdiction the column is marked with an N/A. DHS&EM directed that until inundation maps are competed, the tsunami areas not be designated on hazard asset matrices.

Table 22. King Cove Hazard Asset Matrix

King Cove Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Erosion
1. Dave Beach Propane	H	H	NOT MAPPED	M	N/A
2. City of K.C. Tank Farm	H	H		M	N/A
3. Warehouses & Powerhouse	H	H		M	N/A
4. Alaska Commercial Co.	H	H		M	N/A
5. Melanie & Connie's Bar	H	H		M	N/A
6. King Cove Harbor House	H	H		M	N/A
7. Peter Pan Seafoods (PPSF) Powerhouse	H	H		M	N/A
8. PPSF Carpenter Shop	H	H		M	N/A
9. PPSF Cannery	H	H		M	N/A
10. Fuel Shack	H	H		M	N/A
11. PPSF Stockroom	H	H		M	N/A
12. PPSF Store	H	H		M	N/A
13. PPSF Mess Hall	H	H		M	N/A
14. PPSF Laundry Room	H	H		M	N/A
15. PPSF Mail Room	H	H		M	N/A

King Cove Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Erosion
16. PPSF Lounge	H	H		M	N/A
17. PPSF Plaza Cookhouse	H	H		M	N/A
18. King Cove School	H	H		M	N/A
19. Co-op Center	H	H		M	N/A
20. Gould's Store	H	H		M	N/A
21. King Cove School Bus Barn	H	H	NOT MAPPED	M	N/A
22. GCI Satellite Station	H	H		M	N/A
23. K.C. Teen Center	H	H		M	N/A
24. Police & EMT Stations	H	H		M	N/A
25. City Ceramic Shop	H	H		M	N/A
26. Pizza Shop	H	H		M	N/A
27. King Cove Corp Hotel	H	H		M	N/A
28. Post Office	H	H		M	N/A
29. Harrlett's Apartments	H	H		M	N/A
30. City of King Cove Muni Building	H	H		M	N/A
31. St. Hermans Orthodox Church	H	H		M	N/A
32. Dave Bash Auto Supplies	H	H		M	N/A
33. King Cove Bible Chapel	H	H		M	N/A

King Cove Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Erosion
35. Bellofski Trailer	H	H		M	N/A
36. King Cove Community Center	H	H	NOT MAPPED	M	N/A
37. Ram's General Store	H	H		M	N/A
38. Aleutian Housing Office	H	H		M	N/A
39. King Cove Clinic	H	H		M	N/A
40. Aleutian East Borough	H	H		M	N/A
41. City Shop	H	H		M	N/A
42. Adgaagux Tribal Office	H	H		M	N/A

Section 3. King Cove Mitigation Projects

> ***Federal Requirement***
>
> ***§201.6(c)(3)(iv):*** *For multi-jurisdictional plans, there* ***must*** *be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Table 23 presents a strategy for mitigation of the natural hazards faced by the communities and includes a brief description of the projects, lead agencies, costs, potential funding sources and an estimated timeframe for each project. The final column allows for the communities to make note of specific progress on projects during the 5-year life of the plan.

Table 23. King Cove Potential Mitigation Projects

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Annual Review
Identify buildings and facilities that must be able to remain operable during and following an earthquake event in the City of King Cove	City of King Cove DHS&EM	Staff Time	PDM State Grants	1 year	
Consider Participation in the Tsunami Awareness Programs for the residents of the City of King Cove	City of King Cove DHS&EM	Staff Time	DHS&EM	Ongoing	
Conduct special awareness activities, such as Winter Weather Awareness Week in King Cove	City of King Cove DHS&EM	Staff Time	City Budget	Ongoing	
Update, as needed, emergency notification procedures and emergency planning for ash fall events	City of King Cove AVO DHS&EM	N/A	PDM HMGP	Ongoing	
Siren and lights in communities and other hazardous warnings	City of King Cove Borough DHS&EM	N/A	PDM HMGP DHS&EM/ NOAA NTHMP	>1 year	

Chapter 9. Tribal Village of Nelson Lagoon

Section 1. Community Overview

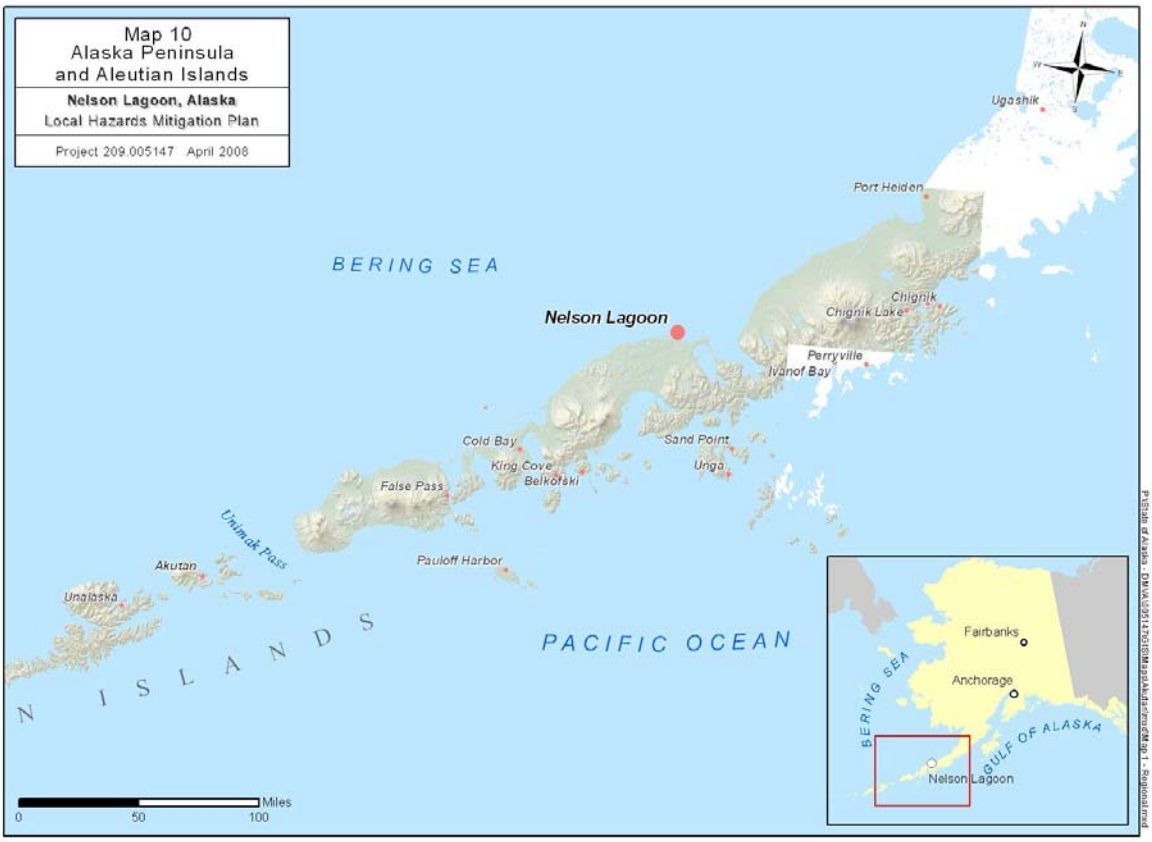
Section 1, Community Overview information is from the DCRA Community Database online at http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.htm.

Current Population	65 (2008 Estimated Population, Not Certified)
Incorporation Type	Tribal Village, unincorporated

History

Nelson Lagoon was used historically as an Unangan (Aleut) summer fish camp. The resources of the lagoon and nearby Bear River are excellent. The lagoon was named in 1882 for Edward William Nelson of the U.S. Signal Corps, an explorer in the Yukon Delta region between 1877 and 1920. A salmon saltery operated from 1906 to 1917, which attracted Scandinavian fishermen, but there has been no cannery since that time. In 1965, a school was built and the community began to be occupied year-round.

Map 10. Nelson Lagoon Location Map



Facilities

Water is derived from a lake about 10 miles from Nelson Lagoon and is treated. Water storage capacity is 600,000 gallons. All homes are connected to the piped water system. Individual septic systems enable households to have complete plumbing. A washeteria is available. There are no garbage collection services, but a landfill is available.

Transportation

Nelson Lagoon is accessible only by air and sea. A State-owned 4,000-foot-long by 75-foot-wide gravel runway serves regularly-scheduled flights. A dock, boat ramp, a harbormaster's office and warehouse were completed in the mid- to late 1990s. Some freight is landed at the Peter Pan Seafoods dock, 30 miles away at Port Moller.

Section 2. Risk Assessment

> ***Federal Requirement***
>
> ***§201.6(c)(2)(iii):*** *For multi-jurisdictional plans, the risk assessment* ***must*** *assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Hazard Description

Nelson Lagoon is at risk for the natural hazards of earthquake, volcano, tsunami, severe weather and erosion.

According to the USACE Erosion Study, the erosion problems in Nelson Lagoon include coastline erosion on the Bering Sea and Nelson Lagoon side of the spit, and river erosion from the Nelson and Sapsuk Rivers. The community study indicates that factors causing and contributing to the erosion include high tides, storm surges, and wind and wave action. The community reported in the study that much of Nelson Lagoon was protected by ice for part of the winter storm season, but during the past 10 to 15 years, this protection has not been present.

Location

Earthquake, Volcanoes, Tsunami and Severe Weather

The natural hazards of earthquake, volcano, and severe weather are area wide hazards in the community. Any part of the community is at equal risk from these hazards. The tsunami hazard has not been mapped, so the location is indeterminate at this time.

Erosion

See Figure 11 in this Chapter for areas that are at risk for erosion in Nelson Lagoon.

Extent

Earthquake, Volcano and Tsunami

Based on information from the *Alaska All-Hazard Risk Mitigation Plan, 2007*, other plans and reports, and information from the AEIC, WCATWC, AVO, and the AEB EOP, 2006 the extent of an earthquake, volcanic eruption or a tsunami in Nelson Lagoon could be ***critical***. Table 4. Extent of Hazard Ranking, uses the following criteria to determine the extent of possible damage: Injuries and/or illnesses result in permanent disability, complete shutdown of critical facilities for at least two weeks, more than 25% of property is severely damaged.

