The City of Dillingham Multi-Hazard Mitigation Plan

Meeting the dual requirement of a local and flood hazard mitigation plan

Prepared by The Dillingham Hazard Mitigation Planning Team with assistance from

URS

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Acronyms/Abbreviations

BBAHC	Bristol Bay Area Health Corporation
CDQ	community development quota
CFR	Code of Federal Regulations
CRS	Community Rating System
DMA 2000	Disaster Mitigation Act of 2000
ADOT&PF	State of Alaska, Department of Transportation and Public Facilities
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
ft	feet/foot
FY	Fiscal Year
GIS	Geographic Information System
HMGP	Hazard Mitigation Grant Program
HIS	Indian Health Service
MHHW	mean high high water
MHMP	Multi-Hazard Mitigation Plan
MM	Modified Mercalli
mph	miles per hour
NFIP	National Flood Insurance Program
NGO	nongovernmental organizations
PDM	Pre-Disaster Mitigation
PGA	peak ground acceleration
RFC	Repetitive Flood Claims
RL	Repetitive Loss
SOI	Southern Oscillation Index
SRL	Severe Repetitive Loss
Stafford Act	Robert T. Stafford Disaster Relief and Emergency Assistance Act
STAPLE+E	Social, Technical, Administrative, Political, Legal, Economic, and Environmental
URS	URS Corporation
US	United States
USACOE	United States Army Corps of Engineers
USC	United States Code
USGS	United States Geological Survey
WUI	Wildland-Urban Interface

This section provides a brief introduction to hazard mitigation planning, Local Mitigation Plan and Flood Mitigation Plan requirements, the grants associated with these requirements, and a description of this Multi-Hazard Mitigation Plan (MHMP).

1.1 HAZARD MITIGATION PLANNING

Hazard mitigation, as defined in Title 44 of the Code of Federal Regulations (CFR), Subpart M, Section 206.401, is “any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards.” As such, hazard mitigation is any work done to minimize the impacts of any type of hazard event before it occurs. It aims to reduce losses from future disasters. Hazard mitigation is a process in which hazards are identified and profiled, people and facilities at risk are analyzed, and mitigation actions are developed. The implementation of the mitigation actions, which include long-term strategies that may include planning, policy changes, programs, projects, and other activities, is the end result of this process.

1.2 PLANNING REQUIREMENTS

1.2.1 Local Mitigation Plans

In recent years, local hazard mitigation planning has been driven by a new Federal law. On October 30, 2000, Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) (P.L. 106-390) which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) (Title 42 of the United States Code [USC] 5121 et seq.) by repealing the act’s previous mitigation planning section (409) and replacing it with a new mitigation planning section (322). This new section emphasized the need for state, tribal, and local entities to closely coordinate mitigation planning and implementation efforts. In addition, it provided the legal basis for the Federal Emergency Management Agency’s (FEMA) mitigation plan requirements for mitigation grant assistance.

To implement these planning requirements, FEMA published an Interim Final Rule in the *Federal Register* on February 26, 2002 (FEMA 2002a), 44 CFR Part 201. The planning requirements for local entities are described in detail in Section 2 and are identified in their appropriate sections throughout this MHMP. The FEMA crosswalk, which documents compliance with 44 CFR, is provided in Appendix A.

1.2.2 Flood Mitigation Plans

In addition to meeting the Local Mitigation Plan requirements of the DMA 2000, this plan also addresses the Local Flood Mitigation Plan requirements of the Flood Mitigation Assistance (FMA) grant program. The FMA grant program was created pursuant to Section 1366 of the National Flood Insurance Act of 1968, 42 USC 4104c, as amended by the National Flood Insurance Reform Act of 1994, Public Law 103-325, and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, Public Law 108-264. The goal of the FMA grant program is to reduce or eliminate flood insurance claims under the National Flood Insurance Program (NFIP). Particular emphasis for this program is placed on mitigating repetitive loss (RL) properties.

Similar to the DMA 2000, states, tribes, and local entities must have a FEMA-approved flood mitigation plan or a local mitigation plan that meets the requirements of the FMA planning requirements, which are outlined in 44 CFR 78.5 and 78.6, to be eligible for FMA project funding. Similar to the DMA 2000 requirements, the flood mitigation plan requirements are described in detail in Section 2 and in their appropriate sections throughout this MHMP. In addition, the FEMA crosswalk, which documents compliance with 44 CFR for both the Local Mitigation Plan and the Flood Mitigation Plan requirements, is provided in Appendix A.

1.3 GRANT PROGRAMS WITH MITIGATION PLAN REQUIREMENTS

Currently five FEMA grant programs provide funding to states, tribes, and local entities that have a FEMA-approved state or local mitigation plan and to local entities that have a FEMA-approved local mitigation plan with a flood annex or a stand-alone flood mitigation plan. Two of the grants are authorized under the Stafford Act and DMA 2000, while the remaining three are authorized under the National Flood Insurance Act and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act.

1.3.1 Stafford Act Grant Programs

The following grant programs require a state, tribe, or local entity to have a FEMA-approved state or local mitigation plan.

Hazard Mitigation Grant Program (HMGP): HMGP provides grants to states, tribes, and local entities to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the flood. In addition, a project’s potential savings must be more than the cost of implementing the project. Funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The amount of funding available for the HMGP under a particular disaster declaration is limited. The program may provide a state or tribe with up to 20 percent of the total disaster grants awarded by FEMA. The cost-share for this grant is 75 percent federal/25 percent non-federal.

Pre-Disaster Mitigation (PDM) Program: PDM provides funds to state, tribes, and local entities, including universities, for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. PDM grants are awarded on a nationally competitive basis. Like HMGP funding, a PDM project’s potential savings must be more than the cost of implementing the project. In addition, funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The total amount of PDM funding available is appropriated by Congress on an annual basis. In Fiscal Year (FY) 2007, PDM program funding totaled $100 million. The cost-share for this grant is 75 percent federal/25 percent non-federal.

1.3.2 National Flood Insurance Act Grant Programs

The following grant programs require a local entity to have a FEMA-approved state or local mitigation plan with a flood annex or a stand-alone flood mitigation plan.

FMA Grant Program: As noted above, the goal of the FMA grant program is to reduce or eliminate flood insurance claims under the NFIP. Particular emphasis for this program is placed on mitigating RL properties. The primary source of funding for this program is the National Flood Insurance Fund. Grant funding is available for three types of grants, including Planning, Project, and Technical Assistance. Project grants, which use the majority of the program's total funding, are awarded to states, tribes, and local entities to apply mitigation measures to reduce flood losses to properties insured under the NFIP. In FY 2007, FMA funding totaled $31 million. The cost-share for this grant is 75 percent federal/25 percent non-federal. However, 90 percent federal/10 percent non-federal to mitigate severe repetitive loss (SRL) properties is available in certain situations.

Repetitive Flood Claims (RFC) Program: The RFC program provides funding to reduce or eliminate the long-term risk of flood damage to residential and nonresidential structures insured under the NFIP. Structures considered for mitigation must have had one or more claim payments for flood damages. In FY 2007, Congress appropriated $10 million for the implementation of this program. All RFC grants are eligible for up to 100 percent Federal assistance.

SRL Program: The SRL program provides funding to reduce or eliminate the long-term risk of flood damage to residential structures insured under the NFIP. Structures considered for mitigation must have at least four NFIP claim payments over $5,000 each, when at least two such claims have occurred within any 10-year period, and the cumulative amount of such claims payments exceeds $20,000; or for which at least two separate claims payments have been made with the cumulative amount of the building portion of such claims exceeding the value of the property, when two such claims have occurred within any 10-year period. Congress has authorized up to $40 million per year from FY 2005 – FY 2009. The cost-share for this grant is 75 percent federal/25 percent non-federal. However, 90 percent federal/10 percent non-federal to mitigate SRL properties is available when the state or tribal plan addresses ways to mitigate SRL properties.

1.4 MHMP DESCRIPTION

The remainder of this MHMP consists of the following sections and appendices:

1.4.1 Section 2: Prerequisites

Section 2 addresses the prerequisites of plan adoption, which include adoption by the City of Dillingham. The adoption resolution is included in Appendix B.

1.4.2 Section 3: Community Description

Section 3 provides a general history and background of the City of Dillingham, including historical trends for population and the demographic and economic conditions that have shaped the area. Trends in land use and development are also discussed. A location figure of the area is included.

1.4.3 Section 4: Planning Process

Section 4 describes the planning process and identifies the planning team members, the meetings held as part of the planning process, the URS Corporation (URS) consultants, and the key stakeholders within the city and the surrounding area. In addition, this section documents public outreach activities (attached as Appendix C) and the review and incorporation of relevant plans, reports, and other appropriate information.

1.4.4 Section 5: Hazard Analysis

Section 5 describes the process through which the planning team identified, screened, and selected the hazards to be profiled in this version of the MHMP. The hazard analysis includes the nature, history, location, extent, impact, and probability of future events for each hazard. Extra detail is given to the flood hazard profile, to meet the FMA planning requirements. In addition, historical and location hazard figures are included.

1.4.5 Section 6: Vulnerability Analysis

Section 6 identifies potentially vulnerable assets—people, residential and nonresidential buildings dwelling units (where available), critical facilities, and critical infrastructure—in the City of Dillingham. These data were compiled by assessing the potential impacts from each hazard using Geographic Information System (GIS) information. The resulting information identifies the full range of hazards that the City of Dillingham could face and potential social impacts, damages, and economic losses.

1.4.6 Section 7: Mitigation Strategy

The mitigation strategy (Section 7) provides a blueprint for reducing the potential losses identified in the vulnerability analysis. The planning team developed a list of mitigation goals and potential actions to address the risks facing the City of Dillingham. Mitigation actions include preventive actions, property protection techniques, natural resource protection strategies, structural projects, emergency services, and public information and awareness activities. In addition, mitigation strategies are developed for continued compliance with the NFIP and the reduction of flood damage to flood-prone structures.

1.4.7 Section 8: Plan Maintenance

Section 8 describes the planning team's formal plan maintenance process to ensure that the MHMP remains an active and applicable document. The process includes monitoring, evaluating (Appendix E), and updating the MHMP; implementation through existing planning mechanisms; and continued public involvement.

1.4.8 Section 9: References

Section 9 lists the reference materials used to prepare this MHMP.

1.4.9 Appendix A

Appendix A provides the FEMA crosswalk, which documents compliance with 44 CFR for both the local mitigation plan requirements and the flood mitigation plan requirements.

1.4.10 Appendix B

Appendix B provides the adoption resolutions for the City of Dillingham.

1.4.11 Appendix C

Appendix C provides public outreach information, including press releases, information posted on the City of Dillingham's website, and public workshop material.

1.4.12 Appendix D

Appendix D contains the Benefit-Cost Analysis Fact Sheet used to select and prioritize mitigation actions.

1.4.13 Appendix E

Appendix E provides the plan maintenance documents, such as an annual review sheet and the progress report form.

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2.1 ADOPTION BY LOCAL GOVERNING BODIES AND SUPPORTING DOCUMENTATION

The requirements for the adoption of this MHMP by the local governing body, as stipulated in the DMA 2000 and its implementing regulations, are described below.

DMA 2000 and FMA REQUIREMENTS: PREREQUISITES

Local Plan Adoption

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

FMA Requirement §78.5(f): Documentation of formal plan adoption by the legal entity submitting the plan (e.g., Governor, Mayor, County Executive, etc.).

Element

- Has the local governing body adopted the plan?
- Is supporting documentation, such as a resolution, included?

Source: FEMA, March 2004.

The City of Dillingham is the local jurisdiction represented in this MHMP and meets the requirements of Section 409 of the Stafford Act and Section 322 of the DMA 2000.

The local governing body of the City of Dillingham adopted the MHMP by resolution on (ADD DATE). A scanned copy of the resolution is included in Appendix B.

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This section describes the location, geography, and history; demographics; and land use development trends of the City of Dillingham.

3.1 LOCATION, GEOGRAPHY, AND HISTORY

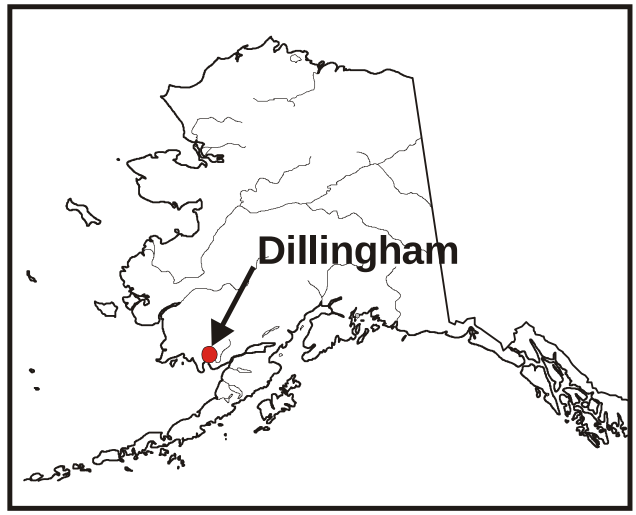

Figure 3-1 Dillingham Location Map

Dillingham is located at the head of Nushagak Bay at the confluence of the Wood and Nushagak Rivers (Figure 3-1). The community sits at the edge of rolling tundra, with ridges of spruce and birch trees. Rivers ox bow through the land, and pristine lakes and streams abound. To the north, rugged mountains criss-cross the horizon. Dillingham is surrounded by 1.6 million acres of Wood-Tikchik State Park, the largest state park in the United States. The park is known for its spectacular stair-step lakes, connected by short rivers. The Togiak National Wildlife Refuge is only accessible by plane or boat. The refuge comprises 4,000 square miles of tundra wetlands, rivers, jagged peaks, glacial valleys, as well as rugged sea cliffs and beaches.

Consistent with its geological history, the topography of Dillingham is a mix of wet lowlands, gentle hills and moraine deposits. There are a few areas with slopes too steep for development. Most noteworthy are the steep coastal bluffs that begin near the core townsite and extend beyond the end of Wood River Road. These steep-sided waterfront slopes are erosion-prone, offer poor access and limit the feasible sites for development of marine transportation facilities. Apart from these areas, slopes present severe limitations for development on some of the steeper backslopes of hills and some of the steep slopes that run along drainages. Forested areas of moderate slope generally reflect favorable surface drainage.

The City of Dillingham was once covered by glaciers, and the topography of the area is characteristic of areas where deposition by continental glaciers occurred. The landscape consists of rolling hills with many irregularly shaped moraine knolls and ridges separated by flat, wetlands and muskeg. The upland moraine hills are covered with a thick layer of silty, wind-laid material called loess - a mixture of silt blown from unvegetated floodplains and hills adjacent to the melting glaciers, and volcanic ash from the Aleutian Range to the east and south. Beneath this mantle of loess, the substratum is mostly coarse grained sand and gravel.

The primary climatic influence is maritime, however, the arctic climate of the Interior also affects the Bristol Bay coast. Average summer temperatures range from 37 to 66 degrees Fahrenheit. Average winter temperatures range from 4 to 30 degrees Fahrenheit. Annual precipitation is 26 inches, and annual snowfall is 65 inches. Heavy fog is common in July and August. Winds of up to 60-70 miles per hour (mph) may occur at any time of the year, however are common from August through December, roughly coinciding with the peak Pacific typhoon season. The Nushagak River is ice-free from mid-May through late October.

3.2 DEMOGRAPHICS

The Dillingham area was first settled by Yup'ik Eskimo peoples who trace their ancestry back to the migration of Asiatic peoples across the Bering Land Bridge during the last Ice Age, 15,000 to 20,000 B.C. The first contact with Europeans occurred sometime between 1791 and 1824 as explorers, fur traders, and Russian Orthodox missionaries arrived in the area. Commercial fisheries developed after 1883 and also had a tremendous influence on the population of the area, attracting Asian, Scandinavian, and Italian fishermen and cannery workers.

The community is now a highly mixed population of non-Natives, Yup'ik, Aleut, and Athabaskan peoples. Approximately 61 percent of the population is of Native heritage. Population growth has fluctuated over the years, with the highest growth occurring in the 1930s and 1960s. The year 2000 population was 2,466 individuals. The 2006 population was 2,491. This population doubles in the summer months due to commercial fishing and tourism.

According to the 2000 U.S. Census, 73 percent of the population 16 years and older, approximately 1,150 residents, are employed. 353 are employed by the Bristol Bay Area Health Corporation, which employs the most people in Dillingham. It operates the 16 bed federally-funded Kanakanak Hospital and employed 290 city residents in 2007.

Various state agencies employed 61 workers in the spring of 2007. The Dillingham City School District employed 101 classified and certified staff in the 2006/2007 school year. Tribal organizations employed 245 residents. Of these, the Bristol Bay Native Association employed the most, 237 city residents in the same period.

The 2007 tax rolls identified 169 private businesses in the City of Dillingham. 10 percent of Dillingham families live below the federal poverty level.

3.3 LAND USE AND DEVELOPMENT TRENDS

Current land use is shown on Figure 3-2. The City of Dillingham is a first class city in the unorganized borough. Under Alaska Statutes, the city has platting authority. All subdivisions which are not of restricted Native allotments, must be brought before the Planning Commission.

Dillingham and Choggiung Ltd. are coordinating efforts to develop a land use plan for parcels conveyed to the city for public use under the Alaska Native Claims Settlement Act. Dillingham is currently updating its comprehensive plan.

The Dillingham townsite is densely populated with mixed-uses including urban residential, commercial, light industrial, and public facilities. The small boat harbor and "all-tide" dock anchor the primary base activities and subsequent land use patterns. Fishing-related businesses and services are in the core town site. Development northwest, northeast, and south of the core townsite is primarily rural residential.

