2010

City & Borough of Sitka Multi-Hazard Mitigation Plan

April 20, 2010

Prepared by
The City & Borough of Sitka

WHPacific

Bechtol Planning & Development

Acknowledgements

City & Borough of Sitka Assembly
Scott McAdams, Mayor
Larry Crews
Phyllis Hackett
Mim McConnell
Jack Ozment, Vice Deputy Mayor
Reber Stein
Cheryl Westover

Sitka Planning and Zoning Commission
Robert Alexander
Jeremy Twaddle
Brian McNitt
Larry Crews
Richard Parmelee

Local Emergency Planning Committee
Dave Miller, Fire Chief
Barry Allen, Police Lieutenant
Members from each category:
Elected local officials
Law Enforcement
Media/Broadcast
Community Groups
Owners/Operators of Facilities
Community Members
LEPC Information Coordinator/SERC liaison

City & Borough of Sitka Staff
Jim Dinley, Municipal Administrator
Dave Miller, Fire Chief
City & Borough of Sitka
100 Lincoln Street
Sitka, AK 99835
(907) 747-3294
http://www.cityofsitka.com/
Email: davem@cituyofsitka.com

Consultants
WHPacific, Inc.
Suzanne Taylor, Project Manager
300 West 31st Avenue
Anchorage, Alaska 99503
Phone: 1-800-478-4153 or (907) 339-6500
Email: staylor@whpacific.com

Bechtol Planning and Development
Eileen R. Bechtol, AICP
P.O. Box 3426
Homer, Alaska 99603
Phone: (907) 399-1624
Email: bechtol@pobox.xyz.net

Technical Assistance
Ervin Petty, Alaska State DHS&EM

Photography
Cover: Sitka Tsunami Evacuation Sign
Photos: WHPacific, Inc.
City & Borough of Sitka

The preparation of this plan was financed by funds from a grant from the Alaska Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency.

U.S. Department of Homeland Security
Region X
130 228th Street, SW
Bothell, WA 98021-9796

FEMA

April 20, 2010

Honorable Scott McAdams
Mayor, City of Sitka
100 Lincoln St.
Sitka, Alaska 99835

Dear Mayor McAdams:

The U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) has approved the ***City of Sitka Hazard Mitigation Plan*** as a local plan as outlined in 44 CFR Part 201. With approval of this plan, the city of Sitka is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through April 20, 2015.

The plan's approval provides eligibility to apply for hazard mitigation projects through your State. All requests for funding will be evaluated individually according to the specific eligibility and other requirements of the particular program under which the application is submitted. For example, a specific mitigation activity or project identified in the plan may not meet the eligibility requirements for FEMA funding, and even eligible mitigation activities are not automatically approved for FEMA funding under any of the aforementioned programs.

Over the next five years, we encourage your community to follow the plan's schedule for its monitoring and updating, and to develop further mitigation actions. The plan must be reviewed, revised as appropriate, and resubmitted for approval within five years in order to continue project grant eligibility.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact our State counterpart, Alaska Division of Homeland Security and Emergency Management, which coordinates and administers these efforts for local entities.

Sincerely,

Mark Carey, Director
Mitigation Division

cc: Mark Roberts, Alaska Division of Homeland Security and Emergency Management

Enclosure

KM:bb

CITY AND BOROUGH OF SITKA

RESOLUTION NO. 2010-07

A RESOLUTION OF THE CITY AND BOROUGH OF SITKA ADOPTING THE CITY AND BOROUGH OF SITKA LOCAL MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City and Borough of Sitka recognizes 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 Local Multi-Hazard Mitigation Plan is required as a condition of future grant funding for mitigation projects; and

WHEREAS, the Sitka Local 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 Assembly of the City and Borough of Sitka, Alaska hereby adopts the City and Borough of Sitka Local Multi-Hazard Mitigation Plan as an official plan; and

BE IT RESOLVED, that the City and Borough will submit the adopted Local Multi-Hazard Mitigation Plan to the Alaska Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency officials for final review and approval.

PASSED, APPROVED AND ADOPTED by the assembly of the City and Borough of Sitka, Alaska on this 23 day of February 2010.

Jack Ozment, Deputy Mayor

ATTEST:

Colleen Ingman, MMC
Municipal Clerk

Table of Contents

List of Maps

List of Tables

List of Figures

Acronyms

AEIC	Alaska Earthquake Information Center
AEIS	Alaska Economic Information System
AOR	Area of Responsibility
CFR	Code of Federal Regulations
DART	Deep Ocean Assessment and Reporting Tsunamis
DCCED	(Alaska) Department of Commerce, Community and Economic Development
DCRA	(DCCED) Division of Community and Regional Affairs
DHS&EM	(Alaska) Division of Homeland Security and Emergency Management
DGGS	(Alaska) Division of Geological and Geophysical Surveys
DNR	(Alaska) Department of Natural Resources
DOT&PF	(Alaska) Department of Transportation & Public Facilities
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
FEMA	Federal Emergency Management Agency
HMP	Hazard Mitigation Plan
HMPG	Hazard Mitigation Planning Grant
LEPC	Local Emergency Planning Committee
MHMP	Multi-Hazard Mitigation Plan
NFIP	National Flood Insurance Program
NOAA	National Oceanographic and Atmospheric Administration
NTHMP	National Tsunami Hazard Mitigation Program
NWS	National Weather Service
PDM	Pre Disaster Mitigation
SBA	Small Business Administration
SERC	State Emergency Response Commission
SMHMP	Sitka Multi-Mitigation Hazard Plan
UAF	University of Alaska, Fairbanks
USGS	U.S. Geological Survey
WCATWC	West Coast and Alaska Tsunami Warning Center

Chapter 1. Planning Process and Methodology

Introduction

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).

Local Mitigation Plan regulations are found in the Code of Federal Regulations (CFR) at 44 CFR Part 201. This plan has been developed using the regulations to ensure compliance with federal criteria.

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. It is not intended to help jurisdictions establish procedure to respond to disasters or write an emergency operations plan. The goal of mitigation is to decrease the need for response as opposed to increasing response capability (FEMA 386-8).

The City & Borough of Sitka is a unified city and borough, organized under a home rule charter. It was first adopted in October 1960 and has been amended eight times since that date, most recently in 2002. Any amendments to the Charter must be approved by a public vote. The Sitka Charter may be viewed on the City & Borough website at http://www.cityofsitka.com/clerk/clerk.html.

The boundaries of the municipality are the same as the boundaries of the Greater Sitka Borough. This plan is a multi-hazard single jurisdiction plan.

The scope of Sitka Multi-Hazard Mitigation Plan (SMHMP) is natural hazards: ***flooding/erosion, earthquake, snow avalanche, tsunami, severe weather, and ground failure*** hazards. However, some of the mitigation projects for natural hazards would also mitigate impacts from manmade hazards, such as technological and economic hazards.

The City & Borough of Sitka Local Multi-Hazard Mitigation Plan (MHMP) includes information to assist the borough government and residents with planning to avoid potential future disaster losses. The plan provides information on natural hazards that affect Sitka, descriptions of previous disasters, and lists projects that may help the community prevent disaster losses. The plan was developed to help the community of Sitka make decisions regarding natural hazards that affect City & Borough.

Plan Development

Location

The City & Borough of Sitka is located off the mainland on Baranof Island, in Sitka Sound facing the Pacific Ocean. Located approximately 95 miles southwest of Juneau, and 185 miles northwest of Ketchikan; it lies approximately 57.053060° North Latitude and -135.330° West Longitude. Sitka is located in the Sitka Recording District. The area encompasses 2,874 square miles of land and 1,937.5 square miles of water. The Borough of Sitka is located on the west side of the Alexander Archipelago. The Borough encompasses Baranof Island and the southern half of Chichagof Island; an area of approximately 4,710 square miles.
The Borough is completely within the Tongass National Forest.

Project Staff

The City & Borough of Sitka contact person for the SMHMP and was Dave Miller, Fire Chief, and Wells William, Planning Director facilitated coordination with the Planning Commission. WHPacific and Bechtol Planning & Development were hired by the State to write the plan.

Mark Roberts and Ervin Petty of the Division of Homeland Security & Emergency Management (DHS&EM) provided technical assistance and reviewed the drafts of this plan.

Plan Research

The plan was developed utilizing existing Sitka plans and studies as well as outside information and research. Sources are credited in parenthesis after their inclusion and in the bibliography.

1. *Alaska All-Hazard Risk Mitigation Plan*. Prepared by and for DHS&EM. October 2007

2. *Alaska DHS&EM Disaster Cost Index*. Prepared by and for DHS&EM. 2008

3. *City & Borough Comprehensive Plan Update*. Prepared by and for City & Borough of Sitka. 2007.

4. *City & Borough of Sitka Legislative Request FY 2009*. City & Borough of Sitka. January 2008.

5. *Coastal Management Plan, Revised*. Prepared by LaRoche + Associates for the Sitka and Borough of Sitka. April 7, 2008.

6. *Division of Community and Regional Affairs (DCRA) Community Information*: http://www.commerce.state.ak.us/dca/commdb/CF_BOCK.htm.

7. *Emergency Operations Plan*. Prepared by City & Borough of Sitka. December 2003.

8. *Federal Emergency Management Agency (FEMA) How to Guides:*

- Getting Started: Building Support For Mitigation Planning (FEMA 386-1)
- Local Multi-Hazard Mitigation Planning Guidance, July 1, 2008 (FEMA 386-8)
- 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)

9. *Tsunami Hazard Mapping of Alaska Coastal Communities*, Alaska GEO Survey News, Vol. 6, No. 2, Prepared by DGGS, June 2002.

10. *University of Alaska, Fairbanks, and Alaska Earthquake Information Center* website at: http://www.giseis.alaska.edu/Seis/

11. USGS Earthquake Probability Mapping: **Error! Hyperlink reference not valid.**

12. West Coast and Alaska Tsunami Warning Center, NOAA, http://wcatwc.arh.noaa.gov/

General Hazard Planning Websites

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 public meeting on the SMHMP was held on April 15, 2008, in collaboration with the Sitka Borough Planning Commission, Sitka Fire Chief, and City and Borough employees. The public was noticed regarding the meeting using the Borough's usual noticing procedures. A copy of the meeting agenda and minutes is in the Appendix.

The Sitka Local Emergency Planning Committee (LEPC) reviewed the plan and provided revisions that were incorporated into the plan. The LEPC is a community wide group with the following composition:

Local Emergency Planning Committee
Dave Miller, Fire Chief, Chair
Barry Allen, Police Lieutenant
Mayor Scott McAdams, Assembly Liaison
The following groups are represented on the committee:
Leslie Wood, Coast Guard
Ken Coffin, Forest Service
Penny Lehmann, SEARHC Hospital
Kathy Ingallinera, Sitka Community Hospital
Sitka Tribe of Alaska
Ken Pate, Radio Station
Trish White, Pharmacist
University of Alaska
Gwen Lazzarini, Public Member
Barry Allen, Police Officer
Mark Branson, Banking Representative
LEPC Information Coordinator/State Emergency Response Commission (SERC) liaison

In addition a copy of the SMHMP draft was available for public perusal at the Fire Department and the final plan will be available for public information on the Borough website: http://cityofsitka.com.

The appendix includes a copy of the Sitka Community Newsletter which was posted at local governmental offices, businesses, City Library and at the Borough City Hall. The newsletter was also sent to the Chamber of Commerce, school board and other interested parties.

All meetings were advertised and open to the public, using normal public noticing procedures of the Borough.

All comments and/or revisions were incorporated into the plan.

The Sitka Assembly will review and approve the plan after pre-approval by DHS&EM and FEMA.

Plan Implementation

The City & Borough of Sitka Assembly will be responsible for adopting the Sitka MHMP and all future updates. This governing body has the authority to promote sound public policy regarding hazards. The Hazard Mitigation Plan will be assimilated into other Sitka plans and documents as they come up for review according to each plans' review schedule.

Table 1. Sitka Plans

Document	Completed	Next Review
Sitka Comprehensive Plan	1999/Updated 2007	2012
Sitka Legislative Priorities	FY 2009	Annually
Emergency Operations Plan	2003	2012
Southeast Alaska Transportation Plan	2004	2012
Revised Sitka Coastal Management Plan	2007	2012
Sitka Non-Motorized Transportation Plan	2002	As needed
Sitka Trail Plan	2003	As needed
City & Borough of Sitka Land Management Program	1996	As needed

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 City & Borough of Sitka Manager or designee is responsible for monitoring the plan. On an annual basis, the Borough Manager will request a report from the agencies and departments responsible for implementing the mitigation projects in Chapter 4 of the plan. The compiled report will be provided to the Planning Commission and Assembly 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 Borough Manager or designee 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:

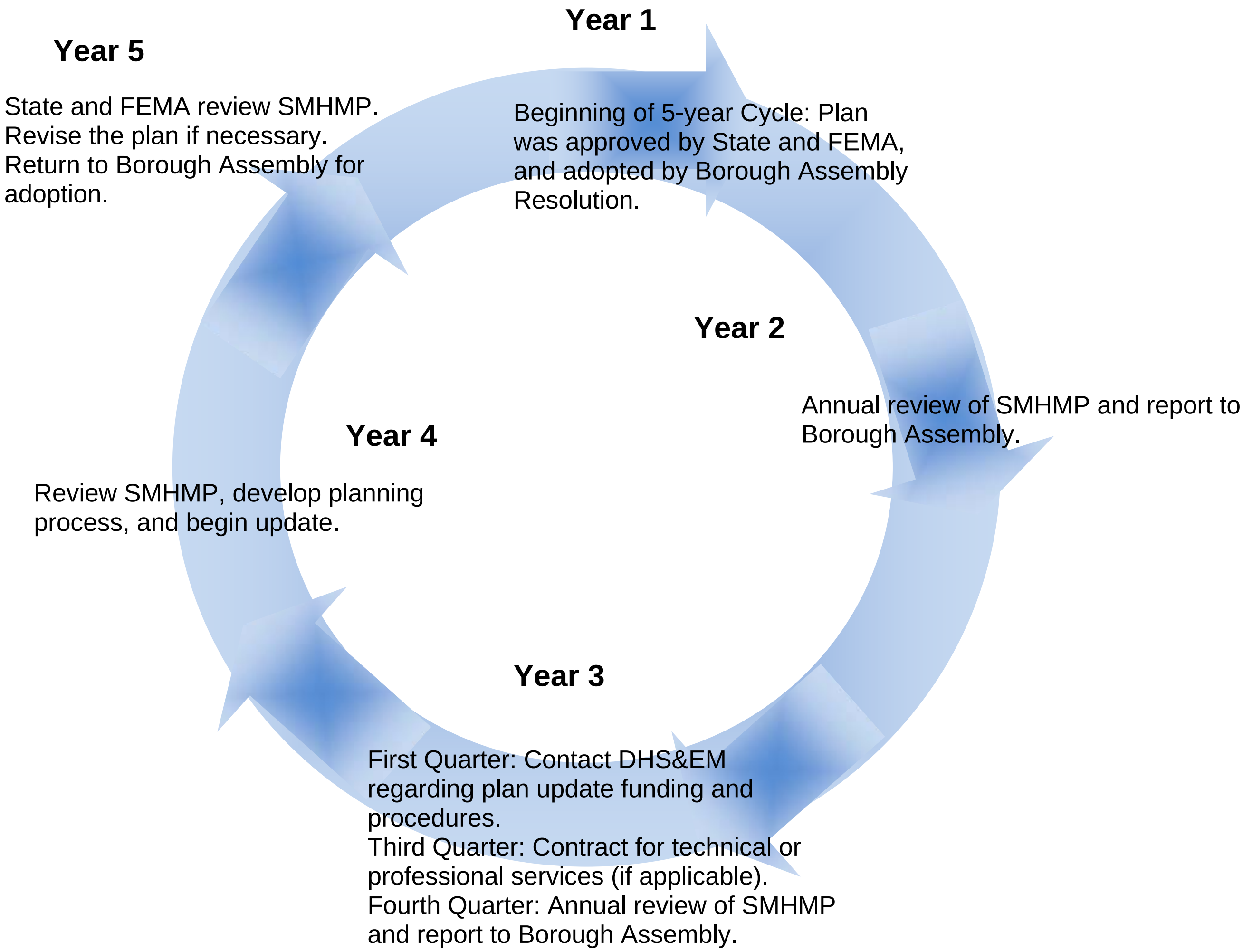
- The goals and objectives address current and expected conditions.
- The nature, magnitude and/or types of risks have changed.
- The current resources are appropriate for implementing the mitigation projects in Chapter 4.
- There are implementation problems, such as technical, political, legal or coordination 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.

Figure 1. Plan Review Schedule



Continued Plan Development

The Sitka MHMP will be further developed as funding and time allow. Additional hazards not currently covered in the plan, including technological and manmade hazards, will be added, if funding becomes available during the next five-year update cycle.

The plan will be updated every 5 years or as required by DHS&EM.

The Planning Director will be responsible for updating and maintaining the plan by adding additional hazards and completing vulnerability assessments for existing hazard chapters.

Table 2. Continued Plan Development below lists the schedule for completion of these tasks, provided that funds are available to do so:

Table 2. Continued Plan Development

Hazard	Status	Hazard Identification Completion Date	Vulnerability Assessment Completion Date
Flood/Erosion	Completed	2009	2009
Earthquake	Completed	2009	2009
Snow Avalanche	Completed	2009	2009
Tsunami	Completed	2009	2009
Severe Weather	Completed	2009	2009
Ground Failure	Completed	2009	2009
Economic	Future Addition	2013	2015
Technological	Future Addition	2013	2015
Public Health Crisis	Future Addition	2013	2015

Continued Public Involvement

The following methods will be used for continued public involvement.

A copy of the MHMP will be put online at the city website: http://www.cityofsitka.com/reports.html

Places where the hazard plan will be kept:

- Planning Department
- Fire Department
- Public Works Department
- City & Borough Clerk's Office
- Library

On an annual basis the Planning Commission will review the plan, which will be advertised to the public using the same method established under the public involvement section of this plan.