Severe Weather

Severe weather could result in a ***limited*** extent event in Nelson Lagoon. Table 4. Extent of Hazard Ranking, defined limited as an event that would cause injuries and/or illnesses do not result in permanent disability; complete shutdown of critical facilities for more than one week and more than 10% of property is severely damaged.

Erosion

The USACE Erosion Study describes the following erosion projects that have been done to minimize the potential critical extent of damages from erosion in Nelson Lagoon.

"In recent years the community has installed the following major erosion protection measures along the beach: (a) placement of gabions to anchor existing wood in the breakwater; and (b) placement of geotube containment structures, consisting of sediment-filled sleeves of geotextile fabric. The completed structure includes about 300 linear feet of geotube that is 5 feet high, with a 7½-foot attached scour apron on the seaward side to prevent toe scour.

"The gabions project is reported to have cost about $60,000. It is further reported that the measure has had little success due to high winds and tides. This project appears to correspond to *Alaska Legislative Appropriations for Flood and Erosion Control* summary collected by the Division of Community Advocacy showing Nelson Lagoon received funding for erosion control including dock protection totaling $80,000 (1986-1989).

"The geotube placement was a demonstration project funded by a $100,000 Coastal Impact Assistance Program grant to the AEB. The project, completed in September 2005 has been in place for too short a time period for the community to assess its effectiveness.

"According to the USACE Erosion Study an effective long-term erosion control program will be necessary in the future to ensure the safety of the water system and other community infrastructure(USACE Erosion Study)."

Based on the information from the USACE Erosion Study, the extent of damage in Nelson Lagoon from erosion could be ***critical***. Table 4. Extent of Hazard Ranking, page 11, uses the following criteria to

determine the extent of possible damage: Injuries and/or illnesses result in permanent disability, complete shutdown of critical facilities for at least two weeks, more than 25% of property is severely damaged.

Probability

Earthquake and Volcano

As outlined in Chapter 3, Section 1, Earthquake and Section 2, Volcano, Nelson Lagoon has a ***high*** probability of an earthquake and volcanic event. Table 5. Probability Criteria Table, page 13, lists the following criteria for high probability: hazard is present with a high probability of occurrence within the next calendar year. Event has up to 1 in 1 year chance of occurring.

Tsunami

Chapter 3, Figure 6, the AEIC Alaska Priority List, on page 36, indicates that all of the communities in the AEB have a risk of a tsunami event. Nelson Lagoon is listed as Number 48 on the priority list.

The community is designated as having a low potential for a distant source tsunami hazard. A ***distant source tsunami hazard*** means the tsunami is generated so far away that the earthquake was not felt at all or only slightly. An estimate can be made of potential danger. Maximum runup heights would only be reached at the shoreline and the maximum distance inland only reached where the coast is low, flat, and unobstructed. *"**Low"*** means possible runup to a 20-foot elevation and reaching up to 1/2 mile inland.

Nelson Lagoon is at risk for having a ***local tsunami hazard,*** which means a tsunami could be generated in nearby waters and reach the community before a formal warning could be transmitted. These waves may arrive in less than one hour and have historically been the highest, up to 100 feet or more. The estimated possible height in each community is difficult to determine. Coastal residents who feel a very strong earthquake (lasting over 30 seconds or if they have difficulty standing) should move to higher ground immediately (AEIC).

Severe Weather

Based on information in Chapter 3, Section 4, Severe Weather, Nelson Lagoon has a ***moderate*** probability of a severe weather event. Table 5. Probability Criteria Table, page 12, lists the following criteria for moderate probability: hazard is present with a moderate probability of occurrence within the next three years. Event has up to 1 in 3 years chance of occurring.

Erosion

Based on the USACE Erosion Study, Nelson Lagoon has a **moderate** probability of an erosion event. Table 5. Probability Criteria Table, page 13, lists the following criteria for moderate probability: hazard is present with a moderate probability of occurrence within the next three years. Event has up to 1 in 3 years chance of occurring.

Previous Occurrences

In addition to the previous occurrences of earthquake, volcanoes, tsunami and severe weather hazards that are described in Chapter 3, the following information is specific to Nelson Lagoon.

The beach area historically tends to wash out in one area and then rebuild in another. The active erosion area along the Nelson Lagoon side of the spit is less than 100 feet from community structures, including housing and the airstrip. This area is of highest priority and greatest concern to the community. In this area during winter of 1998, a storm event resulted in the exposure of 3,000 feet of the community's water line, which then froze. Major erosion events in the community have been constant for the last 20 years, resulting in an average of 5 feet per year of shoreline erosion. Erosion along the spit occurs at a rate of 1 to 2 feet per year, per the USACE Erosion Study, however no specific measurements of extent were provided.

Impact

The impacts to the profiled natural hazard are the same as outlined in Chapter 3; for earthquake, volcanoes, tsunamis and severe weather. The following impacts, noted in the USACE Erosion Study, could occur in Nelson Lagoon.

"The spit is getting longer and narrower as erosion advances on both sides. Based on the community survey, a number of residences, as well as the airport runway and associated facilities are at risk from erosion, with structures less than 100 feet away from advancing erosion areas. Additionally, erosion poses a threat to the 10.5 mile long water transmission line, which has required major repairs as part of an overall water system upgrade project. The community reported that community water lines have been replaced 3 times in past years due to erosion and storm damage (costs were not reported). The water line is now buried and the community has planted beach grasses over it in an effort to help protect against erosion damage (USACE Erosion Study)."

The Village of Nelson Lagoon is located on a spit that is being threatened continuously by erosion from both the Bering Sea side and sections on the lagoon side of the spit. In the past, the village was protected by the winter ice pack, but during the last several decades, this protection has been in significant decline due to global warming. The shoreline is now exposed to the winds and tidal surges of severe winter storms.

The Army Corps of Engineers has estimated an annual average erosion rate of five feet per year in Nelson Lagoon. This erosion continuously exposes from 400 to 1500 feet of community water transmission line per year, which then either breaks due to the wave action, or freezes due to winter temperatures (during the winter of 1998, a storm exposed approximately 3,000 feet of the community's 10-mile-long water transmission line, which subsequently froze). Residents continuously replace and re-bury the exposed, broken line which rapidly depletes the Tribal general fund. There is much anxiety in the village among residents when the line freezes, as they must wait for temperatures to rise above freezing before the water can flow again.

Annual flooding from the lagoon reaches several houses and floods their septic tanks. When the flood waters recede, there is layer of human waste covering the vicinity including the roads. This is a health and safety issue, especially for children playing in the area and for people walking on the roads.

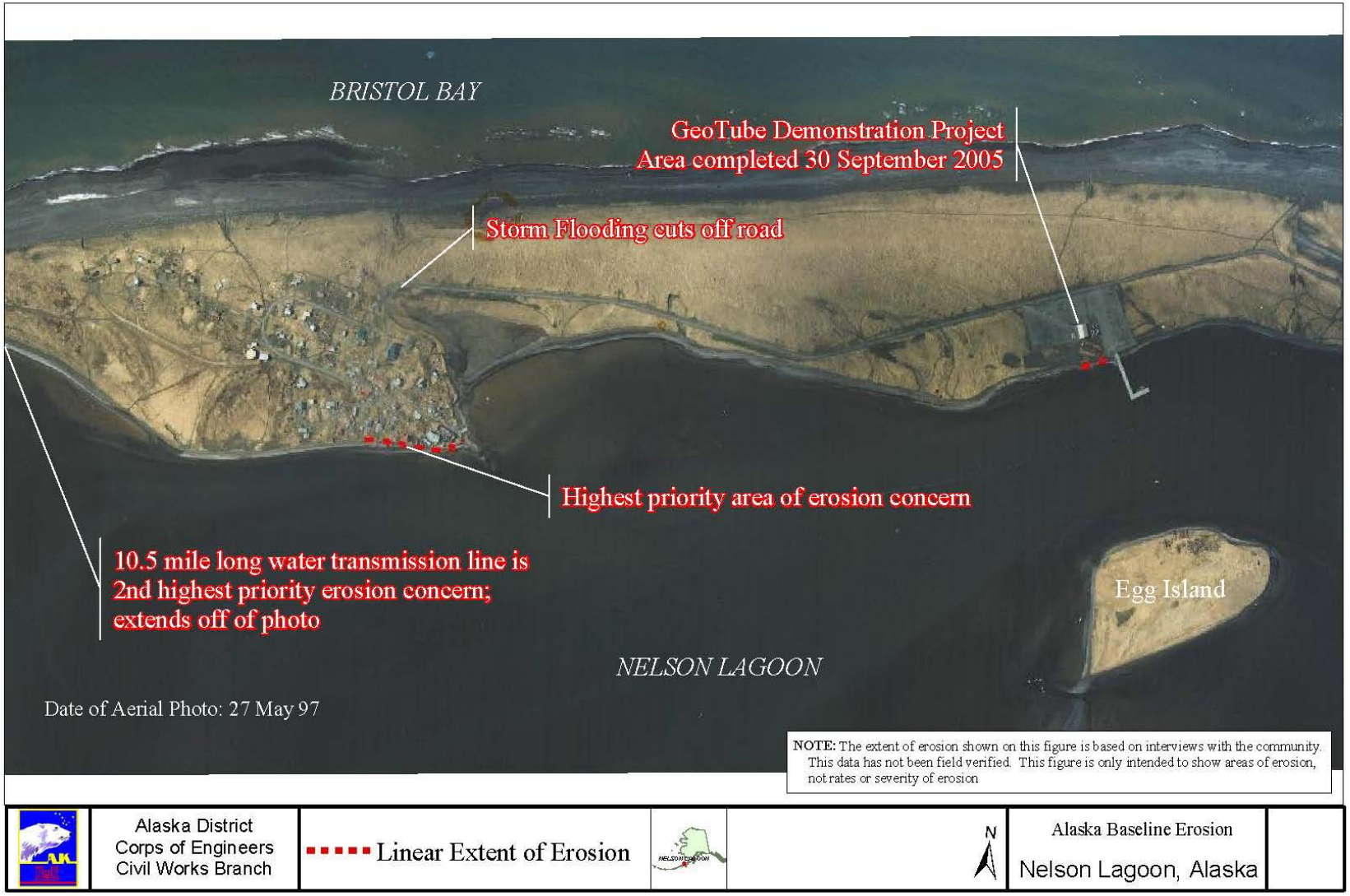
Strong winds have exposed sections of buried utility lines along Landfill Road. The road consists of sand material which continuously blows away and exposes the line. Residents fear for the safety of children who play by the road and who may step on exposed wiring.