Around 90 percent of Dillingham homes are fully plumbed. City water is supplied from three deep wells. Water is treated, stored in tanks (capacity is 1,250,000 gallons) and distributed. Approximately 40 percent of homes are served by the city's piped water system; 60 percent use individual wells. Most of the core townsite is served by a piped sewage system; waste is treated in a sewage lagoon. However, the majority of residents (75 percent) have septic systems.

The city is implementing its 2003 Water and Sewer Master Plan which includes improving the existing water source and infrastructure in the core town site. Improvements include identifying and developing a new water source near the airport; and tying it to the existing system. Ultimately the plan aims to tie most of the town into the city's water and sewer system.

Other future development includes:

- 2003 Water and Sewer Master Plan
- Tower Road Upgrade
- New Downtown Fire Station
- Downtown Roads Rehabilitation
- Harvey Samuelsen Community Center
- Small Boat Harbor Improvements
- Wood River Ramp
- Wood River Road Upgrade
- Renovate Senior Center
- Community Pavilion
- Expand Dillingham Jail
- Bayside Drive Sewer System
- Confined Disposal Facility

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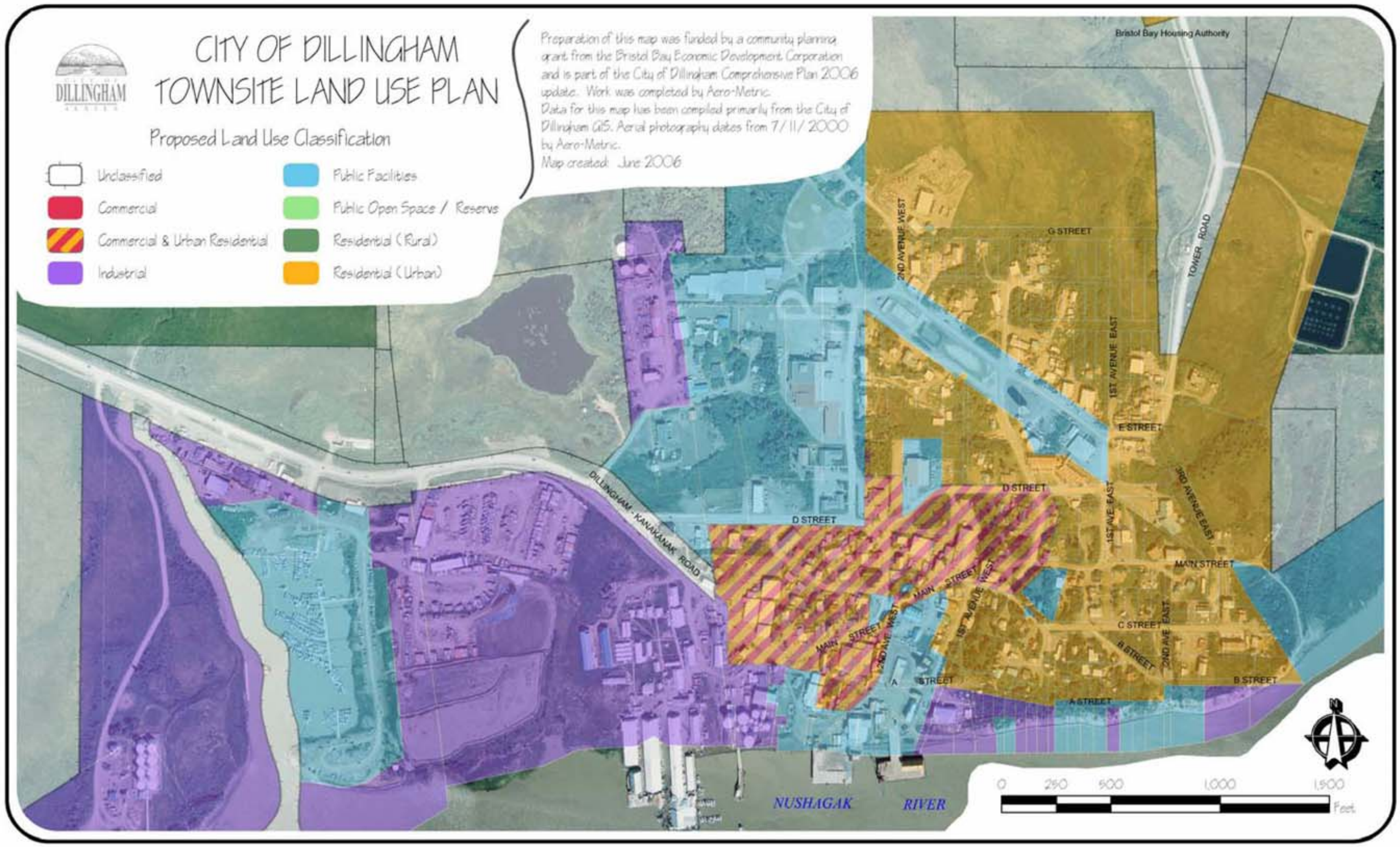

Figure 3-2 Dillingham Land Use Map (Source: Dillingham Comprehensive Plan)

3.4 ECONOMY

Dillingham is the economic, transportation, and public service center for western Bristol Bay. Commercial fishing, fish processing, and support of the fishing industry are the town's primary industrial activities. A total of 309 residents held commercial salmon fishing permits in 2007. As a fishing industry center, the population is highly seasonal-- in spring and summer the population doubles.

Dillingham is also the seat of the regional community development quota (CDQ) group which allocates quota to fishermen from the region's "CDQ" member communities. In 2007, 47 fishermen received CDQ permits to fish for halibut under that program.

Besides fishing, many residents depend on subsistence activities, hunting and fishing for food throughout the year, and trapping furbearers for cash income. Salmon, grayling, pike, moose, bear, caribou, and berries are harvested.

The city's role as the regional center for government and services helps to stabilize seasonal employment.

Dillingham can only be reached by air and sea. The State-owned airport provides a 6,404 feet (ft) long by 150 (ft) wide paved runway and flight service station. Regular jet service is available from Anchorage, although the town's only passenger jet service, Alaska Airlines, cut back their Dillingham operations from year round to summer only as of fall 2007. A seaplane base is available 3 miles west at Shannon’s Pond; it is owned by the United States (US) Bureau of Land Management, Division of Lands. A heliport is available at Kanakanak Hospital. In 2007, four freight airlines served Dillingham; thirteen charter services served smaller communities from Dillingham; and two passenger airlines connected southwest Alaska residents from Bristol Bay and points south and west to King Salmon and Anchorage.

The City operates a small boat harbor during the summer, an all-tide dock boat harbor and boat launch facilities. Two private companies provide boat haul-out and storage services. Two barge lines make scheduled trips from Seattle. There is a 23-mile State of Alaska-maintained paved road to Aleknagik; constructed in 1960 and paved to the city limits in 1998. The road also had a paved pedestrian and bike path alongside the Aleknagik Lake Road up to mile 7. The pavement was extended to Aleknagik Lake and the bike path finished from the Dillingham Townsite to the Lake Road in 2004.

3.5 INDUSTRY

In 2006, twenty-one different fish processors operated in the Nushagak District, southeast of Dillingham. Of those, only one major processor, Peter Pan Seafoods, operates a processing plant onshore. Three other major processors, Ocean Beauty, Trident, and Icicle Seafoods, coordinated their operations on floating processors from offices in town. A variable number of mom and pop direct marketers and secondary processors operated onshore during the season. In January 2008, SNOPAC purchased a shoreside plan on the Wood River.

Dillingham Refuse Inc., a private firm, collects refuse three times a week. The Senior Center collects aluminum for recycling, and NAPA recycles used batteries. The Chamber of Commerce coordinates recycling of several materials, including fishing web. The Curyung Tribe coordinates an electronic equipment recycling program.

Nushagak Electric Cooperative owns and operates a diesel plant in Dillingham which also supplies power to Aleknagik.

There are 2 schools in the community, attended by 526 students. Local hospitals or health clinics include Kanakanak Hospital (842-5201) and the Dillingham Health Center (842-5671). The hospital is a qualified acute care facility (842-5201).

The hospital also offers specialized care at Jakes Place (crisis, respite, lodging, health care); at Our House (emergencies, crisis, respite, lodging, health care); and at the Bristol Bay Area Health Corporation (BBAHC) Community Mental Health Center (City 842-1230).

Dillingham is classified as a Regional Center. It is found in EMS Region 2I in the Bristol Bay Region. Emergency Services have limited highway, coastal, airport, floatplane, and helicopter access. Emergency service is provided by 911 telephone service through the Dillingham Department of Public Safety, State troopers, and volunteers. Auxiliary health care is provided by the Dillingham Volunteer Fire and Rescue Squad (842-2288/5354) and BBAHC Medevac (842-5201/2950). Medical Services are also provided to 34 villages in the region. The BBAHC also runs the Community Health Aide Program which operates 29 clinics in the region.

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This section provides an overview of the planning process; identifies the planning team members and key stakeholders; documents public outreach efforts; and summarizes the review and incorporation of existing plans, studies, and reports used to develop this MHMP. Additional information regarding the planning team and public outreach efforts is provided in Appendices C and D.

The requirements for the planning process, as stipulated in DMA 2000 and its implementing regulations, are described below.

DMA 2000 and FMA Requirements: Planning Process

Local Planning Process

Requirement §201.6(b): An open public involvement process is essential to the development of an effective plan.

In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

FMA Requirement §78.5(a): Description of the planning process and public involvement. Public involvement may include workshops, public meetings & hearings.

Element

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and nonprofit interests to be involved in the planning process; and
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

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

Element

- Does the plan provide a narrative description of the process followed to prepare the plan?
- Does the plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)
- Does the plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)
- Was there an opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?

Source: FEMA, March 2004.

4.1 OVERVIEW OF PLANNING PROCESS

The planning process began with the EMS/planning team meeting on March 20, 2006. The City of Dillingham Planning Director, City Manager, and Assistant Fire Chief first examined existing plans and reports for information pertaining to Dillingham that would contribute to the mitigation planning effort. They created a work schedule and identified a hazard mitigation planning team to carry out planning activities and to obtain public opinion and input in the planning effort.

In May of 2006, the hazard mitigation planning team conducted a survey of all boxholders in the City of Dillingham to involve the public, businesses, local academia, and interested stakeholders in the planning process. The survey was used to educate the public about the hazard mitigation planning process, assess the public's primary concerns about natural hazards in the Dillingham area, and to develop mitigation measures appropriate for our community.

The hazard mitigation planning team identified natural hazards using the State of Alaska Hazard Mitigation Plan (SHMP) and community information to focus on which hazards to profile in this mitigation plan.

Based on the results of the survey, the planning team began the risk assessment process. They reviewed previous planning documents in order to track the history of present hazards in the jurisdiction and to predict the occurrence of an event. Interviews with property owners that have been affected by recent coastal storms and associated hazards were conducted to document the extent and cost of damage done to property and infrastructure, as well as to predict the impact, cost, and likelihood of another occurrence. There was also a review of the replacement value or assessed value of all city infrastructure and property within known hazard areas. This was subsequently used to estimate potential damage and loss during a hazard event.

Once the planning team was formed, the following five-step process took place from May 2006 through January 2008.

1. Organize resources: Members of the planning team identified resources, including staff, agencies, and local community members, who could provide technical expertise and historical information needed in the development of the hazard mitigation plan.
2. Assess risks: The planning team identified the hazards specific to Dillingham, and with the assistance of a hazard mitigation planning consultant (URS) developed the risk assessment for the seven identified hazards. The planning team reviewed the risk assessment, including the vulnerability analysis, prior to and during the development of the mitigation strategy.
3. Assess capabilities: The planning team reviewed current administrative and technical, legal and regulatory, and fiscal capabilities to determine whether existing provisions and requirements adequately address relevant hazards.
4. Develop a mitigation strategy: After reviewing the risks posed by each hazard, the planning team developed a comprehensive range of potential mitigation goals, objectives, and actions. Subsequently, the planning team identified and prioritized the actions to be implemented.
5. Monitor progress: The planning team developed an implementation process to ensure the success of an ongoing program to minimize hazard impacts to Dillingham.

4.2 HAZARD MITIGATION PLANNING TEAM

The planning team consists of representatives of the City's departments of Public Safety, Fire, Planning, the Bristol Bay Area Health Corporation, and ADOT&PF. The planning team for the hazard mitigation plan is lead by Jody Seitz with assistance from Malcolm Wright. URS is also providing assistance to the planning team. Table 4-1 identifies the hazard mitigation planning team.

Table 4-1 Multi-Hazard Mitigation Planning Team

Name	Title	Organization	Phone
Jody Seitz	Planning Team Leader City Planner	City of Dillingham	842-5225
Malcolm Wright	Assistant Fire Chief	Fire Department	842-5894
John Dunson	Fire Department Equipment Technician	Fire Department	842-2288
Norman “Koolie” Heyano	Fire Chief	Fire Department	842-5511
Teresa Seybert	EMS Director	Bristol Bay Area Health Corporation	842-5201
Richard Thompson	Police Chief	Department of Public Safety	842-5354
Dennis Varner	Coordinator	Fire Department	842-2288
Laura Young	Mitigation Planning Consultant	URS	261-9704

To ensure that all facets of public safety are considered in future hazard mitigation planning efforts, representation from the City of Dillingham, Department of Public Safety will be required on the hazard mitigation planning team. It will also help meet federal requirements that *other relevant planning mechanisms* be incorporated into this MHMP, and that the information outlined in this document be *considered and addressed in other relevant planning documents*. It is anticipated that other departments within the City of Dillingham, as well as other interested agencies, stakeholders, and the general public will hold positions on the hazard mitigation planning team in the future.

4.3 PUBLIC INVOLVEMENT

In May 2006, shortly after the first planning team meeting, the planning team sent out a boxholder survey to all residents, businesses, and local and Tribal government organizations. The purpose of the survey was to educate the public about the hazard mitigation planning process, and to request public input regarding hazards and potential mitigation actions. Of the 975 surveys sent out, a total of 42 were returned.

A summary of the results of the survey are presented in Tables 4-2 and 4-3:

Table 4-2 Summary of Boxholder Survey Results – Hazard Screening

HAZARD	Very Concerned	Somewhat Concerned	No Opinion	Not Very Concerned	Not At All Concerned
Earthquake	2	13	3	19	4
Flood	4	18	1	13	6
Fire/Wildfire	14	16	1	9	2
Severe weather	7	20	2	6	5
Erosion	11	15	4	7	4
Wind	3	15	5	14	4
Terrorist attack	0	1	3	11	24
Epidemic of infectious disease	3	21	2	9	5
Extended power outage	10	19	2	7	4
Highway hazardous material accident	1	8	4	16	10
(other?) No Flights	1	0	0	0	0
Tsunami	0	1	0	0	0
Mine Waste	1	0	0	0	0
Drug Trafficking	2	0	0	0	0
Aquifer Pollution	2	0	0	0	0

Table 4-3 Summary of Boxholder Survey Results – Mitigation Actions

MITIGATION MEASURE	Agree Strongly	Agree	No Opinion	Disagree	Disagree Strongly
Review potential hazards during land use permit application process (A land use permit must be applied for when anyone constructs a new building, driveway, or fence within city limits)	13	16	3	4	3
Review potential hazards during subdivision process	15	18	3	1	2
Increase recruitment, incentives, and training for emergency response personnel	11	21	5	2	2
Restrict construction in areas with high risk for natural hazards such as flooding or erosion	19	13	4	3	2
Adopt updated building codes for all structures	13	10	8	3	6
Enforce building codes for residential housing that is a three-plex or smaller; require building permits and review plans	12	10	5	6	7
Institute a citizen emergency response program	15	19	4	1	2
Increase accuracy of floodplain mapping	14	15	5	4	1
Identify and replace undersized culverts at road crossings	13	21	4	0	1
Encourage the creation of firebreaks	12	16	8	3	1
Promote FireWise and FireWise building practices	15	21	5	0	1
Clear spruce bark beetle killed standing deadwood around residential structures	13	18	5	3	2
(other?)					
Support EMS & Fire Volunteers	1	0	0	0	0
Increase trained traffic control responders & response equip	1	0	0	0	0
Survey soils re: H20 saturation	1	0	0	0	0

After reviewing the results of the survey and other relevant hazard studies, the planning team selected the hazards to carry through the risk assessment. Hazard profile information and community asset data was collected by the planning team and a risk assessment was completed showing the hazards to which each asset is vulnerable. The results of the risk assessment as well as potential mitigation actions addressing each hazard were presented to the public on December 27, 2007. The meeting was widely advertised to the public via email, posters, public radio, and the City's and State of Alaska, Department of Military and Veterans Affairs, Division of Homeland Security and Emergency Management (DHS&EM) websites.

Other opportunities for public involvement in the hazard mitigation planning process included:

- On August 9, 2006, Liz Brown of the Marine Advisory Program, University of Alaska, held a community workshop on erosion in coastal communities. The Dillingham Public Works Director gave a tour of the City's existing seawall and explained the importance of this key hazard mitigation infrastructure.
- On July 20, 2006 and March 22, 2007, the Alaska Rural Water Association and Alaska Department of Environmental Conservation made presentations to the Dillingham Planning Commission regarding a volunteer wellhead protection planning program funded by the US Department of Agriculture.

Members of the community; both residents and businesses, neighboring communities, academia, non-profits, and local, State, Tribal, and Federal agencies were invited to participate in the planning process by attending these public meetings or commenting directly on the project.

4.4 INCORPORATION OF EXISTING PLANS AND OTHER RELEVANT INFORMATION

During the planning process, the planning team reviewed and incorporated information from existing plans, studies, reports, and technical reports into the MHMP. A synopsis of the sources follows.