Chapter 2: Community Profile

Section 1. Community Overview

Current Population:	8,833 (2006 DCCED Certified Population)
Pronunciation:	SIT-kuh
Incorporation Type:	Unified Home Rule Municipality
Borough:	Sitka Borough
Census Area:	Sitka

Map 1. Regional Map

Table 3. Community Information

Community Information	Contact Information and Type
City & Borough of Sitka	100 Lincoln St. Sitka, AK 99835 Phone: (907) 747-3294 Fax: (907) 747-7403 Email: colleen@cityofsitka.com Web: http://www.cityofsitka.com
Borough	City & Borough of Sitka
Village Corporation	Shee Atika, Incorporated 315 Lincoln St. #300 Sitka, AK 99835 Phone: (907) 747-3534 Fax: (907) 747-5727 Email: faleene@sheeatika.com Web: http://www.sheeatika.com
Village Council	Sitka Tribe of Alaska 456 Katlain St. Sitka, AK 99835 Lawrence Widmark, Jr., Chairman Phone: (907) 747-3207 Fax: (907) 747-4915 Email: webmaster@sitkatribe.org Web: http://www.sitkatribe.org
Regional Native Corporation:	Sealaska Corporation 1 Sealaska Plaza, Suite 400 Juneau, AK 99801 Phone: (907) 586-1512 Fax: (907) 586-2304 Web: http::www.sealaska.com
Census Area	Sitka
Regional Development	Sitka Economic Development Assoc. 329 Harbor Drive #212 Sitka, AK 99835 Jonathan Krebs, Executive Director Phone: (907) 747-2660 Fax: (907) 747-7688 Email: info@sitka.net Web: http://www.sitka.net

Source: DCRA website information, April 2008

History

Originally called “Shee Atika,” Sitka was inhabited by a Tlingit tribe. Russian explorer Vitus Bering “discovered” Sitka in 1741. The site became known as “New Archangel” in 1799. During the 1802 Battle of Sitka, local Tlingits burned and looted St. Michael

Redoubt fort and trading post built by Russian Alexander Baranof, manager of the Russian-American Company. In retaliation, the Russians destroyed the Tlingit Fort in 1804. The Battle of Sitka was the Tlingit's last stand against the Russians, after which, Tlingits evacuated the area until about 1822. In 1808, Sitka was the capital of Russian Alaska and home to a major fur trade port on the north Pacific coast. Salmon, lumber and ice were also exported to Hawaii, Mexico and California.

In 1867, the U.S. purchased Alaska from Russia. Sitka remained the Territory's capital until 1906, when the capital was moved to Juneau. The first canneries in Alaska were built in Sitka in 1878. That same year Presbyterian missionary, Sheldon Jackson, opened Sitka's first school. In the early 1900s, gold mines spurred Sitka's growth and in 1913 the City was incorporated.

World War II brought a naval air base and 30,000 military personnel to Japonski Island across the harbor from Sitka. The Bureau of Indian Affairs (BIA) converted some of the base's buildings into Mt. Edgecumbe High School, an Alaska Native boarding school, after the war. The U.S. Coast Guard now maintains the rest of the air station.

Culture

Nearly a quarter of Sitka's residents are Alaska Native. Tlingit and Russian culture still influence modern day Sitka.

Population

The population of Sitka consists primarily of Caucasians. Approximately 25 percent of the residents are Alaska Native or partially Native. During the 2000 U.S. Census, total-housing units numbered 3,650, with 372 vacant housing units. Housing units vacant due to seasonal use totaled 169.

Economy

Fishing, tourism, government, transportation, retail and health care services drive Sitka's economy. There are 586 residents who hold commercial fishing permits. Seasonal employees process fish. Over 200,000 tourists arrive in Sitka via cruise ships annually, helping to drive the economy. Regional health and government services employ a significant number of residents. Sitka's potential work force is 6,700 of which 4,567 are employed, resulting in a 7.8 percent unemployment rate. The median household income is $51,901; per capita income is $23,622 and 7.8 percent of Sitka's residents live below the poverty line.

Facilities

Water is drawn from a reservoir on Blue Lake and Indian River. The water is treated, stored and piped to 95 percent of Sitka's homes. The system has a maximum capacity of 8.6 million gallons per day, with a storage capacity of 197 million gallons. Refuse is collected by a city-contracted private firm and disposed of in a class 2, lined landfill. Sitka has an aggressive recycling program that covers common items such as tin, aluminum, glass, and paper, as well as batteries, used oil, packing materials, film and printer cartridges. A public sewer system serves 89.5 percent of Sitka's residents. Electricity is generated by borough-owned hydroelectric facilities at Blue and Green Lakes and a diesel-fueled generator at Indian River.

Transportation

Sitka Borough has a total of 35.2 miles of paved roads and 4.3 miles of unpaved roads. The national highway system within the borough covers 13.8 miles. Local paved roads account for the other 21.4 miles. The Rocky Gutierrez Airport is state owned and has a 6,500-foot-long by 150-foot-wide paved and lighted runway. The airport, located on Japonski Island, has an instrument landing system and a 24-hour FAA Flight Service Station. Daily jet service, air taxis, charters and helicopter services are available. The City & Borough operate five small boat harbors and a seaplane base. Larger cruise ships anchor in the Harbor and lighter visitors to shore. The Alaska Marine Highway System and the fast ferry M/V Fairweather also serve Sitka.

Climate

Mild temperatures and heavy precipitation characterize Sitka's climate. The average low temperature during the winter is 23º to 25º Fahrenheit (F); the average high during the summer is 48º to 61ºF. Temperature extremes have been measured from 0º to 88ºF. Snowfall averages 39 inches, with total precipitation of 96 inches per year.

Vegetation and Soil

Sitka sits atop soil that is stable when undisturbed but changes to a fluid or jelly when shaken or agitated. The soil contains a considerable amount of volcanic ash from an eruption of the Kruzof Island volcanoes about 10,000 years ago. In stream valleys where ash has been washed away Alluvium is present. Sitka also has several low, wet muskeg bogs.

Section 2. Sitka Capability Assessment

Government

This section outlines the resources available to the City & Borough of Sitka and its communities for mitigation and mitigation-related activities.

The City & Borough of Sitka is organized under a home rule charter. It was first adopted in October 1960 and has been amended eight times since that date, most recently in 2002. Any amendments to the Charter must be approved by a vote of the public. The Sitka Charter may be viewed on the City & Borough website.

The City & Borough of Sitka Assembly consists of a mayor and six council members, elected by the citizens in Sitka. The vice mayor is selected to serve a one-year term from among the council members shortly after the elections. Municipal elections are held the first Tuesday of October and each council member elected serves a three-year term. The Council meets for regularly scheduled meetings the first and third Tuesdays of each month.

Local Resources

Sitka has a number of planning and land management tools that will allow it to implement hazard mitigation activities. The resources available in these areas have been assessed by the Borough, and are summarized in Tables 4, 5 and 6.

Table 4. Legal and Technical Capability

Regulatory Tools (ordinances, codes, plans)	Local Authority (Yes/No)	Year of Most Recent Update
Building code	Yes	
Zoning ordinance	Yes	2002
Subdivision ordinance or regulations	Yes	2002
Special purpose ordinances (floodplain management, stormwater management, hillside or steep slope ordinances, wildfire ordinances, hazard setback requirements)	Flood Plain Regulations 1982	Need new FIRMs
Growth management ordinances (also called “smart growth” or anti-sprawl programs)	No	
Site plan review requirements	No	
Comprehensive plan	Yes	2007
A capital improvements plan	Yes	Annually
An economic development plan	No	
An emergency response plan	Yes	2003
A post-disaster recovery plan	No	
Real estate disclosure requirements	No	

Table 5. Sitka Staff Resources

Staff/Personnel Resources	Yes/No	Department/Agency and Position
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Yes	Two building officials One building maintenance supervisor
Planners or Engineer(s) with an understanding of natural and/or human-caused hazards	Yes	City engineer
Floodplain manager	Yes	Building official
Surveyors	No	Not a Staff Position
Staff with education or expertise to assess the community's vulnerability to hazards	No	None
Personnel skilled in GIS and/or HAZUS	Yes	Planning Director, GIS coordinator
Scientists familiar with the hazards of the community	No	None
Emergency manager	No	Fire Chief
Grant writers	No	None

Table 6. Fiscal Capability

Financial Resources	Accessible or Eligible to Use (Yes or No)
Community Development Block Grants (CDBG)	Yes
Capital improvements project funding	Yes
Authority to levy taxes for specific purposes	Yes
Fees for sewer	Yes
Impact fees for homebuyers or developers for new developments/homes	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax and revenue bonds	Yes
Incur debt through private activity bonds	No
Withhold spending in hazard-prone areas	No

State Resources

- **Alaska DHS&EM** is responsible for coordinating all aspects of emergency management for the State of Alaska. Public education is one of its identified main categories for mitigation efforts.

  Improving hazard mitigation technical assistance for local governments is another high priority list item for the State of Alaska. Providing hazard mitigation training, current hazard information, and the facilitation of communication with other agencies encourages local hazard mitigation efforts. DHS&EM provides resources for mitigation planning on their website at http://www.ak-prepared.com.

- **DCCED/DCRA:** Provides training and technical assistance on all aspects of the National Flood Insurance Program (NFIP) and flood mitigation.

- **Division of Senior Services:** Provides special outreach services for seniors, including food, shelter and clothing.

- **Division of Insurance:** Provides assistance in obtaining copies of policies and provides information regarding filing claims.

- **Department of Military and Veterans Affairs:** Provides damage appraisals and settlements for VA-insured homes, and assists with filing of survivor benefits.

Federal Resources

The federal government requires local governments to have hazard mitigation plans in place to be eligible for funding opportunities through FEMA such as the Pre-Disaster Mitigation Assistance Program and the Hazard Mitigation Grant Program. The Mitigation Technical Assistance Programs available to local governments are also a valuable resource. FEMA may provide temporary housing assistance through rental assistance, mobile homes, furniture rental, mortgage assistance, and emergency home repairs. The Disaster Preparedness Improvement Grant also promotes educational opportunities with respect to hazard awareness and mitigation.

FEMA, through its Emergency Management Institute, offers training in many aspects of emergency management, including hazard mitigation. FEMA has also developed a large number of documents that address implementing hazard mitigation at the local level. Five key resource documents are available from FEMA Publication Warehouse (1-800-480-2520) and are briefly described below:

- **How-to Guides:** FEMA has developed a series of how-to guides to assist states, communities, and tribes in enhancing their hazard mitigation planning capabilities. The first four guides mirror the four major phases of hazard mitigation planning used in the development of the Sitka Hazard Mitigation Plan. The last five how-to guides address special topics that arise in hazard mitigation planning such as conducting cost-benefit analysis and preparing multi-jurisdictional plans. The use of worksheets, checklists, and tables make these guides a practical source of guidance to address all stages of the hazard mitigation planning process. They also include special tips on meeting Disaster Mitigation Act (DMA) 2000 requirements (http://www.fema.gov/fima/planhowto.shtm).

- **Post-Disaster Hazard Mitigation Planning Guidance for State and Local Governments.** FEMA DAP-12, September 1990. This handbook explains the basic concepts of hazard mitigation and shows state and local governments how they can develop and achieve mitigation goals within the context of FEMA's post-disaster hazard mitigation planning requirements. The handbook focuses on approaches to mitigation, with an emphasis on multi-objective planning.

- **Mitigation Resources for Success CD.** FEMA 372, September 2001. This CD contains information about mitigation and is useful for state and local government planners and other stakeholders in the mitigation process. It provides mitigation case studies, success stories, information about Federal mitigation programs, suggestions for mitigation measures to homes and businesses, appropriate relevant mitigation publications, and contact information.

- **A Guide to Federal Aid in Disasters.** FEMA 262, April 1995. When disasters exceed the capabilities of state and local governments, the President's disaster assistance program (administered by FEMA) is the primary source of federal assistance. This handbook discusses the procedures and process for obtaining this assistance, and provides a brief overview of each program.

- **The Emergency Management Guide for Business and Industry.** FEMA 141, October 1993. This guide provides a step-by-step approach to emergency management planning, response, and recovery. It also details a planning process that businesses can follow to better prepare for a wide range of hazards and emergency events. This effort can enhance a business's ability to recover from financial losses, loss of market share, damages to equipment, and product or business interruptions. This guide could be of great assistance to Sitka businesses.

Other federal resources include:

- **Department of Agriculture.** Assistance provided includes: Emergency Conservation Program, Non-Insured Assistance, Emergency Watershed Protection, Rural Housing Service, Rural Utilities Service, and Rural Business and Cooperative Service.

- **Department of Energy, Office of Energy Efficiency and Renewable Energy, Weatherization Assistance Program.** This program minimizes the adverse effects of high energy costs on low-income, elderly, and handicapped citizens through client education activities and weatherization services such as an all-around safety check of major energy systems, including heating system modifications and insulation checks.

- **Department of Housing and Urban Development, Office of Homes and Communities, Section 108 Loan Guarantee Programs.** This program provides loan guarantees as security for federal loans for acquisition, rehabilitation, relocation, clearance, site preparation, special economic development activities, and construction of certain public facilities and housing.

- **Department of Housing and Urban Development, Community Development Block Grants.** Administered by Alaska Department of Commerce, Community and Economic Development (DCCED) DCRA. Provides grant assistance and technical assistance to aid communities in planning activities that address issues detrimental to the health and safety of local residents, such as housing rehabilitation, public services, community facilities, and infrastructure improvements that would primarily benefit low-and moderate-income persons.

- **Department of Labor, Employment and Training Administration, Disaster Unemployment Assistance.** Provides weekly unemployment subsistence grants for those who become unemployed because of a major disaster or emergency. Applicants must have exhausted all benefits for which they would normally be eligible.

- **Federal Financial Institutions.** Member banks of FDIC, FRS or FHLBB may be permitted to waive early withdrawal penalties for Certificates of Deposit and Individual Retirement Accounts.

- **Internal Revenue Service, Tax Relief.** Provides extensions to current year tax return, allows deductions for disaster losses, and allows amendment of previous tax returns to reflect loss back to three years.

- **United States Small Business Administration.** May provide low-interest disaster loans to individuals and businesses that have suffered a loss due to a disaster. Requests for SBA loan assistance should be submitted to the Alaska Division of Homeland Security and Emergency Management.

Other resources: The following are websites that provide focused access to valuable planning resources for communities interested in sustainable development activities.

- **Federal Emergency Management Agency,** http://www.fema.gov – includes links to information, resources, and grants that communities can use in planning and implementation of sustainable measures.

- **American Planning Association,** http://www.planning.org – a non-profit professional association that serves as a resource for planners, elected officials, and citizens concerned with planning and growth initiatives.

- **Institute for Business and Home Safety,** http://ibhs.org – an initiative of the insurance industry to reduce deaths, injuries, property damage, economic losses, and human suffering caused by natural disasters. Online resources provide information on natural hazards, community land use, and ways citizens can protect their property from damage.

Other Funding Sources and Resources

- **Real Estate Business.** State law for properties within flood plains requires real estate disclosure.

- **American Red Cross.** Provides for the critical needs of individuals such as food, clothing, shelter, and supplemental medical needs. Provides recovery needs such as furniture, home repair, home purchasing, essential tools, and some bill payment may be provided.

- **Crisis Counseling Program.** Provides grants to State and Borough mental health departments, which in turn provide training for screening, diagnosing and counseling techniques. Also provides funds for counseling, outreach, and consultation for those affected by disaster.

Chapter 3: 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 the future impacts of a hazard including loss of life, property damage, and 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. A risk assessment measures the potential loss from a disaster event caused by an existing hazard by evaluating the vulnerability of buildings, infrastructure, and people. It identifies the characteristics and potential consequences of hazards and their impact on community assets.

Federal Requirements for Risk Assessment

Federal regulations for hazard mitigation plans outlined in 44 CFR Section §201.6(c)(2) include a requirement for a risk assessment 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 Sitka MHMP meets those criteria are outlined in Table 7.

Table 7. Risk Assessment - Federal Requirements

Section §201.6(c)(2) Requirement	Sitka Multi-Hazard Mitigation Plan Where it is Addressed in Plan
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 3, Section 1 identifies ***flood/erosion, earthquake, snow avalanche, tsunami, severe weather and ground failure*** as natural hazards in Sitka.
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 4, Sections 1-6 are hazard-specific sections that profile the natural hazards that may affect the City & Borough. The Plan includes **location, extent, impact** and **probability** for each natural hazard identified. The MHMP also provides hazard specific information on **previous occurrences** of hazards events.

Section §201.6(c)(2) Requirement	Sitka Multi-Hazard Mitigation Plan Where it is Addressed in Plan
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 4, Sections 1-6 contain overall summaries of each hazard and the impacts on the community.
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.	There are no repetitively damaged structures in the City & Borough of Sitka. Chapter 4, Section 1 Flood/Erosion explains this requirement in more detail.
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.	Chapter 3, Section 1, Table 13, lists structures, infrastructure and critical facilities located in the identified hazard areas.
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.	Chapter 3, Section 2, Table 14 estimates potential dollar losses to Borough owned facilities. The methodology used to obtain the losses is described above the table.

Vulnerability Assessment Methodology

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

1. ***Hazard 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 3: Risk Assessment - Overview.

2. ***Vulnerability Assessment*** – The second step is to identify the jurisdiction's vulnerability; the people, infrastructure and property that are likely to be affected. It includes everyone who enters the jurisdiction including residents, employees, commuters, shoppers, tourists, and others.

   Populations with special needs such as children, the elderly, and the disabled should be considered; as should facilities such as the hospital, health clinic, senior housing and schools because of their additional vulnerability to hazards.

   Inventorying the jurisdiction's assets to determine the number of buildings, their value, and population 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.

3. ***Risk Analysis*** – The third step is to calculate the potential losses to determine which hazard 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.

For example, there might be several schools exposed to one hazard but one school may be exposed to four different hazards. A multi-hazard approach will identify such high-risk areas and indicate where mitigation efforts should be concentrated.

The purpose of a vulnerability assessment is to identify the assets of a community that are susceptible to damage should a hazard incident occur.

Facilities are designated in the plan as critical if they are: (1) vulnerable due to the type of occupant (children, disabled or elderly for example); (2) critical to the community's ability to function (roads, power generation facilities, water treatment facilities, etc.); (3) have a historic value to the community (museum, cemetery); or (4) critical to the community in the event of a hazard occurring (emergency shelter, etc.).

Profiling Hazards

Chapter 4, Sections 1-6 include hazard-specific sections that profile the natural hazards that may affect the City & Borough. The Plan includes **location, extent, impact** and **probability** for each natural hazard identified. The MHMP also provides hazard specific information on **previous occurrences** of hazards events.

- The **location** or geographical area(s) of the hazard in the community.

- The **extent** (i.e. magnitude or severity) of potential hazard events, based on the criteria listed in Table 8.

Table 8. Extent of Hazard Ranking below was used to rank the extent of each hazard. Sources of information to determine the extent include the *State All-Hazard Mitigation Plan*, historical or past occurrences and other outside sources.

Table 8. 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 9. Probability Criteria Table taken from the *State All-Hazard Mitigation Plan* categorizes the probability of a hazard occurring. Sources of information to determine the probability for each specific hazard include the *State All-Hazard Mitigation Plan*, historical or past occurrences and information from interviews with residents or other stakeholders.

Table 9. 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 years 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 years 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.