Structures in Nelson Lagoon Hazard Areas

Table 24 lists critical facilities and other structures and their vulnerability to natural hazards in Nelson Lagoon as shown on Figure 11. USACE Erosion Survey and Map 11. Nelson Lagoon Critical Infrastructure.

Potential replacement values of city owned critical facilities and other structures will be added in a future addition.

Figure 11. USACE Erosion Survey



Map 11. Nelson Lagoon Critical Infrastructure

Nelson Lagoon Hazard Asset Matrix

Table 24 list structures and their vulnerability to identified natural hazards and whether, based on its location, each asset has a low, moderate or high vulnerability to specific natural hazards. If it is not identified as a hazard in the jurisdiction the column is marked with a N/A. DHS&EM directed that until inundation maps are competed, that the tsunami areas not be designated on hazard asset matrices.

Table 24. Nelson Lagoon Hazard Asset Matrix

Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
Map 11. Nelson Lagoon						
1. Community Center	H	H		M	N/A	M
2. COHO Commercial Store	H	H		M	N/A	N/A
3. Existing Community Clinic	H	H		M	N/A	N/A
4. Water Treatment Plant	H	H	NOT MAPPED	M	N/A	N/A
5. Water Tower	H	H		M	N/A	N/A
6. Community Storage Building	H	H		M	N/A	N/A
7. Aleutians East Borough School District Teacher Living Quarter	H	H		M	N/A	N/A
8. Private Shop	H	H		M	N/A	N/A
9. Tide's Inn	H	H		M	N/A	M
10. Community Office/Building	H	H		M	N/A	N/A
11. Private Shop	H	H		M	N/A	N/A

Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
12. Bering Inn	H	H	NOT MAPPED	M	N/A	N/A
13. Aleutians East Borough School District School Building	H	H		M	N/A	M
14. Public Dock/Boat Ramp	H	H		M	N/A	M
15. Nelson Lagoon Electrical	H	H		M	N/A	M
16. Nelson Lagoon Storage Company	H	H		M	N/A	M
17. Nelson Lagoon Airport	H	H		M	N/A	M

Section 3. Nelson Lagoon Mitigation Projects

> ***Federal Requirement***
>
> ***§201.6(c)(3)(iv):*** *For multi-jurisdictional plans, there* ***must*** *be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Table 25 presents a strategy for mitigation of the natural hazards faced by the communities and includes a brief description of the projects, lead agencies, costs, potential funding sources and an estimated timeframe for each project. The final column allows for the communities to make note of specific progress on projects during the 5-year life of the plan.

Table 25. Nelson Lagoon Mitigation Project Plan

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Annual Review
Identify buildings and facilities that must be able to remain operable during and following an earthquake event in the Village of Nelson Lagoon.	DHS&EM	N/A	PDM State Grants	1 year	
Consider Participation in the Tsunami Awareness Programs for the residents of the Village of Nelson Lagoon	Tribal Village DHS&EM	N/A	DHS&EM	Ongoing	
Conduct special awareness activities, such as Winter Weather Awareness Week in Nelson Lagoon	Tribal Village DHS&EM	N/A	City Budget	Ongoing	
Long term erosion control project to protect waterline and other infrastructure	Tribal Village DHS&EM	>$100,000	PDM HMGP	>3 years	
Update, as needed, emergency notification procedures and emergency planning for ash fall events	Tribal Village AVO DHS&EM	N/A	PDM HMGP	Ongoing	

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Annual Review
Siren and lights in communities and other hazardous warnings	Tribal Village Borough DHS&EM	N/A	PDM HMGP DHS&EM/ NOAA NTHMP	>1 year	
Relocate Nelson Lagoon water transmission line away from shoreline.	Tribal Village Borough DHS&EM	Not determined	DHS&EM Village Safe Water	1-5 years	

Chapter 10. Sand Point Annex

Section 1. Community Overview

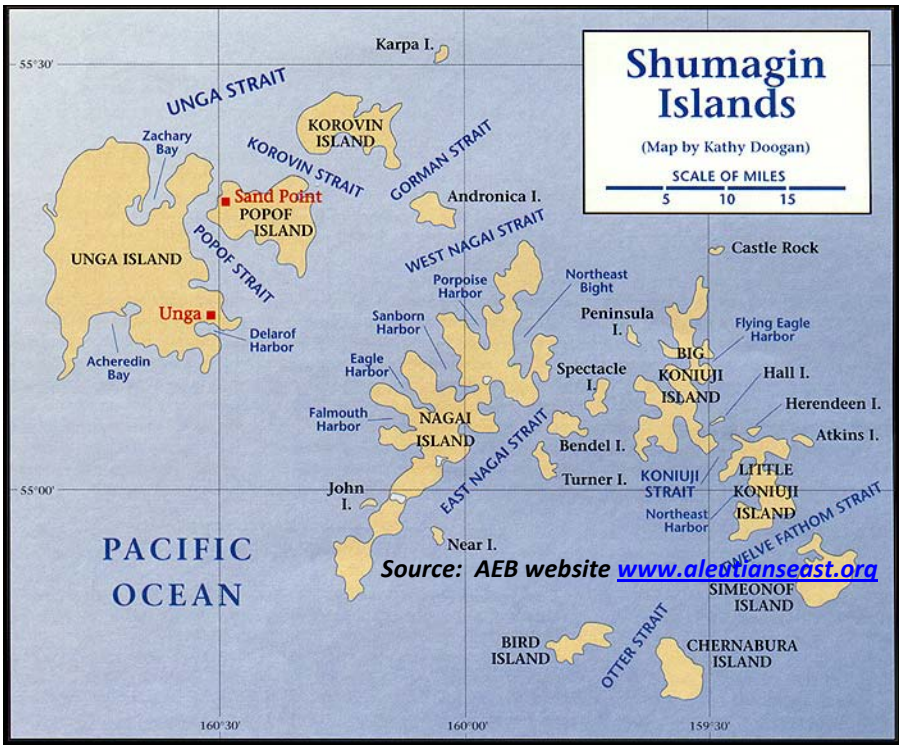
Section 1, Community Overview information is derived from the DCRA Community Database online at http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.htm.

Current Population:	890 (2006 DCCED certified population)
Other Names:	Qagun Tayagungin
Incorporation Type:	1st Class City

Description of Sand Point

The City of Sand Point is located on the northwest portion of Popof Island, in the Shumagin Island group, which lies south of the Alaska Peninsula. Popof Island is home to numerous species of birds, including eagles, cormorants, kittiwakes and puffins. A large herd of buffalo, managed by the Shumagin Corporation, roam the area. Otters, sea lions, and seals are present in the surrounding waters. Migrating whales are also seen during the summer months in Popof Strait.

Popof Island, like the rest of the Aleutians, is naturally treeless. Native vegetation consists of alder and willow shrub, and alpine tundra. In the summer months the island is rich in salmonberries, mossberries, blueberries, and cranberries. Grasses and sedges, mosses and wild-flowers are also abundant (Description, AEB website www.aleutianseast.org).

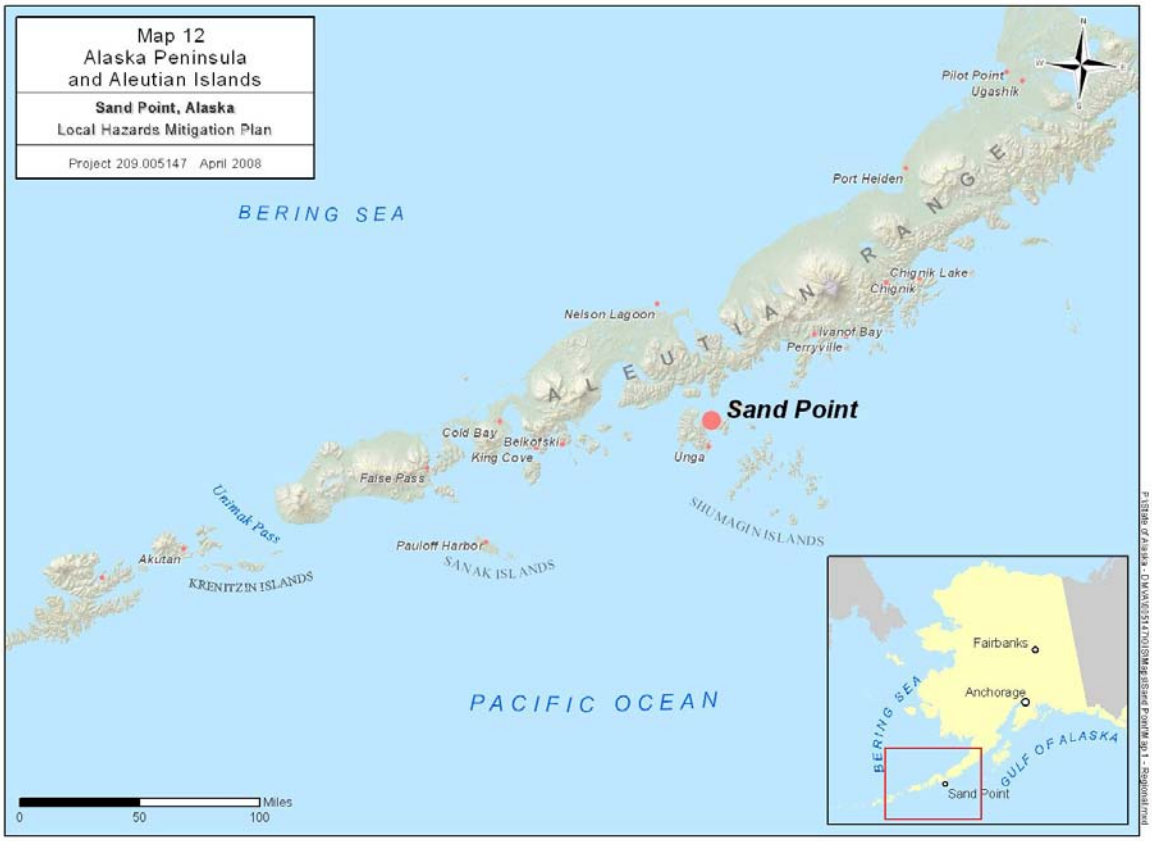


Source: AEB website www.aleutianseast.org

The Fishing Industry

Today Sand Point is home to one of the largest fishing fleets in the Aleutian Chain. It is a mixed native and non-Native community. It is characterized as self sufficient and progressive, with commercial fishing activities at the heart of the local culture. Cod, salmon and halibut have been and remain the mainstay of the city. Nearly everyone has at least one family member who is a commercial fisherman (AEB website www.aluetianseast.org).