- *City of Dillingham Comprehensive Plan and Land Use Maps*
- *Dillingham Disaster Response Plan*
- *Dillingham Water and Sewer Master Plan*
- *City of Dillingham Municipal Code:*
  - *Subdivision Ordinance – Title 17*
  - *Floodplain Regulations Ordinance – Title 15*
  - *Land Use Maps (designations)*
- *Bristol Bay Area Health Corporation Emergency Preparedness Plan*
- *Dillingham Emergency Management Strategic Plan 2001*
- *Letter Report Environmental Assessment and Finding of No Significant Impact, City Shoreline Emergency Bank Stabilization, Dillingham, Alaska, US Army Corps of Engineers (USACOE), December 2007*

The City also reviewed and followed instructions for readiness under the following National Oceanic and Atmospheric Administration (NOAA) programs:

- *StormReady - http://www.stormready.noaa.gov/*
- *TsunamiReady - http://www.tsunamiready.noaa.gov/*

The following FEMA guides were also consulted for general information on the MHMP process:

- *How-To Guide #1: Getting Started: Building Support for Mitigation Planning* (FEMA 2002c)
- *How-To Guide #2: Understanding Your Risks – Identifying Hazards and Estimating Loss Potential* (FEMA 2001)
- *How-To Guide #3: Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies* (FEMA 2003a)
- *How-To Guide #4: Bringing the Plan to Life: Implementing the Hazard Mitigation Plan* (FEMA 2003b)

A complete list of the sources consulted is provided in Section 9.

This section identifies and profiles the hazards that could affect the City of Dillingham.

5.1 OVERVIEW OF A HAZARD ANALYSIS

A hazard analysis includes the identification, screening, and profiling of each hazard. Hazard identification is the process of recognizing the natural and human-caused events that threaten an area. Natural hazards result from unexpected or uncontrollable natural events of sufficient magnitude. Human-caused hazards result from human activity and include technological hazards, terrorism, and random acts of crime/violence. Technological hazards are generally accidental or result from events with unintended consequences (for example, an accidental hazardous materials release). Terrorism is defined as the calculated use of violence (or threat of violence) to attain goals that are political, religious, or ideological in nature. Random acts of crime/violence are those acts that may be drug or alcohol induced that are committed for the purpose of violating, damaging, or abusing (homicide or arson). Even though a particular hazard may not have occurred in recent history in the study area, all hazards that may potentially affect the study area are considered; the hazards that are unlikely to occur or for which the risk of damage is accepted as being very low, are eliminated from consideration.

Hazard profiling is accomplished by describing hazards in terms of their nature, history, magnitude, frequency, location, and probability. Hazards are identified through the collection of historical and anecdotal information, review of existing plans and studies, and preparation of hazard maps of the study area. Hazard maps are used to determine the geographic extent of the hazards and define the approximate boundaries of the areas at risk.

5.2 HAZARD IDENTIFICATION AND SCREENING

The requirements for hazard identification, as stipulated in DMA 2000 and its implementing regulations, are described below.

DMA 2000 and FMA Requirements: Risk Assessment: Identifying Hazards

Identifying Hazards

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

FMA Requirement §78.5(b): Description of the existing flood hazard and identification of the flood risk, including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential.

Element

- Does the plan include a description of the types of all natural hazards that affect the jurisdiction? If the hazard identification omits (without explanation) any hazards commonly recognized as threats to the jurisdiction, this part of the plan cannot receive a Satisfactory score. Consult with the State Hazard Mitigation Officer to identify applicable hazards that may occur in the planning area.

Source: FEMA, March 2004.

For the first step of the hazard analysis, the planning team identified 16 possible hazards that could affect the City of Dillingham. The planning team evaluated and screened the comprehensive list of potential hazards based on a range of factors, including prior knowledge or perception of the relative risk presented by each hazard, the ability to mitigate the hazard, and the known or expected availability of information on the hazard (see Table 5-1). The planning team determined that seven hazards pose the greatest threat to the City: erosion, earthquake, flood, severe weather, urban conflagaration, volcano, and wildland fire. The remaining hazards excluded through the screening process were considered to pose a lower threat to life and property in the City due to the low likelihood of occurrence or the low probability that life and property would be significantly affected. In addition, several technological hazards were identified (Other Hazards), which will be analyzed during the next plan update. Should the risk from these hazards increase in the future, the MHMP can be updated to incorporate vulnerability analyses for these hazards.

Table 5-1 Identification and Screening of Hazards

Hazard Type	Should It Be Profiled?	Explanation
Avalanche	No	No historic events have been recorded for the City of Dillingham or the surrounding area.
Erosion	Yes	Shoreline erosion by wind and waves, bluff erosion by waves, and surface runoff occur continually.
Earthquake	Yes	The City of Dillingham is within 300 miles of the Alaska-Aleutian seismic zone.
Flood	Yes	Flooding events occur regularly.
Ground Failure	No	No historic events have occurred in the City of Dillingham or the surrounding area.
Severe Weather	Yes	Severe weather including heavy snow, ice storms, hail, and high winds occur regularly in the City of Dillingham and the surrounding area.
Tsunami & Seiche	No	While there is historic evidence of volcano-induced tsunami inundation, there have been no reported tsunami events within the past 9,500 years in the Dillingham area. This hazard presents a low risk of occurrence and a detailed analysis will be performed in the next plan update.
Urban Conflagration	Yes	Urban conflagration in high density areas of downtown Dillingham is a concern.
Volcano	Yes	There is historic evidence of volcano-activity that may impact the Dillingham area.
Wildland Fires	Yes	The terrain, vegetation, and weather conditions in the region are favorable for the ignition and rapid spread of wildland fires in the City of Dillingham and the surrounding area
Other Hazards (*these hazards have been identified to occur in the City of Dillingham, and detailed analyses will be performed in the next plan update).*		
Technological	No	This hazard is present in the City of Dillingham and a detailed analysis will be performed in the next plan update. (Includes terrorist activity and extended power outages).
Hazardous Materials	No	This hazard is present in the City of Dillingham and a detailed analysis will be performed in the next plan update.
Infectious Disease	No	This hazard is present in the City of Dillingham and a detailed analysis will be performed in the next plan update.
Mine Waste	No	This hazard is present in the City of Dillingham and a detailed analysis will be performed in the next plan update.
Drug Trafficking	No	This hazard is present in the City of Dillingham and a detailed analysis will be performed in the next plan update.

Table 5-1 Identification and Screening of Hazards

Hazard Type	Should It Be Profiled?	Explanation
Aquifer Pollution	No	This hazard is present in the City of Dillingham and a detailed analysis will be performed in the next plan update.

5.3 HAZARD PROFILE

The requirements for hazard profiles, as stipulated in DMA 2000 and its implementing regulations, are described below.

DMA 2000 and FMA Requirements: Risk Assessment – Profiling Hazards

Profiling Hazards

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

FMA Requirement §78.5(b): Description of the existing flood hazard and identification of the flood risk, including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential.

Element

- Does the risk assessment identify the location (i.e., geographic area affected) of each natural hazard addressed in the plan?
- Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in the plan?
- Does the plan provide information on previous occurrences of each hazard addressed in the plan?
- Does the plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the plan?

Source: FEMA, March 2004.

The specific hazards selected by the planning team for profiling have been examined in a methodical manner based on the following factors:

- Nature
- History
- Location
- Extent (to include magnitude and severity)
- Impact
- Probability of future events

Each hazard is assigned a rating based on the following criteria for probability (Table 5-2) and magnitude/severity (Table 5-3).

Table 5-2. Hazard Probability Criteria

Probability	Criteria
4 - Highly Likely	Event is probable within the calendar year. Event has up to 1 in 1 year chance of occurring (1/1=100%) History of events is greater than 33% likely per year. Event is "Highly Likely" to occur
3 - Likely	Event is probable within the next three years. Event has up to 1 in 3 years chance of occurring (1/3=33%) History of events is greater than 20% but less than or equal to 33% likely per year. Event is "Likely" to occur
2 - Possible	Event is probable within the next five years. Event has up to 1 in 5 years chance of occurring (1/5=20%) History of events is greater than 10% but less than or equal to 20% likely per year Event could "Possibly" occur
1 - Unlikely	Event is possible within the next ten years Event has up to 1 in 10 years chance of occurring (1/10=10%) History of events is less than or equal to 10% likely per year Event is "Unlikely" but is possible of occurring

Probability is determined based on historic events, using the criteria identified above, to provide the likelihood of a future event.

Table 5-3. Hazard Magnitude / Severity Criteria

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

Similar to estimating probability, magnitude and severity are determined based on historic events using the criteria identified above.

The following table provides further criteria to assist in prioritizing risk. Warning Time and Duration are given four ranges each, as shown in the following table. Also indicated is the "weighting" factor for each of the four parts of the Calculated Priority Risk Index. The Probability factor is "weighted" at .45, Magnitude / Severity at .30, Warning Time at .15, and Duration at .10. These "weights" of significance are used to assign relative importance to each of these factors when combined to generate the Calculated Priority Risk Index value.

Table 5-4. Calculated Priority Risk Index			
.45 Probability	.30 Magnitude / Severity	.15 Warning Time	.10 Duration
4 - Highly Likely	4 - Catastrophic	4 - Less Than 6 Hours	4 - More Than 1 Week
3 - Likely	3 - Critical	3 - 6-12 Hours	3 - Less Than 1 Week
2 - Possible	2 - Limited	2 - 12-24 Hours	2 - Less Than 1 Day
1 - Unlikely	1 - Negligible	1 - 24+ Hours	1 - Less Than 6 Hours

Following is a table representing the Calculated Priority Risk Index for each hazard facing the community:

Table 5-5. Dillingham Calculated Priority Risk Index by Hazard

Hazard	Probability	Magnitude /Severity	Warning Time	Duration	Priority Risk Index
Earthquake	1 Unlikely	1 Negligible	4 < 6 Hours	1 < 6 Hours	1.45
Erosion	4 Highly Likely	3 Critical	1 24+ Hours	4 > One Week	3.25
Flooding	2 Possible	1 Negligible	1 24+ Hours	2 < One Day	1.55
Severe Storms	2 Possible	2 Limited	2 12-24 Hours	2 < One Day	2
Severe Winter Storm	3 Likely	2 Limited	1 24+ Hours	3 < One Week	2.4
Tsunami	1 Unlikely	2 Limited	4 < 6 Hours	1 < 6 Hours	1.75
Volcano	1 Unlikely	1 Negligible	4 < 6 Hours	3 < One Week	1.65
Wildfires	2 Possible	1 Negligible	4 < 6 Hours	3 < One Week	2.1

The hazards profiled for the City of Dillingham are presented in the rest of Section 5.3. The order of presentation does not signify the level of importance or risk.

5.3.1 Erosion

5.3.1.1 Nature

Erosion rarely causes death or injury. However, erosion causes the destruction of property, development and infrastructure. Erosion is the wearing away, transportation, and movement of land. It is usually gradual but can occur rapidly as the result of floods, storms and other events. Erosion rates can vary significantly-occurring rather quickly after a flash flood, coastal storm or other event or slowly as the result of long-term environmental changes. Erosion is a natural process, but its effects can be exacerbated by human activity.

Due to the location of Dillingham at the mouth of the Nushagak River where it empties into Nushagak Bay, the City is vulnerable to a combination of riverine and coastal erosion caused by wind generated waves and high tides.

Coastal erosion is sometimes referred to as tidal, bluff, or beach erosion. However, other times these erosion types encompass different categories of erosion altogether. For this profile, tidal, bluff and beach erosion will be nested within the term erosion.

Coastal erosion is the attrition of land resulting in loss of beach, shoreline, or dune material from natural activity or human influences. Coastal erosion occurs over the area roughly from the top of the bluff out into the near-shore region to about the 30-ft water depth. It is measured as the rate of change in the position or horizontal displacement of a shoreline over a period of time. Bluff recession is the most visible aspect of coastal erosion because of the dramatic change it causes to the landscape. As a result, this aspect of coastal erosion usually receives the most attention.

The forces of erosion are embodied in waves, currents, and winds on the coast. Surface and ground water flow, and freeze-thaw cycles may also play a role. Not all of these forces may be present at any particular location. Coastal erosion can occur from rapid, short-term daily, seasonal, or annual natural events such as waves, storm surge, wind, coastal storms, and flooding, or from human activities including boat wakes and dredging. The most dramatic erosion often occurs during storms, particularly because the highest energy waves are generated under storm conditions. This is the case in Dillingham.

Coastal erosion may also be due to multi-year impacts and long-term climatic change such as sea-level rise, lack of sediment supply, subsidence, or long-term human factors such as aquifer depletion or the construction of shore protection structures and dams.

Ironically, attempts to control erosion though shoreline protective measures such as groins, jetties, seawalls, or revetments, can actually lead to increased erosion activity. This is because shoreline structures eliminate the natural wave run-up and sand deposition processes and can increase reflected wave action and currents at the waterline. The increased wave action can cause localized scour both in front of and behind structures and prevent the settlement of suspended sediment.

There are three main types of erosion that affect human activity in Alaska. Listed in order of their destructiveness, they are:

- **Coastal erosion** - Coastal erosion is the wearing away of land and loss of beach, shoreline, or dune material because of natural activity or man-made influences. It can occur gradually or suddenly. Usually erosion is a long-term event but can happen quickly during storm events.
- **Riverine erosion** - Riverine erosion results from the force of flowing water in and adjacent to river channels. This erosion affects the bed and banks of the channel and can alter or preclude any channel navigation or riverbank development. In less stable braided channel reaches, erosion and deposition of material are a constant issue. In more stable meandering channels, episodes of erosion may only occur occasionally.
- **Wind erosion** - Wind erosion occurs when wind removes, moves, and redeposits soil. It can cause a loss of topsoil, hindering agricultural production. Blowing dust can also reduce visibility and have a negative effect on air quality.

As stated above, the City of Dillingham is vulnerable to all three.

5.3.1.2 History

The City of Dillingham has experienced significant erosion loss over the past 60 years. The annual amounts of rain, wind, and waves that assail the shoreline combined with tidal fluctuations induce large amounts of erosion, particularly during severe storm events.

Erosion may be exacerbated by climate cycles such as El Niño (strongly negative Southern Oscillation Index [SOI]) and La Nina (strongly positive SOI). Based on averages from 1967 through 2002, historical data show higher than average mean sea levels during both the 1982/1983 and 1997/1998 El Niño cycles. When large waves combine with high tides, they can reach higher elevations, which contribute to significantly higher rates of coastal erosion. Higher sea levels also can lead to significant beach and bluff erosion. The following descriptions provide a brief overview of substantial historic erosion events in the City of Dillingham.

- A serious storm in 1980 caused severe erosion and damage to the municipal dock and cold storage facilities. Up to 8 feet of bank was lost between the Peter Pan docks and the small boat harbor. The storm prompted the city to build a 305-ft timber-plank and pile seawall in 1983 in the immediate vicinity of the dock.
- A series of storms in the fall of 1993 caused severe damage to Snag Point and eroded the bluff to expose portions of the city's sewer system and a manhole, with the potential to cause a serious health hazard. By 1994, the coastal bluff was eroding at a rate of 9 feet per year.
- A storm combined with a high tide in August 2005 inflicted major damage to the unprotected portions of the Dillingham shoreline. Waves overtopped the sheet-pile seawall at the harbor parking lot by at least two feet, washing parked vehicles into the harbor and boats moored in the harbor onto the shore. Up to 10 feet of bank was lost. Erosion flanked the east end of the harbor sheet-pile sea-wall and removed a substantial amount of fill from behind it, encroaching on the nearby park and parking area. The berm containing dredge disposal east of the harbor and the west side of the harbor entrance were heavily eroded.
- On October 4, 2007 a storm eroded the east bank of the harbor an average of 5 ft. The unprotected west side of the harbor mouth continues to erode, particularly during storms.

5.3.1.3 Location, Extent, Impact, and Probability of Future Events

Location

The core townsite lies along a 10 to 80-foot high bluff overlooking the Nushagak River estuary. Dillingham’s corporate limits include approximately ten miles of river bank and coastline. These are the banks of the Wood River and the Nushagak River estuary. Critical segments along four miles of this eroding shoreline have been protected, but other unprotected segments of the shoreline are at risk of further erosion. Shifts in the Nushagak's channels exacerbate shoreline erosion.

Areas vulnerable to the effects of erosion are shown on Figures 5-1a, b, c, d, and e.