Previous occurrences of natural events are described for identified natural hazards. The information was obtained from the *State All-Hazard Mitigation Plan*, *State Disaster Cost Index*, Borough records, other state and federal agency reports, newspaper articles, and web searches.

Section 2. Identifying Hazards

This section identifies and describes the hazards likely to affect the City & Borough of Sitka. The community used the following sources to identify the hazards present in community: the *Alaska All-Hazard Mitigation Plan*, Borough ordinances and reports, Sitka Emergency Operations Plan, and previous occurrences of events.

Alaska State All-Hazard Mitigation Plan, 2007 Matrices

Table 10. Hazard Vulnerability Matrix

City & Borough of Sitka					
Flood/ Erosion	**Wildland Fire**	**Earthquake**	**Volcano**	**Snow Avalanche**	**Tsunami & Seiche**
Y	Y	Y-H	Y	Y-H	Y-H
Severe Weather	**Ground Failure**				
Y	Y				

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 years 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 years 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 State All-Hazard Mitigation Plan, 2007

Table 11. Previous Occurrence of Hazards 1978 to Present

City & Borough of Sitka					
Flood	**Wildland Fire**	**Earthquake**	**Volcano**	**Avalanche**	**Tsunami & Seiche**
1-L	Z	Z	Z	Z	Z
Severe Weather	**Ground Failure**	**Erosion**			
2-L	Z	1-L			

Extent:
Z = Zero
L = Limited
T = Total
Number: Occurrences

Source: Alaska State All-Hazard Mitigation Plan, 2007

Identification of Natural Hazards Profiled in the MHMP

Based on consultation with the Alaska DHS&EM, the above tables from the *State All-Hazard Mitigation Plan*, Sitka plans and reports, interviews and newspaper articles Sitka identified the following hazards to be profiled.

Table 12. Hazard Identification and Decision to Profile

Hazard	Yes/No	Decision to Profile Hazard
Flood/Erosion	Yes	Participates in NFIP, has had limited damage in the past.
Wildland Fire	No	The soil conditions and abundant rainfall combine to make wildland fire hazard unlikely
Earthquake	Yes	Designed in state plan as high risk. Located near the Queen Charlotte – Fairweather System
Volcano	No	The Alaska Volcano Observatory identifies the closest active volcano to Sitka at being over 300 miles away.
Snow Avalanche	Yes	Designated as a high hazard in the *Alaska State All-Hazard Mitigation Plan, 2007.*
Tsunami	Yes	Designated as a high hazard in *Alaska State All-Hazard Mitigation Plan, 2007*. The City has an approved tsunami plan, which is incorporated into this plan.
Severe Weather	Yes	Sitka Fire Chief identified extreme weather as being the highest hazard in the community.
Ground Failure	Yes	Previous occurrences have resulted in damage to infrastructure.

Please see Chapter 4, Section 7, Hazards not Profiled in the MHMP for more information on the hazards not profiled in this plan. Each hazard that is present in the community is profiled in hazard specific sections.

Section 3. Assessing Vulnerability

Overview

The vulnerability overview section is a summary of Sitka's vulnerability to the above-identified hazards. The summary includes, by type of hazard, and the types of structures, infrastructures and critical facilities affected by the hazards.

Maps and Figures Depicting Natural Hazards

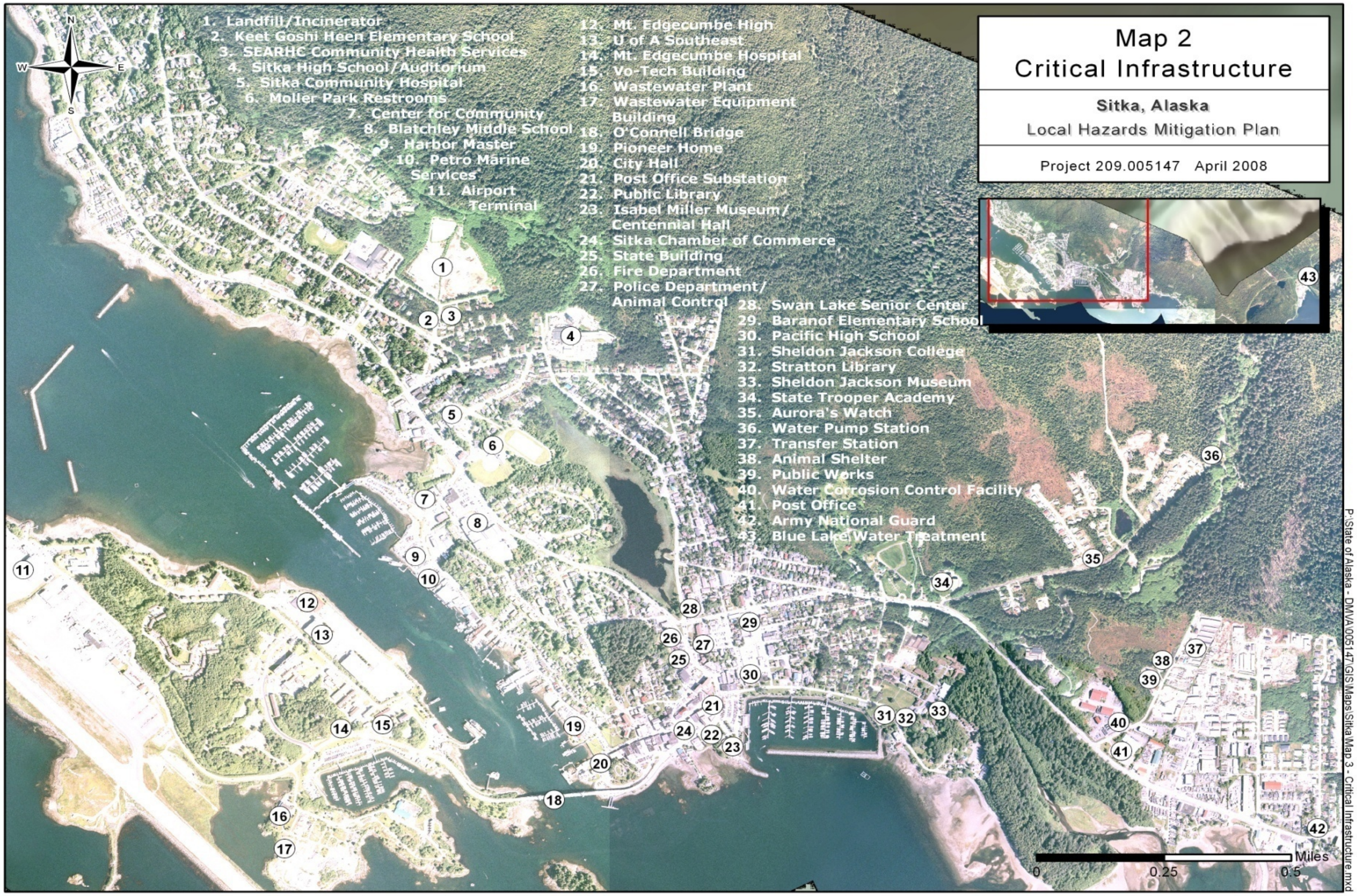
The following maps and figures illustrate existing critical facilities, businesses and infrastructure and the FEMA flood overlay zone for Sitka.

1. Map 2. Critical Infrastructure

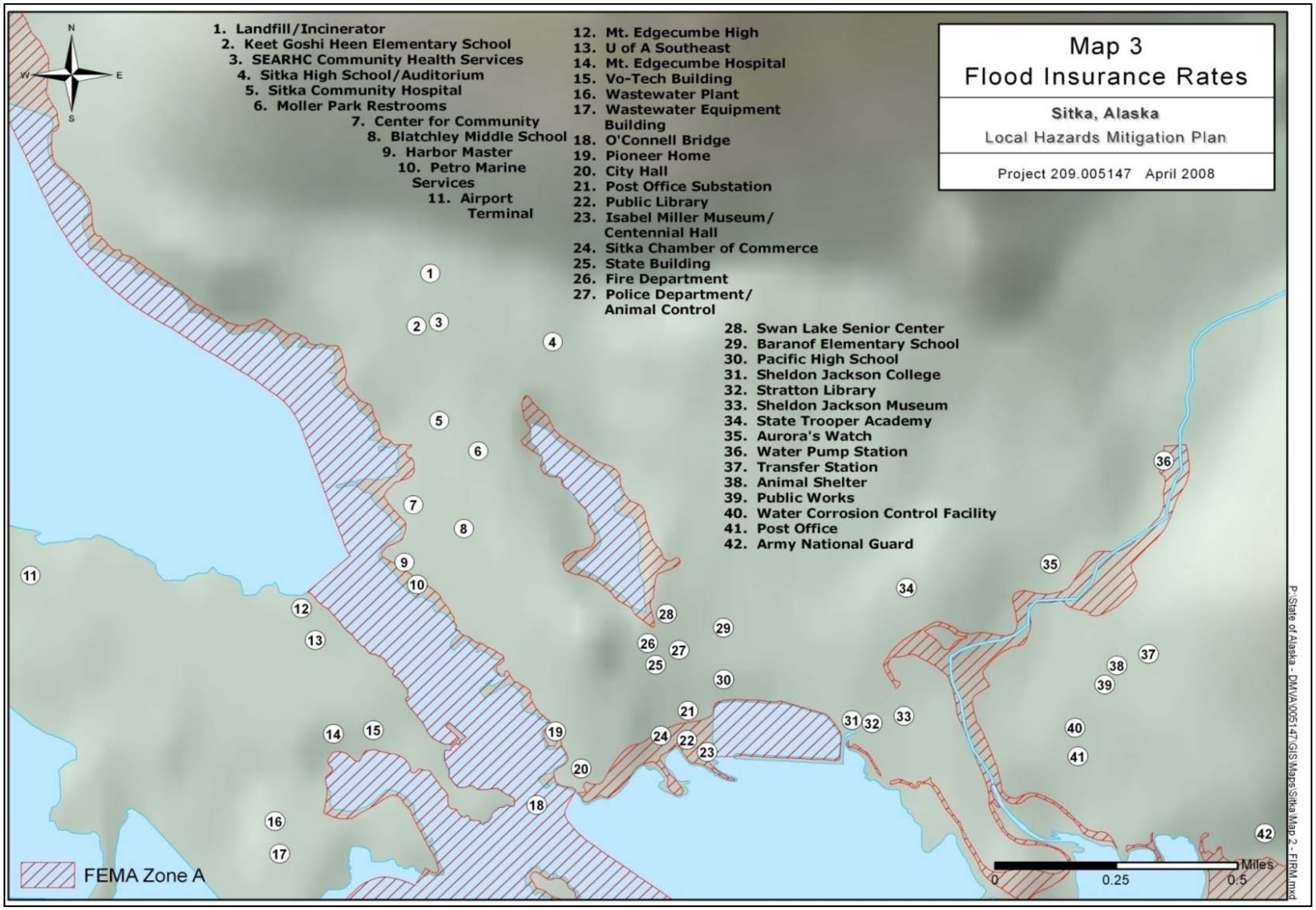
2. Map 3. Flood Rate Insurance Map Overlay

Picture on the Sitka Borough Website: www.cityofsitka.com/

Map 2. Critical Infrastructure



Map 3. Flood Insurance Rate Map Overlay



Hazard Asset Matrix

The Hazard Asset Matrix in Table 13 includes a list of facilities, businesses and infrastructure. These facilities are shown on Map 2. Critical Infrastructure and

Map 3. Flood Insurance Rate Map Overlay. Each hazard depicts 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.

Table 13. Hazard Asset Matrix

Structure/Facility	Flood/ Erosion	Earth-Quake	Snow Avalanche	Tsunami	Extreme Weather	Ground Failure
Airport Terminal Building		H			H	
O'Connell Bridge	L	H			H	
Public Library	L	H			H	
Stratton Library		H			H	
Centennial Hall	L	H			H	
Water Pump Station		H			H	
Sitka Chamber of Commerce	L	H	NOT MAPPED	NOT MAPPED	H	NOT MAPPED
Animal Shelter		H			H	
Animal Control Facility		H			H	
Marine Services Building		H			H	
Wastewater Plant		H			H	
Wastewater Equipment Building		H			H	
Fire Station		H			H	
City State Building		H			H	
City Hall		H			H	
Sitka Community Hospital		H			H	
Moller Park Restrooms		H			H	
Harbor Master Office	L	H			H	
SCIP Admin Building		H			H	
SCIP Dock & Warehouse		H			H	
SCIP Sewage Treatment Building		H			H	
Public Works Shop & Warehouse		H			H	
Transfer Station		H			H	
Water Corrosion Control Building		H			H	
Baranof Elementary		H			H	
Keet Gooshi Heen Elementary		H			H	
Blatchley Middle School		H			H	
Sitka High School		H			H	

Structure/Facility	Flood/ Erosion	Earth-Quake	Snow Avalanche	Tsunami	Extreme Weather	Ground Failure
Votech Building		H			H	
Sitka High School Auditorium		H	NOT MAPPED	NOT MAPPED	H	NOT MAPPED
Petro Marine Services	L	H			H	
Mt. Edgecumbe/ SEARHC Hospital		H			H	
Sitka Pioneer Home	L	H			H	
Aurora’s Watch		H			H	
Landfill/Incinerator		H			H	
Sheldon Jackson Museum		H			H	
Isabel Miller Museum		H			H	
AK Army National Guard		H			H	
US Post Office Main Office		H			H	
US Post Office Substation		H			H	
Blue Lake Water Treatment Facility		H			H	
Mt. Edgecumbe High		H			H	
Pacific High School		H			H	
Sheldon Jackson College		H			H	
University of Alaska South East		H			H	
AK State Trooper Academy		H			H	
Center for Community		H			H	
Swan Lake Senior Center		H			H	

Estimating Potential Dollar Losses

The following table lists the replacement values, plus content values of municipal owned buildings. The Sitka Finance Department provided the Replacement Value column, which was obtained from the city insurance provider. The Content Value Percentage column is percentages of replacement value calculations that were recommended from the *Understanding Your Risks: Identifying Hazards And Estimating Losses (FEMA 386-2).*

Table 14. Potential Dollar Losses of Municipal Structures

Municipal Owned Structures	Replacement Value	Content Value (%)	Total
Airport Terminal Building	$3,300,000	150	$8,250,000
ANB Harbor Restrooms	$178,000	100	$356,000
Crescent Harbor Shelter	$429,000	100	$858,000
Crescent Harbor Restrooms	$178,000	100	$356,000
Harbor Drive Restrooms	$119,000	100	$238,000
Library	$1,800,000	100	$3,600,000
Centennial Hall	$5,800,000	100	$11,600,000
Water Pump Station	$466,000	100	$932,000
Animal Shelter	$423,000	100	$846,000
Marine Services Building	$3,000,000	100	$6,000,000
Wastewater Plant	$11,450,000	100	$22,900,000
Wastewater Equipment Building	$306,000	100	$612,000
Fire Station	$4,750,000	150	$11,875,000
City State Building	$5,000,000	100	$10,000,000
Senior Center	$625,000	100	$1,250,000
City Hall	$3,750,000	100	$7,500,000
Sitka Community Hospital	$17,000,000	150	$42,500,000
Moller Park Restrooms	$119,000	100	$238,000
Sealing Cove Restrooms	$178,000	100	$356,000
Eliason Harbor Restrooms	$178,000	100	$356,000
Harbor Master Office	$160,000	100	$320,000
Whale Park Restrooms and Park	$750,000	100	$1,500,000
Lightering Facility Restrooms	$178,000	100	$356,000
Sandy Beach Restrooms	$186,000	100	$372,000
Thomsen Harbor Restrooms	$178,000	100	$356,000
SCIP Admin Building	$4,160,000	100	$8,320,000
SCIP Dock & Warehouse	$4,935,000	100	$9,870,000

Municipal Owned Structures	Replacement Value	Content Value (%)	Total
SCIP Sewage Treatment Building	$633,000	100	$1,266,000
Public Works Shop & Warehouse	$3,213,000	100	$6,426,000
Transfer Station	$1,425,000	100	$2,850,000
Water Corrosion Control Building	$950,000	100	$1,900,000
Tom Young Cabin	$164,000	100	$328,000
Baranof Elementary	$9,800,000	100	$19,600,000
Keet Gooshi Heen Elementary	$12,141,000	100	$24,282,000
Blatchley Middle School	$17,300,000	100	$34,600,000
Sitka High School	$21,800,000	100	$43,600,000
Votech Building	$1,000,000	150	$2,500,000
Sitka High School Auditorium	$16,000,000	100	$32,000,000
Total Potential Dollar Losses	**$154,022,000**		**$321,069,000**

Chapter 4. Risk Assessment – Hazard Specific Sections

Section 1 – Flood/Erosion

The following flood/erosion hazard profile includes a description of the hazard, the location, extent and probability of the hazard and previous occurrences of flooding/erosion in Sitka. Section 4 of this chapter deals with the tsunami hazard in Sitka.

Hazard Description

Flood hazards in Sitka include voluminous rainfall, snow and glacier melt and release of glacier-dammed lakes and coastal storms.

<u>Rainfall/Snowmelt/Glacier Melt Flooding</u>

Floods occur in rivers as a result of a large input of water to the drainage basin in the form of rainfall, snowmelt, glacier melt, or a combination of these inputs. In the Sitka area, as well as most coastal areas of Southcentral and Southeast Alaska, the floods due to snowmelt are typically lower in magnitude than those due to rainstorms in late summer or fall. Glacier melt is typically largest in late summer; increasing the potential magnitude of late summer rainfall floods in glacial streams.

Deposition is the accumulation of soil, silt, and other particles on a river bottom or delta. Deposition leads to the destruction of fish habitat and presents a challenge for navigational purposes. Deposition also reduces channel capacity, resulting in increased flooding or bank erosion.

<u>Erosion</u>

Erosion is a process that involves the wearing away, transportation, and movement of land. Erosion rates can vary significantly as erosion can occur quite quickly as the result of a flash flood, coastal storm or other event. It can also occur slowly as the result of long-term environmental changes. Erosion is a natural process but its effects can be exacerbated by human activity.

Stream bank erosion involves the removal of material from the stream bank. When bank erosion is excessive, it becomes a concern because it results in loss of streamside vegetation, loss of fish habitat, and loss of land and property.

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 an area, 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 either eroding, accreting or stable. When evaluating coastal erosion in an area, one should focus 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.

Erosion is measured as a rate, with respect to either a linear retreat (i.e., feet of shoreline recession per year) or volumetric loss (i.e., cubic yards of eroded sediment per linear foot of shoreline frontage per year). Erosion rates are not uniform, and vary over time at any single location. Annual variations are the result of seasonal changes in wave action and water levels.