Map 12. Sand Point Location Map



Facilities

Water is derived from Humbolt Creek, treated and piped to all community residents. The city operates both the water and sewer system. Trident Seafoods has first water rights. Refuse is collected by the City and taken to a class three landfill which is also operated by the city. The electric utility, Sand Point Electric Company, operates a diesel generator. Trident Seafoods built an independent power generation facility.

The Sand Point Medical Clinic is a qualified emergency care center. Sand Point is an isolated town, emergency services have limited marine and air access. The clinic is staffed by volunteers and a health aide.

Sand Point School serves preschool through twelfth grade. The school has 103 students, 14 teachers and is located within the Aleutians East School District.

Transportation

The community has air access via a State-owned airport with a 4,000-foot-long by 150-foot-wide paved runway. Direct flights to Anchorage are available. A runway expansion and airport road paving is planned. Marine facilities included a 25-acre boat harbor with four docks, 134 boat slips, a harbormaster

office, barge off-loading area, and a 150-ton lift. A new boat harbor is scheduled to be constructed at Black Point by the Corps of Engineers. Regular barge services supply the community. The State Ferry operates bi-monthly between May and October.

Section 2. Risk Assessment

> ***Federal Requirement***
>
> ***§201.6(c)(2)(iii):*** *For multi-jurisdictional plans, the risk assessment* ***must*** *assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Hazard Description

Chapter 3. Risk Assessment - Hazard Specific Sections, Sections 1 through 4 include descriptions for earthquake, volcano, tsunami and severe weather. Further information regarding Sand Point's risk to the identified hazards is included in this chapter.

Location

The natural hazards of earthquake, volcano, and severe weather are area wide hazards in the community. Any part of the community is at equal risk from these hazards. The tsunami hazard has not been mapped, so the location is indeterminate at this time.

Extent

Earthquake, Volcano and Tsunami

Based on information from the *Alaska All-Hazard Risk Mitigation Plan, 2007*, other plans and reports, and information from the AEIC, WCATWC, AVO, and the AEB EOP, 2006 the extent of an earthquake, volcanic eruption or a tsunami in Sand Point could be ***critical***. Table 4. Extent of Hazard Ranking, uses the following criteria to determine the extent of possible damage: Injuries and/or illnesses result in permanent disability, complete shutdown of critical facilities for at least two weeks, more than 25% of property is severely damaged.

Severe Weather

Severe weather could result in a ***limited*** extent event in Sand Point. Table 4. Extent of Hazard Ranking, defined limited as an event that would cause injuries and/or illnesses that do not result in permanent disability; complete shutdown of critical facilities for more than one week and more than 10% of property is severely damaged.

Probability

Earthquake and Volcanoes

As outlined in Chapter 3, Section 1, Earthquake and Section 2, Volcano, Sand Point has a ***high*** probability of an ***earthquake and volcanic*** event. Table 5, Probability Criteria Table, page 13, lists the following criteria for high probability: hazard is present with a high probability of occurrence within the next calendar year. Event has up to 1 in 1 year chance of occurring.

Tsunami

Chapter 3, Figure 6, the AEIC Alaska Priority List, page 36, illustrates that all of the communities in the AEB have a risk of a tsunami event. Sand Point is listed as Number 4 on the priority list.

The community is designated as having a high potential for a distant source tsunami hazard. A ***distant source tsunami hazard*** means the tsunami is generated so far away that the earthquake was not felt at all or only slightly. An estimate can be made of potential danger. Maximum runup heights would only be reached at the shoreline and the maximum distance inland only reached where the coast is low, flat, and unobstructed. ***"High"*** means possible runup to 50-foot elevation and reaching up to 1 mile inland.

Sand Point is also listed as having a ***local tsunami hazard*** which means a tsunami could be generated in nearby waters and reach the community before a formal warning could be transmitted. These waves may arrive in less than one hour and have historically been the highest, up to 100 foot or more. The estimated possible height in each community is difficult to determine. Coastal residents who feel a very strong earthquake (lasting over 30 seconds or if they have difficulty standing) should move to higher ground immediately.

Severe Weather

Based on information in Chapter 3, Section 4, Severe Weather, Sand Point has a ***moderate*** probability of a severe weather event. Table 5. Probability Criteria Table, page 12, lists the following criteria for moderate probability: hazard is present with a moderate probability of occurrence within the next three years. Event has up to 1 in 3 years chance of occurring.

Previous Occurrences

See Chapter 3, Sections 1, 2, 3 and 4 previous occurrences of earthquake, volcanoes, tsunami and severe weather hazards in the AEB.

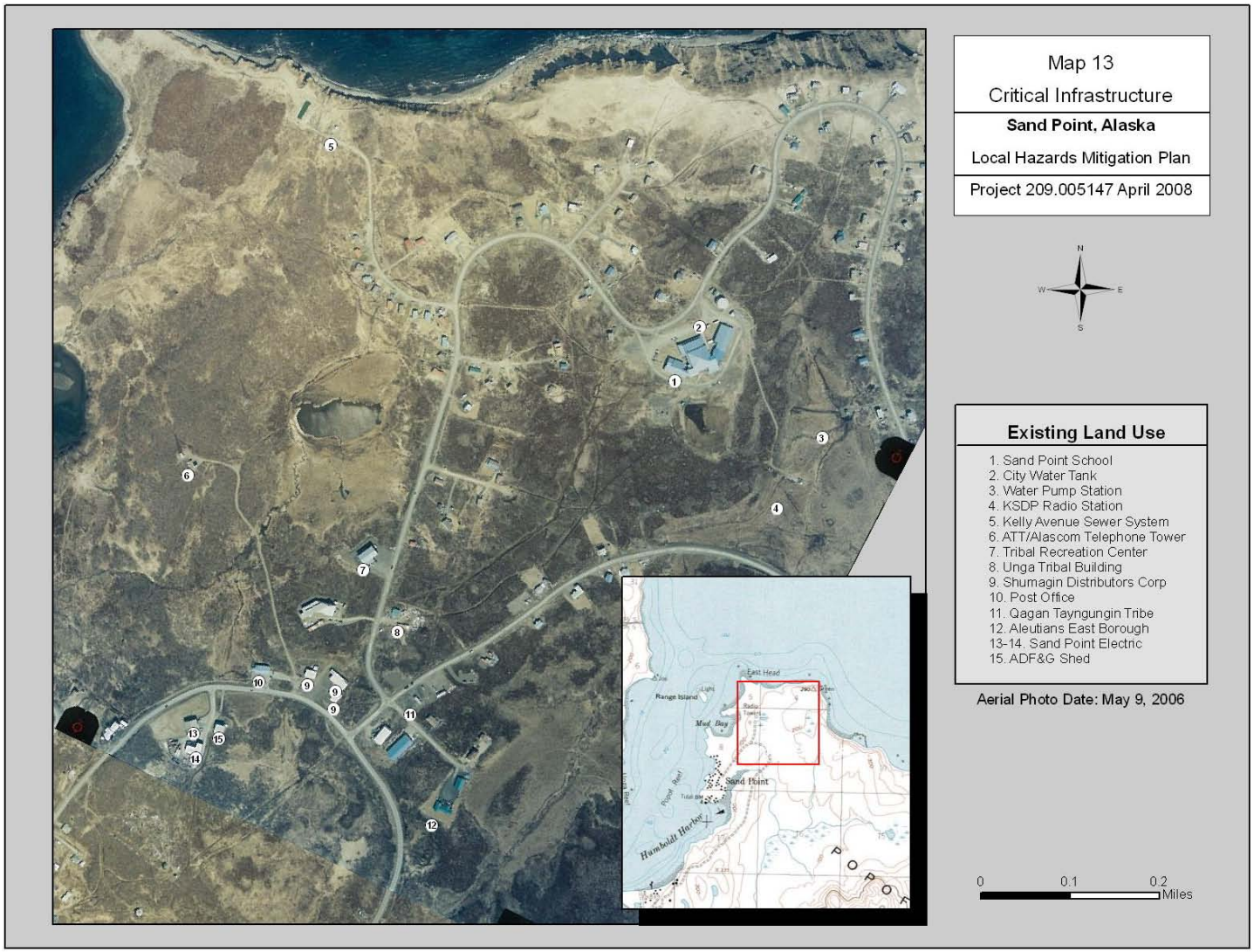
Impact

The impact of floods, earthquake, tsunami and severe weather hazards are the same as outlined in Chapter 3.