Extent

A variety of natural and human-induced factors influence the erosion process. For example, shoreline orientation and exposure (which can be altered by human development) to prevailing winds, open ocean swells and waves all influence erosion rates. Beach composition also influences erosion rates, as a beach composed of sand and silt will erode easily, whereas beaches composed primarily of boulders or large rocks are more resistant to erosion. Other factors that may influence coastal erosion include:

- Shoreline type
- Geomorphology
- Structure types along the shoreline
- Density of development
- Amount of encroachment in the high hazard zone
- Proximity to erosion inducing coastal structures
- Nature of the coastal topography
- Elevation of coastal bluffs
- Shoreline exposure to wind and waves

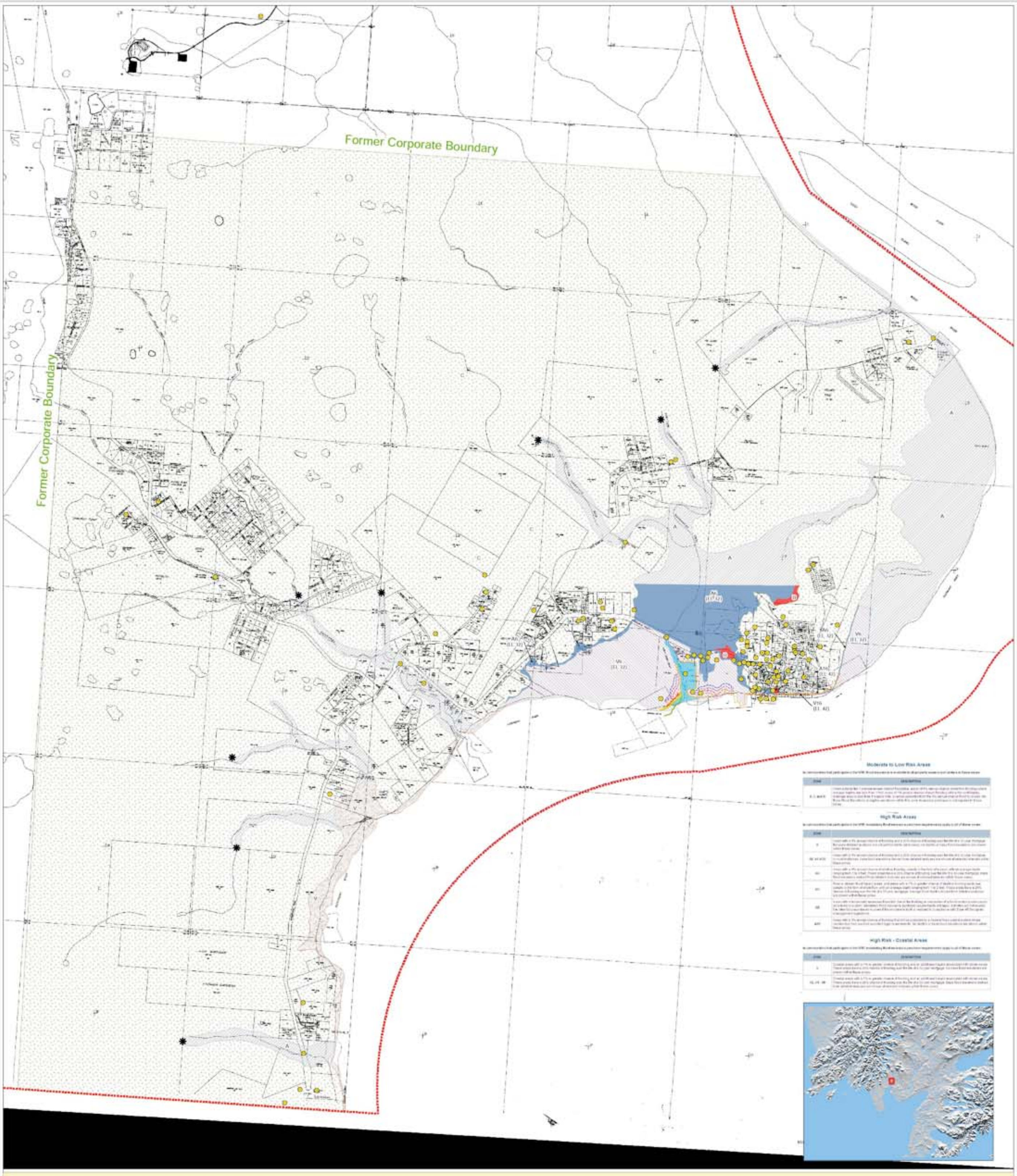
Damage from coastal erosion is not usually something that happens immediately, rather it happens slowly over time. Significant events however, can cause infrastructure and homes to literally fall into the sea. In many areas throughout the country coastal erosion is eating away communities and property.

Much of the rest of Dillingham's shoreline experiences, particularly at Squaw Creek, Hansonville, Olsonville and Kanakanak. Publicly funded mitigation efforts have been concentrated in the core town-site where public and private investments are concentrated. Businesses, including fish processors and fuel tank farms have also put in sea-walls or bank protection at the Wood River landing, in the downtown area, and at the mouth of Scandinavian Creek. A small private wooden seawall has protected part of the bank of Squaw Creek, but is now failing. Private property owners have also slowed the loss of their land by using old vehicles and other large objects to protect bluffs.

Nearly six acres of land have been lost to erosion west of the harbor mouth since 1972. The banks that once provided a natural breakwater south of the harbor entrance are gone, leaving the interior of the harbor exposed to waves and swells in excess of four feet. This has intensified erosion of the banks within the harbor.

Roads in Dillingham have been subject to erosion as a result of unusually high run-off during spring thaw and heavy rain storms exceeding culvert capacity.

Wood River road has been severed for about a day at a time when heavy spring run-off washed out culverts. Wash-outs northeast of the intersection with Waskey Road have left residents of the end of Wood River Road without vehicular egress.



1982 FEMA Flood Zones

(Data digitized from the 1982 FEMA Flood zone maps)

City of Dillingham

Planning Department

Background Imagery: Dillingham Street Map (year unknown)

0 500 1,000 2,000 3,000 4,000 Feet
1:12,000

Legend
Limit of Study
Corporate Boundary
15 Critical Facility ID
1982 FEMA Flood Zones
A - 100 yr flood
A16 - 100 yr (base flood elevations/hazards determined)
A6 - 100 yr (base flood elevations/hazards determined)
B - Area between 100yr and 500yr floods
C - Minimal Flooding
V - 100 yr coastal flood with velocity (wave action)
V16 - 100 yr coastal flood (base flood elevations/hazards determined)
V6 - 100 yr coastal flood (base flood elevations/hazards determined)
Erosion Rates (ACOE 2001)
1972
1980
1988
1992
2001
Predicted Shoreline (ACOE 2005)
1985 (Historical)
2005 (Date of photo)
2015
2022
2030

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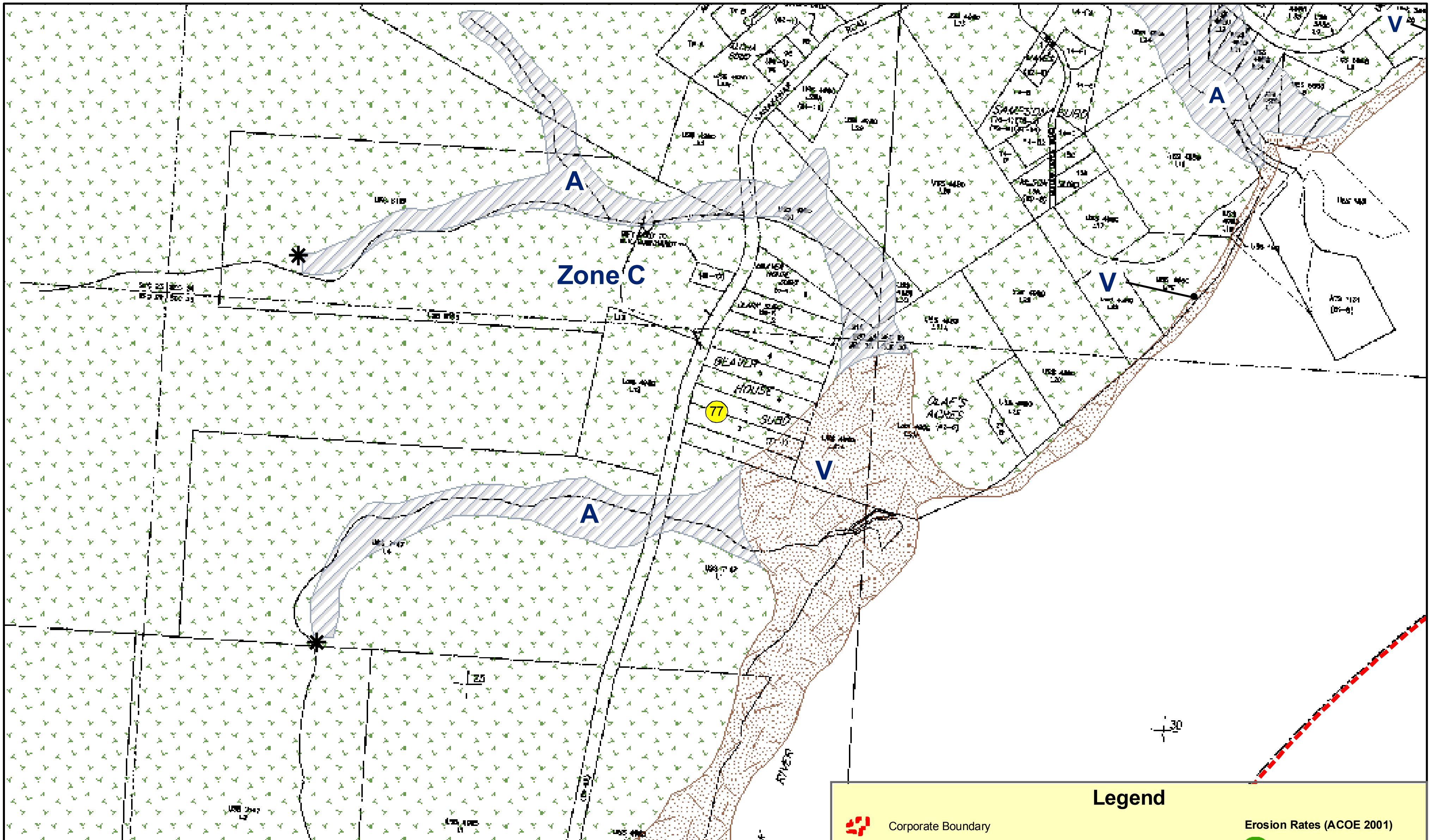

1982 FEMA Flood Zones

(Data digitized from the 1982 FEMA Flood zone maps)

City of Dillingham

Planning Department

Background Imagery: Dillingham Street Map (year unknown)

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Date: January 7, 2008

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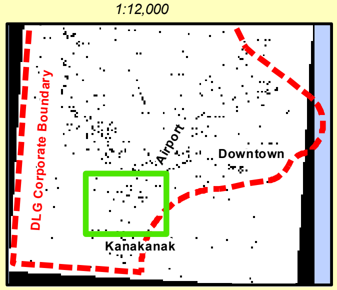

Legend

Corporate Boundary

1982 FEMA Flood Zones

- A - 100 yr flood
- A16 - 100 yr (base flood elevations/hazards determined)
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- Limit of Study
- 15 Critical Facility ID

Erosion Rates (ACOE 2001)

- 1972
- 1980
- 1988
- 1992
- 2001

Predicted Shoreline (ACOE 2005)

- 1985 (Historical)
- 2005 (Date of photo)
- 2015
- 2022
- 2030

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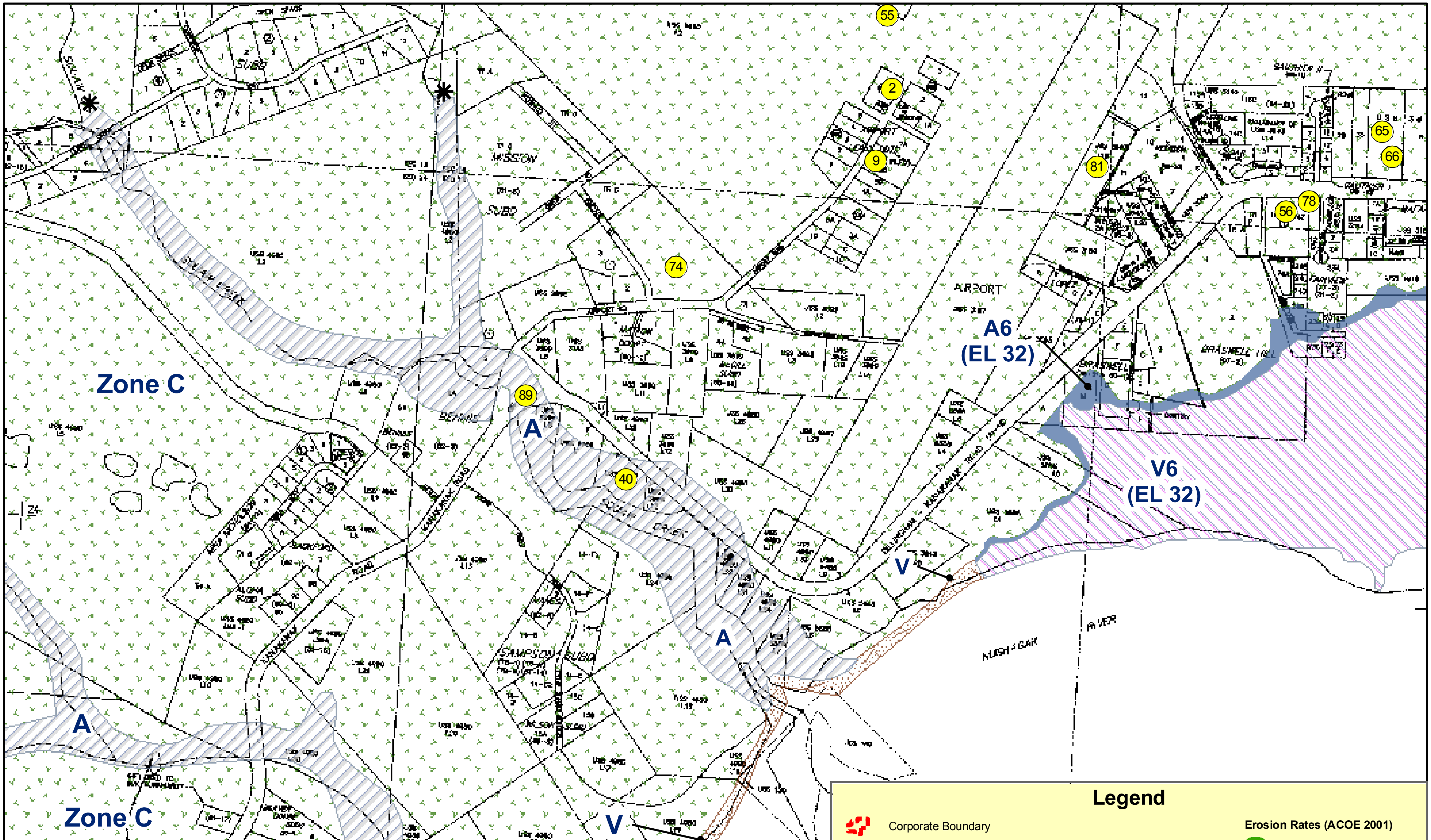

1982 FEMA Flood Zones

(Data digitized from the 1982 FEMA Flood zone maps)

City of Dillingham

Planning Department

Background Imagery: Dillingham Street Map (year unknown)

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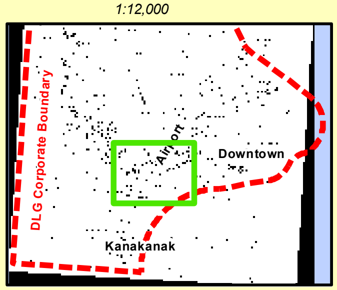
Date: January 7, 2008



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- Limit of Study
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- 1972
- 1980
- 1988
- 1992
- 2001

Predicted Shoreline (ACOE 2005)

- 1985 (Historical)
- 2005 (Date of photo)
- 2015
- 2022
- 2030

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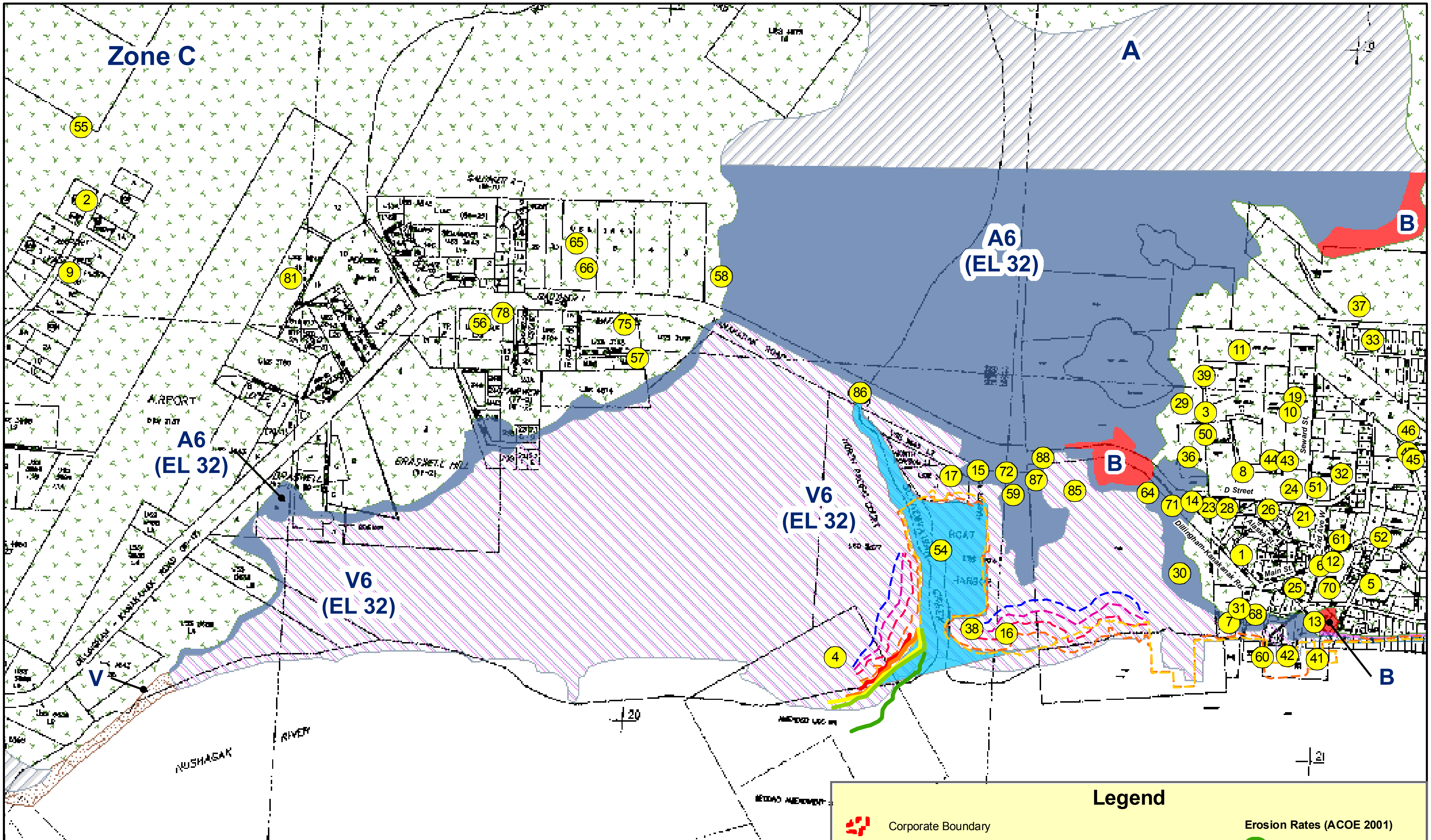