Erosion is caused by coastal storms and flood events; changes in the geometry of tidal inlets, river outlets, and bay entrances; man-made structures and human activities such as shore protection structures and dredging; long-term erosion; and local scour around buildings and other structures. 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

National Flood Insurance Rate Maps

Map 2, FEMA Flood Overlay, page 28, shows areas of the community that are located within the National Flood Insurance Rate Map (FIRM) “A” zone. The “A” zones are defined as areas of 100-year flood zones.

The FIRMs for Sitka are from mapping that was completed in 1982. Since that time, areas have been filled to above the Base Flood Evaluation in some cases. Until the FIRM has an official revision or a Letter of Map Revision is approved by FEMA, the designations stand but may not be accurate and do not necessarily reflect the current situation in the field.

Properties unaffected directly by flooding, may suffer due to road closures, impacts to public safety (access and response capabilities), limited availability of perishable commodities, and isolation.

Emergency Operations Plan, 2003

The Emergency Operations Plan (EOP) states that the most probable source of flooding in Sitka is along Indian River. The EOP also states that homes located along the shoreline are also vulnerable from storm surges.

Coastal Management Plan Update, 2007

The Coastal Management Plan (CMP) states that there is some potential for damage by local flooding, should an earthquake dislodge a snow avalanche or landslide that could dam a creek and later give way, sending a wall of water downstream.

Indian River Floodway

The Indian River Floodway prohibits all development unless an engineer demonstrates no encroachment (zero rise in water surface elevation). The flood elevations for coastal flooding (flood having 1% chance of occurrence in any given year or "100-year-flood" in Sitka Sound in feet) are as follows: (CMP 2007)

- At Dove Island 14.8 ft
- At Marina 14.8 ft
- At Sitka Harbor 17.0 ft
- At Harbor Point 14.8 ft
- At Alice & Charcoal Islands 15.7 ft
- At Galankin Island 14.8 ft

Extent

The extent (i.e. magnitude or severity) of the flood/erosion hazard is measured in this plan by using statistics from the National Flood Insurance Program (NFIP), historical previous events and the *Alaska State All-Hazard Mitigation Plan, 2007*. Based on these factors and using the criteria established in Table 8. Extent of Hazard Ranking, page 22, the City & Borough of Sitka has a **limited** extent of flooding not due to tsunami, which is covered in Section 4 of this chapter.

The *Alaska State All-Hazard Mitigation Plan, 2007* describes Sitka as having a limited severity of flooding.

The City & Borough of Sitka (CID 020006) participates in the NFIP. Only one critical facility complex, the Greater Sitka Chamber of Commerce buildings, is located in the "A" flood zone.

The function of the NFIP is to provide flood insurance to homes and businesses located in floodplains at a reasonable cost. In trade, the City & Borough of Sitka would agree to regulate new development and substantial improvement to existing structures in the floodplain, or to build safely above flood heights to reduce future damage to new construction. The program is based upon mapping areas of flood risk, and requiring local implementation to reduce flood damage primarily through requiring the elevation of structures above the base (100-year) flood elevations.

The table below describes the FIRM zones.

Table 15. FIRM Zones

Firm Zone	*Explanation*
A	Areas of 100-year flood; base flood elevations and flood hazard not determined.
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet, average depths of inundation are shown but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood.
C	Areas of minimal flooding.
D	Areas of undetermined, but possible, flood hazards.

Development permits for all new building construction, or substantial improvements, are required by the City & Borough in all A, AO, AH, A-numbered Zones. Flood insurance purchase may be required in flood zones A, AO, AH, A-numbered zones as a condition of loan or grant assistance. An Elevation Certificate is required as part of the development permit. The Elevation Certificate is a form published by FEMA required to be maintained by communities participating in the NFIP. According to the NFIP, local governments must maintain records of elevations for all new construction, or substantial improvements, in floodplains and must keep the certificates on file.

Elevation Certificates are used to:

1. Record the elevation of the lowest floor of all newly constructed buildings, or substantial improvement, located in the floodplain.
2. Determine the proper flood insurance rate for floodplain structures.

Local governments must insure that elevation certificates are filled out correctly for structures built in floodplains. Certificates must include:

- The location of the structure (tax parcel number, legal description and latitude and longitude) and use of the building.
- The FIRM panel number and date, community name and source of base flood elevation date.
- Information on the building's elevation.
- Signature of a licensed surveyor or engineer.

Table 13. Hazard Asset Matrix, page 29, lists facilities located within the areas susceptible to flooding and erosions, Table 16. NFIP Statistics lists NFIP statistics.

Table 16. NFIP Statistics

Emergency Program Date Identified	Regular Program Entry Date	Map Revision Date	NFIP Community Number	CRS Rating Number	Total # of Current Policies (10/13/09)
11/8/1974	6/1/1982	None	0200006	N/A	92
Total Premiums	**Total Loss Dollars Paid Since 1978**	**Average Value of Loss Since 1978**	**AK State # of Current Policies (10/13/09)**	**AK State Total Premiums (10/13/09)**	**AK Total Loss Dollars Paid Since 1978**
$97,830	$20,130	$4,260	2,818	$2.2 million	$4.7 million
Sitka Average Premium (10/13/09)	**AK State Average Premium (10/13/09)**	**Repetitive Loss Claims**	**Dates of Rep. Losses**	**Total Rep. Loss**	**Average Rep. Loss**
$1,063	$796	0	0	0	0

Table 17. State and Local Floodplain Coordinators

Sitka Floodplain Coordinator	Sitka City & Borough Contact Person: Wells Williams, Planning Director Address: 100 Lincoln Street, Sitka, AK 99835 Phone: (907) 747-1824 Email: wells@cityofsitka.com
State of AK Floodplain Coordinator	Floodplain Management Programs Coordinator Division of Community and Regional Affairs Department of Commerce, Community & Economic Development Taunnie Boothby, State Floodplain Coordinator 550 W. 7th Avenue, Suite 1640 Anchorage, AK 99501 (907) 269-4567 (907) 269-4563 (fax) Email: taunnie_boothby@commerce.state.ak.us Website: http://www.commerce.state.ak.us/dca/nfip/nfip.htm

Impact

A flooding event in Sitka could damage the structures and infrastructure that are located along the shoreline in the community and within the flood zones described above. A flooding event in Sitka could isolate the community from other areas of the state and cause wide spread damage.

Probability

Based on the *Alaska State All-Hazard Mitigation Plan, 2007*, NFIP, City & Borough records and previous historical events Sitka has a **low** probability of flooding. Table 9. Probability Criteria Table, 23, defines criteria used for determining low probability, as the 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.

The Alaska State All-Hazard Mitigation Plan lists Sitka as having flood hazard present but with an unknown probability. The NFIP statistics for Sitka are described above and the previous occurrences are listed below.

Previous Occurrences

The following record of flooding for Sitka was obtained from the *DHS&EM Disaster Cost Index*.

Southeast Alaska, November 26, 1984: A hurricane force windstorm and wind driven tides caused extensive damage to public and private property in five Southeast Alaskan communities. The State provided public and individual assistance grants and temporary housing in Juneau, **Sitka**, Kake, Angoon and Tenakee Springs. Small Business Administration (SBA) provided disaster loan assistance and the American Red Cross made grants to meet immediate needs of victims. The Governor's request for a Presidential declaration was denied.

Southeast Storm (AK-06-216) declared December 23, 2005 by Governor Murkowski: Beginning on November 18, 2005 and continuing through November 26, 2005, a strong winter storm with high winds and record rainfall occurred in the City/Borough of Juneau, the **City/Borough of Sitka**, the City/Borough of Haines, the City of Pelican, the City of Hoonah, and the City of Skagway, which resulted in widespread coastal flooding, landslides, and severs damage and threat to life and property, with the potential for further damage. The following conditions exist as a result of this disaster: severe damage to personal residences requiring evacuation and relocation of residents; to individuals personal and real property; to businesses; and to a marine highway system dock, the road systems eroded and blocked by heavy debris that prohibited access to communities and residents, and other public infrastructures, necessitating emergency protective measures and temporary and permanent repairs. The total estimated amount of assistance is approximately $1.87 million. This includes Individual Assistance totaling $500,000 for 52 applicants. There was no hazard mitigation.

Repetitive Loss Properties

The risk assessment in all plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged floods. Under NFIP guidelines, repetitive loss structures include any currently insured building with two or more flood losses (occurring more than ten days apart) greater than $1,000 in any 10-year period since 1978. States should provide communities with information on historic floods throughout the state so communities will know what type of damage has occurred (even if it didn't occur within that particular community).

States should ensure that lists of repetitive loss properties are kept up to date and that communities have the most current list. States should contact their FEMA Regional Office for this information.

FEMA also maintains a national list of properties that comprise the "Repetitive Loss Target Group". These are repetitive loss properties that have either experienced four or more losses with the characteristics above, or have had losses that cumulatively exceed the property value of the building.

Repetitive loss properties are those with at least two losses in a rolling ten-year period and two losses that are at least ten days apart. Specific property information is confidential, but the State DCRA Floodplain Coordinator related that but within the City & Borough of Sitka there have been ***zero*** properties that meet the FEMA definition of repetitive loss.

Flood/Erosion Mitigation Goals and Projects

Goals

Goal 1. Reduce and prevent flood damage.

Support elevation, flood proofing, buyout or relocation of structures that are in danger of flooding or are located on eroding banks.

Goal 2. Increase public awareness

Increase public knowledgeable about mitigation opportunities, floodplain functions, emergency service procedures, and potential hazards.

Projects

Specific Projects

FLD-1. Identify Drainage Patterns and Develop a Comprehensive Drainage System (Goal 1)

FLD-2. Structure Elevation and/or Relocation (Goal 1)

FLD-3. Updated FIRM Sitka Maps (Goal 1)

FLD-4. Public Education (Goal 2)

FLD-5. Pursue obtaining a Community Rating System rating to lower flood insurance rates. (Goal 1)

FLD-6. Continue to obtain flood insurance for all Borough structures, and continue compliance with NFIP. (Goal 1)

FLD-7. Require that all new public structures be constructed according to NFIP requirements and set back from the shoreline to lessen future erosion concerns and costs. (Goal 1)

Table 21. Mitigation Project Strategy Table, page 84, provides more information on specific projects to mitigate flooding and erosion.

Background Information

Please note: The following project from the Sitka EOP, 2003 was completed by DHS&EM in 2009.

Community Warning Siren System: $425,000. The City & Borough of Sitka is in need of a new Community Warning Siren System. The current sirens are old and increasingly unreliable, and a considerable area of the community is not within siren hearing range. The City is seeking State and Federal grants to help fund this upgrade, but funds are very limited, and it is estimated a complete replacement program could take nine or more years to fully fund.

This new system provides for coverage of nearly 100 percent of the community at the minimum federal audibility levels without excessive overlap. In addition, there are huge benefits with this new system. The units have no moving parts. They are storm rated for winds to 120 MPH. They are omni-directional, unlike the current units. They have far more covered and meet current standards for warning siren systems. They have audio to permit voice messages, which is important to advise why the siren is sounding and what to do. They have activation strobes at the top that also give a visual signal when activated, so persons in high noise environments can see the strobe by day or reflections at night to determine the siren is running. Cost for the system includes $45,000 for the 6032-siren unit and control center at the fire station; $28,000 for a model 4016 unit, and $259,000 for seven mod 6032-siren units, for a total of $332,000, plus $90,000 to set the class "H" poles, supply electrical power, and cover crane and other installation costs. If even a portion of the cost could be funded, it could enable the upgrade to begin. Total Community Warning Siren System cost is estimated at $425,000 (EOP, 2003).

Section 2. Earthquake Hazard

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 quakes in the world since 1900 have occurred here. Earthquakes of magnitude 7 or greater occur in Alaska on average of 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. The dangers associated with earthquakes include: ground shaking, surface faulting, ground failures, snow avalanches, seiches and tsunamis. The extent of damage is dependent on the magnitude of the quake, 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 are slower and usually have a side-to-side movement. They 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. The damage to buildings depends on how the specific characteristics of each incoming wave interact with the buildings' 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.

There are three general types of faulting. 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.

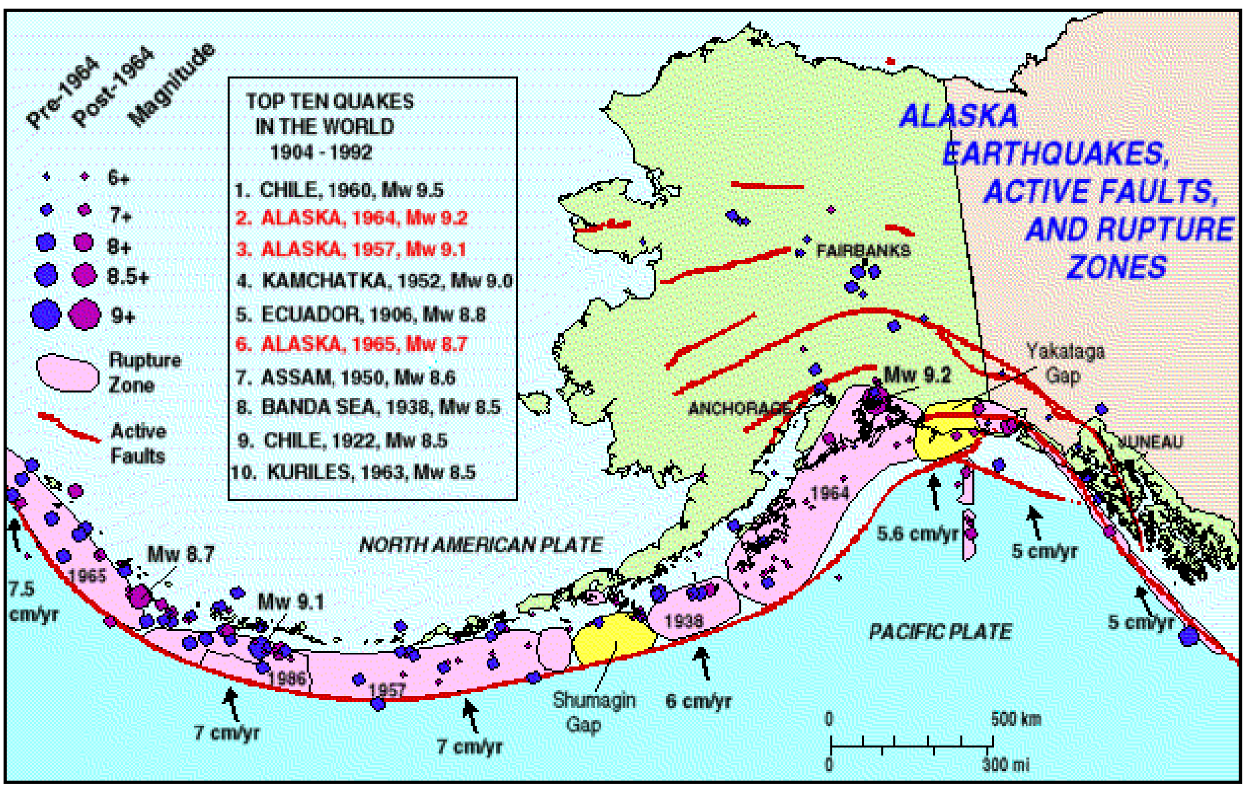
Earthquake-induced ground failure is often the result of liquefaction, which occurs when soil (usually sand and course silt with high water content) loses strength as a result of the shaking and acts like a viscous fluid.

Liquefaction causes three types of ground failures: lateral spreads, flow failures, and loss of bearing strength. In the 1964 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.

The following figure was obtained from the University of Alaska, Fairbanks (UAF), Alaska Earthquake Information Center (AEIC) website at:
http://www.giseis.alaska.edu/Seis/

Figure 2. AEIC Earthquake Active Faults



Southeastern Alaska

Southeastern Alaska, also known as "the panhandle", includes the area of the state from Prince of Wales Island to Icy Bay. In 1904, the state's first seismic monitoring station was installed in southeastern Alaska at the Astronomical Observatory in Sitka. It was the only seismic station monitoring earthquakes in Alaska until 1935 when a second station was installed at College near Fairbanks. The Sitka station continues to operate today as part of a statewide network of seismograph stations (AEIC).

Major faults in the area include the Queen Charlotte fault, the Fairweather fault, and the Chatham Strait fault, described in further detail below. Minor faults in the area include the Clarence Strait fault and the Peril Strait fault. The eastern end of the Denali and Transition faults (main discussions in Interior and Southcentral seismicity sections) are also found in southeastern Alaska (AEIC).

The strongest shaking will occur in muskeg, man-made fills, modern alluvial and delta deposits, and volcanic ash deposits. The saturated muskeg and reworked volcanic ash would be subject to possible liquefaction during severe earthquake-caused ground shaking, and are thus unreliable as stable foundation materials.

An earthquake potentially could also cause other disastrous events to occur at the same time, including tsunamis, fires, release of hazardous materials, and energy shortages (EOP 2003).

Queen Charlotte - Fairweather fault system

The Queen Charlotte and Fairweather faults are part of a long fault system that marks the eastern boundary of the Pacific plate and the western boundary of the North American plate. The Pacific plate moves in a northwestward direction relative to the North American plate, creating a transform boundary, the name given to the interface between two plates moving horizontally in opposite directions. The fault associated with a transform boundary is a strike-slip fault. The Queen Charlotte and Fairweather faults are very similar to California's San Andreas Fault system, some of the most well known strike-slip faults in the world.

At the northern end of the Queen Charlotte-Fairweather fault system is the Fairweather fault, a strike-slip fault with right lateral movement. The Fairweather fault is visible on land for about 280 kilometers from Cross Sound northwestward to its junction with the St. Elias fault in the vicinity of Yakutat Bay. Seismic exploration methods have projected the Fairweather fault just offshore of the Alexander Archipelago from Cross Sound to the mouth of Chatham Strait. At this point, the fault is believed to connect with the Queen Charlotte fault. The Queen Charlotte fault, which extends southeastward from Chatham Strait past the Queen Charlotte Islands, is also a strike-slip fault with right lateral movement (AEIC).

Chatham Strait fault

The Chatham Strait fault is the second largest right lateral strike-slip fault in southeastern Alaska. Starting near Sitka, the fault follows Lynn Canal south into Chatham strait and is thought to be truncated by the Fairweather-Queen Charlotte fault system west of Iphigenia Bay (AEIC).

Location

The hazards of earthquake could potentially impact any part of Sitka.

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 Sitka 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 finally public utilities.

Extent

The extent of an earthquake in Sitka could be ***critical***. Table 8. Extent of Hazard Ranking, page 22, 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.