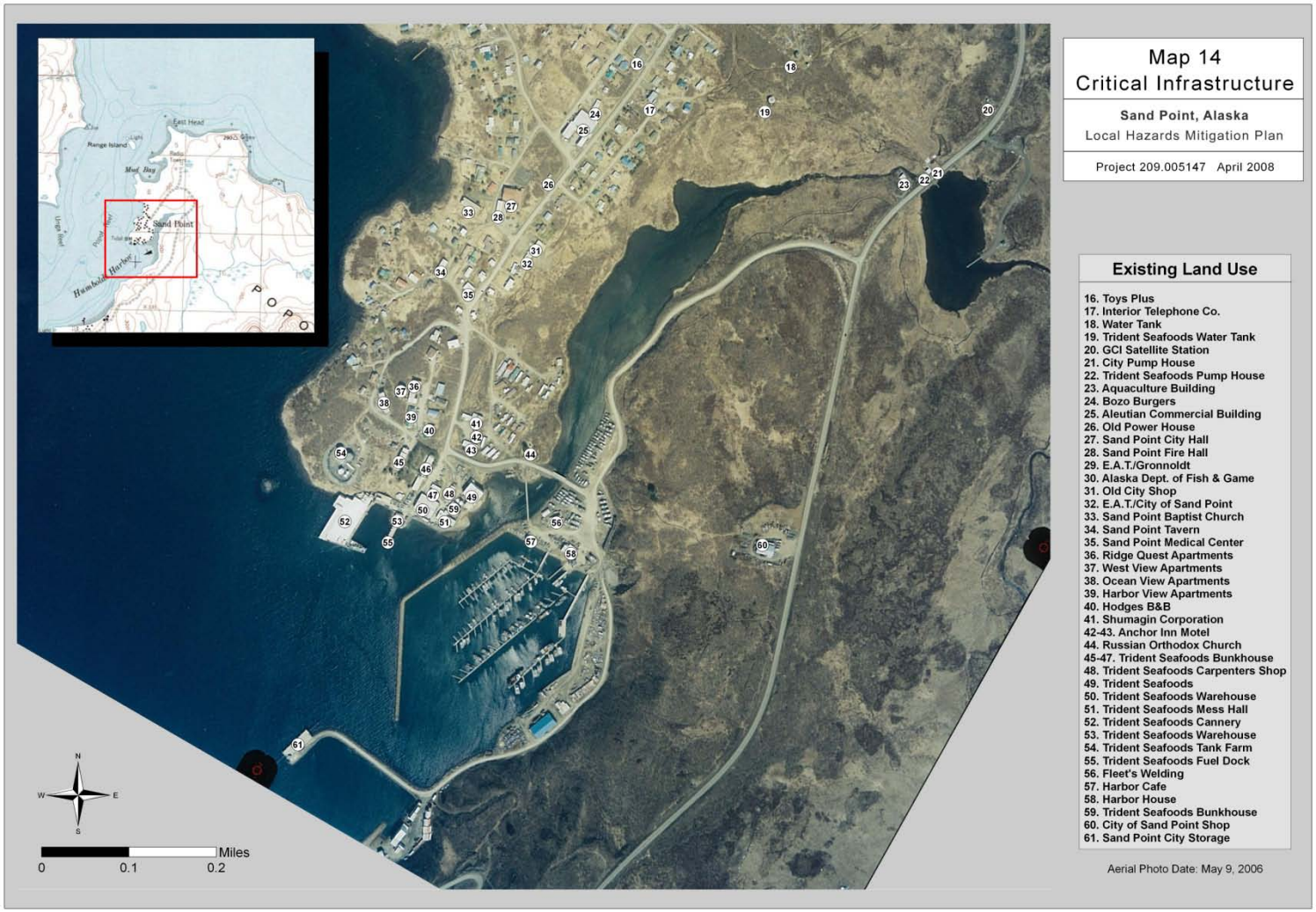
Structures in Sand Point Hazard Areas

Table 26. Sand Point Hazard Asset Matrix, contains a list of facilities, business and infrastructure shown on Map 13. Sand Point Critical Infrastructure , and, their vulnerability to identified natural hazards and whether, based on its location, each asset has a low, moderate or high vulnerability to specific natural hazards. If it is not identified as a hazard in the jurisdiction the column is marked with a N/A. DHS&EM directed that until inundation maps are competed, that the tsunami areas not be designated on hazard asset matrices.

Map 13. Sand Point Critical Infrastructure



Map 14. Sand Point Critical Infrastructure, continued



Sand Point Hazard Asset Matrix

Table 26 contains a list of facilities, business and infrastructure shown on Map 13. Sand Point Critical Infrastructure , and Map 14, and designates their vulnerability to identified natural hazards and whether, based on its location, each asset has a low, moderate or high vulnerability to specific natural hazards. If it is not identified as a hazard in the jurisdiction the column is marked with a N/A. DHS&EM directed that until inundation maps are competed, that the tsunami areas not be designated on hazard asset matrices.

Table 26. Sand Point Hazard Asset Matrix

Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
Map 13. Sand Point						
1. Sand Point School	H	H		M	N/A	N/A
2. City Water Tank	H	H		M	N/A	N/A
3. Water Pump Station	H	H		M	N/A	N/A
4. KSDP Radio Station	H	H	NOT MAPPED	M	N/A	N/A
5. Kelly Avenue Sewer System	H	H		M	N/A	N/A
6. ATT/Alascom Telephone Tower	H	H		M	N/A	N/A
7. Tribal Recreation Center	H	H		M	N/A	N/A
8. Unga Tribal Building	H	H		M	N/A	N/A
9. Shumagin Distributors Corp	H	H		M	N/A	N/A
10. Post Office	H	H		M	N/A	N/A
11. Qagan Tayngungin Tribe	H	H		M	N/A	N/A
12. Aleutian East Borough	H	H		M	N/A	N/A

Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
Map 14. Sand Point, continued						
13. Sand Point Electric	H	H		M	N/A	N/A
14. Sand Point Electric	H	H		M	N/A	N/A
15. ADF&G Shed	H	H		M	N/A	N/A
16. Toys Plus	H	H		M	N/A	N/A
17. Interior Telephone Co.	H	H		M	N/A	N/A
18. Water Tank	H	H		M	N/A	N/A
19. Trident Seafoods Water Tank	H	H	NOT MAPPED	M	N/A	N/A
20. GCI Satellite Station	H	H		M	N/A	N/A
21. City Pump House	H	H		M	N/A	N/A
22. Trident Seafoods Pump House	H	H		M	N/A	N/A
23. Aquaculture Building	H	H		M	N/A	N/A
24. Bozo Burgers	H	H		M	N/A	N/A
25. Aleutian Commercial Building	H	H		M	N/A	N/A
26. Old Power House	H	H		M	N/A	N/A
27. Sand Point City Hall	H	H		M	N/A	N/A
28. Sand Point Fire Hall	H	H		M	N/A	N/A
29. E.A.T./Gronnoldt	H	H		M	N/A	N/A

Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
30. ADF&G	H	H		M	N/A	N/A
31. Old City Shop	H	H		M	N/A	N/A
32. E.A.T/City of Sand Point	H	H		M	N/A	N/A
33. Sand Point Baptist Church	H	H		M	N/A	N/A
34. Sand Point Tavern	H	H		M	N/A	N/A
35. Sand Point Medical Clinic	H	H	NOT MAPPED	M	N/A	N/A
36.. Ridge Quest Apartments	H	H		M	N/A	N/A
37. West View Apartments	H	H		M	N/A	N/A
38. Ocean View Apartments	H	H		M	N/A	N/A
39. Harbor View Apartments	H	H		M	N/A	N/A
40. Hodges B&B	H	H		M	N/A	N/A
41. Shumagin Corporation	H	H		M	N/A	N/A
42. Anchor Inn Motel	H	H		M	N/A	N/A
43. Anchor Inn Motel	H	H		M	N/A	N/A
44. Church	H	H		M	N/A	N/A
45 - 47 Trident Seafoods Bunkhouses	H	H		M	N/A	N/A
48. Trident Seafoods Carpenters Shop	H	H		M	N/A	N/A
49. Trident Seafoods	H	H		M	N/A	N/A

Infrastructure/Structures	Earthquake	Volcanoes	Tsunami	Severe Weather	Flood	Erosion
50. Trident Seafoods Warehouse	H	H		M	N/A	N/A
51. Trident Seafoods Mess Hall	H	H		M	N/A	N/A
52. Trident Seafoods Cannery	H	H		M	N/A	N/A
53. Trident Seafoods Warehouse	H	H		M	N/A	N/A
54. Trident Seafoods Tank Farm	H	H		M	N/A	N/A
55. Trident Seafoods Fuel Dock	H	H		M	N/A	N/A
56. Fleet's Welding	H	H		M	N/A	N/A
57. Harbor Café	H	H		M	N/A	N/A
58. Harbor House	H	H		M	N/A	N/A
59. Trident Seafoods Bunkhouse	H	H		M	N/A	N/A
60. City of Sand Point Shop	H	H		M	N/A	N/A
61. Sand Point City Storage	H	H		M	N/A	N/A

NOT MAPPED

Section 3. Sand Point Mitigation Projects

Federal Requirement

§201.6(c)(3)(iv): *For multi-jurisdictional plans, there* ***must*** *be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Table 27 presents a strategy for mitigation of the natural hazards faced by the communities and includes a brief description of the projects, lead agencies, costs, potential funding sources and an estimated timeframe for each project. The final column allows for the communities to make note of specific progress on projects during the 5-year life of the plan.

Table 27. Sand Point Mitigation Project Plan

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Annual Review
Construct a shelter, with stocked supplies	DHS&EM	N/A	PDM State Grants	>1 year	
Construct a heliport	DHS&EM	N/A	PDM State Grants	>5 year	
Build a road to a higher elevation in case of tsunami	DHS&EM	N/A	PDM State Grants	>1 year	
Identify buildings and facilities that must be able to remain operable during and following an earthquake event in the City of Sand Point	DHS&EM	N/A	PDM State Grants	1 year	
Consider Participation in the Tsunami Awareness Programs for the residents of the City of Sand Point	City of Sand Point DHS&EM	N/A	DHS&EM	Ongoing	
Conduct special awareness activities, such as Winter Weather Awareness Week in Sand Point	City of Sand Point	N/A	City Budget	Ongoing	

Chapter 11. Plan Maintenance

Monitoring, Evaluating and Updating the Plan

Section §201.6(c)(4)(i) of the mitigation planning regulation requires that the plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Monitoring the Plan

The AEB Administrator, and City Administrators or their designees are responsible for monitoring the plan. On an annual basis the Administrations will seek a report from the agencies and departments responsible for implementing the mitigation projects in Chapter 4 and 5 of the plan. The compiled report will be provided to the Borough and City Councils as information and noticed to the public. A report outlining all five years of the plan monitoring will be included in the plan update.