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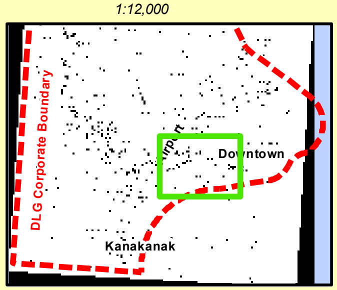

1982 FEMA Flood Zones

(Data digitized from the 1982 FEMA Flood zone maps)

City of Dillingham

Planning Department

Background Imagery: Dillingham Street Map (year unknown)

Filename: DLG_FEMA_Flood_Plain_Facility_Street_Zoom_Letter.mxd
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Predicted Shoreline (ACOE 2005)
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- 2030

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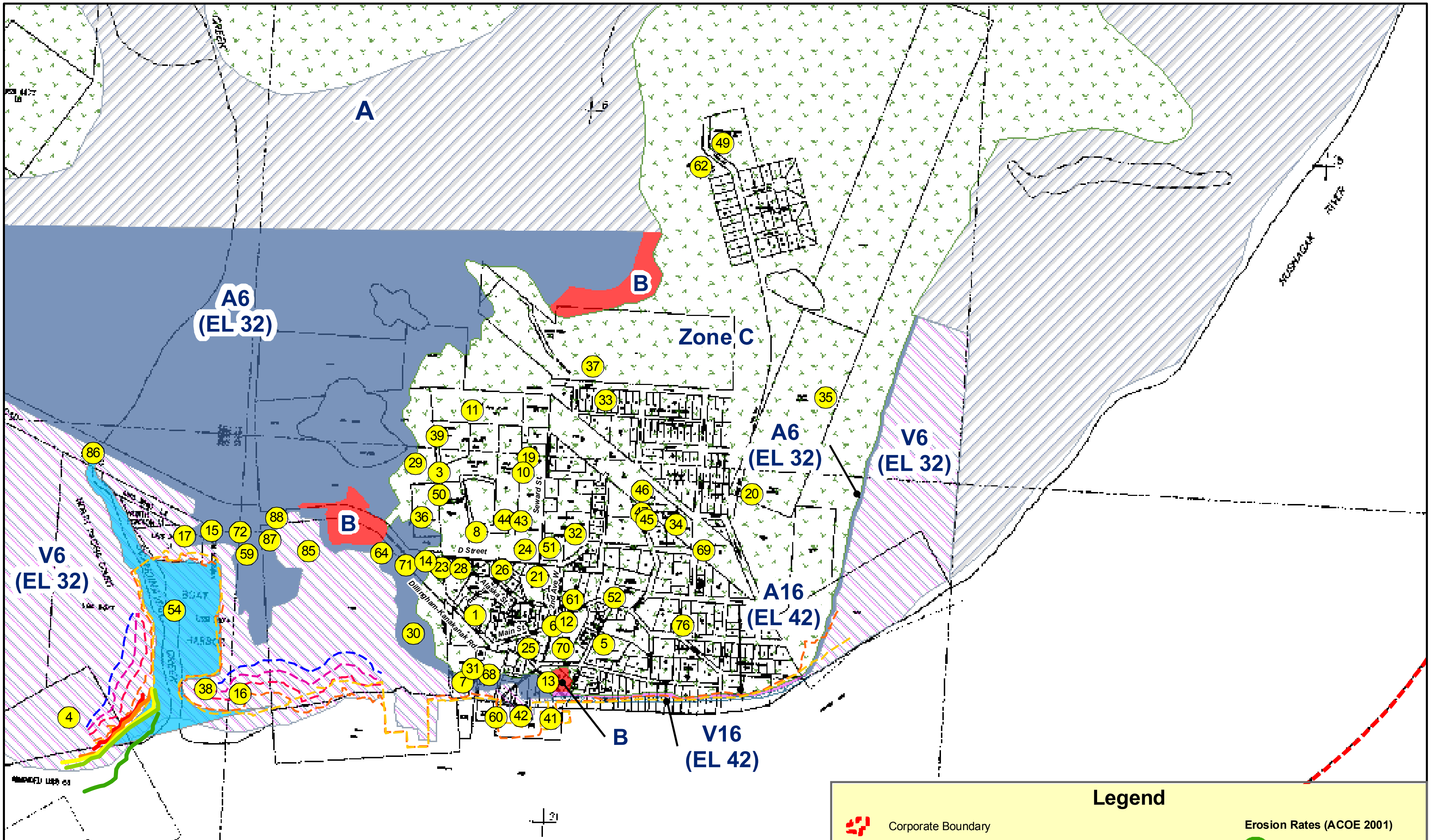


0 500 1,000 2,000
Feet
1:12,000

1982 FEMA Flood Zones

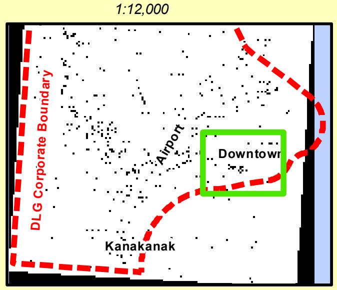
(Data digitized from the 1982 FEMA Flood zone maps)

City of Dillingham

Planning Department

Background Imagery: Dillingham Street Map (year unknown)

Filename: DLG_FEMA_Flood_Plain_Facility_Street_Zoom_Letter.mxd
Date: January 7, 2008



Legend

Corporate Boundary

1982 FEMA Flood Zones

- A - 100 yr flood
- A16 - 100 yr (base flood elevations/hazards determined)
- A6 - 100 yr (base flood elevations/hazards determined)
- B - Area between 100yr and 500yr floods
- C - Minimal Flooding
- V - 100 yr coastal flood with velocity (wave action)
- V16 -100 yr coastal flood (base flood elevations/hazards determined)
- V6 - 100 yr coastal flood (base flood elevations/hazards determined)

Limit of Study

(15) Critical Facility ID

Erosion Rates (ACOE 2001)

- 1972
- 1980
- 1988
- 1992
- 2001

Predicted Shoreline (ACOE 2005)

- 1985 (Historical)
- 2005 (Date of photo)
- 2015
- 2022
- 2030

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Within the past 6 years ice and debris jammed large culvert under Kanakanak Road in front of Kanakanak Hospital resulted in the formation of a pond which nearly topped the road before workers were able to clear the jam. The paved gravel causeway is more than 20 ft above a stream bed. Had the water topped the causeway it would have failed, in which case erosion would have destroyed more than 40 ft of road, isolating Kanakanak Hospital from vehicular traffic from the rest of the community for up to a week.

The following mitigation actions have been implemented to reduce the severity of erosion impacts in the City of Dillingham.

- A sheet-pile seawall was constructed between 1995 and 1998 beginning just east of the city dock and extending 1,600 feet east to Snag Point. It has mitigated further coastal erosion of the bluff above, protecting private and public properties. A 1994 staff estimate put the value of properties and improvements that benefited from the project at more than $5.7 million.
- A 429-foot sheet-pile seawall was built in 1999 to protect the front of the small boat harbor. 184-feet of rock riprap revetment was installed to protect the east side of the harbor mouth.
- In 2004-2005 older timber-plank and pile bulkheads were replaced with open cell sheet pile.
- The city has had to move the east side float arm bases inland, resulting in increased risk to vessels moored in the harbor. The floats themselves are no longer positioned over the dredged portion of the harbor.
- The City has been working with the USACOE on critical erosion control projects in the Small Boat Harbor and Scandinavian Creek. USACOE issued a Concept Design Report in November 2005 for Dillingham City Emergency Bank Protection; the project site is bounded by the Corps of Engineers Small Boat Harbor on the west side and the Peter Pan Seafood's docks on the east.

As described in Section 5.3.1.2, significant erosion loss has eroded up to 10 feet of bank in a single event.

Based on past events and the criteria identified in Table 5-3, the magnitude and severity of erosion impacts in the City of Dillingham are considered critical with the potential for critical facilities to be shutdown for at least two weeks, and more than 25% of property or critical infrastructure being severely damaged.

Impact

Impacts include loss of land and any development on that land. It can cause increased sedimentation of harbors and river deltas and hinder channel navigation – affecting marine transport. Other impacts include reduction in water quality due to high sediment loads, loss of native aquatic habitats, damage to public utilities (docks, harbors, electric and water/wastewater utilities) and maintenance costs associated with trying to prevent or control erosion sites.

Probability of Future Events

Based on historic events, aerial photo review, studies completed by the USACOE, and the criteria identified in Table 5-2, it is highly likely that all structures located along the coastline in the City of Dillingham and surrounding areas are vulnerable to erosion.

The USACOE has projected, based on past erosion loss, that an estimate of 0.2 acres per year of future land will be lost due to erosion. Critical facilities and infrastructure at the highest risk of erosion impacts have been identified as the small boat harbor, the Bristol Alliance Bulk Fuel Facility, electrical utilities, and the city park.

5.3.2 Earthquake

5.3.2.1 Nature

An earthquake is a sudden motion or trembling caused by a release of strain accumulated within or along the edge of the earth's tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. Earthquakes usually occur without warning and, after just a few seconds, can cause massive damage and extensive casualties. The most common effect of earthquakes is ground motion, or the vibration or shaking of the ground during an earthquake.

Ground motion generally increases with the amount of energy released and decreases with distance from the fault or epicenter of the earthquake. It causes waves in the earth's interior, also known as seismic waves, and along the earth's surface, known as surface waves. Two kinds of seismic waves occur: P (primary) waves are longitudinal or compressional waves similar in character to sound waves that cause back-and-forth oscillation along the direction of travel (vertical motion), and S (secondary) waves, also known as shear waves, are slower than P waves and cause structures to vibrate from side to side (horizontal motion). Also two kinds of surface waves occur: Raleigh waves and Love waves. These waves travel more slowly and typically are significantly less damaging than seismic waves.

In addition to ground motion, several secondary natural hazards can occur from earthquakes, such as the following:

- **Surface Faulting** is the differential movement of two sides of a fault at the earth's surface. Displacement along faults, both in terms of length and width, varies but can be significant (e.g., up to 20 ft), as can the length of the surface rupture (e.g., up to 200 miles). Surface faulting can cause severe damage to linear structures, including railways, highways, pipelines, and tunnels.
- **Liquefaction** occurs when seismic waves pass through saturated granular soil, distorting its granular structure, and causing some of the empty spaces between granules to collapse. Pore water pressure may also increase sufficiently to cause the soil to behave like a fluid for a brief period and cause deformations. Liquefaction causes lateral spreads (horizontal movements of commonly 10 to 15 ft, but up to 100 ft), flow failures (massive flows of soil, typically hundreds of feet, but up to 12 miles), and loss of bearing strength (soil deformations causing structures to settle or tip). Liquefaction can cause severe damage to property.
- **Landslides/Debris Flows** occur as a result of horizontal seismic inertia forces induced in the slopes by the ground shaking. The most common earthquake-induced landslides include

shallow, disrupted landslides such as rock falls, rockslides, and soil slides. Debris flows are created when surface soil on steep slopes becomes totally saturated with water. Once the soil liquefies, it loses the ability to hold together and can flow downhill at very high speeds, taking vegetation and/or structures with it. Slide risks increase after an earthquake during a wet winter.

- **Tsunamis:** As an Oceanic Plate is subducted beneath a Continental Plate, it sometimes brings down the lip of the Continental Plate with it. Eventually, too much stress is put on the lip and it snaps back, sending shockwaves through the earth's crust, causing a tremor under the sea, known as an Undersea Earthquake. Factors that affect tsunami generation from an earthquake event include magnitude (generally, a 7.5 magnitude and above), depth of event (a shallow marine event that displaces seafloor), and type of earthquake (thrust as opposed to strike-slip).

The severity of an earthquake can be expressed in terms of intensity and magnitude. Intensity is based on the damage and observed effects on people and the natural and built environment. It varies from place to place depending on the location with respect to the earthquake epicenter, which is the point on the Earth's surface that is directly above where the earthquake occurred. The severity of intensity generally increases with the amount of energy released and decreases with distance from the fault or epicenter of the earthquake. The scale most often used in the U.S. to measure intensity is the Modified Mercalli (MM) Intensity Scale. As shown in Table 5-6, the MM Intensity Scale consists of 12 increasing levels of intensity that range from imperceptible to catastrophic destruction. Peak ground acceleration (PGA) is also used to measure earthquake intensity by quantifying how hard the earth shakes in a given location. PGA can be measured in *g*, which is acceleration due to gravity (see Table 5-6).

Magnitude is the measure of the earthquake strength. It is related to the amount of seismic energy released at the earthquake's hypocenter, the actual location of the energy released inside the earth. It is based on the amplitude of the earthquake waves recorded on instruments, known as the Richter magnitude test scales, which have a common calibration (see Table 5-6).

Table 5-6 Magnitude/Intensity/Ground-Shaking Comparisons

<table>
<tr><th>Magnitude</th><th>Intensity</th><th>PGA (% g)</th><th>Perceived Shaking</th></tr>
<tr><td rowspan="2">0 – 4.3</td><td>I</td><td><0.17</td><td>Not Felt</td></tr>
<tr><td>II-III</td><td>0.17 – 1.4</td><td>Weak</td></tr>
<tr><td rowspan="2">4.3 – 4.8</td><td>IV</td><td>1.4 – 3.9</td><td>Light</td></tr>
<tr><td>V</td><td>3.9 – 9.2</td><td>Moderate</td></tr>
<tr><td rowspan="2">4.8 – 6.2</td><td>VI</td><td>9.2 – 18</td><td>Strong</td></tr>
<tr><td>VII</td><td>18 – 34</td><td>Very Strong</td></tr>
<tr><td rowspan="3">6.2 – 7.3</td><td>VIII</td><td>34 – 65</td><td>Severe</td></tr>
<tr><td>IX</td><td>65 – 124</td><td>Violent</td></tr>
<tr><td>X</td><td rowspan="3">124 +</td><td rowspan="3">Extreme</td></tr>
<tr><td rowspan="2">7.3 – 8.9</td><td>XI</td></tr>
<tr><td>XII</td></tr>
</table>

5.3.2.2 History

The City of Dillingham has no history of major earthquake activity. In the last 20 years, there have been recordings of only a few epicenters within a 100-mile radius of the City. Local residents have reported feeling jolts and seeing lamp-shades shaking (from boxholder surveys).

On Good Friday, March 27, 1964, North America's strongest recorded earthquake, with a moment magnitude of 9.2, rocked central Alaska. On a global level, three of the ten strongest earthquakes ever recorded occurred in Alaska.

5.3.2.3 Location, Extent, Impact, and Probability of Future Events

Location

The entire geographic area of Alaska is vulnerable to the effects of an earthquake. The City of Dillingham lies 200 to 300 miles from the Alaska-Aleutian seismic zone. Many of the faults closer to Dillingham have been inactive for more than 10,000 years.

Since 1972, a total of 159 earthquakes have been recorded within a 100 mile radius of Dillingham. Of those, the following exceeded a magnitude of 5.0 (US Geological Survey [USGS]).

- May 1, 1990, 6.3 M (Lat 58.84, Long -156.86, Depth 211, Distance 94 kilometers)
- May 9, 1998, 5.4 M (Lat 57.89, Long -156.82, Depth 0, Distance 159 kilometers)
- May 9, 1998, 5.4 M (Lat 57.98, Long -156.96, Depth 0, Distance 146 kilometers)
- May 9, 1998, 5.4 M (Lat 57.93, Long -156.83, Depth 0, Distance 156 kilometers)
- February 27, 2003, 5.5 M (Lat 58.71, Long -156.87, Depth 202, Distance 99 kilometers)

Figure 5-2 shows the locations of active and potentially active faults in Alaska.

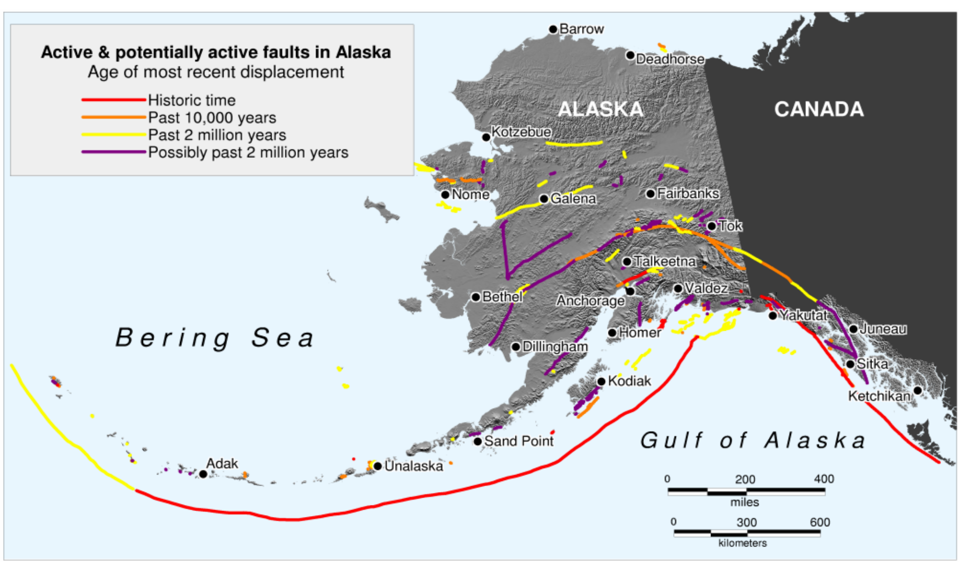

Figure 5-2. Active and Potentially Active Faults in Alaska

Figure 5-3 was generated using the USGS Earthquake Probability Mapping model and indicates less than a 0.05% probability of a greater than 5.0 magnitude earthquake occurring over the next 10 years in the vicinity of Dillingham.