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

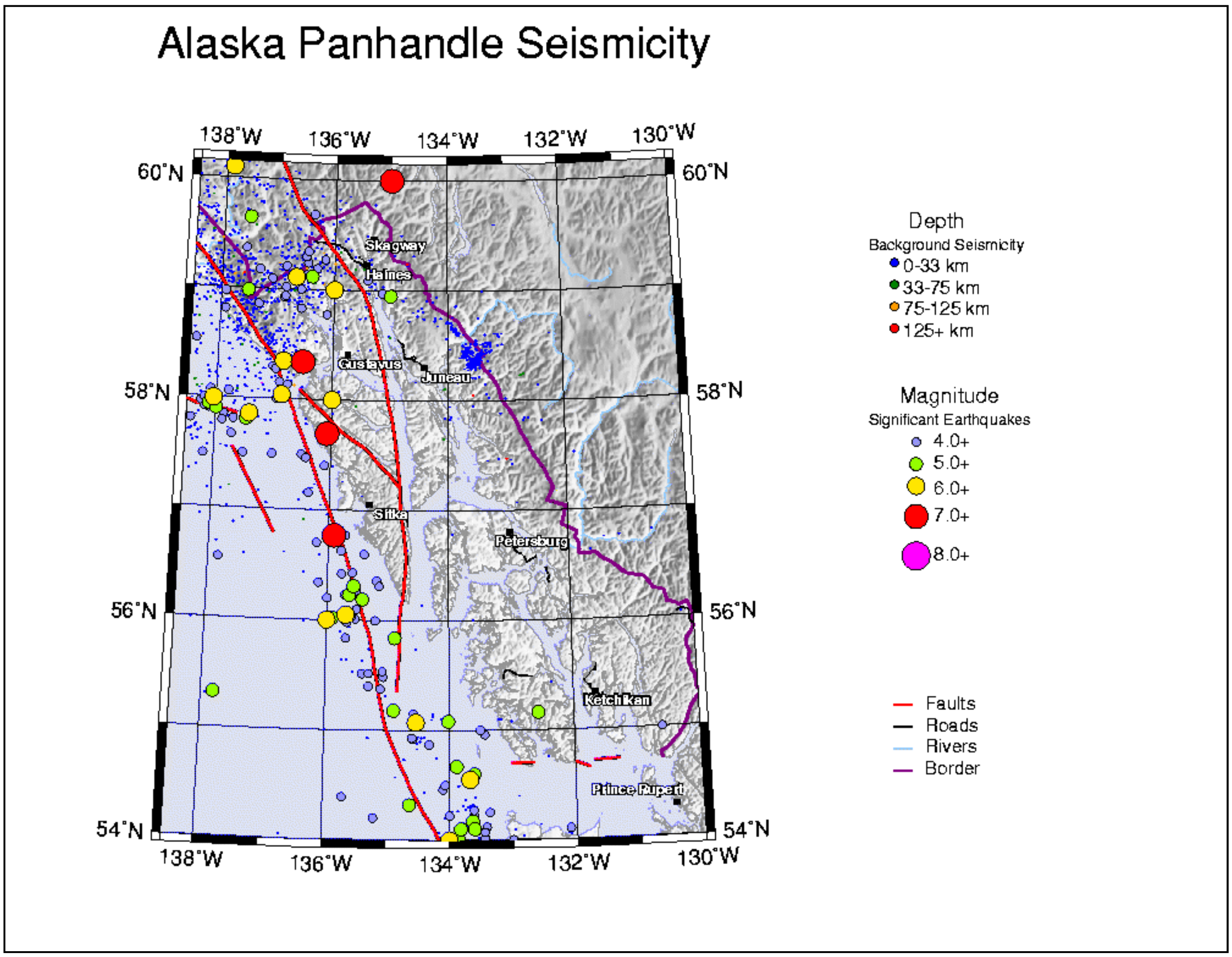
The "intensity" reported at different points generally decreases away from the earthquake epicenter. Local geologic conditions strongly influence the intensity of an earthquake; commonly, sites on soft ground or alluvium have intensities 2 to 3 units higher than sites on bedrock.

The Richter Scale expresses magnitude as a decimal number. A magnitude of 2 or less is called a microearthquake, they cannot even 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 (British Columbia 1700, Chile 1960, Alaska 1964). The Richter Scale 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.

The extent of a major earthquake in Sitka could be critical. Sitka is located near the Fairweather fault, which extends from south of Queen Charlotte Islands to Sitka. The fault moves right-laterally approximately 2.25 inches per year. A study by the U.S. Geological Survey predicts a magnitude 8 or greater earthquake will occur near Sitka in the future. This could be especially devastating because ground shaking can cause liquefaction of Sitka's thixotropic soils.

Figure 3. AEIC Alaska Panhandle Seismicity, from the UAF AEIC, illustrates that a major earthquake has occurred near Sitka in the past and indicates that a fault is located near the Greater Sitka area.

Figure 3. AEIC Alaska Panhandle Seismicity



Source: http://www.aeic.alaska.edu/html_docs/information_releases.html

Impact

The greatest potential earthquake effects include compaction, settlement, liquefaction, subsidence and ground fracturing of poorly consolidated, water-saturated deposits, as well as sliding on steep slopes of fine grained plastic sediments and damage from waves induced by submarine sliding.

The impact on the community of Sitka of a high-magnitude earthquake could be extensive. Earthquake damage could be area-wide with potential damage to critical infrastructure. Limited building damage assessors are available in Sitka 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 finally public utilities.

Probability

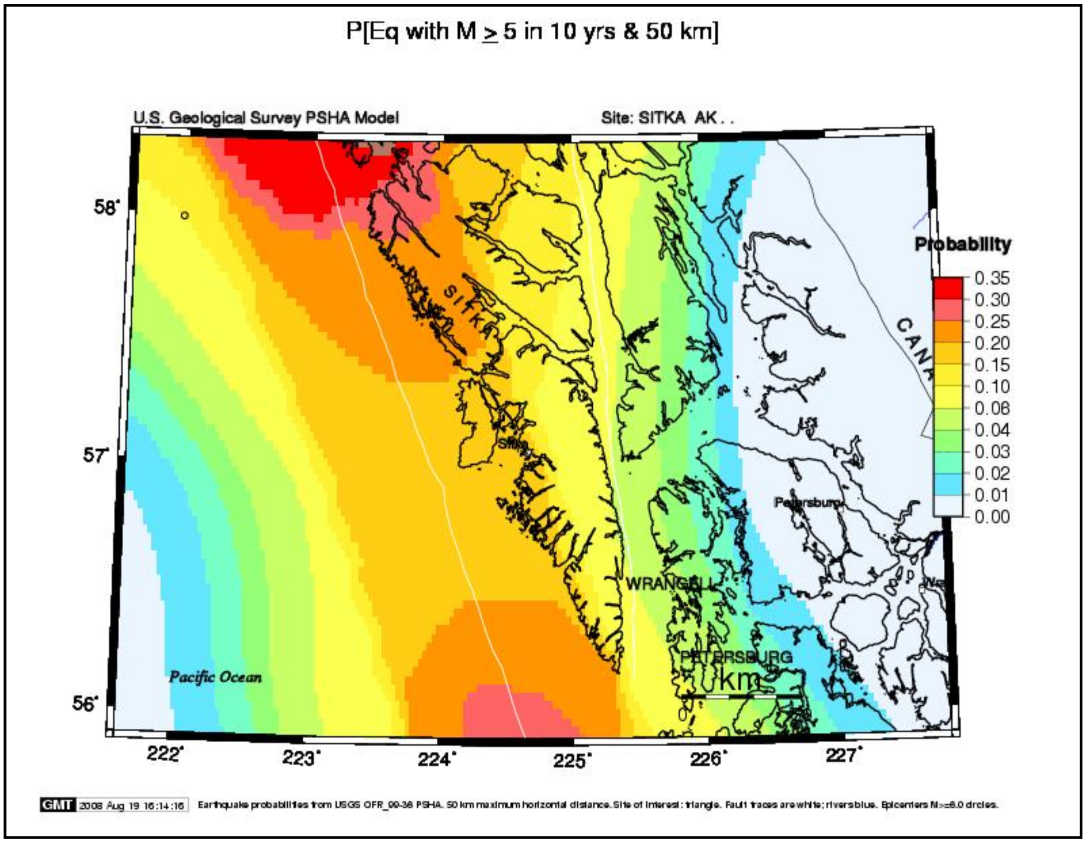
Sitka has a ***high*** probability of earthquake hazard. Table 9, page 23, lists the following criteria for a high probability: hazard is present with a high probability of occurrence with the next three years. Event has up to 1 in 1 year chance of occurring.

As stated above Sitka is located near the Fairweather fault, which extends from south of Queen Charlotte Islands to Sitka. The fault moves right-laterally approximately 2.25 inches per year. A study by the U.S. Geological Survey (USGS) predicts a magnitude 8 or greater earthquake will occur near Sitka in the future. This could be especially devastating because ground shaking can cause liquefaction of Sitka's thixotropic soils.

While it is not possible to predict an earthquake, the USGS has developed Earthquake Probability Maps that use the most recent earthquake rate and probability models. These models are derived from earthquake rate, location and magnitude data from the USGS National Seismic Hazard Mapping Project.

Figure 4 was developed by using the USGS website (see source for web address). The figure indicates that the probability of an earthquake with an intensity of 5.0 or greater will occur within the next ten years within 50 kilometers (31 miles) of Sitka is 20 percent.

Figure 4. USGS Probability Map



Source: USGS Earthquake Probability Mapping; http://eqint.cr.usgs.gov/eqprob/2002/index.php

The *Alaska All-Hazard Mitigation Plan* Vulnerability Matrix, Table 10, page 24 of this plan, lists the probability of an earthquake occurring within one year in Sitka as high. Which is defined as the event has up to 1 in 1 year chance of occurring.

Previous Occurrences

Four major earthquakes have been linked to the Queen Charlotte-Fairweather fault system in the last century. In 1927, a magnitude 7.1 (Ms - surface wave magnitude) earthquake occurred in the northern part of Chichagof Island; in 1949, a magnitude 8.1 (Mw - moment magnitude) earthquake occurred along the Queen Charlotte fault near the Queen Charlotte Islands; in 1958, movement along the Fairweather fault near Lituya Bay created a magnitude 7.9 (Ms) earthquake; and in 1972, a magnitude 7.4 (Ms) earthquake occurred near Sitka. The 1958 Lituya Bay earthquake, which was felt as far away as Seattle, Washington, caused a large rockslide, which deposited the contents of an entire mountainside into the bay. The gigantic wave that resulted from this rockslide scoured the shores of the bay down to bedrock and uprooted trees as high as 540 meters above sea level. Fishing boats were carried on the wave at a reported height of at least 30 meters over the spit at the entrance to the bay and tossed into the open ocean.

Geologic evidence shows that the Chatham Strait fault was active as recently as the mid-Tertiary period and had total right lateral displacement up to 150 km.

Although a 1987 magnitude 5.3 (mb - body wave magnitude) earthquake was located near the Chatham Strait fault, very few earthquakes in the area appear to have been directly related to the fault (AEIC).

Table 18 was developed from the AEIC Database, using the following search criteria:

- 56.0 <= latitude <=58
- -137 <= longitude >= -134
- 0 to 350 feet depth
- 01/01/1898 to 5/31/2008
- Earthquakes of over 5.0 magnitudes

Table 18. Historical Earthquake Events

Date	Depth (feet)	Mb	ML	MS
05/18/1919	0.0		6.0	
10/24/1927	80.0	7.1	7.1	7.1
9/18/1939	0.0		6.0	
10/31/1949	0.0		6.2	6.2
10/31/1949	0.0		5.0	6.2
7/30/1972	92.8	6.5	7.6	7.6
08/04/1972	57.6	5.1	5.0	5.0
08/04/1972	0.0	5.6	5.8	5.8
08/15/1972	0.0	5.6	5.4	4.8
11/17/1972	105.6	5.0	4.8	
01/06/2006	3.2	5.5	6.1	5.9

Mb - Body wave Magnitude - Based on the amplitude of P (compressional) body-waves. This scale is most appropriate for deep earthquakes.

ML - Local Magnitude - The original magnitude relationship defined by Richter and Gutenberg for local earthquakes in 1935. It is based on the maximum amplitude of a seismogram recorded on a Wood-Anderson torsion seismograph. Although these instruments are no longer widely used, Ml values are calculated using modern instruments with appropriate adjustments.

MS - Surface wave Magnitude - A magnitude for distant earthquakes based on the amplitude of the Rayleigh surface wave.

Source: http://www.aeic.alaska.edu/html_docs/db2catalog.html

Earthquake Mitigation Goal and Projects

<u>Goal</u>

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. Contract a structural engineering firm to assess and identified buildings and facilities to determine their structural integrity and strategy to improve their earthquake resistance.

E-3. Assess facilities and improve earthquake preparedness through such measures as installing bookshelf tie-downs, improving computer servers' resistance to earthquakes, moving heavy objects to lower shelves, etc.

E-4. Conduct mock emergency exercises to identify response vulnerabilities.

Section 3. Snow Avalanche

Hazard Description

Alaska experiences many snow avalanches every year. The exact number is undeterminable as most occur in isolated areas and go unreported. Avalanches tend to occur repeatedly in localized areas and can sheer trees, cover communities and transportation routes, destroy buildings, and cause death. Alaska leads the nation in avalanche accidents per capita.

Avalanche Types

A snow avalanche is a swift, downhill moving snow mass. The amount of damage is related to the type of avalanche, the composition and consistency of the material in the avalanche, the force and velocity of the flow, and the avalanche path. There are two main types of snow avalanches; loose snow and slab. Other types that occur in Alaska include: cornice collapse, ice, and slush avalanches.

Loose Snow Avalanches

Loose snow avalanches, sometimes called point releases, generally occur when a small amount of uncohesive snow slips and causes more uncohesive snow to go downhill. They occur frequently as small local cold dry 'sluffs', which remove excess snow (involving just the upper layers of snow) keeping the slopes relatively safe.

They can be large and destructive, though. For example, wet loose snow avalanches occur in the spring are very damaging. Loose snow avalanches can also trigger slab avalanches. Loose snow avalanches typically occur on slopes above 35 degrees, leaving behind an inverted V-shaped scar. They are often caused by snow overloading (common during or just after a snowstorm), vibration, or warming (triggered by rain, rising temperatures or solar radiation).

Slab Avalanches

Slab avalanches are the most dangerous types of avalanches. They happen when a mass of cohesive snow breaks away and travels down the mountainside. As it moves, the slab breaks up into smaller cohesive blocks. Slab avalanches usually require the presence of structural weaknesses within interfacing layers of the snow pack. The weakness exists when a relatively strong, cohesive snow layer overlies weaker snow or is not well bonded to the underlying layer. The weaknesses are caused by changes in the thickness and type of snow cover due to changes in temperature or multiple snowfalls. The interface may fail for several reasons. It can fail naturally by earthquakes, blizzards, temperature changes or other seismic and climatic causes, or artificially by human activity.

When a slab is released, it accelerates, gaining speed and mass as it travels downhill. The slab is defined by fractures. The uppermost fracture delineating the top line of the slab is termed the “crown surface”, the area above that is called the crown. The slab sides are called the flanks. The lower fracture indicating the base of the slab is called the “stauchwall”. The surface the slab slides over is called the “bed surface”. Slabs can range in thickness from less than an inch to 35 feet or greater.

Cornice Collapse

A cornice is an overhanging snow mass formed by wind blowing snow over a ridge crest or the sides of a gulley. The cornice can break off and trigger bigger snow avalanches when it hits the wind-loaded snow pillow.

Icefall Avalanche

Icefall avalanches result from the sudden fall of broken glacier ice down a steep slope. They can be unpredictable as it is hard to know when icefalls are imminent. Despite what some people think, they are unrelated to temperature, time of day or other typical avalanche factors.

Slush Avalanches

Slush avalanches occur mostly in high latitudes such as in the Brooks Range. They have also occurred in the mountain areas of Alaska's Seward Peninsula and occasionally in the Talkeetna Mountains near Anchorage. Part of the reason they are more common in high-latitudes is because of the rapid onset of snowmelt in the spring. Slush avalanches can start on slopes from 5 to 40 degrees but usually not above 25 to 30. The snow pack is totally or partially water saturated. The release is associated with a bed surface that is nearly impermeable to water. It is also commonly associated with heavy rainfall or sudden intense snowmelt. Additionally, depth hoar is usually present at the base of the snow cover.

Slush avalanches can travel slowly or reach speeds over 40 miles per hour. Their depth is variable as well, ranging from 1 foot to over 50 feet deep.

<u>Avalanche Terrain Factors</u>

There are several factors that influence avalanche conditions, with the main ones being slope angle, slope aspect and terrain roughness. Other factors include slope shape, vegetation cover, elevation, and path history. Avalanches usually occur on slopes above 25 degrees. Terrain with slopes below 25 degrees, are usually not steep enough to stress the snow pack resulting in a slide. Terrain with slopes above 60 degree, are too steep causing snow to ‘sluff’ off and preventing accumulation. Avalanches can occur outside this slope angle range, but are not as common. Slope aspect, also termed orientation, describes the direction a slope faces with respect to the wind and sun. Leeward slopes loaded by wind-transported snow are problematic because the wind-deposited snow increases the stress and enhances slab formation.

Intense direct sunlight, primarily during the spring months, can weaken and lubricate the bonds between the snow grains, weakening the snow pack. Shaded slopes are potentially unstable because the weak layers are held for a longer time in an unstable state.

Terrain influences snow avalanches because trees, rocks, and general roughness act as anchors, holding snow in place. However, once an anchor is buried by snow, it loses its effectiveness. Anchors make avalanches less likely but do not prevent them unless the anchors are so close together that a person could not travel between them.

<u>Avalanche Path</u>

The local terrain features determine an avalanche’s path. The path has three parts: the starting zone, the track, and the run-out zone.

The starting zone is where the snow breaks loose and starts sliding. It is generally near the top of a canyon, bowl, ridge, etc., with steep slopes between 25 and 50 degrees. Snowfall is usually significant in this area.

The track is the actual path followed by an avalanche. The track has milder slopes, between 15 and 30 degrees, but this is where the snow avalanche will reach maximum velocity and mass. Tracks can branch, creating successive runs that increase the threat, especially when multiple releases share a run-out zone.

The run-out zone is a flatter area (around 5 to 15 degrees) at the path base where the avalanche slows down, resulting in snow and debris deposition.

The impact pressure determines the amount of damage caused by a snow avalanche. The impact pressure is related to the density, volume (mass) and velocity of the avalanche (*2007 Alaska All-Hazard Mitigation Plan*).

Location

A growing number of people are snowboarding, riding snow machines and cross-country skiing in back country areas such as Harbor Mountain, Mt. Verstovia, Bear Mountain and Mt. Edgecumbe. Avalanches have occurred in all these areas. At present, there is no warning system in place to alert people about snow conditions and avalanche potential.