Evaluating the Plan

The Aleutians East Borough Administrator, and City Administrators or their designees will evaluate the plan during the five-year cycle of the plan. On an annual basis, concurrent with the report above the evaluation should assess, among other things, whether:

- The goals and objectives address current and expected conditions.
- The nature, magnitude and/or types of risks have changed.
- The current resources are appropriate for implementing the mitigation projects in Chapter 4.
- There are implementation problems, such as technical, political, legal or coordination issues with other agencies.
- The outcomes have occurred as expected (a demonstration of progress).
- The agencies and other partners participated as originally proposed.

Updating the Plan

The mitigation planning regulations at §201.6(d)(3) direct the update of Mitigation Plans. Plans must be updated and resubmitted to FEMA for approval every five years in order to continue eligibility for FEMA hazard mitigation assistance programs. Plan updates must demonstrate that progress has been made in the past five years to fulfill commitments outlined in the previously approved plan. This involves a comprehensive review and update of each section of the plan and a discussion of the results of evaluation and monitoring activities described above. Plan updates may validate the information in the previously approved plan or may involve a major plan rewrite. A plan update may not be an annex to this plan; it must stand on its own as a complete and current plan.

The schedule for the plan update is to start the following tasks before the end of the five-year cycle as shown in Figure 12.

Figure 12. Mitigation Planning Cycle

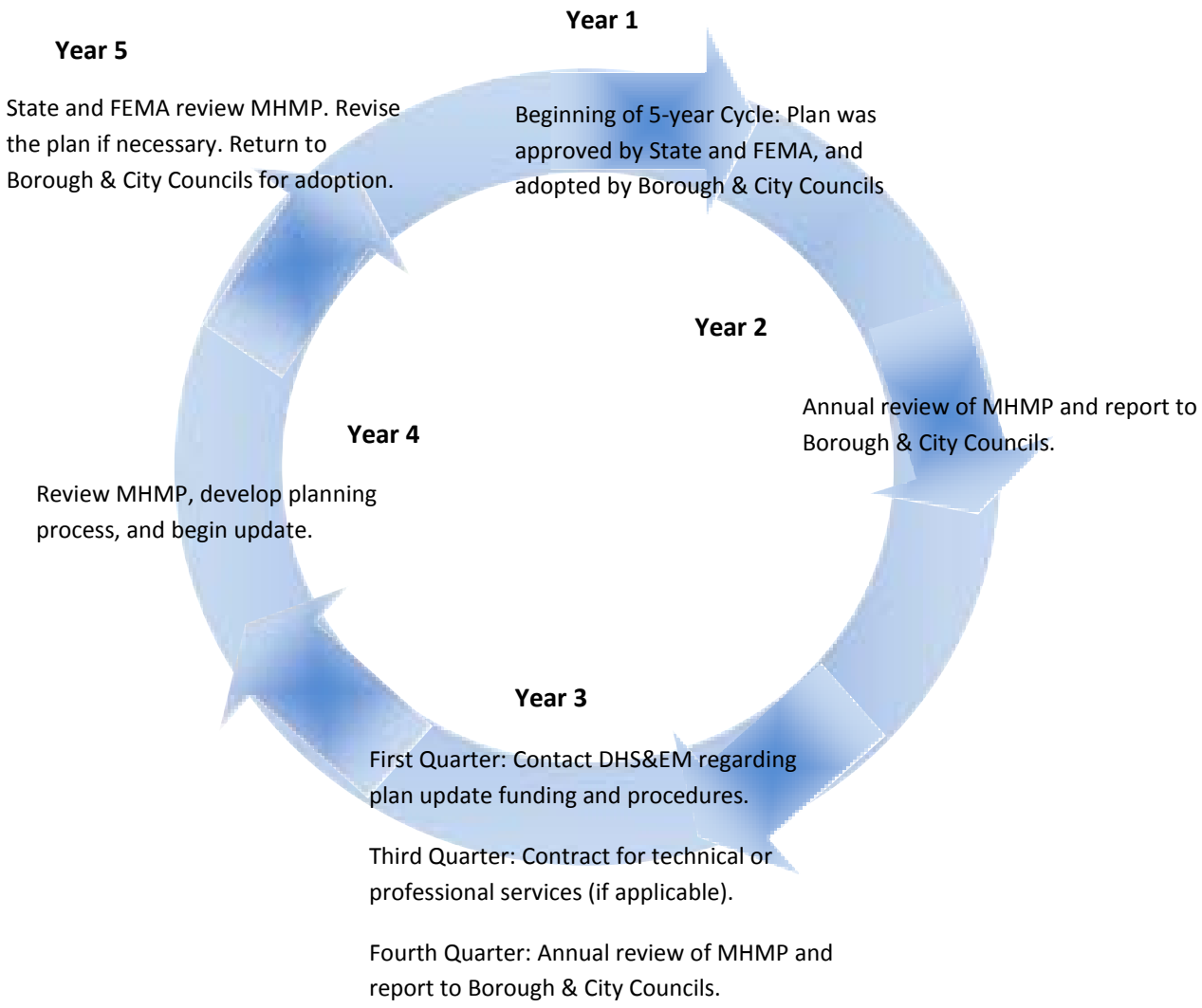


Table 28 lists the schedule for completion of these tasks, provided that funds are available to do so.

Table 28. Continued Plan Development

Hazard	Status	Hazard Identification Completion Date	Vulnerability Assessment Completion Date
Earthquake	Completed	2009	2009
Volcano	Completed	2009	2009
Tsunami	Completed	2009	2009
Severe Weather	Completed	2009	2009
Floods	Completed	2009	2009
Erosion	Completed	2009	2009
Snow Avalanche	Future Addition	2014	2014
Ground Failure	Future Addition	2009	2014
Economic	Future Addition	2014	2014
Technological	Future Addition	2014	2014
Public Health Crisis	Future Addition	2014	2014

Continued Public Involvement

The following methods will be used for continued public involvement.

A copy of the MHMP will be put online at the borough website: http://www.aleutianseast.org.

Hardcopies of the MHMP will be kept in the following locations:

- Borough Office
- Fire Departments
- Public Works Departments
- Clerk's Offices
- Libraries
- City Halls

On an annual basis the communities of the Borough will review the plan. Scheduled reviews will be advertised to the public using the same method established under the public involvement section of this plan. The public will be involved in the process described in the section on Monitoring, Evaluating and Updating the Plan.

Glossary of Terms

A-Zones Type of zone found on all Flood Hazard Boundary Maps (FHBMs), Flood Insurance Rate Maps (FIRMs), and Flood Boundary and Floodway Maps (FBFMs).

Acquisition Local governments can acquire lands in high hazard areas through conservation easements, purchase of development rights, or outright purchase of property.

Asset Any manmade or natural feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.

Base Flood A term used in the National Flood Insurance Program to indicate the minimum size of a flood. This information is used by a community as a basis for its floodplain management regulations. It is the level of a flood, which has a one-percent chance of occurring in any given year. Also known as a 100-year flood elevation or one-percent chance flood.

Base Flood Elevation (BFE) The elevation for which there is a one-percent chance in any given year that flood water levels will equal or exceed it. The BFE is determined by statistical analysis for each local area and designated on the Flood Insurance Rate Maps. It is also known as 100-year flood elevation.

Base Floodplain The area that has a one percent chance of flooding (being inundated by flood waters) in any given year.

Building A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.

Building Code The regulations adopted by a local governing body setting forth standards for the construction, addition, modification, and repair of buildings and other structures for the purpose of protecting the health, safety, and general welfare of the public.

Community Any state, area or political subdivision thereof, or any Indian tribe or tribal entity that has the authority to adopt and enforce statutes for areas within its jurisdiction.

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 points. A community's points can earn people in their community a discount on their flood insurance premiums.

Critical Facility Facilities that are critical to the health and welfare of the population and that are especially important during and after a hazard event. Critical facilities include, but are not limited to, shelters, hospitals, and fire stations.

Designated Floodway The channel of a stream and that portion of the adjoining floodplain designated by a regulatory agency to be kept free of further development to provide for unobstructed passage of flood flows.

Development Any man-made 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 or of equipment or materials.

Digitize To convert electronically points, lines, and area boundaries shown on maps into x, y coordinates (e.g., latitude and longitude, universal transverse mercator (UTM), or table coordinates) for use in computer

Disaster Mitigation Act (DMA) 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 new legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur.

Earthquake A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the earth's tectonic plates.

Elevation The raising of a structure to place it above flood waters on an extended support structure.

Emergency Operations Plan A document that: describes how people and property will be protected in disaster and disaster threat situations; details who is responsible for carrying out specific actions; identifies the personnel, equipment, facilities, supplies, and other resources available for use in the disaster; and outlines how all actions will be coordinated.

Erosion The wearing away of the land surface by running water, wind, ice, or other geological agents.

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 A general and temporary condition of partial or complete inundation of water over normally dry land areas from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.

Flood Disaster Assistance Flood disaster assistance includes development of comprehensive preparedness and recovery plans, program capabilities, and organization of Federal agencies and of State and local governments to mitigate the adverse effects of disastrous floods. It may include maximum hazard reduction, avoidance, and mitigation measures, as well policies, procedures, and eligibility criteria for Federal grant or loan assistance to State and local governments, private organizations, or individuals as the result of the major disaster.

Flood Elevation Elevation of the water surface above an establish datum (reference mark), e.g. National Geodetic Vertical Datum of 1929, North American Datum of 1988, or Mean Sea Level.

Flood Hazard Flood Hazard is the potential for inundation and involves the risk of life, health, property, and natural value. Two reference base are commonly used: (1) For most situations, the Base Flood is that flood which has a one-percent chance of being exceeded in any given year (also known as the 100-year flood); (2) for critical actions, an activity for which a one-percent chance of flooding would be too great, at a minimum the base flood is that flood which has a 0.2 percent chance of being exceeded in any given year (also known as the 500-year flood).

Flood Insurance Rate Map Flood Insurance Rate Map (FIRM) is an official map of a community, on which the Floodplain Administrator has delineated both the special hazard areas and the risk premium zones applicable to the community.

Flood Insurance Study Flood Insurance Study or Flood Elevation Study is an examination, evaluation and determination of flood hazards and, if appropriate, corresponding water surface elevations, or an examination, evaluations and determination of mudslide (i.e., mudflow) and/or flood-related' erosion hazards.