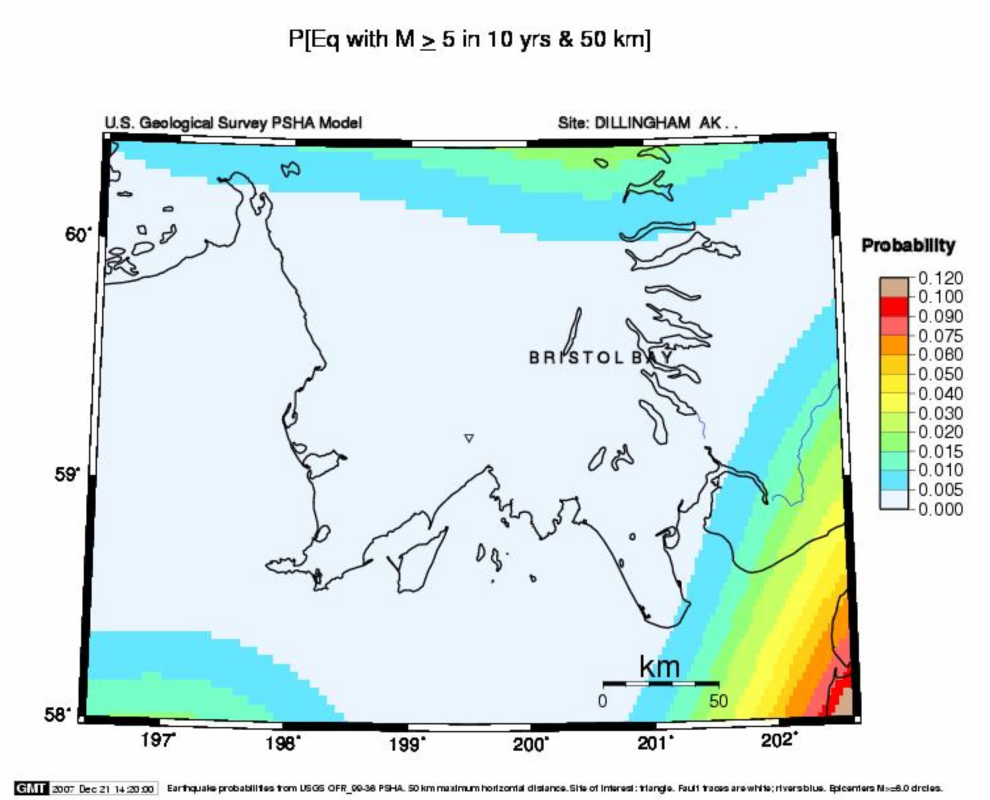

Figure 5-3. Dillingham Earthquake Probability

Source – USGS Earthquake Probability Mapping – probability of a M>/=5.0 within 10 years. http://eqint.cr.usgs.gov/eqprob/2002/index.php 2007.

Extent

Each year Alaska has approximately 5,000 earthquakes, including 1,000 that measure above 3.5 on the Richter scale. Alaska is vulnerable to three types of earthquakes. One type is called a subduction zone earthquake, which is caused by one crustal plate moving beneath another plate. This is the case in Southcentral Alaska and along the Aleutian Islands, the Pacific Plate dives beneath the North American plate. This type of action usually leads to the Earth's largest earthquakes, such as the Good Friday earthquake. Another type of earthquake that is common in Alaska is the "transform fault" earthquake. These earthquakes occur when crustal plates slide by each other. This is the geologic setting offshore of Southeastern Alaska, where the North American plate and the Pacific plate slide past each other on the Fairweather Queen Charlotte fault. This is the same type of movement as on the San Andreas Fault in California. Thirdly, Alaska can experience intraplate earthquakes which occur within a tectonic plate, sometimes at great distance from the plate boundaries. They can have magnitudes into the 7s. Shallow earthquakes in the Fairbanks area would be considered intraplate earthquakes.

Earthquakes felt in the Dillingham area have not exceeded 6.3 M in the past 35 years, and damage has never been reported due to an earthquake event.

Based on past historic earthquake events and the criteria identified in Table 5-3, the magnitude and severity of earthquake impacts in the City of Dillingham are considered negligible with minor injuries, the potential for critical facilities to be shutdown for less than 24 hours, less than 10% of property or critical infrastructure being severely damaged, and little to no permanent damage to transportation or infrastructure or the economy.

Impact

Dillingham is located in an area that is less active than others in the state, although the effects of earthquakes centered elsewhere are expected to be felt in Dillingham. Impacts to the community such as significant ground movement that may result in infrastructure damage are not expected. Minor shaking may be seen or felt based on past events.

Probability of Future Events

The City of Dillingham has no official record of significant earthquake activity resulting in damage or injuries. According to the Earthquake UBC Zone Map in the SHMP, Dillingham is located in Zone 1; Zone 0 with the lowest risk and Zone 4 being the highest risk of occurrence. The Uniform Building Code Seismic Zones in Alaska Map, and the SHMP, classify Dillingham in Zone 2; Zone 0 being the lowest risk and Zone 4 being the highest risk. This indicates a low probability of a future occurrence.

The Seismic Activity in Alaska map in the SHMP indicates that Dillingham is approximately 20 miles from a fault line that has possibly been active in the last 2 million years. Dillingham is approximately 300 miles from an active fault line.

While the probability of an earthquake is likely throughout the State of Alaska, based on its geographic location and information provided in the Alaska HMP and the Alaska Seismic Activity Map, it is unlikely that an earthquake would be centered in an area around Dillingham. Figure 5-3 was generated using the USGS Earthquake Probability Mapping model and indicates a less than 0.05% probability of a greater than 5.0 magnitude earthquake occurring over the next 10 years in the vicinity of Dillingham.

5.3.3 Flood

5.3.3.1 Nature

Flooding is the accumulation of water where usually none occurs or the overflow of excess water from a stream, river, lake, reservoir, or coastal body of water onto adjacent floodplains. Floodplains are lowlands adjacent to water bodies that are subject to recurring floods. Floods are natural events that are considered hazards only when people and property are affected.

Nationwide, floods result in more deaths than any other natural hazard. Physical damage from floods includes the following:

- Inundation of structures, causing water damage to structural elements and contents.
- Erosion or scouring of stream banks, roadway embankments, foundations, footings for bridge piers, and other features.

- Impact damage to structures, roads, bridges, culverts, and other features from high-velocity flow and from debris carried by floodwaters. Such debris may also accumulate on bridge piers and in culverts, increasing loads on these features or causing overtopping or backwater effects.
- Destruction of crops, erosion of topsoil, and deposition of debris and sediment on croplands.
- Release of sewage and hazardous or toxic materials as wastewater treatment plants are inundated, storage tanks are damaged, and pipelines are severed.

Floods also result in economic losses through closure of businesses and government facilities, disrupt communications, disrupt the provision of utilities such as water and sewer service, result in excessive expenditures for emergency response, and generally disrupt the normal function of a community.

Riverine floodplains range from narrow, confined channels in the steep valleys of mountainous and hilly regions to wide, flat areas in plains and coastal regions. The amount of water in the floodplain is a function of the size and topography of the contributing watershed, the regional and local climate, and land use characteristics. Flooding in steep, mountainous areas is usually confined, strikes with less warning time, and has a short duration. Larger rivers typically have longer, more predictable flooding sequences and broad floodplains.

Localized flooding may occur outside of recognized drainage channels or delineated floodplains due to a combination of locally heavy precipitation, increased surface runoff, and inadequate facilities for drainage and stormwater conveyance. Such events frequently occur in flat areas and in urbanized areas with large impermeable surfaces. Local drainage may result in “nuisance flooding,” in which streets or parking lots are temporarily closed and minor property damage occurs.

In the City of Dillingham three types of flooding occur: riverine flooding (also known as overbank flooding), due to excessive rainfall and minor ice-jams; coastal flooding due to wave run-up; and combination of snowmelt and rain on top of frozen ground. Severe storms in conjunction with high tides and strong winds can cause significant wave run-up.

5.3.3.2 History

Several floods have been recorded in the City of Dillingham throughout the years.

- A coastal flood in 1929 flooded the lower areas of Dillingham to an elevation of 30 feet (10 feet above mean higher high water (MHHW)). The greatest impact of this storm was that vessels anchored in Wood River were blown up onto the flooded flats to the north east where they remained stranded (from a conversation with Hjalmar and Peter Olson, who reported that the hulls were visible there when they were children).

  According to Hjalmar and Peter Olson, later storms also damaged anchored vessels, leading to a push to create a small boat harbor on Scandinavian Creek. They did not recall damage from flooding to have been significant.
- A coastal storm in 1981 caused some wave action damage to the city dock, but no significant flooding was reported.

- A storm in August 2005 caused minimal flooding in the vicinity of the small boat harbor and Bristol Alliance Fuels tank-farm. Wave action significantly eroded unprotected portions of the harbor entrance, and waves breaking over the sea-walls damaged vehicles parked at the harbor and a small building at Bristol Alliance. No significant damage was reported as a result of flooding, even though the tank farm access road and parking lot, as well as parts of the harbor parking lot, were temporarily covered with nearly two feet of standing water.

During some very high tides occurring with onshore winds, water has also temporarily flooded low-lying portions of the main road, temporarily impeding traffic.

Highly localized flooding has occurred around creeks within the city as a result of blocked culverts and/or beaver dams, particularly in times of high run off.

An area on the north side of the core townsite is particularly subject to flooding during spring snowmelt. When the ground is frozen and it rains or warms enough for snow to melt, septic systems in this area have been known to flood and backup. Hank Boggs, the Maintenance Foreman for SAFE, the shelter for victims of violence, says that facility had to replace their septic because of this problem. He says the septic overflowed and sewage reached the nearby City Public Works shop. Ramon Rocque, former Public Works Director, says every spring they have to pump out the septic to keep it from flooding. The septic for the duplex Boggs owns in that area has had problems annually as long as he’s owned it. At least one residence has had flooded septic systems because of flooding due to snowmelt.

The area in question is less than half a mile from the town’s main well. The Alaska Rural Water Association ranked the well susceptibility to contamination as High, resulting from the conclusion that while the well has a low susceptibility to contamination, the susceptibility of the aquifer to contamination is very high. Domestic wastewater collection systems contribute to the susceptibility of the public drinking water source, along with aircraft maintenance shops, gas stations; car repair shops, large septic systems; injection wells, seafood processing facilities, above and underground fuel drums and tanks, leaking underground storage tanks, boatyards, a floatplane dock/refueling area, an airport, seafood and meat processing facilities, and numerous other sources of contaminants.

Kleepuk Hill Road has been constructed piecemeal, never built up to code. There are 3 homes at the end of this road which is the only means of egress to the main road system, the hospital and stores. Every spring the road becomes nearly impassible because of localized flooding due to melting snow and ice on the surrounding tundra.

The bridge and bike path over Scandinavian Creek are the only egress into the core Dillingham townsite and the HUD housing complex, the highest density of population in Dillingham. The bridge and path are threatened by flooding when high tides combine with storm surge. Waters have repeatedly covered the bridge and during warmer months when there’s no ice, threaten to eat away at the bike path which is one of the community’s few public recreation areas.

There is no history of ice-jam flooding on the main rivers effecting Dillingham, although docks have been damaged by ice flows coming out of the rivers during break-up.

5.3.3.3 Location, Extent, Impact, and Probability of Future Events

Location

The most readily available source of information regarding the 100-year flood is the system of Flood Insurance Rate Maps (FIRMs) prepared by FEMA. These maps are used to support the NFIP. The FIRMs show 100-year floodplain boundaries for identified flood hazards. These areas are also referred to as Special Flood Hazard Areas and are the basis for flood insurance and floodplain management requirements. The FIRMs also show floodplain boundaries for the 500-year flood, which is the flood having a 0.2 percent chance of occurrence in any given year. FEMA has prepared FIRMs for the City of Dillingham (1982). The City of Dillingham contracted with Blue Sky Solutions to have the FIRMS digitized for the purposes of this MHMP. FEMA is also in the process of updating digital FIRMS for Region X.

The FIRMs and Flood Insurance Studies for the City of Dillingham show identified Special Flood Hazard Areas for the following flooding sources:

- Wood River
- Nushagak River
- Squaw Creek
- Snake River
- Scandinavian Creek

Figure 5-1a-e shows the location of the 100-year and 500-year floodplains. An area totaling 2.36 square miles within the City of Dillingham is within the 100-year floodplain and an additional 0.012 square miles is within the 500-year floodplain. While most of the floodplains are located within relatively undeveloped areas, infrastructure and other nonresidential and residential development susceptible to flooding include:

- Scandinavian Creek Bridge
- Small Boat Harbor
- Nushagak Electric Power Plan
- City Dock
- Bristol Alliance Bulk Fuel Facility
- Tank Farm Access Road
- Tank Farm Parking Lot
- Harbor Parking Lot
- Kanakanak Road
- National Guard Armory
- LFS
- Squaw Creek Bridge
- Kleepuk Hill Road
- City of Dillingham Public Works Department
- SAFE

Extent

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence.

The following factors contribute to the frequency and severity of riverine flooding:

- Rainfall intensity and duration
- Antecedent moisture conditions
- Watershed conditions, including steepness of terrain, soil types, amount, and type of vegetation, and density of development
- The existence of attenuating features in the watershed, including natural features such as swamps and lakes and human-built features such as dams
- The existence of flood control features, such as levees and flood control channels
- Velocity of flow
- Availability of sediment for transport, and the erodibility of the bed and banks of the watercourse

The following factors contribute to the frequency and severity of coastal flooding:

- Astronomical tides
- Storm surge - the rise in water from wind stress and low atmospheric pressure
- Waves
- Peak still-water elevation

The magnitude of flood used as the standard for floodplain management in the U.S. is a flood having a probability of occurrence of 1 percent in any given year, also known as the 100-year flood or base flood.

The rivers and streams for which FEMA has prepared detailed engineering studies may also have designated floodways. The floodway is the channel of a watercourse and portion of the adjacent floodplain that is needed to convey the base or 100-year flood event without increasing flood levels by more than 1 foot and without significantly increasing flood velocities. The floodway must be kept free of development or other encroachments.

As described in Section 5.3.3.2, flood hazard events in Dillingham have results in flood levels exceeding MHHW by 10 ft.

Based on past flood events and the criteria identified in Table 5-3, the magnitude and severity of flood impacts in the City of Dillingham are considered negligible with minor injuries, the potential for critical facilities to be shutdown for less than 24 hours, less than 10% of property or critical infrastructure being severely damaged, and little to no permanent damage to transportation or infrastructure or the economy.

Impact

Impacts associated with flooding in the City of Dillingham include boat strandings, overflowing septic systems, and localized areas of standing water in parking lots and roadways, however long-term closures or economic losses have not been identified.

Probability of Future Events

Flood studies often use historical records, such as stream-flow gages, to determine the probability of occurrence for floods of different magnitudes. The probability of occurrence is expressed in percentages as the chance of a flood of a specific extent occurring in a given year.

Based on previous occurrences and criteria identified in Table 5-2, it is possible for a significant flood event to occur within the next ten years (event has up to a 1 in 10 year chance of occurring).

5.3.4 Severe Weather

5.3.4.1 Nature

Severe weather in Alaska includes thunderstorms, lightening, hail, heavy and drifting snow, freezing rain/ice storm, extreme cold, high winds, coastal storms/storm surge and ivu. With the exception of ivu, the City of Dillingham is vulnerable to all types of severe weather.

Thunderstorms

A thunderstorm is considered severe if its winds reach or exceed 58 mph, it produces a tornado, or it drops surface hail at least 0.75 inches in diameter.

Turbulence and atmospheric imbalance cause thunderstorm events. They arise from combining:

- unstable rising warm air,
- adequate moisture to form clouds and rain, and
- the upward lift of air currents resulting from interacting weather fronts (warm and cold), sea breezes, or mountains.

Localized downdrafts, downbursts & microbursts, are also important in Alaska. Downbursts and microbursts can be generated by thunderstorms. Downburst winds are strong concentrated straight-line winds created by falling rain and sinking air that can reach speeds of 125 mph. The combination induces strong wind downdrafts due to aerodynamic drag forces or evaporation processes. Microburst winds are more concentrated than downbursts and can reach speeds up to 150 mph. They can cause significant damage as both can last 5 – 7 minutes. Because of wind shear and detection difficulties, they pose a big threat to aircraft landings and departures.

Types of Thunderstorms

- Single Cell - Short-lived storms (20 to 30 minutes) that cover a limited area (a few square miles).
- Multicell - Multicell thunderstorms are an organized cluster of two or more single cell storms. Air flowing out of one storm fuels other storms, causing new storms to develop on the right or rear storm flank every 5 to 15 minutes.

- Supercell - Supercells produce the most severe weather, last the longest (1 to 6 hours), and travel 200 miles or more. These storms can cause winds of more than 78 mph, giant hail (e.g., 2 inches), and tornado activity. Supercells produce updrafts of 56 to 112 mph that coexist with sustained downdrafts. Together, the updrafts and downdrafts act to extend the storm's duration.
- Squall Lines - A line or band of active thunderstorms, a squall line may extend over 250 to 500 miles, may be from 10 to 20 miles wide, and consist of many laterally aligned cells that do not interfere with one another. The cells may be any combination of types (ordinary to severe, single cell to supercell). Squall lines may form along cold fronts, but often form as much as 100 miles ahead of an advancing cold front in the warm sector of an extratropical storm. They often trail a large, flat cloud layer that brings significant rain after the storms pass.