Blue Lake Road crosses the path of several large avalanche chutes. People in Sitka use this road extensively during the winter months for cross-country skiing, sledding, walking pets, and mountain biking. There is presently no advanced warning system to alert people about dangerous conditions on this road (EOP 2003).

Extent

Because the above noted location for snow avalanches in Sitka occurs in the backcountry and along Blue Lake Road the extent of avalanche risk is ***limited,*** as defined by Table 8, page 22.

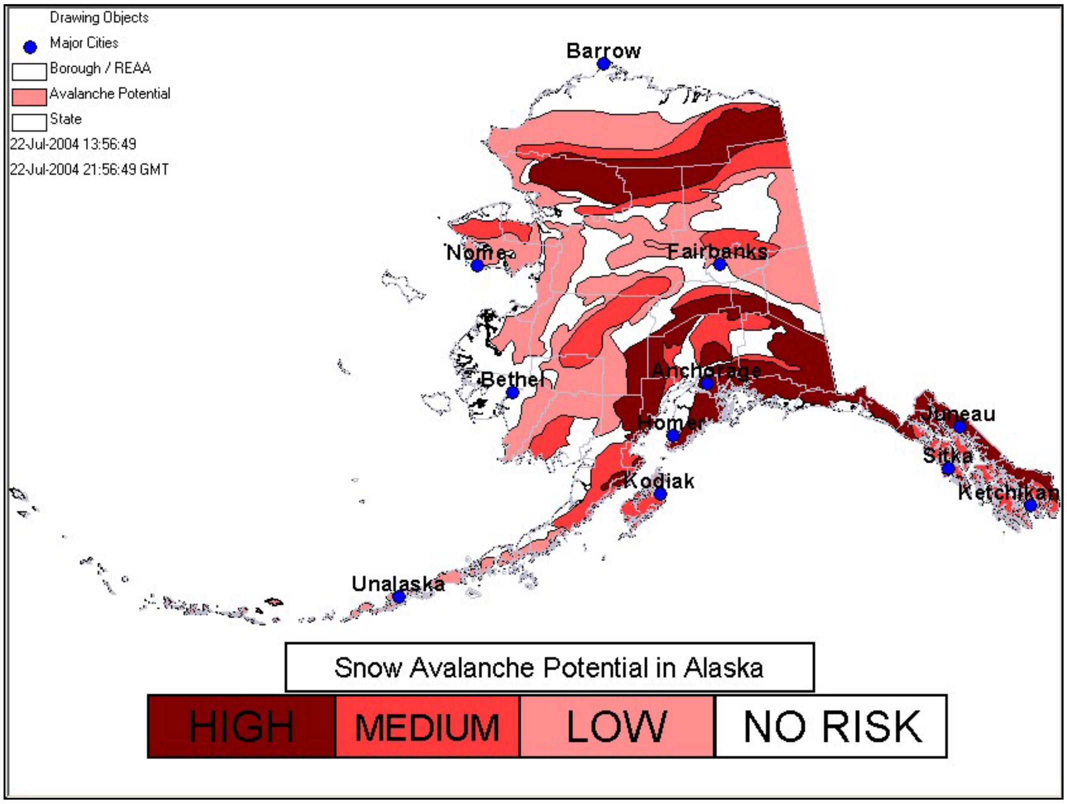
Impact

The greatest danger from snow avalanche in the Borough is in the backcountry. Several times in the past, as described in the previous occurrence section, Sitka has been isolated by road closures due to snow avalanches. Regional infrastructure damage is also a high risk in Sitka, as well as the potential for injuries or death.

Probability

The *State All-Hazard Mitigation Plan,* Vulnerability Matrix, Table 10, page 24, lists the probability of a snow avalanche in Sitka as ***high***. The hazard is present with a high probability of occurrence within the calendar year. Event has up to 1 in 1 year chance of occurring.

Figure 5. Snow Avalanche Potential in Alaska



Source: Alaska All-Hazard Risk Mitigation Plan, 2007

Previous Occurrences

Fire Chief Dave Miller related that a young man (approximately 20 years old) was killed while traversing a snow field caused by a snow avalanche. This accident occurred in the Blue Lake Road area in the mid 1990s. There have been no other recorded snow avalanche events that have resulted in injuries or property damage in Sitka.

Snow Avalanche Goals and Projects

<u>Goals</u>

Goal 1. Reduce Sitka's vulnerability to avalanche hazards in terms of threat to life and property.

Goal 2. Have comprehensive information regarding avalanche throughout Sitka's developed area, including areas that will be developed in the future.

Goal 3. Increase public awareness of avalanche and landslide dangers and hazard zones.

Projects

S/A-1. Prohibit new construction in avalanche areas. (Goal 1)

S/A-2. Utilize appropriate methods of structural avalanche control. (Goal 1, 2)

S/A-3. Enact buyout of homes in avalanche paths. (Goal 1)

S/A-4. Install warning signage in mapped avalanche areas. (Goal 3)

S/A-5. Continue to educate public about avalanche hazards. (Goal 3)

Section 4. Tsunami Hazard

Note: the Sitka Borough Fire Department and Local Emergency Planning Committee wrote portions of this section, in 2003, as part of the Emergency Operation Plan. The 2003 Tsunami Plan has been reformatted to fit this plan.

Hazard Description

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 slope 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 waves 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 event occurs, a tsunami could reach the shore

Sitka Evacuation Route, 2008

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. The first wave is usually not the largest in the series of waves, nor is it the most significant. One coastal community may experience no damaging waves while another may experience destructive deadly waves. Some low-lying areas could experience severe inland inundation of water and deposition of debris of more than 1000 feet inland.

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. According to the West Coast and Alaska Tsunami Warning Center (WCATWC), if an earthquake of this magnitude occurs, Alaska's coastlines can be expected to flood within 15 minutes.

Types of Tsunami

Tele-Tsunami

Tele-tsunami is the term for a tsunami observed at places several thousand kilometers from their source. In many cases, tele-tsunamis can allow sufficient warning time for evacuation.

No part of Alaska is expected to have significant damage due to a tele-tsunami. Only one tele-tsunami has caused damage in Alaska; the 1960 Chilean tsunami. Damage occurred to pilings at MacLeod Harbor, Montague Island on Cape Pole, and Kosciusko Island where a log boom broke free.

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. They generally reach land 20 to 45 minutes after starting.

Landslide-generated tsunami

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

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

Seiches

A seiche is a wave that oscillates in partially or totally enclosed bodies of water. They can last from a few minutes to a few hours because of an earthquake, underwater landslide, atmospheric disturbance or avalanche. The resulting effect is similar to bathtub water sloshing repeatedly from side to side. The reverberating water continually causes damage until the activity subsides. The factors for effective warning are similar to a local tsunami. The onset of the first wave can occur in a few minutes, giving virtually no time for warning.

Characteristics of Tsunamis

Debris: As the tsunami wave comes ashore, it brings with it debris from the ocean, including man-made debris such as boats, and as it strikes the shore, creates more on-shore debris. Debris can damage or destroy structures on land.

Distance from shore: Tsunamis can be both local and distant. Local tsunamis cause more devastation and give residents only a few minutes to seek safety. Distant tsunamis originating in places like Chile, Japan, Russia, or other parts of Alaska can also cause damage.

High tide: If a tsunami occurs during high tide, the water height will be greater and cause greater inland inundation, especially along flood control and other channels.

Outflow: Outflow following inundation creates strong currents, which rip at structures and pound them with debris, and erode beaches and coastal structures.

Water displacement: When a large mass of earth on the ocean bottom impulsively sinks or uplifts, the column of water directly above it is displaced, forming the tsunami wave. The rate of displacement, motion of the ocean floor at the earthquake epicenter, the amount of displacement of the rupture zone, and the depth of water above the rupture zone all contribute to the intensity of the tsunami.

Wave runup: Runup is the height that the wave extends up to on steep shorelines, measured above a reference level (the normal height of the sea, corrected to the state of the tide at the time of wave arrival).

Wave strength: Even small wave heights can cause strong, deadly surges. Waist-high surges can cause strong currents that float cars, small structures, and other debris.

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 UAF and the Alaska 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. AEIC Priority List of Community Inundation Mapping Projects lists Sitka as number seven on the list to receive inundation mapping. Until the maps are finished it is not possible to determine the possible locations of runup from a future tsunami.

Figure 6. AEIC Priority List of Community Inundation Mapping Projects

Community	Tsunami Ready Community	State's Priority (Yes / No)	Distant Tsunami Potential	Local Tsunami / Seiche Potential	Large Scale USGS Base Maps	Infrastructure	Tourism	Cruise Ships (Tour Bus/Ship)	Special Seasonal Events	Fishing / Commercial / Timber
1. Kodiak City/Map Combined with	✓	Done	H	Y	✓	✓	✓		✓	✓
2. Woman's Bay		Done	H	Y	✓					
3. US Coast Guard Station		Done	H	Y	✓					
4. Homer/Map Combined with	✓	Done	H	Y	✓	✓	✓	✓	✓	✓
5. Seldovia		Done	H	Y						
6. Seward	✓	Y	H	Y	✓	✓	✓	✓	✓	✓
7. Sitka	✓	Y	H	Y	✓	✓	✓	✓	✓	✓
8. Valdez		Y	L	Y	✓	✓	✓	✓	✓	✓
9. Sand Point		Y	H	Y		✓	✓	□	✓	✓
10. Unalaska		Y	H	Y		✓	✓	✓	✓	✓
11. Juneau/Douglas		Y	L	Y	✓	✓	✓	✓	✓	✓
12. Whittier		Y	L	Y	✓	✓	✓	✓	✓	✓
13. Cordova		Y	M	Y	✓	✓	✓	✓	✓	✓
14. Akutan		Y	M	Y					✓	✓
15. Yakutat		Y	H	Y	✓	✓	✓		✓	✓
16. Ketchikan		Y	L	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-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 causing difficulty standing) should move to higher ground immediately.

Source; http://www.aeic.alaska.edu/tsunami/intro.html

Extent

A tsunami in Sitka could be of a ***catastrophic*** extent. Sitka has been designated by DHS&EM and DGGS as having a high potential both local and Pacific-wide tsunamis. Sitka is located directly on the Gulf of Alaska and is not protected by islands, as is much of Southeastern Alaska. It is possible for a catastrophic event that could cause multiple deaths, complete shutdown of facilities and severe property damage.

The following factors will affect the severity of a tsunami:

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 create effects that result in greater damage. Offshore canyons can focus tsunami wave energy, and islands can filter the energy. The orientation of the coastline determines whether the waves strike head-on or are refracted from other parts of the coastline. A tsunami wave 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.

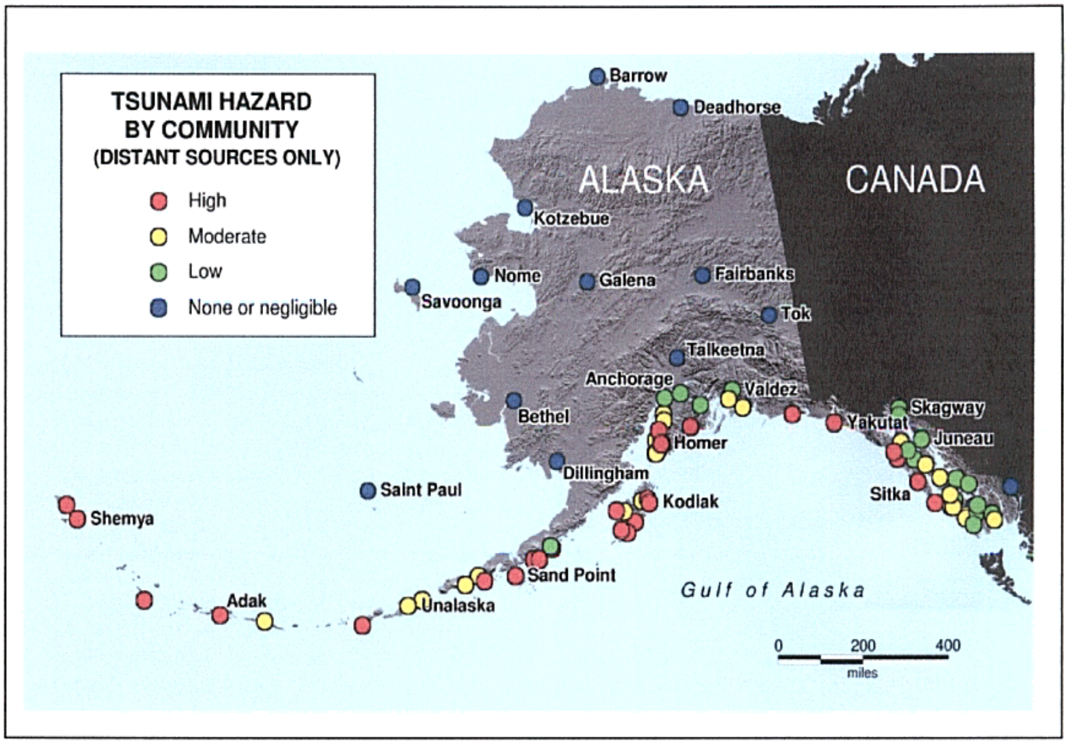
Earthquake characteristics: Several characteristics of the earthquake that generates the tsunami contribute to the intensity of the tsunami, including the area and shape of the rupture zone, and:

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. Additionally, loading on the delta from added weight such as trains or a warehouse or added fill can add to an area's instability.

Figure 7. Tsunami Hazard by Community



Source: Alaska All-Hazard Risk Mitigation Plan, 2007

Probability

Sitka has a **high** probability of a tsunami event. The hazard is present with a high probability of occurrence with the calendar year. Event has up to 1 in 1 year chance of occurring. The State Divisions of DHS&EM and DGGS have designated Sitka as being one of the most high-risk communities in the State for a tsunami event.

Alaska has the greatest earthquake and tsunami potential in the entire United States. It is a very seismically active region where the Pacific plate is subducting under the North American plate. This subduction zone, the Alaska-Aleutian megathrust zone, creates high tsunami hazards for the adjacent coastal areas. The coseismic crustal movements that characterize this area have a high potential for producing vertical sea floor displacements, which are highly tsunamigenic (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 coastlines can be expected to flood within 15 minutes (WCATWC).

Since science cannot predict when earthquakes will occur, they cannot determine exactly when a tsunami will be generated. But, with the aid of historical records of tsunamis and numerical models, science can get an idea as to where they are most likely to be generated. Past tsunami height measurements and computer modeling help to forecast future tsunami impact and flooding limits at specific coastal areas. There is an average of two destructive tsunamis per year in the Pacific basin. Pacific wide tsunamis are a rare phenomenon, occurring every 10 - 12 years on the average (WCATWC).

Impact

A tsunami event in Sitka could damage the structures and infrastructure that are located along the shoreline in the community, and within the flood zones described above. A tsunami event in Sitka could isolate the community from other areas of the state and cause wide spread damage.

Previous Occurrences

Earthquakes have generated local subaerial and subaqueous landslides, which have the potential to trigger local tsunamis. The largest tsunami to impact Sitka was 7.8-foot high wave, generated by the 1964 Prince William Sound earthquake. This tsunami caused the loss of one dock in Sitka. There was no other damage or loss of life (AEIC).

Historic tsunamis that were generated by earthquakes in the Alaska-Aleutian subduction zone, have resulted in widespread damage and loss of life along the Alaskan Pacific coast and other exposed locations around the Pacific Ocean. Seismic water waves originating in Alaska can travel across the Pacific and destroy coastal towns hours after they are generated. However, they are considered to be a near-field hazard for Alaska, and can reach Alaskan coastal communities within minutes after an earthquake. Therefore, saving lives and property depends on how well a community is prepared, which makes it essential to model the potential flooding area in a case of a local or distant tsunami (AEIC).

There has been at least one confirmed volcanically triggered tsunamis in Alaska. In 1883, debris from the Saint Augustine volcano triggered tsunamis that inundated Port Graham with waves 30 feet high.

Tsunami Mitigation Goals and Projects:

Goals

Goal 1. Increase Public Education about Tsunamis and Seiches.

Goal 2. Continue the Tsunami Ready Community Designation Program.

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

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

Projects

T-1: Continue Participation in the Tsunami Awareness Programs. (Goal 1, 2)

T-2. Update Sitka Emergency Operations Plan, as needed, Conduct Emergency Operation Plan Exercises. (Goal 4)

T-3. Inundation Mapping. (Goal 3)

The Sitka EOP lists the following **existing** Tsunami Program and Strategies

1. Deep Ocean Assessment and Reporting Tsunamis (DART)

The DART project is a component of the U.S. National Tsunami Hazard Mitigation Program (NTHMP). The NTHMP is a comprehensive, joint Federal/State effort to reduce the loss of life and property due to tsunami inundation of U.S. coastlines..

The DART project is an ongoing effort to develop and implement a capability for the early detection and real time reporting of tsunamis in the open ocean. Project goals are to:

- Reduce the loss of life and property in U.S. coastal communities.
- Eliminate false alarms and the high economic cost of unnecessary evacuations.

2 West Coast/Alaska Tsunami Warning Center

The WCATWC was established in Palmer, Alaska in 1967 as a direct result of the earthquake that occurred in Prince William Sound in March 27, 1964. This earthquake alerted State and Federal officials to the need for a facility to provide timely and effective tsunami warnings and information for the coastal areas of Alaska.

Tsunami warnings are of two types: regional warning for tsunamis produced in or near the area of responsibility (AOR) and warning for tsunamis generated outside the AOR.

Regional warnings are issued within 15 minutes of earthquake origin time and are based solely on seismic data. Warnings are issued for any coastal earthquake in the WCATWC AOR over a moment magnitude of 7. Warnings outside the WCATWC's AOR are issued after coordination with the Pacific Tsunami Warning Center in Ewa Beach, Hawaii. The warnings are based on seismic data, along with historical tsunami records and recorded tsunami amplitudes from tide gauges.

In addition to tsunami warning messages, the WCATWC also issues information messages for earthquakes that may be felt strongly by local citizens but are not large enough to generate a tsunami. Each year, the WCATWC staff responds to more than 250 alarms averaging approximately five a week. The messages are important in preventing needless evacuations since citizens near coastal areas are taught to move to higher ground when severe earthquake shaking occurs. Other messages issued by the WCATWC include seismic data exchanges among other centers, and tsunami information messages for large earthquakes outside the AOR that are not potentially dangerous to the AOR. The information provided by the WCATWC is critical in providing the public correct information.

3. TsunamiReady Community

The City & Borough of Sitka achieved "TsunamiReady Certification" in June of 2003. The TsunamiReady Community program promotes tsunami hazard preparedness as an active collaboration among Federal, State and local emergency management agencies, the public, and the National Weather Service (NWS) tsunami warning system. This collaboration supports better and more consistent tsunami awareness and mitigation efforts among communities at risk. The main goal is improvement of public safety during tsunami emergencies.