Floodplain A floodplain is the lowland adjacent to a river, lake, or ocean. Floodplains are designated by the frequency of the flood that is large enough to cover them. For example, the 10-year floodplain will be covered by the 10-year flood, the 100-year floodplain by the 100-year flood.

Floodplain Management The operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to emergency preparedness plans, flood control works and floodplain management regulations.

Floodplain Management Regulations Floodplain Management Regulations means zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as floodplain ordinance, grading ordinance and erosion control ordinance) and other applications of police power. The term describes such state or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction.

Flood Zones Zones on the Flood Insurance Rate Map (FIRM) in which a Flood Insurance Study has established the risk premium insurance rates.

Flood Zone Symbols

A - Area of special flood hazard without water surface elevations determined.

A1-30 - AE Area of special flood hazard with water surface elevations determined.

AO - Area of special flood hazard having shallow water depths and/or unpredictable flow paths between one and three feet.

A-99 - Area of special flood hazard where enough progress has been made on a protective system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes.

AH - Area of special flood hazard having shallow water depths and/or unpredictable flow paths between one and three feet and with water surface elevations determined.

B - X Area of moderate flood hazard.

C - X Area of minimal hazard.

D - Area of undetermined but possible flood hazard.

Geographic Information System (GIS) A computer software application that relates physical features of the earth to a database that can be used for mapping and analysis.

Governing Body The legislative body of a municipality that is the assembly of a borough or the council of a city.

Hazard A source of potential danger or adverse condition. Hazards in the context of this plan will include naturally occurring events such as floods, earthquakes, tsunami, coastal storms, landslides, and wildfires that strike populated areas. A natural event is a hazard when it has the potential to harm people or property.

Hazard Event A specific occurrence of a particular type of hazard.

Hazard Identification The process of identifying hazards that threaten an area.

Hazard Mitigation Any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards. (44 CFR Subpart M 206.401)

Hazard Mitigation Grant Program (HMGP) The program authorized under section 404 of the Stafford Act, which may provide funding for mitigation measures identified through the evaluation of natural hazards conducted under §322 of the Disaster Mitigation Act 2000.

Hazard Profile A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.

Hazard and Vulnerability Analysis The identification and evaluation of all the hazards that potentially threaten a jurisdiction and analyzing them in the context of the jurisdiction to determine the degree of threat that is posed by each.

Mitigate To cause something to become less harsh or hostile, to make less severe or painful.

Mitigation Plan A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in the State and includes a description of actions to minimize future vulnerability to hazards.

National Flood Insurance The Federal program, created by an act of Congress in Program (NFIP) 1968 that makes flood insurance available in communities that enact satisfactory floodplain management regulations.

One Hundred (100)-Year Flood The flood elevation that has a one-percent chance of occurring in any given year. It is also known as the Base Flood.

Planning The act or process of making or carrying out plans; the establishment of goals, policies, and procedures for a social or economic unit.

Repetitive Loss Property A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1000 each have been paid within any 10-year period since 1978.

Risk The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It can also be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Riverine Relating to, formed by, or resembling rivers (including tributaries), streams, creeks, brooks, etc.

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

Runoff That portion of precipitation that is not intercepted by vegetation, absorbed by land surface, or evaporated, and thus flows overland into a depression, stream, lake, or ocean (runoff, called immediate subsurface runoff, also takes place in the upper layers of soil).

Seiche An oscillating wave (also referred to as a seismic sea wave) in a partially or fully enclosed body of water. May be initiated by landslides, undersea landslides, long period seismic waves, wind and water waves, or a tsunami.

Seismicity Describes the likelihood of an area being subject to earthquakes.

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 the threat of a disaster is imminent. The state of disaster emergency shall continue until the governor finds that the threat or danger has passed or that the disaster has been dealt with to the extent that emergency conditions no longer exist and terminates the state of disaster emergency by executive order or proclamation.

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 to and from disaster areas. It is required before a Presidential Disaster Declaration can be requested.

Topography The contour of the land surface. The technique of graphically representing the exact physical features of a place or region on a map.

Tribal Government A Federally recognized governing body of an Indian or Alaska native Tribe, band, nation, pueblo, village or community that the Secretary of the Interior acknowledges to exist as an Indian tribe under the Federally Recognized Tribe List Act of 1994, 25 U.S.C. 479a. This does not include Alaska Native corporations, the ownership of which is vested in private individuals.

Tsunami A sea wave produced by submarine earth movement or volcanic eruption with a sudden rise or fall of a section of the earth's crust under or near the ocean. A seismic disturbance or landslide can displace the water column, creating a rise or fall in the level of the ocean above. This rise or fall in sea level is the initial formation of a tsunami wave.

Vulnerability Describes how exposed or susceptible to damage an asset it. Vulnerability depends on an asset's 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 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.

Watercourse A natural or artificial channel in which a flow of water occurs either continually or intermittently.

Watershed An area that drains to a single point. In a natural basin, this is the area contributing flow to a given place or stream.

Appendices

Public Involvement

The Planning Process

The Disaster Mitigation Act of 2000 requires the plan to follow and record the following elements:

1. Planning process
2. Hazard Identification
3. Risk Assessment
4. Mitigation Strategy with Goals, Objectives and Actions
5. Plan Maintenance
6. Adoption by local government
7. Approval from FEMA, and the State Department of Homeland Security and Emergency Management

For more information on mitigation planning you can visit FEMA's website at http://www.fema.gov/plan/mitplanning/index.shtm

Multi-Hazards Mitigation Planning

Disasters, such as avalanches, coastal erosion, earthquakes, floods, high winds, landslides, tsunamis, wildfires, and severe weather, are events beyond human control. However, reducing the risks and damage from these events through mitigation efforts is possible.

The Federal Emergency Management Agency (FEMA) wants to ensure that each community's critical facilities and services will continue to function after a natural disaster. FEMA has funds available for projects that help to do this.

Preparing a Multi-Hazards Mitigation Plan (MHMP) is the first step in this process. Through the planning process risks from each type of hazard are assessed, critical facilities are identified within the community and their vulnerability to hazard is determined, potential losses are estimated, and community land use is considered.

With this information, a mitigation strategy will be developed, including mitigation goals, objectives and actions to reduce or avoid long-term risk or damage from disaster events. Projects will be identified, evaluated and prioritized, and an implementation strategy developed.

The plan must be approved by the local government, FEMA, and the state Department of Homeland Security and Emergency Management (DHS&EM) before it is official.

Once the plan is finalized, the community is eligible to apply to FEMA and DHS&EM for funds for the community's identified

State DHS&EM sponsors planning effort in AEB

The Alaska Division of Homeland Security and Emergency Services has funded a multi-jurisdictional multi-hazards mitigation plan for the Aleutians East Borough (AEB). WHPacific, Inc. and Bechtol Planning and Development (BP&D) have been hired to help the community to prepare the plan.

The MHMP will include information specific to the **AEB, and the Cities of Sand Point, King Cove, Cold Bay, False Pass, and Akutan, and the Tribal Village of Nelson Lagoon** including critical facilities, potential threats from natural hazards, and strategies to minimize the risk to people and property.

Strategies may be for immediate implementation or long term activities, and can range from educating residents about what to do in the event of a natural disaster to relocating structures away from high-risk areas.

To Get Involved

The most practical plans are ones that have local public input. Your ideas are valuable to the planning team and to the usefulness of the plan. In the following months information will be sent out to the communities and public meetings will be held on the project. We are interested in which natural hazards are of most concern to the communities and any ideas on projects that could mitigate damage.

Your comments are welcome!

The planning team hopes that you will take an active role in the AEB MHMP development. If you would like more information or have questions or comments, you can reach the planning team by phone or email:

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AEB Comm. Dev. Coordinator
3380 C Street, Suite 205
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Ervin.Petty@alaska.gov

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1.800.427.4153, 907.339.6570
staylor@whpacific.com
Eileen Bechtol, AICP
Bechtol Planning & Development
907.235.4246
bechtol@pobox.xyz.net

Further information may also be found on the DHS&EM website at:

http://www.ak-prepared.com/plans/mitigation/mitplanresourcesa.htm

Planning Goals and Objectives

Mitigation is any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.

Primary goals of hazard mitigation are to:

- Minimize loss of life and injuries
- Minimize damages
- Restore public services
- Promote economic development

To attain these goals the Multi-Hazard Mitigation Plan will include mitigation projects to:

- Save lives and reduce injuries
- Prevent or reduce property damage

Awareness, education and preparedness, together with prediction and warning systems can reduce the disruptive impacts of natural disaster on communities

Further information may also be found on the DHS&EM website at:

http://www.ak-prepared.com/plans/mitigaton/mitplanresourcesa.htm

Mitigation is any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.

WHPacific

From: Laura Tanis [ltanis@aeboro.org]

Sent: Thursday, September 03, 2009 10:38 AM

To: 'Eileen R. Bechtol'

Subject: RE: AEB newsletter

Attachments: In the Loop Newsletter - May 15, 2009.pdf

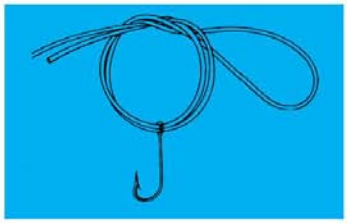
Hi Eileen.

Here is a copy of our newsletter, In the Loop. The AEB multi-hazard mitigation plan story appears on page 4.

We don't give out private email addresses, but in general, this newsletter was distributed to AEB residents and staff, the AEB school district employees, teachers and superintendent, fishermen in the region, the AEB Assembly and mayor, a few folks with the state (DOT employees and the legislative staff from Sen. Hoffman and Rep. Edgmon's office) and Eastern Aleutian Tribes employees.

Please let me know if they need anything else.

Thanks!



In the Loop

Bringing the Aleutians East Borough, the AEB School District and Eastern Aleutian Tribes together by sharing common goals.

Borough Launches Multi-Hazard Mitigation Planning Process

By Eileen Bechtol

AEB is working on a multi-hazard mitigation plan to ensure FEMA funds are available in the event of a disaster, such as a tsunami.