Lightning

Lightning results from a buildup of charged ions within the thundercloud. It occurs in all thunderstorms.

Bureau of Land Management sensors positioned across the interior have located an average of 26,000 cloud-to-ground lightning strikes per year. Very active thunderstorm days may feature 2,000 to 5,000 lightning strikes, mainly occurring during the late afternoon hours during the end of June – beginning of July. Many of these lightning strikes occur in the northern boreal forests of the interior occasionally leading to wildfires.

Hail

Hailstones are ice formations that are greater than 0.75 inches in diameter that fall with rain. They occur with thunderstorms.

Hailstorms are an outgrowth of thunderstorms in which ball or irregular shaped lumps of ice greater than 0.75 inches in diameter fall with rain. The size and severity of the storm determine the size of the hailstones. In Alaska, hailstorms are fairly rare and cause little damage, unlike the hailstorms in mid-western states. The extreme conditions of atmospheric instability needed to generate hail of a damaging size (greater than ¾ inch diameter) are highly unusual in Alaska. Small hail of pea-size has been observed periodically.

Heavy and Drifting Snow

Heavy snow generally means snowfall accumulating to 4 inches or more in depth in 12 hours or less or 6 inches or more in depth in 24 hours or less. Drafting is the uneven distribution of snowfall and snow depth caused by strong surface winds. Drifting snow may occur during or after a snowfall.

Freezing Rain/Ice Storm

Freezing rain and ice storms occur when rain or drizzle freezes on surfaces, accumulating 12 inches in less than 24 hours.

Extreme Cold

The definition of extreme cold varies according to the normal climate of a region. In areas unaccustomed to winter weather, near freezing temperatures are considered “extreme”. In Alaska, extreme cold usually involves temperatures between -20 to -50 degrees Fahrenheit.

Excessive cold may accompany winter storms, be left in their wake, or can occur without storm activity.

High Winds

High winds occur in Alaska when there are winter low-pressure systems in the North Pacific Ocean and the Gulf of Alaska. Alaska's high wind can equal hurricane force but fall under a different classification because they are not cyclonic nor possess other characteristics of hurricanes. In Alaska, high winds (winds in excess of 60 mph) occur rather frequently over the coastal areas along the Bering Sea and the Gulf of Alaska.

Strong winds occasionally occur over the interior due to strong pressure differences, especially where influenced by mountainous terrain, but the windiest places in Alaska are generally along the coastlines. The west coast along Bristol Bay and the Bering Sea, the Aleutian Islands, Kodiak Island, the Alaska Peninsula, the Gulf of Alaska coast, and the Southeast Panhandle all experience wind storms on a fairly regular basis. Coastal areas that are framed by mountains, such as at Sitka, Craig, Ketchikan, and Juneau are particularly susceptible to high winds due to the channeling affect of the terrain as storms move inland.

Coastal Storms

A coastal storm is a generic term for a storm that strikes a coastal area. It can produce high winds, flooding and erosion.

Storm surges, or coastal floods, occur during coastal storms when the sea is driven inland above the high-tide level onto land that is normally dry. Often, heavy surf conditions driven by high winds accompany a storm surge adding to the destructive force of the flooding waters.

The conditions that cause storm surges can also cause significant shoreline erosion as the flood waters undercut roads and other structures. Low atmospheric pressure and strong winds coincident with big high tides promote storm surges. Winds blowing directly onshore or along the shore with the shoreline to the right of the direction of the flow and winds maintained from roughly the same direction over a long distance across the open ocean have the greatest effect.

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

Storm surges, or coastal floods, occur when the sea is driven inland above the high-tide level onto land that is normally dry. Often heavy surf conditions driven by high winds accompany a storm surge adding to the destructive force of the flooding waters. The conditions that cause coastal floods also can cause significant shoreline erosion as the flood waters undercut roads and other structures. Storm surge is a leading cause of property damage in Alaska. The meteorological parameters conducive to coastal flooding are low atmospheric pressure, strong winds (blowing directly onshore or along the shore with the shoreline to the right of the direction of the flow), and winds maintained from roughly the same direction over a long distance across the open ocean (fetch).

Communities that are situated on low coastal lands with gradually sloping bathymetry near the shore and exposure to strong winds with a long fetch over the water are particularly susceptible to coastal flooding. Several communities and villages along the Bristol Bay coast, the Bering Sea coast, the Arctic coast, and the Beaufort Sea coast have experienced significant damage from coastal floods over the past several decades. Most coastal flooding occurs during the late summer or early fall in these locations. As shorefast ice forms along the coast before winter, the risk of coastal flooding abates.

5.3.4.2 History

Dillingham has suffered damage from severe storms on a regular basis. Winds gusting in excess of 50 mph regularly bring down trees, damage buildings, vehicles, and power lines. Gusts of 60-75 mph have occurred occasionally and have damaged parked airplanes.

A coastal storm in 1929 flooded the lower areas of Dillingham to an elevation of 30 ft (10 ft above MHHW). Flooding did little damage, but vessels anchored in Wood River were blown up onto the flooded flats to the northeast where they remained stranded. (from an interview of Hjalmar and Peter Olson, who reported that the hulls were still visible when they were children).

Later storms also damaged anchored vessels, leading to development of the small boat harbor on Scandinavian Creek (H. & P. Olson) in 1962.

A serious storm in 1980 caused severe erosion and damage to the municipal dock and cold storage facilities (city records). Winds gusting to 90 mph tore metal roofing from at least one house (Norman Heyano).

A coastal storm in 1981 caused some wave action damage to the city dock (city records).

A series of storms in the fall of 1993 caused severe damage to Snag Point and eroded the bluff there, exposing portions of the city's sewer system, including a man-hole (city records).

Wave action during a coastal storm in August 2005 heavily damaged Peter Pan Cannery docks and significantly eroded unprotected portions of the harbor entrance. Erosion flanked the east end of the harbor seawall and removed a large amount of gravel from behind the sheet-pile and from the berm of the southeast dredge waste containment area. Waves breaking over seawalls damaged vehicles parked at the harbor and moved a small building at the Bristol-Alliance fuel farm. Waves also caused minor erosion at the Delta Western and Bristol Alliance fuel facilities. The surge briefly flooded the Bristol-Alliance tank farm access road and parking lot, as well as parts of the harbor parking lot with up to two feet of water. At the height of the tide, vessels within the harbor were exposed to wave action and high wind (city records, USACE report, interviews with fuel company employees).

During the August 2005 storm, a fuel barge moored at the Bristol Alliance farm was not moved upriver to safer anchorage. This resulted in the vessel leaking diesel fuel through the vents as it was repeatedly slammed into the face of the Bristol Alliance dock by wave, tide, and wind action. This fuel was driven by the same wave and tidal action into the Dillingham Small Boat Harbor. After the storm abated, the vessel was sheltered up the Wood River.

During some very high tides occurring with onshore winds, water has also temporarily flooded low-lying portions of the main road, temporarily impeding traffic along Scandinavian Flats and at the Airport “Y”.

Thunder storms have been rare, but are occurring more frequently in the Dillingham area. Lightning has ignited wildfires within a few miles of Dillingham, but to-date there are no reports of fires or other lightning damage within city limits. Small hail also occurs, but no significant damage has been reported as a result. Funnel clouds have occasionally been spotted inland of the city.

In the summer of 2005 a thunderstorm crossed the Nushagak a few miles south of Dillingham, generating a powerful squall which swamped at least one skiff fishing on the windward shore of the bay.

5.3.4.3 Location, Extent, Impact, and Probability of Future Events

Location

The entire Dillingham area is equally vulnerable to the effects of severe weather. Coastal areas are at higher risk of coastal storm surges. Thunderheads develop inland of Dillingham with increasing frequency. However, they tend to dissipate as they approach the coast.

Extent

As discussed in Section 5.3.4.2, winds exceeding 90 mph, flooding exceeding 10 feet MHHW, and erosion loss up to 10 ft in a single event have occurred. Based on past severe weather events and the criteria identified in Table 5-3, the magnitude and severity of impacts in the City of Dillingham are considered limited with injuries that do not result in permanent disability, the potential for critical facilities to be shutdown for more than one week, and more than 10% of property or critical infrastructure being severely damaged.

Impact

The intensity, location and the land's topography influence the impact of severe weather conditions on a community. In the City of Dillingham severe weather events occur rather frequently.

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 the cold weather.

Extreme cold can bring transportation to a halt across 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 to villages. Long cold spells can cause rivers to freeze, disrupting shipping and increasing the likelihood of ice jams and associated flooding. 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 and furnaces 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 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 supercooled and freezes upon impact with cold surfaces.

Probability of Future Events

Based on previous occurrences and the criteria identified in Table 5-2, it is possible for a significant severe weather event to occur within the next five years (event has up to a 1 in 5 year chance of occurring).

5.3.5 Urban Conflagration

5.3.5.1 Nature

Downtown Dillingham contains several areas comprising predominately older wooden structures in close proximity to each other with inadequate structural fireproofing. Many structures in downtown Dillingham have been designated “high hazard areas” due to the possibility of conflagration. High winds, combined with no defensible space and limited escape routes compound this problem.

Conflagration is a fire that occurs in the built environment, starting at one structure and quickly spreading to many more. Therefore, a fire conflagration expands uncontrollably beyond its original source area to engulf adjoining regions. A conflagration can have many causes, including:

- Criminal acts (arson, illegal explosive devices, acts of terrorism, civil unrest)
- Residential accidents (improper use of electrical and heating appliances, improper storage of handling of flammables, faulty connections, grease fires, misuse of matches and lighters, and improper disposal of charcoal and wood ashes)
- Industrial accidents (hazardous material incidents, explosions, and transportation accidents)
- Acts of nature (lightning strike, ignitions following a large earthquake)

In addition, wind, extremely dry weather conditions, explosions, and a dense built environment can contribute to a conflagration.

Most fires start in the contents of a building. For example, a smoldering cigarette may start a fire in a garbage can, stuffed chair or mattress. If the flames are not quickly extinguished while still in the content phase, they will extend throughout the structure. Fire spreads throughout concealed spaces, walls, common roof or attic spaces; and sometimes even along the outside of the building.

Types of construction *(this section will be used to further classify structures in the City of Dillingham as part of a more detailed analysis in the next plan update)*

There are five basic groups of building construction used throughout the US. All buildings in America can be associated with one of the five basic types of construction, identified by Roman numerals in building codes and by engineering schools throughout the nation and listed in order from least combustible to most combustible:

Type I	(fire resistive) - Least combustible
Type II	(non-combustible)
Type III	(ordinary)
Type IV	(heavy timber)
Type V	(wood frame) Most combustible

Fire-resistive construction (type I) was originally designed to contain fire inside the building to one floor. This concrete and steel structure, called "fire resistive" when first built at the turn of the century, was supposed to confine a fire with its construction. Faults in modern construction allow fire to spread over several floors in a fire-resistive building despite its steel-and-concrete structure by spreading through air-conditioning and heating ducts as well as from lower windows to windows above in a multi-story building.

Non-combustible (type II) buildings have steel or concrete walls, floors, and structural framework. When a fire occurs inside a type II building, flames rising to the underside of the steel roof deck may conduct heat through the metal and ignite the combustible roof.

Ordinary construction (type III) is also called brick-and-joist construction. It has masonry-bearing walls but the floors, structural framework and roof are made of wood or other combustible material. Ordinary construction has been described by some firefighters as a "lumberyard enclosed by four brick walls."

Heavy-timber (type IV) construction is sometimes called "mill construction" because it was the type of structure used at the turn of the century to house textile mills. These buildings have masonry walls like type III buildings, but the interior wood consists of large timbers that can create large radiated heat waves after the windows break during a blaze. A fire in a heavy-timber building can produce a tremendous conflagration with flames coming out of the windows, spreading fire to adjoining buildings.

Wood-frame (type V) construction is the most combustible of the five building types. The interior framing and exterior walls may be wood. A wood-frame building is the only one of the five types of construction that has combustible exterior walls.

5.3.5.2 History

Structure fires are a threat to the City of Dillingham. A significant conflagration has been avoided to-date, however the construction of side-by-side wooden buildings make structures fires difficult to control.

There have been a number of boat and structure fires in the down-town area and other areas with relatively closely clustered buildings. Extension to multiple buildings or vessels was possible in some cases, but was prevented by suppression activities.

Structure fires and boat fires have killed at least seven people in Dillingham in the past 22 years. These deaths and nearly all the injuries occurred in the structure of origin.

A review of information contained in the Dillingham Department of Public Safety records management system indicates that Dillingham Volunteer Fire has responded to 199 calls for fire related services since 10/26/99.

Those calls break down as follows:

Structure fires	70
False alarm/other	77
Vehicle fires	18
Wildland/grass fires	17
Boat fires	06
Unknown	11

One of the structure fires caused a wildland fire as a secondary consequence, and two wildland fires destroyed buildings other than steambaths as secondary consequences. These instances are accounted for singly as the primary fire type.

Additionally, urban conflagration issues are not confined to the townsite area. Despite the severe threat to the Delta Western fuel storage facility (located in the townsite area) posed by the conflagration at the Dillingham Commercial Company building in the mid 1980's, other areas of the community are at statistically greater risk of massive conflagration: specifically the Dillingham Small Boat Harbor and associated PAF Boat Yard. Past fires have been started by deliberate or accidental human action.

In the years covered by the current Dillingham Department of Public Safety records management system (1999-2008) five boats in, and around, the harbor have reported fires. Fires in these areas have resulted in at least one death (PAF Yard) and several significant injuries. Five other fires in the harbor or yard involving motor vehicles or other structures have also been responded to in this period.

These fires occur, generally, during the summer fishing season when fire department personnel are at their lowest response levels of the year. They occur in areas otherwise bereft of adequate fire response capabilities. In the case of the harbor, they occur at a time of year and in a place where tidal conditions crowd potentially hundreds of boats cheek to jowl in a dry hole that does not have adequate, or occasionally even operational, first response fire fighting capabilities. The resultant damage of a fire in the harbor could cripple the community's economy for years to come. Estimation of the potential for loss of life and injury aboard boats mired outboard of a spreading fire is difficult.

Children playing with fire or fireworks have been the most frequent cause. Accidental spread from deliberate brush, grass or trash burning has also been a common cause. Spread from cooking fires, structure or vehicle fires and deliberate arson has also happened occasionally.

5.3.5.3 Location, Extent, Impact, and Probability of Future Events

Location

Figure 5-4 shows the locations of potential urban conflagration.

Within the built environments, low intensity development, which includes areas with impervious surfaces that account for 20 to 49 percent of total cover and commonly include single-family housing units, are at a low risk to this hazard. Areas at moderate risk include medium intensity development, including areas with impervious surfaces that account for 50 to 79 percent of total cover and commonly include single-family housing units and a few multi-dwelling units. Finally, areas at high risk to an urban conflagration, include highly developed areas where people reside and/or work in high numbers, including apartment complexes, row houses, and commercial/industrial buildings. Generally, impervious surfaces in these areas account for 80 to 100 percent of the total land cover.

It is important to note that criteria used to develop the hazard ratings did not take into account the age or type of structures. Older structures often do not conform to modern building and fire codes and do not contain fire detection devices. In addition, many of these structures are also prone to faulty electrical and heating systems. Older residential buildings were also constructed in close proximity to one another without adequate firewall protection, thereby enabling a fire to spread quickly. As part of the next plan update, the City intends to classify all structures by construction type to perform a more detailed analysis.

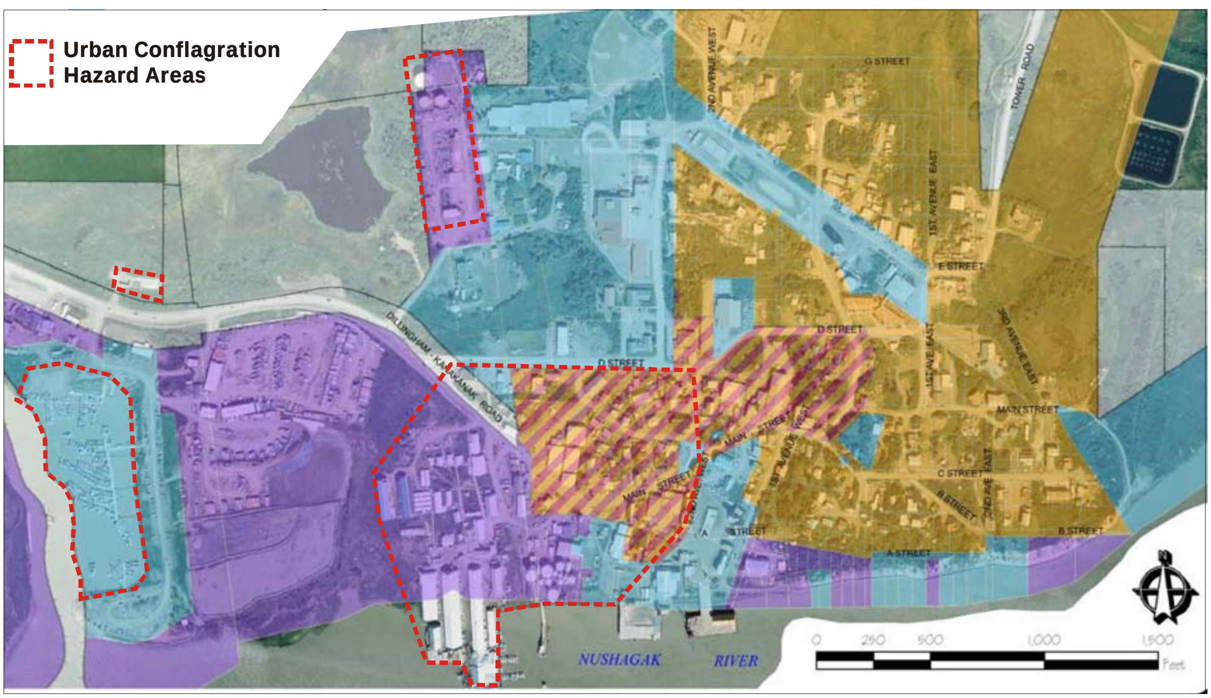

Figure 5-4 Urban Conflagration Hazard Areas

Extent

Based on past urban conflagration events and the criteria identified in Table 5-3, the magnitude and severity of impacts in the City of Dillingham are considered negligible with minor injuries, the potential for critical facilities to be shutdown for less than 24 hours, less than 10% of property or critical infrastructure being severely damaged, and little to no permanent damage to transportation or infrastructure or the economy.