The City & Borough of Sitka has implemented the following steps to qualify as a TsunamiReady community.

➢ Communications and Coordination Center

A key to effective hazards management is effective communication. To ensure a coordinated response, the CBS established the following:

24-Hour Warning Point - The Sitka Volunteer Fire Department (SVFD) is the designated 24-hour warning point (WP) that can receive NWS tsunami information and provide local reports and advice. The SVFD warning point has:

- 24-hour operations.
- Warning reception capability.
- Warning dissemination capability.
- Ability and authority to activate local warning system(s).

- Emergency Operations Center (EOC) - The SVFD operates under the Incident Command System. In the event of a Tsunami an emergency operations center will be established at Keet Gooshi Heen School. Summarized below are the tsunami-related roles of the EOC:

  - The EOC is activated based on guidelines outlined in the City and Borough of Sitka Emergency Hazard Plan.
  - The EOC will be staffed with members of the SVFD or those designated by the Fire Chief or designee.
  - The EOC has warning reception/dissemination capabilities equal to or better than the warning point.
  - The EOC has the ability to communicate with EOCs/Warning points in Port Alexander, Angoon, Kake, Pelican and Hoonah. Remote communities in Little Port Walter, Baranof Warm Springs, and hatchery facilities at Hidden Falls will receive warnings on VHF radio Channel 16 from the United States Coast Guard.
  - Ability to communicate with local National Weather Service (NWS) office or Tsunami Warning Center.

4. Tsunami Warning Reception

EOC has multiple ways to receive NWS tsunami warnings.

- NOAA Weather Radio receiver with tone alert and Specific Area Message Encoding
- Statewide Telecommunications System: Automatic relay of NWS products on statewide emergency management or law enforcement system
- Statewide warning fan-out system: State authorized system of passing message throughout warning area
- E-mail from Tsunami Warning Center: Direct e-mail from Warning Center to emergency manager
- Radio/TV via Emergency Alert System: Local Radio/TV or cable TV
- US Coast Guard broadcasts: WP/EOC monitoring of United States Coast Guard marine channels
- National Warning System drop: FEMA-controlled civil defense hotline

5. Warning Dissemination

Upon receipt of NWS warnings or other reliable information suggesting a tsunami is imminent, the SVFD officials will disseminate warning of the threat as follows.

- Outdoor warning sirens.
- Television audio/video overrides.
- Local broadcast system or emergency vehicles.
- Phone messaging (dial-down) systems.

- The City and Borough of Sitka has distributed 35 national weather receivers with tone alert receiver to all the schools, Sheldon Jackson College, University of Alaska, Kettleson Library,
- SEARHC Hospital, Sitka Community Hospital, Pioneer Home, U.S. Forest Service, Sitka Police Department, Coast Guard and Alaska State government offices.
- The City and Borough of Sitka has established a communications network ensuring the flow of information among all remote communities under its jurisdiction.

6. Community Preparedness

Public education is vital in preparing citizens to respond properly to tsunami threats. An educated public is more likely to take steps to receive tsunami warnings, recognize potentially threatening tsunami events, and respond appropriately to those events. The City & Borough of Sitka conducts the following emergency preparedness activities:

- The SVFD conducts or sponsors tsunami awareness programs in schools, local hospitals, workshops, and community meetings.
- City and Borough of Sitka has designated tsunami evacuation areas and evacuation routes, and installed evacuation route signs.
- There are designated tsunami shelters outside the hazard zone at Sitka High School and Keet Gooshi Heen School.
- Provided written tsunami hazard information to the community
- Evacuation routes
- Basic tsunami information

These instructions are distributed through mailings and posted at common meeting points such as libraries and public buildings throughout the community.

Local schools meet the following guidelines:

- Tsunami information is included in primary and secondary school curriculums. NWS will help identify curriculum support material.
- Have a biannual tsunami awareness presentation.
- Schools within the defined hazard zone have tsunami evacuation drills at least biannually.
- Written safety materials are provided to all staff and students.
- Each school has an earthquake plan.

Residents and visitors will be educated about the threat of tsunamis to the City of Sitka, as well as being informed about tsunami evacuation areas, routes and safe areas. Community members will be encouraged to develop a Family Disaster Plan and an Emergency Survival Kit for their home and vehicles.

Section 5. Severe Weather

Hazard Description

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

In Alaska, there is great potential for weather disasters. High winds can combine with loose snow to produce a blinding blizzard and wind chill temperatures to 75°F below zero. Extreme cold (-40°F to -60°F) and ice fog may last for weeks at a time. Heavy snow can impact the interior and is common along the southern coast. A quick thaw means certain flooding.

Winter Storms

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

- Cold air - Subfreezing temperatures (below 32ºF, 0ºC) in the clouds and/or near the ground to make snow and/or ice.
- Moisture - The air must contain moisture in order to form clouds and precipitation.
- Lift - A mechanism to raise the moist air to form the clouds and cause precipitation.

Heavy Snow

Heavy snow, generally more than 12 inches of accumulation in less than 24 hours, can immobilize a community by bringing transportation to a halt. Until the snow can be removed, airports and major roadways are impacted, even closed completely, stopping the flow of supplies and disrupting emergency and medical services. Accumulations of snow can cause roofs to collapse and knock down trees and power lines. Heavy snow can also damage light aircraft and sink small boats. A quick thaw after a heavy snow can cause substantial flooding. The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts on cities and towns. Injuries and deaths related to heavy snow usually occur as a result of vehicle accidents. Casualties also occur due to overexertion while shoveling snow and hypothermia caused by overexposure to cold weather.

Extreme cold

What is considered an excessively cold temperature varies according to the normal climate of a region. In areas unaccustomed to winter weather, near freezing temperatures are considered "extreme cold". In Alaska, extreme cold usually involves temperatures below –40˚ Fahrenheit. Excessive cold may accompany winter storms, be left in their wake, or can occur without storm activity.

Extreme cold can bring transportation to a halt across interior Alaska for days or sometimes weeks at a time. Aircraft may be grounded due to extreme cold and ice fog conditions, cutting off access as well as the flow of supplies.

Extreme cold also interferes with a community's infrastructure. It causes fuel to congeal in storage tanks and supply lines, stopping electric generation. Without electricity, heaters do not work, causing water and sewer pipes to freeze or rupture. If extreme cold conditions are combined with low or no snow cover, the ground's frost depth can increase disturbing buried pipes.

The greatest danger from extreme cold is its effect on people. Prolonged exposure to the cold can cause frostbite or hypothermia and become life threatening. Infants and elderly people are most susceptible. The risk of hypothermia due to exposure greatly increases during episodes of extreme cold, and carbon monoxide poisoning is possible as people use supplemental heating devices.

Ice Storms

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

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

Weather extremes in Sitka are due to heavy rainfall and high winds. Emergencies could arise from a combination of events.

Location

The hazards of severe weather impact Sitka on an area wide basis.

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

Extent

Extreme weather could result in a ***critical*** situation in Sitka. Injuries and/or illness could result from excessive rainfall or snowfall and with high winds cause the shutdown of critical facilities, damage property and isolate Sitka.

The *Alaska All-Hazard Mitigation Plan, 2007* lists severe weather as creating two limited damage events in Sitka.

Impact

Because of its remote location, Sitka must be very self-reliant. Severe weather can cut off air access limiting medevac availability and access to goods and services, including groceries and medical supplies. Severe wind and heavy snow can cause extensive damage to critical structures including residences and public facilities.

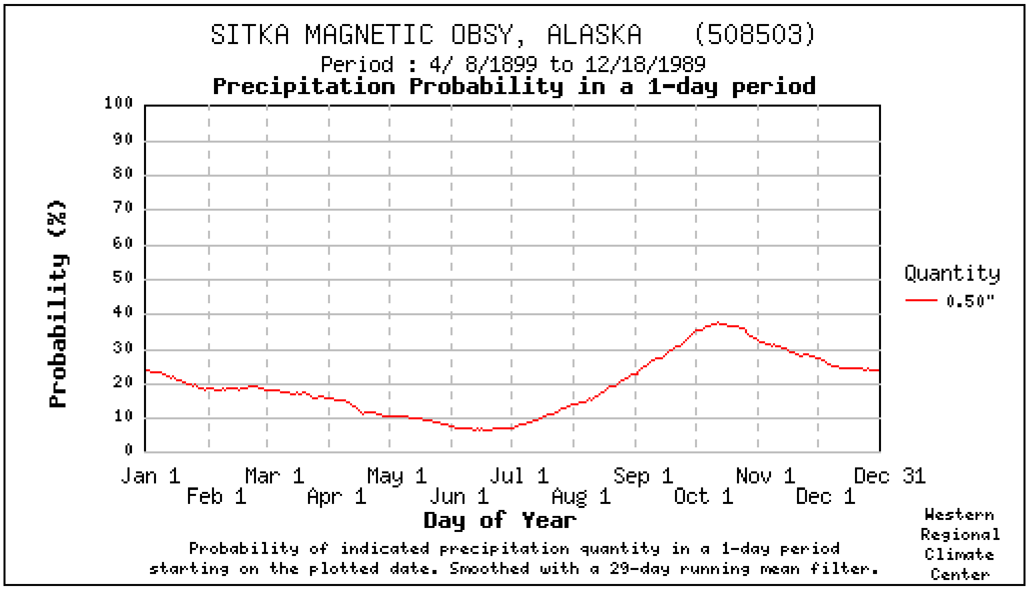
A severe weather event would create an area wide impact and could damage structures and potentially isolate Sitka from the rest of the state.

Probability

The past Sitka Fire Chief (S. Ulmer) related that severe weather is the highest natural hazard risk in Sitka, due to extreme rainfall and high winds. As noted on the table below, Sitka has a ***high*** probability of severe weather, which is defined, as the hazard is present with a high probability of occurrence within the calendar year. Event has up to 1 in 1 year chance of occurring.

Figure 7 from the Western Regional Climate Center shows that Sitka has a 10% to 40% chance of at least a half-inch of rainfall most days.

Figure 8. Precipitation Probability in a 1-day period



Previous Occurrences

Southeast Alaska, November 26, 1984: A hurricane force windstorm and wind driven tides caused extensive damage to public and private property in five Southeast Alaskan communities. The State provided public and individual assistance grants and temporary housing in Juneau, **Sitka**, Kake, Angoon and Tenakee Springs. SBA provided disaster loan assistance and the American Red Cross made grants to meet immediate needs of victims. The Governor's request for a Presidential declaration was denied.

Southeast Storm (AK-06-216) declared December 23, 2005 by Governor Murkowski: Beginning on November 18, 2005 and continuing through November 26, 2005, a strong winter storm with high winds and record rainfall occurred in the City/Borough of Juneau, the City/Borough of Haines, the **City/Borough of Sitka**, the City of Pelican, the City of Hoonah, and the City of Skagway, which resulted in widespread coastal flooding, landslides, and sever damage and threat to life and property, with the potential for further damage. The following conditions existed as a result of this disaster: severe damage to personal residences requiring evacuation and relocation of residents; to individual's personal and real property; to businesses; and to a marine highway system dock, the road systems eroded and blocked by heavy debris that prohibited access to communities and residents, and other public infrastructures, necessitating emergency protective measures and temporary and permanent repairs. The total estimated amount of assistance is approximately $1.87 million. This includes the following: Individual Assistance totaling $500,000 for 52 applicants. There was no hazard mitigation (DHS&EM Disaster Cost Index).

Table 20 from the Western Regional Climate Center illustrates the temperate climate in Sitka.

Table 19. Sitka Temperature Summary

Period of Record General Climate Summary - Temperature

Station:(508503) SITKA																
From Year=1899 To Year=2008																
	Monthly Averages			Daily Extremes				Monthly Extremes				Max. Temp.		Min. Temp.	
	Max.	Min.	Mean	High	Date	Low	Date	Highest Mean	Year	Lowest Mean	Year	>= 90 F	<= 32 F	<= 32 F	<= 0 F
	F	F	F	F	dd/yyyy or yyyymmdd	F	dd/yyyy or yyyymmdd	F	-	F	-	# Days	# Days	# Days	# Days
January	37.7	26.9	32.3	60	31/1940	-8	30/1947	43.2	1926	16.4	1969	0.0	5.9	21.7	0.5
February	40.4	28.3	34.3	63	28/1968	-4	02/1968	41.8	1977	25.4	1904	0.0	2.8	19.2	0.1
March	43.1	29.5	36.3	65	15/1900	-5	03/1955	43.8	1926	29.4	1951	0.0	0.9	20.9	0.0
April	48.0	33.2	40.6	79	29/1976	6	04/1929	45.8	1940	34.7	1954	0.0	0.0	13.8	0.0
May	53.6	38.5	46.0	85	22/1963	26	05/1965	50.6	1981	41.8	1971	0.0	0.0	3.6	0.0
June	58.3	44.3	51.3	86	05/1980	26	01/1925	56.3	1936	47.1	1904	0.0	0.0	0.1	0.0
July	61.0	48.6	54.8	87	27/1899	33	12/1911	58.1	1940	50.6	1904	0.0	0.0	0.0	0.0
August	62.1	49.1	55.6	86	02/1929	32	25/1948	61.0	1923	52.1	1969	0.0	0.0	0.0	0.0
September	58.9	44.8	51.8	82	15/1937	27	26/1972	55.3	1938	48.9	1972	0.0	0.0	0.4	0.0
October	51.4	39.0	45.2	70	02/1923	14	30/1984	50.1	1923	40.3	1956	0.0	0.0	4.7	0.0
November	43.8	32.5	38.1	64	02/1970	-3	26/1985	45.2	1936	26.5	1985	0.0	1.4	14.3	0.0
December	38.9	28.9	33.9	64	08/1934	-6	31/1949	42.9	1925	19.1	1933	0.0	4.9	19.8	0.2
Annual	**49.8**	**36.9**	**43.4**	**87**	**18990727**	**-8**	**19470130**	**48.3**	**1926**	**40.1**	**1972**	**0.0**	**16.1**	**118.6**	**1.0**
Winter	39.0	28.0	33.5	64	19341208	-8	19470130	41.8	1926	25.0	1969	0.0	13.7	60.7	0.9
Spring	48.2	33.7	41.0	85	19630522	-5	19550303	46.3	1926	37.4	1954	0.0	0.9	38.3	0.0
Summer	60.5	47.3	53.9	87	18990727	26	19250601	58.0	1926	50.2	1904	0.0	0.0	0.1	0.0
Fall	51.4	38.7	45.1	82	19370915	-3	19851126	49.1	1936	39.8	1985	0.0	1.5	19.4	0.0

Western Regional Climate Center, wrcc@dri.edu

Severe Weather Mitigation Goals and Projects

Severe Weather Goals

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

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

Projects

SW-1. Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc. (Goal 2)

SW-2. Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability. (Goal 1, 3)

SW-3. Encourage weather resistant building construction materials and practices. (Goal 1)

Section 6. Ground Failure Hazard

Ground failure is a problem throughout Alaska with landslides presenting the greatest threat. Ground failure hazards exist to some degree in all areas of the state.

Hazard Description

Landslides are described as downward movement of a slope and materials under the force of gravity. The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Landslides are influenced by human activity (mining and construction of buildings, railroads, and highways) and natural factors (geology, precipitation, and topography). They are common all over the United States and its territories.

Landslides occur when masses of rock, earth, or debris move down a slope. Therefore, gravity acting on an overly steep slope is the primary cause of a landslide. They are activated by storms, fires, and by human modifications to the land. New landslides occur as a result of rainstorms, earthquakes, volcanic eruptions, and various human activities.

Mudflows (or debris flows) are flows of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt, changing the earth into a flowing river of mud or "slurry." Slurry can flow rapidly down slopes or through channels and can strike with little or no warning at avalanche speeds. Slurry can travel several miles from its source, growing in size as it picks up trees, cars, and other materials along the way.

Other types of landslides include: rock slides, slumps, mudslides, and earth flows. All of these differ in terms of content and flow.

Landslides usually affect infrastructure such as roads and bridges, but they can also affect individual buildings and businesses.

The four types of landslides are classified according to the type of material and movement involved.

Slides

Slides are characterized by shear displacement along one or several surfaces. The two general types of slides are rotational and translation. During a rotational slide the ruptured surface is concave upward, and the mass rotates along the concave shear surface. Rotational slides, also called slumps, can occur in bedrock, debris, or earth. In a translational slide, the rupture surface is a smooth or gently rolling slope. If an intact mass slide down a slope on a distinct shear it is called a block slide. If rock fragments or debris slide down a slope on a distinct shear plane it is called a rockslide or debris slide.

Flows

Fast moving soils, rocks and organic materials mixed with air and water going down a hill. They differ from slides by having higher water content and resemble a viscous fluid. Common to Alaska are flows in bedrock, also called sackung, gravitational sagging, or ridgetop spreading. Sackung may occur slowly or may develop in response to seismic shaking.

Flows in soil or debris also include soil creep, solifluction, block streams, etc.

Creep is an imperceptibly slow, downward movement of slope-forming soil or rock due to gravity.

Solifluction is a slow down-slope flow of water-saturated soil. It often occurs in areas with perennially frozen ground, because the frozen ground traps snow and ice melt within the surface layer making it more fluid. In such areas this process is properly called gelifuction. Spring rain and meltwater saturate the soil because it cannot percolate in the frozen layers below. Surface layers, during the short summers, only thaw to a small depth; creating a very unstable situation at the interface between the frozen and unfrozen layers. The result is waterlogged beds on top flow slowly down slope moving several inches per day.

Landslide area, 2008

Block streams are slow moving tongues of rocky debris on steep slopes, which are often fed by talus cones.

Lateral Spreads

Lateral spreads consist of material which is laterally displaced or of surface materials that are spreading apart. They often occur on gentle slops that range between .3 and 3 degrees and occur commonly in fine-grained soils. Slopes are especially vulnerable if the soil has been remolded or distributed by construction, grading or similar activities. They can be produced through liquefaction; which can occur spontaneously because of changes in pore-water pressure or as the result of vibrations.

Falls and Topples

A fall is when rock or other material breaks free from a cliff or slope and moves by free fall, bouncing or rolling. Falls typically occur on steep slopes with a slope angle between 45 to 90 degrees; making fall movement very fast. Topples are a mass of rocks or soil rotating forward from a slope at a point that is below the mass' center of gravity. The movement is tilting without collapse but if the mass pivots far enough, a fall may result.

Landslide area, 2008

Geology, precipitation, topography and cut and fill construction practices all influence landslide activity. They often are the result of seismic activity, flooding, volcanic activity, heavy precipitation, construction work, or coastal storms. Landslides can also trigger secondary hazards, such as tsunamis and flooding.

Location

Landslides can occur along the Blue Lake Road, Green Lake Road and power line corridor. Landslides have occurred in the past destroying a remote section of the power line (EOP 2003).