Disasters, such as avalanches, coastal erosion, earthquakes, floods, high winds, landslides, tsunamis, wildfires, and severe weather are events beyond human control. However, reducing the risks and damages from these events through mitigation efforts is possible. The Federal Emergency Management Agency (FEMA) wants to ensure that each community's critical facilities and services will continue to function after a natural disaster. FEMA has funds available for projects that can help to do this.

Preparing a Multi-Hazards Mitigation Plan (MHMP) is the first step in this process. Risks from each type of hazard are assessed, critical facilities are identified within the community and their vulnerability to hazard is determined. Potential losses are estimated, and community land use is considered. With this information, a mitigation strategy will be developed, including mitigation goals, objectives and actions to reduce or avoid long-term risk or damage from disaster events. Projects will be identified, evaluated and prioritized, and an implementation strategy will be developed.

The plan must be approved by the local government, FEMA, and the state Department of Homeland Security and Emergency Management (DHS&EM) before it is official. Once the plan is finalized, the community is eligible to apply to FEMA and DHS&EM for funds for the community's identified mitigation projects. The Alaska Division of Homeland Security and Emergency Services has funded a multi-hazards mitigation for the AEB. WHPacific, Inc. and

The planning team is interested in finding out which natural hazards, such as earthquakes, are of most concern to the communities.

Bechtol Planning and Development (BP&D) have been hired to help the community to prepare the plan.

The MHMP will include information specific to the AEB, and the Cities of Sand Point, King Cove, Cold Bay, False Pass, and Akutan, and the Tribal Village of Nelson Lagoon, including critical facilities, potential threats from natural hazards and strategies to minimize the risk to residents and property. Strategies may be for immediate implementation or for long-term activities. They can range from educating residents about what to do in the event of a natural disaster, to relocating structures away from high-risk areas.

Your ideas are valuable to the planning team. In the following months, information will be sent out to the communities and public meetings will be held on the project. We are interested in which natural hazards are of most concern to the communities and any ideas on projects that could mitigate damage. The planning team hopes that you will take an active role in the AEB MHMP development. If you would like more information or have questions or comments, you can reach the planning team by email or phone:

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Further information can be found on the DHS&EM website at:

http://www.ak-prepared.com/plans/mitigation/mitplanresourcesa.htm

Draft AEB Multi-Hazards Mitigation Plan - On Website

The Draft MHMP includes information specific to the **Communities of the AEB; Akutan, Cold Bay, False Pass, King Cove, Nelson Lagoon and Sand Point** regarding potential threats from natural hazards, and strategies to minimize the risk to people and property.

Strategies may be for immediate implementation or long term activities, and can range from educating residents about what to do in the event of a natural disaster to relocating structures away from high-risk areas.

The AEB has posted the Draft MHMP on its website at: www.aleutianseast.org.

If you have any written comments, please email Eileen Bechtol: bechtol@pobox.xyz.net and send copies of comments to the following community contacts:

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Mitigation is any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.

FEMA Crosswalk

To be filled out after final editing.

LOCAL MITIGATION PLAN REVIEW SUMMARY The plan cannot be approved if the plan has not been formally adopted. Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk. A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. Reviewer's comments must be provided for requirements receiving a **"Needs Improvement"** score.

Prerequisite(s) (Check Applicable Box)	**NOT MET**	**MET**
1. Adoption by the Local Governing Body: §201.6(c)(5) OR		
2. Multi-Jurisdictional Plan Adoption: §201.6(c)(5) **AND**		
3. Multi-Jurisdictional Planning Participation: §201.6(a)(3)		

Planning Process	**N**	**S**
4. Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)		

Risk Assessment	**N**	**S**
5. Identifying Hazards: §201.6(c)(2)(i)		
6. Profiling Hazards: §201.6(c)(2)(i)		
7. Assessing Vulnerability: Overview: §201.6(c)(2)(ii)		
8. Assessing Vulnerability: Addressing Repetitive Loss Properties. §201.6(c)(2)(ii)		
9. Assessing Vulnerability: Identifying Structures, Infrastructure, and Critical Facilities: §201.6(c)(2)(ii)(B)		**N/A**
10. Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)		**N/A**
11. Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)		**N/A**
12. Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii)		

*States that have additional requirements can add them in the appropriate sections of the *Local Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

SCORING SYSTEM

Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Mitigation Strategy	**N**	**S**
13. Local Hazard Mitigation Goals: §201.6(c)(3)(i)		
14. Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)		
15. Identification and Analysis of Mitigation Actions: NFIP Compliance. §201.6(c)(3)(ii)		
16. Implementation of Mitigation Actions: §201.6(c)(3)(iii)		
17. Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)		

Plan Maintenance Process	**N**	**S**
18. Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(ii)		
19. Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)		
20. Continued Public Involvement: §201.6(c)(4)(iii)		

PREREQUISITE(S)

1. Adoption by the Local Governing Body

***Requirement §201.6(c)(5)*:** *[The local hazard mitigation plan **shall** include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Has the local governing body adopted **new or updated** plan?				
B. Is supporting documentation, such as a resolution, included?				
		SUMMARY SCORE		

2. Multi-Jurisdictional Plan Adoption

***Requirement §201.6(c)(5)*:** *For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Does the **new or updated** plan indicate the specific jurisdictions represented in the plan?	**After pre-approval**			
B. For each jurisdiction, has the local governing body adopted the **new or updated** plan?				

C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?				
		SUMMARY SCORE		

3. Multi-Jurisdictional Planning Participation

Requirement §201.6(a)(3)**:** *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process … Statewide plans will not be accepted as multi-jurisdictional plans.*

Element	**Location in the Plan** (section or annex and page #)	**Reviewer's Comments**	**SCORE** NOT MET	**SCORE** MET
A. Does the **new or updated** plan describe **how** each jurisdiction participated in the plan's development?				
B. Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?		N/A – New Plan		N/A

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:*

(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and

(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): *[The plan **shall** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan provide a narrative description of the process followed to prepare the **new or updated** plan?				
B. Does the **new or updated** plan indicate who was involved in the **current** planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, *etc*.?)				

C. Does the **new or updated** plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)				
D. **Does the new or updated plan discuss the** opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?				
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?				
F. Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?		N/A – New Plan		N/A
		SUMMARY SCORE		

RISK ASSESSMENT: *§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

5. Identifying Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the type … of all natural hazards that can affect the jurisdiction.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include **a description** of the types of **all natural hazards** that affect the jurisdiction?				
		SUMMARY SCORE		

6. Profiling Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan **shall** include information on previous occurrences of hazard events and on the probability of future hazard events.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the risk assessment identify the location (i.e., geographic area affected) of each natural hazard addressed in the new or updated plan?				
B. Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in				

the new or updated plan?				
C. Does the plan provide information on previous occurrences of each hazard addressed in the new or updated plan?				
D. Does the plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the new or updated plan?				
		SUMMARY SCORE		

7. Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): *[The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.*

Element	**Location in the Plan** (section or annex and page #)	**Reviewer's Comments**	**SCORE**	
			N	**S**
A. Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?				
B. Does the new or updated plan address the impact of each hazard on the jurisdiction?				
		SUMMARY SCORE		

8. Assessing Vulnerability: Addressing Repetitive Loss Properties

Requirement §201.6(c)(2)(ii): *[The risk assessment]* ***must*** *also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?				
		SUMMARY SCORE		

9. Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): *The plan* ***should*** *describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area … .*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?				N/A

B. Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?				N/A
			SUMMARY SCORE	N/A

10. Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): *[The plan **should** describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate … .*

Element	**Location in the Plan** (section or annex and page #)	**Reviewer's Comments**	**SCORE**	
			N	**S**
A. Does the new or updated plan estimate potential dollar losses to vulnerable structures?				N/A
B. Does the new or updated plan describe the methodology used to prepare the estimate?				N/A
		SUMMARY SCORE		N/A

11. Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): *[The plan **should** describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the new or updated plan describe land uses and development trends?				N/A
		SUMMARY SCORE		N/A

12. Multi-Jurisdictional Risk Assessment

Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?				
		SUMMARY SCORE		

MITIGATION STRATEGY: *§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

13. Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy **shall** include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A Does the **new or updated** plan include a description of mitigation **goals** to reduce or avoid long-term vulnerabilities to the identified hazards?				
		SUMMARY SCORE		

14. Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): *[The mitigation strategy **shall** include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan identify and analyze a **comprehensive range** of specific mitigation actions and projects for each hazard?				
B Do the identified actions and projects address reducing the effects of hazards on **new** buildings and				

infrastructure?				
C. Do the identified actions and projects address reducing the effects of hazards on **existing** buildings and infrastructure?				
		SUMMARY SCORE		

15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Requirement: §201.6(c)(3)(ii): *[The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.*

Element	**Location in the Plan** (section or annex and page #)	**Reviewer's Comments**	**SCORE** N	**SCORE** S
A. Does the new or updated plan describe the jurisdiction (s) participation in the NFIP?				
B. Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?				
		SUMMARY SCORE		

16. Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): *[The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)				
B. Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department , existing and potential resources and the timeframe to complete each action?				
C. Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?				
D. Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?		N/A – New Plan		N/A
		SUMMARY SCORE		

17. Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?				
B. Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?		N/A – New Plan		N/A
		SUMMARY SCORE		

PLAN MAINTENANCE PROCESS

18. Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): *[The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S

A. Does the new or updated plan describe the method and schedule for monitoring the plan, including the responsible department?				
B. Does the new or updated plan describe the method and schedule for evaluating the plan, including how, when and by whom (i.e. the responsible department)?				
C. Does the new or updated plan describe the method and schedule for updating the plan within the five-year cycle?				
		SUMMARY SCORE		

19. Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): *[The plan **shall** include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

Element	**Location in the Plan** (section or annex and page #)	**Reviewer's Comments**	**SCORE** N	**SCORE** S
A. Does the new or updated plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?				
B. Does the new or updated plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when				

appropriate?				
C. Does the updated plan explain how the local government incorporated the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?		N/A – New Plan		N/A
		SUMMARY SCORE		

Continued Public Involvement

Requirement §201.6(c)(4)(iii): *[The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.*

Element	**Location in the Plan** (section or annex and page #)	**Reviewer's Comments**	**SCORE**	
			N	**S**
A. Does the new or updated plan explain how continued public participation will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)				
		SUMMARY SCORE		

END OF REVIEW