Extent

The *Alaska State All-Hazard Mitigation Plan, 2007*, and previous occurrences indicate that a landslide in Sitka would cause ***limited*** damage. Limited is defined as more than 10% of property is severely damaged.

Impact

Ground failure near the shoreline could trigger a tsunami or cause flooding. As shown on the picture above, ground failure can cause road damage and closures and degrade the slope below residences and business. Ground failure in the backcountry areas is danger to people who may be in the area and could cause extensive and expensive regional infrastructure damage.

Probability

Due to the voluminous rainfall and the soil types in Sitka, the probability of a landslide in Sitka is ***high***. A high probability is defined, as the hazard is present with a high probability of occurring within the calendar year. Event has up to 1 in 1 year chance of occurring.

Previous Occurrences

Numerous landslides have occurred in uninhabited areas of Sitka Borough. Blue Lake Road, Green Lake Road and powerline corridor all intersect avalanche chutes. Blue Lake Road is heavily traveled during winter months to access cross-country skiing, sledding, walking pets and mountain biking. Past landslides have destroyed remote sections of the powerline (EOP 2003).

Landslides Mitigation Goals and Projects

<u>Goals</u>

Goal 1. Reduce Sitka's vulnerability to landslide hazards in terms of threat to life and property.

Goal 2. Have comprehensive information regarding avalanche and landslide hazards and unstable soils throughout Sitka's developed area, including areas that will be developed in the future.

Goal 3. Increase public awareness of avalanche and landslide dangers and hazard zones.

<u>Projects</u>

G/F-1. Prohibit removal of vegetation in areas prone to landslides (Goal 1).

G/F-2. Require public disclosure of risk linked to deed or title of property. Require owners notify renters of hazard prior to occupancy (Goal 2, 3).

G/F-3. Install warning signage in mapped landslide zones (Goal 2, 3).

G/F-4. Continue to educate public about avalanche and landslide hazards (Goal 3).

Section 7. Hazards Not Profiled in this Plan

Volcanoes

The responsibility for hazard identification and assessment for the active volcanic Centers of Alaska falls to the Alaska Volcano Observatory (AVO) and its constituent organizations.

The AVO, which is a cooperative program of the U.S. Geological Survey (USGS), DGGS, and the University of Alaska Fairbanks Geophysical Institute (UAF/GI), monitors the seismic activity at 23 of Alaska's 41 active volcanoes in real time. In addition, satellite images of all Alaskan and Russian volcanoes are analyzed daily for evidence of ash plumes and elevated surface temperatures. Russian volcanoes are also a concern to Alaska as prevailing winds could carry large ash plumes from Kamchatka into Alaskan air space. AVO also researches the individual history of Alaska's active volcanoes and produces hazard assessment maps for each center.

The AVO identifies the closest active volcano to Sitka at being over 300 miles away.
http://www.avo.alaska.edu/

Wildland Fire

The soil conditions and abundant rainfall combine to make wildland fire hazard unlikely.

Chapter 5. Mitigation Strategy

Benefit - Cost Review

The methods for conducting a Benefit Cost Review are outlined in the FEMA *How-To-Guide Benefit-Cost Review in Mitigation Planning* (FEMA 386-5). All the guidebooks for developing a MHMP may be accessed online at: http://www.fema.gov/hazard/hurricane/2005katrina/hmp/mitigation_planning.shtm.

The projects listed on the Cost Benefit Listing Table were prioritized 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 will 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. The factors of life-safety and critical facilities steered the prioritization towards projects with likely good benefit-cost ratios. The following factors were used in assigning the priority on the benefit cost listing table.

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 Borough functionality.

4. Hazard probability.

5. Hazard severity.

This method supports the principle of benefit-cost review by using a process that demonstrates a special emphasis on maximization of benefits over costs. 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 386-5).

Benefit-Cost Analysis

The following section, written by FEMA, explains how to perform a benefit –cost analysis (BCA). The complete guidelines document, a benefit-cost analysis document and benefit-cost analysis technical assistance are available online http://www.fema.gov/government/grant/bca.

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.

The latest software for preparing Benefit-Cost Analysis is available from FEMA Regional via the BC Helpline, (at 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.

Eligible Projects for PDM Funding

The PDM (Grant Program) is federally funded through FEMA at 75% of the plan or project and requires a 25% local fund match. The program is annual, nationally competitive and is intended to reduce overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations.

A Hazard Mitigation ***Planning*** grant is only available for communities that do not have a FEMA/State approved and community adopted All-Hazard Mitigation Plan.

A Hazard Mitigation ***Project*** grant is only available for communities that do have a FEMA/State approved and community adopted Hazard Mitigation Plan.

Hazard Mitigation Projects are intended to reduce risk to life and property and 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

Eligible Projects for HMGP Funding

To be eligible for funding under the HMGP, proposed measures must meet the minimum project criteria under 44 CFR 206.434(b). These criteria are 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.

There are five minimum criteria that all projects must meet in order to be considered for funding. Projects must:

- Conform with the *State Hazard Mitigation Plan*;
- Provide beneficial impact upon the designated disaster area;
- Conform with environmental laws and regulations;
- Solve a problem independently or constitute a functional portion of a solution; and,
- Be cost-effective.

Benefit – Costs Review Listing

Table 20. Benefit Cost Review Listing

Mitigation Projects	Benefits (pros)	Costs (cons)	Priority*
Flood/Erosion (FLD)			
FLD-1. Identify Drainage Patterns and Develop a Comprehensive Drainage System	Benefit to entire community Property damage reduction	Engineering study needed >$50,000 1 – 5 years	Medium
FLD-2. Structure Elevation and/or Relocation	Life/Safety project Benefit to government facilities and private properties.	Dollar cost unknown, >$50,000 1 – 5 year implementation	Medium
FLD-3. Updated FIRM Sitka Maps	U.S. Corps of Engineers facilitated project. Can be started immediately.	Expensive, at least $100,000	High
FLD-4. Public Education	DCRA funding may be available. Could be done yearly. Inexpensive <$1,000	Not clear if there would be community interest or participation.	Medium
FLD-5. Pursue obtaining a CRS rating to lower flood insurance rates.	High capability by borough to do on an annual basis Will reduce NFIP insurance for entire community. <$1,000/year	Staff time.	High
FLD-6. Continue to obtain flood insurance for all Borough structures, and continue compliance with NFIP.	High capability by Borough to do on an annual basis. Public benefit to have public buildings insured through NFIP. Inexpensive, approx.$3,000/year.	Staff time	High
FLD-7. Require that all new structures be constructed according to NFIP requirements and set back from the river shoreline to lessen future erosion concerns and costs.	High capability by Borough to do on an annual basis. Public benefit to have public buildings insured through NFIP. Inexpensive, approx.$3,000/year.	Staff time	High

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 community State assistance available	Staff time	High
E-2. Contract a structural engineering firm to assess the identified bldgs and facilities.	Benefit to entire community Risk reduction	Feasibility and need analysis needed. 1 – 5 years	Medium
E-3. Nonstructural mitigation projects (i.e. assessing whether heavy objects are tied down)	Reduce property damage and reduces risk of injury from falling objects	Staff or Volunteer time	Medium
E-4. Conduct mock emergency exercises to identify response vulnerabilities.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff or Volunteer time	Medium
Snow Avalanche (S/A)			
S/A-1. Prohibit new construction in avalanche areas.	Life/Safety issue/Risk reduction Benefit to entire community No direct cost to implement	Political Support not determined. Private property issues. Staff time. 1 – 5 years to adopt ordinance.	Medium
S/A-2. Utilize appropriate methods of structural avalanche control.	Life/Safety issue/Risk reduction Benefit to entire community Federal or State assistance available	Engineering and structural design needed. Dollar cost not determined. Long timeframe to implement >5 years.	Low
S/A-3. Enact buyout of homes in avalanche paths, if any.	Life/Safety issue/Risk reduction Benefit to entire community	Political Support not determined. Private property issues. Staff time. Expensive, >$100,000. Long timeframe 5+ years.	Low

Mitigation Projects	Benefits (pros)	Costs (cons)	Priority*
S/A-4. Continue to educate public about avalanche and landslide hazards.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff time	High
Tsunami (T)			
T-1. Continued Participation Tsunami Ready Community Designation	Life/Safety issue/Risk reduction Benefit to entire community State assistance available	Staff time	High
T-2. Inundation Mapping	Life/Safety issue/Risk Reduction State and federal funds available	Expensive, at least $100,000 Long time frame >5 years	High
T-3. Update Sitka Emergency Operations Plan, as needed	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available.	Staff time	Medium
Severe Weather (S/W)			
S/W-1. Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc.	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available	Staff time	High
S/W-2. Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available	Staff time	High
S/W-3. Encourage weather resistant building construction materials and practices.	Risk and damage reduction. Benefit to entire community.	May require ordinance change. Potential for increased staff time. Research into feasibility necessary. Political and public support not determined. 1 – 5 year implementation	Medium

Mitigation Projects	Benefits (pros)	Costs (cons)	Priority*
Ground Failure (G/F)			
G/F-1. Prohibit removal of vegetation in areas prone to landslides.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available	Staff time	High
G/F-2. Require public disclosure of risk linked to deed or title of property. Require owners notify renters of hazard prior to occupancy.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available.	Political Support not determined. Private property issues. Staff time.	High
G/F-3. Install warning signage in mapped landslide zones.	Life/Safety issue/Risk reduction Benefit to entire community Federal and State assistance available	Mapped landslide zones do not exist at this time. 5+ years to implement	Low

* Priorities:

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.

Mitigation Project Strategy

Table 22 presents Sitka's strategy for mitigation of the natural hazards faced by the community 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 the community to make note of specific progress on projects during the 5-year life of the plan.

Table 21. Mitigation Project Strategy Table

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Project Status (during annual review)
Flood/Erosion (FLD)					
FLD-1. Identify Drainage Patterns and Develop a Comprehensive Drainage System	FEMA NFIP	N/A	PDM FMA	>1 year	
FLD-2. Structure Elevation and/or Relocation	FEMA DHS&EM	N/A	PDM FMA HMGP	>1 year	
FLD-3. Updated FIRM Sitka Maps	FEMA	>$100,000	FMA	<1 year	
FLD-4. Public Education	Borough DHS&EM	Staff Time	Borough	Ongoing	
FLD-5. Pursue obtaining a CRS rating to lower flood insurance rates.	Borough DCRA	<$1,500	Borough	<1 year	
FLD-6. Continue to obtain flood insurance for all Borough structures, and continue compliance with NFIP.	Borough	<$1,500	Borough	Ongoing	

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Project Status (during annual review)
FLD-7. Require that all new structures be constructed according to NFIP requirements and set back from the shoreline to lessen future erosion concerns and costs.	Borough	Staff Time	Borough Budget	Ongoing	
Earthquake (E)					
E-1. Identify buildings and facilities that must be able to remain operable during and following an earthquake event.	City & Borough DHS&EM DCRA	Staff Time	State Grants	>1 year	
E-2. Contract a structural engineering firm to assess the identified bldgs and facilities.	City & Borough DHS&EM	>$10,000	State/local funds	>5 years	
E-3. Nonstructural mitigation projects (i.e. assessing whether heavy objects are tied down)	Borough	Staff time	Borough	<1 year	
E-4. Conduct mock emergency exercises to identify response vulnerabilities.	Borough DHS&EM	Staff/Volunteer time	Borough DHS&EM	>1 year	
Snow Avalanche (S/A)					
S/A-1. Prohibit new construction in avalanche areas.	Borough	Staff Time	Borough Budget	Ongoing	
S/A-2. Utilize appropriate methods of structural avalanche control.	FEMA	>$25,000	PDM HMGP	>5 years	
S/A-3. Enact buyout of homes in avalanche paths.	FEMA	>$25,000	PDM HMGP	>5 years	

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Project Status (during annual review)
S/A-4. Install warning signage in mapped avalanche areas.	State DOT	<$10,000	State/local funds	Ongoing	
S/A-5. Continue to educate public about avalanche hazards.	Borough	Staff Time	Borough Budget	Ongoing	
Tsunami (T)					
T-1: Continued Participation in the Tsunami Awareness Programs.	Borough DHS&EM	Staff Time	Borough DHS&EM	Ongoing	
T-2. Update Sitka Emergency Operations Plan, as needed, Conduct Emergency Operation Plan Exercises	Borough DHS&EM	>$20,000	Borough DHS&EM	Ongoing	
T-3. Inundation Mapping	NOAA NTHMP* DHS&EM	>$150,000	NOAA - NTHMP	>5 years	
Severe Weather (SW)					
SW-1. Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc.	Borough DCRA DHS&EM	Staff Time	Borough DCRA DHS&EM	<1 year	
SW-2. Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability	Borough	Staff Time	Borough NOAA	Ongoing	
SW-3. Encourage weather resistant building construction materials and practices.	Borough	Staff Time	Borough	<1 year	

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Project Status (during annual review)
Ground Failure (G/F)					
G/F-1. Prohibit removal of vegetation in areas prone to landslides.	City & Borough	Staff Time	City & Borough Budget	Ongoing	
G/F-2. Require public disclosure of risk linked to deed or title of property. Require owners notify renters of hazard prior to occupancy.	City & Borough	Staff Time	City & Borough Budget	Ongoing	
G/F-3. Install warning signage in mapped landslide zones.	DHS&EM FEMA City & Borough	<$10,000	State/local funds	Ongoing	
G/F-4. Continue to educate public about avalanche and landslide hazards.	City & Borough	Staff Time	Borough DHS&EM	Ongoing	

Acronyms used on this table:
HMGP: Hazard Mitigation Grant Program
NTHMP: National Tsunami Hazard Mitigation Program
NOAA: National Oceanographic and Atmospheric Administration
PDM: Pre-Disaster Mitigation (Grant)

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) means an official map of a community, on which the 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 means 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

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. Hazard 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

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

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.

Appendix
Public Involvement Strategy

April 1, 2008

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

Local 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 Local Hazards Mitigation Plan (LHMP) 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 mitigation projects.

State DHS&EM sponsors planning effort in Sitka

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

The LHMP will include information specific to the Sitka City & Borough and , 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.

A public presentation about the LHMP process is planned for the City & Borough of Sitka Planning Commission meeting on April 15, 2008 at 7 p.m. At this meeting planning team members will share information about the plan and its value to Sitka.

The team will also be meeting with people in the community to gather information about which facilities are critical to the community's well being and about previous occurrences of natural disasters in Sitka.

Your comments are welcome!

The planning team hopes that you will take an active role in the City & Borough of Sitka LHMP development. If you would like more information or have questions or comments, you can reach the planning team by phone or email:

Local Contact Person, City/Boro of Sitka
Sara Russell, Planning Assistant
907.747.1814
sara@cityofsitka.com

Suzanne Taylor
WHPacific, Inc.
907.339.6570
staylor@whpacific.com

Erv Petty
DHS&EM Mitigation Section
907.428.7015 or 1.800.478.2337
ervin.petty@alaska.gov

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

Public Meeting

Date: April 15, 2008, City & Borough of Sitka, Planning Commission Meeting

Time: 7:00 p.m.

Location: Harrigan Centennial Hall, 330 Harbor Drive

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

WHPacific

City and Borough of Sitka
PLANNING & ZONING COMMISSION
Minutes of Meeting
April 15, 2008

Present: Don Alexander, Larry Crews, Brian McNitt, Richard Parmelee, Jeremy Twaddle, Planning Director Wells Williams, Planner Sara Russell, and Secretary Ptarmica McConnell

Members of the Public: Eileen Bechtol, Fire Chief Elmer, Shannon Haugland (Sentinel Reporter), John Littlefield, Marty Martin, Conner Nelson, Valerie Nelson, Nicole McCullough, and Reber Stein.

The Chair called the meeting to order at 7:00PM.

Consideration of Minutes from the April 1st, 2008 meeting:

MOTION: **M/S Crews/McNitt** moved to approve the minutes from the April 1st, 2008 meeting.

ACTION: Motion **PASSED** unanimously on a voice vote.

The evening's business:

FINAL PLAT
ZERO LOT LINE SUBDIVISION
334 ELIASON LOOP
CASCADE ENTERPRISES

Public hearing and consideration of a final plat for a three lot minor subdivision at 334 Eliason Loop. The request is filed by Cascade Enterprises. The property is also known as Lot 3 Block 3 of the Hillside Subdivision.

Mr. Williams reviewed that this request was on the last agenda and that he didn't see Mr. Goss in the audience but that he felt the Planning Commission should proceed with the request. Mr. Goss built what was approved as a duplex but with zero lot line specs (fire wall and separate utilities to each property). He advised that the request was ready for approval with the condition that all utility and access easements are put in place and are reflected on the plat prior to recording and that the utilities are within the easements.

There were no public comments.

MOTION: **M/S McNitt/Twaddle** to approve the final plat for a zero lot line subdivision at 334 Eliason Loop with the condition that all utility and access easements are put in place, reflected on the plat prior to recording, and that the utilities are within the easements.

ACTION: Motion **PASSED 5-0** on a voice vote.

Mr. Williams stated that it appeared to him that both parties have huge incentives to make a contribution to settle this matter. He also mentioned that Lot 2, owned by Mr. Littlefield's son, is also adversely affected because his access is also outside the easement. Perhaps a solution could include the road being shifted some and the easement being widened some so that there is some give on both sides.

Mr. Twaddle felt that Mr. Nelson's request was in order and the easement is a separate issue.

Mr. Parmelee asked if this request could be approved with the condition that the lower part be settled between the two parties.

Mr. Crews feels that if the request is approved, then the access is also being approved.

Mr. McNitt felt that they were two separate issues.

Mr. Williams stated that there is a compelling argument to approve the request in its present form if the Board is so inclined.

MOTION: **M/S McNitt/Parmelee** to approve the request for a zero lot line subdivision at 107 Littlebyrd Way.

Discussion: Mr. Williams asked for a friendly amendment to include a condition that the utilities and access are within the confines of the plat easement and approved by the City Public Works Department.

AMENDED MOTION: **M/S McNitt/Parmelee** to approve the motion with amendment.

ACTION: Motion **PASSED 4-1** on a voice vote with Crews opposed.

HAZARD MITIGATION PLAN
EILEEN BECHTOL
BECHTOL PLANNING & DEVELOPMENT

Presentation on Sitka Local Hazards Mitigation Plan Process.

Ms. Bechtol came forward and walked the Commission through a Power Point Presentation giving an overview of the Sitka Local Hazards Mitigation Plan Process. Preparing a Local Hazards Mitigation Plan (LHMP) is the first step in the process of ensuring that each community's critical facilities and services will continue to function after a natural disaster. The Federal Emergency Management Agency (FEMA) has funds available for projects to help do this, and LHMP approval is required before being eligible for funding.

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