Impact

Impacts associated with urban conflagration in the City of Dillingham have the potential to include loss of critical infrastructure and utilities as well as loss of life.

Probability of Future Events

Based on previous occurrences and the criteria identified in Table 5-2 it is possible for a significant urban conflagration event to occur within the next five years (event has up to a 1 in 5 year chance of occurring).

5.3.6 Volcano

5.3.6.1 Nature

Alaska is home to 41 historically active volcanoes stretching across the entire southern portion of the state from the Wrangell Mountains to the far western Aleutian Islands. "Historically active" refers to actual eruptions that have occurred during Alaskan historic time, in general the time-period in which written records have been kept; from about 1760. An average of 1-2 eruptions per year occur in Alaska. In 1912, the largest eruption of the 20th century occurred at Novarupta and Mount Katmai, located in what is now Katmai National Park and Preserve on the Alaska Peninsula.

A volcano is a vent or opening in the earth's crust from which molten lava (magma), pyroclastic materials, and volcanic gases are expelled onto the surface. Volcanoes and other volcanic phenomena can unleash cataclysmic destructive power greater than nuclear bombs, and can pose serious hazards if they occur in populated and/or cultivated regions.

There are four general types of volcanoes:

- Lava domes are domes that are formed when lava erupts and accumulates near the vent.
- Cinder cones are cone-shaped and formed by accumulation of cinders, ash, and other fragmented materials originating from an eruption.
- Shield volcanoes are broad, gently sloping volcanic cones of flat domical shape, usually several tens or hundreds of square miles in extent, built chiefly of overlapping and interfingering basaltic lava flows.
- Composite or stratovolcanoes are typically steep-sided, symmetrical cones of large dimensions built of alternating layers of lava flows, volcanic ash, cinders, and blocks. Most composite volcanoes have a crater at the summit containing a central vent or clustered group of vents.

Along with the different kinds of volcanoes there are different types of eruptions. The type of eruption is a major determinant of the type of physical results an event will create, and the particular hazards it poses. Six main types of volcano hazards exist including:

- Volcanic gases are made up of water vapor (steam), carbon dioxide, ammonia, as well as sulfur, chlorine, fluorine, and boron compounds, and several other compounds. Wind is the primary source of dispersion for volcanic gases. Life, health, and property can be endangered from volcanic gases within about 6 miles of a volcano. Acids, ammonia, and other compounds present in volcanic gases can damage eyes and respiratory systems of people and animals, and heavier-than-air gases, such as carbon dioxide, can accumulate in closed depressions and suffocate people or animals.
- Lahars are usually created by shield volcanoes and stratovolcanoes and can easily grow to more than 10 times their initial size. They are formed when loose masses of unconsolidated, wet debris become mobilized. Eruptions may trigger one or more lahars directly by quickly melting snow and ice on a volcano or ejecting water from a crater lake. More often, lahars are formed by intense rainfall during or after an eruption since rainwater can easily erode loose volcanic rock and soil on hillsides and in river valleys. As a lahar moves farther away from a volcano, it will eventually begin to lose its heavy load of sediment and decrease in size.
- Landslides are common on stratovolcanoes because their massive cones typically rise thousands of feet above the surrounding terrain, and are often weakened by the very process that created the mountain – the rise and eruption of molten rock (magma). If the moving rock debris is large enough and contains a large content of water and soil material, the landslide may transform into a lahar and flow down valley more than 50 miles from the volcano.
- Lava flows are streams of molten rock that erupt from a vent and move downslope. Lava flows destroy everything in their path; however, deaths caused directly by lava flows are uncommon because most move slowly enough that people can move out of way easily, and flows usually do not travel far from the source vent. Lava flows can bury homes and agricultural land under tens of feet of hardened rock, obscuring landmarks and property lines in a vast, new, hummocky landscape.
- Pyroclastic flows are dense mixtures of hot, dry rock fragments and gases that can reach 50 mph. Most pyroclastic flows include a ground flow composed of coarse fragments and an ash cloud that can travel by wind. Escape from a pyroclastic flow is unlikely because of the speed at which they can move.
- Tephra is a term describing any size of volcanic rock or lava that is expelled from a volcano during an eruption. Large fragments generally fall back close to the erupting vent, while smaller fragment particles can be carried hundreds to thousands of miles away from the source by wind. Ash clouds are common adaptations of tephra.

Ash fall is the most significant volcanic hazard to Dillingham because, unlike other secondary effects of eruptions such as lahars and lava flows, ash fall can travel thousands of miles from the site of the eruption.

Volcanic ash consists of tiny jagged particles of rock and natural glass blasted into the air by a volcano. Ash can threaten the health of people and livestock, pose a hazard to flying jet aircraft, damage electronics and machinery, and interrupt power generation and telecommunications. Wind can carry ash thousands of miles, affecting far greater areas and many more people than other volcano hazards. Even after a series of ash-producing eruptions has ended, wind and human activity can stir up fallen ash for months or years, presenting a long-term health and economic hazard. Aircraft are of special concern because of the disastrous affects volcanic ash can have on airplane engines.

Ash clouds have caused catastrophic failure in airplane engines, most notably in 1989 when KLM Flight 867, a 747 jetliner, flew into an ash cloud from Mt. Redoubt's eruption and subsequently experienced flameout of all four engines. The jetliner fell 13,000 feet before the flight crew was able to restart the engines and land the plane safely in Anchorage. The significant trans-Pacific and intrastate air traffic in Alaska, directly over or near 41 potentially active volcanoes, has necessitated development of a strong communication and warning link between the Alaska Volcano Observatory (AVO), other government agencies with responsibility in aviation management, and the airline and air cargo industry.

5.3.6.2 History

The responsibility for hazard identification and assessment for the active volcanic centers of Alaska falls to the AVO and its constituent organizations (USGS, DNR, and UAF). AVO is in the process of publishing individual hazard assessments for each active volcano in Alaska. As of 2006, published or in-press hazard assessments cover the following volcanoes: Akutan, Aniakchak, Augustine, Emmons Lake, Great Sitkin, Hayes, Iliamna, Kanaga, the Katmai Group, Makushin, Okmok, Pavlof, Redoubt, Shishaldin, Spurr, and Tanaga. Additional reports for Westdahl and Dutton are expected in the future. Each report contains a description of the eruptive history of the volcano, the hazards they pose and the likely effects of future eruptions on populations, facilities, and ecosystems.

Alaska contains 80+ volcanic centers and is at continual risk for volcanic eruptions. The AVO's Catalog of the Historically Active Volcanoes of Alaska states that "Mount Dutton experienced severe volcano-seismic crises in 1984 and 1988 that resulted from the near-surface movement of magma yet did not yield an eruption. Iliamna volcano experienced similar unrest in 1996."

Most of Alaska's volcanoes are far from settlements that could be affected by lahars, pyroclastic flows and clouds, and lava flows; however ash clouds and ash fall have historically caused significant impact on human populations. "When volcanoes erupt explosively, high-speed flows of hot ash (pyroclastic flows) and landslides can devastate areas 10 or more miles away, and huge mudflows of volcanic ash and debris (lahars) can inundate valleys more than 50 miles downstream. . . Explosive eruptions can also produce large earthquakes. . . the greatest hazard posed by eruptions of most Alaskan volcanoes is airborne dust and ash; even minor amounts of ash can cause the engines of jet aircraft to suddenly fail in flight."

Although Dillingham itself is far from any active volcanoes, many of the volcanoes in Alaska are capable of producing eruptions that can affect Dillingham. Since most active Alaskan volcanoes are far enough from settlements that the resulting pyroclastic flows and lahars are not a significant danger, the primary concern from volcanic eruptions is the danger posed to residents and the environment from significant ash falls. A large ash plume also has the capability of shutting down air operations, which would leave Dillingham dependent upon barge traffic for supplies and assistance in the summer and cut off from outside assistance in winter. Since tephra is damaging to engines, it is possible that not even barges would be available to deliver supplies.

- Archaeological evidence suggests that an eruption of Aniakchak volcano 3,500 years ago spread ash over much of Bristol Bay and generated a tsunami which washed up onto the tundra around Nushagak Bay. Within the past 10,000 years, Aniakchak volcano has significantly erupted on at least 40 occasions.
- The 1989-90 eruption of Mt. Redoubt seriously affected the populace, commerce, and oil production and transportation throughout the Cook Inlet region and air traffic as far away as Texas. Total estimated economic costs are $160 million, making the eruption of Redoubt the second most costly in U.S. history.
- Mt. Spurr's 1992 eruption brought business to a halt and forced the closure of Anchorage International Airport for 20 hours. Communities 400 miles away reported light dustings of ash.
- In 1992, another eruption series occurred, resulting in three separate eruption events. The first, in June, dusted Denali National Park and Manley Hot Springs with 2 mm of ash – a relatively minor event. In August, the mountain again erupted, covering Anchorage with ash, bringing business to a halt and forcing officials to close Anchorage International Airport for 20 hours. St. Augustine's 1986 eruption caused a similar disruption in air traffic.
- Small ash clouds from the 2001 eruption of Mt. Cleveland were noted by USGS to have reached Fairbanks. These clouds dissipated somewhere along the line between Cleveland and Fairbanks. A full plume, visible on satellite imagery, was noted in a line from Cleveland to Nunivak Island. No ashfall was noted in Dillingham for these events.
- The January 10, 2004 eruption of Augustine volcano resulted in a National Weather Service urgent notification of ash fall in the Bristol Bay area, including Dillingham. No measurable ash was recorded.
- On January 17, 2006 the National Weather Services issued urgent notification for the Bristol Bay area, including Dillingham, for ash fall from the last explosive eruption of the Augustine Volcano (Jan - March of 2006).

Figure 5-5. Aircraft Routes that may be Impacted by a Volcanic Eruption (USGS, 2001)

Eruptions, explosive and otherwise, of the Augustine Volcano occur every five to ten years. Plumes from at least one Augustine eruption have been caught on camera, from Dillingham, by security cameras in the HUD Housing area. Small, but measurable amounts of ash from these eruptions have fallen within 70 miles of Dillingham.

Ash clouds have prevented air travel between Dillingham and Anchorage, the only connection Dillingham has to a major urban area (Figure 5-5).

5.3.6.3 Location, Extent, Impact, and Probability of Future Events

Location

Figure 5-6 identifies active and inactive volcanoes throughout Alaska. One of the most active volcanoes in proximity to Dillingham is Aniakchak, 150 miles to the south. Potential ashfall from an Aniakchak eruption is shown on Figure 5-7.

Figure 5-6 Alaska Volcano Location Map (Google Earth, 2008)

Figure 5-7 Hazard Potential from Volcanic Ash from Aniakchak Volcano (USGS, 2001)

Extent

The effects associated with volcanism include severe blast effects, turbulent clouds of ash and gases, lightning discharge, volcanic mudflows, pyroclastic flows, corrosive rain, flash flood, outburst floods, earthquakes, and tsunamis. Some of the results of these activities have been ash fallout in various communities, disruption of air traffic, road transportation, and maritime activities.

In the event of a massive eruption of Aniakchak, Dillingham might receive some ash fall. A tsunami is possible if the eruption included a massive, high speed pyroclastic flow into Bristol Bay.

A much more likely hazard to Dillingham would result from severe volcanic activity elsewhere. Prolonged disruption of air-traffic would disrupt the town’s supplies of food, medicine, and medivac services to a full service hospital.

A massive eruption anywhere on earth, such as Tambora in 1815, could severely effect global climate, radically changing Dillingham’s (and everyone else’s) risk from weather events for weeks, months or years.

Based on actual impacts of historic volcanic activity and the criteria identified in Table 5-3, the magnitude and severity of impacts in the City of Dillingham are considered negligible with minor injuries, the potential for critical facilities to be shutdown for more than 24 hours, less than 10% of property or critical infrastructure being severely damaged, and little to no permanent damage to transportation or infrastructure or the economy.

Impact

An ash fall like the one experienced at Kodiak Island in 1902 would undoubtedly be devastating to the City of Dillingham. Even if no direct impacts of an eruption were to affect Dillingham, the city might still feel the strain on resources should other hub communities be significantly affected by volcanic eruption. An eruption of significant size in southcentral Alaska will certainly affect air routes, which in turn affects the entire state.

Human impacts of a volcanic eruption include respiratory problems from airborne ash, displaced persons/ lack of shelter, and personal injury. Other potential impacts include general property damage (electronics and unprotected machinery), structural damage from ash loading, state/regional transportation interruption, loss of commerce, and contamination of water supply.

These impacts can range from the inconvenient – a few days of no air traffic – to the disastrous – heavy, debilitating ash fall throughout the state, forcing the community to be completely self-sufficient.

Probability of Future Events

By careful analysis of past activity, geologists can make general forecasts of long-term activity associated with individual volcanoes, but these are on the order of trends and likelihood, rather than specific events or timeline. Short-range forecasts are often possible with greater accuracy. Several signs of increasing activity can indicate that an eruption will follow within weeks or months. Magma moving upward into a volcano often causes a significant increase in small, localized earthquakes, and increased emissions of carbon dioxide and compounds of sulfur and chlorine that can be measured. Shifts in magma depth and location can cause changes in ground level elevation that can be detected through ground instrumentation or remote sensing.

Based on the criteria identified in Table 5-2 and information presented in the SHMP, it is possible for a volcanic eruption to occur within the next ten years. Vulnerability depends on the type of activity and current weather, especially wind patterns.

5.3.7 Wildland Fire

5.3.7.1 Nature

A wildland fire is a type of wildfire that spreads through consumption of vegetation. It often begins unnoticed, spreads quickly, and is usually signaled by dense smoke that may be visible from miles around. Wildland fires can be caused by human activities (such as arson or campfires) or by natural events such as lightning. Wildland fires often occur in forests or other areas with ample vegetation. In addition to wildland fires, wildfires can be classified as urban fires, interface or intermix fires, and prescribed fires.

The following three factors contribute significantly to wildland fire behavior and can be used to identify wildland fire hazard areas.

- **Topography:** As slope increases, the rate of wildland fire spread increases. South-facing slopes are also subject to more solar radiation, making them drier and thereby intensifying wildland fire behavior. However, ridgetops may mark the end of wildland fire spread, since fire spreads more slowly or may even be unable to spread downhill.

- **Fuel:** The type and condition of vegetation plays a significant role in the occurrence and spread of wildland fires. Certain types of plants are more susceptible to burning or will burn with greater intensity. Dense or overgrown vegetation increases the amount of combustible material available to fuel the fire (referred to as the "fuel load"). The ratio of living to dead plant matter is also important. The risk of fire is increased significantly during periods of prolonged drought as the moisture content of both living and dead plant matter decreases. The fuel's continuity, both horizontally and vertically, is also an important factor.
- **Weather:** The most variable factor affecting wildland fire behavior is weather. Temperature, humidity, wind, and lightning can affect chances for ignition and spread of fire. Extreme weather, such as high temperatures and low humidity, can lead to extreme wildland fire activity. By contrast, cooling and higher humidity often signal reduced wildland fire occurrence and easier containment.

The frequency and severity of wildland fires is also dependent on other hazards, such as lightning, drought, and infestations (such as the damage caused by spruce-bark beetle infestations). If not promptly controlled, wildland fires may grow into an emergency or disaster. Even small fires can threaten lives and resources and destroy improved properties. In addition to affecting people, wildland fires may severely affect livestock and pets. Such events may require emergency watering/feeding, evacuation, and shelter.

The indirect effects of wildland fires can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams, thereby enhancing flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow hazards.

5.3.7.2 History

The populated portion of Dillingham has no record of major property loss due to wildland fire within the past 100 years or more. Previous wildland fires have not been documented within the city limits of Dillingham; however, several have occurred in the vicinity. Past fires have been started by deliberate or accidental human action. Children playing with fire or fireworks have been the most frequent cause. Spreading fire from deliberate brush, grass or trash burning has also been a common cause. Fires have also been initiated from cooking fires, structure or vehicle fires, and deliberate arson. Thunderstorms accompanied by lightening in the region have been rare, but is becoming more frequent. Wildfires ignited by lightening have occurred inland of Dillingham; however, strikes within city limits are rare and there is no record of a fire caused by such an event.

The most significant wildland fire to affect the "urban interface" occurred in late May of 1996 when children started a grass fire near the intersection of Lupine Drive and Emperor Way. Fire spread rapidly from the high dead grass into spruce on the tundra's edge. These trees "candled" and their flaming tops ignited the tops of neighboring trees, including several trees within a few feet of the Sander Johnson house on Lupine. A tarp on the roof of one outbuilding was ignited. A city firefighter used a hand-line from the first arriving engine to extinguish the tarp and wet the tree-tops and grass around the buildings. No further damage occurred to structures on the property. Fire spread through high grass on the tundra to an adjacent tree-line where burning grass and spruce trees threatened a pair of houses and an auto shop on the property of Joe Valela on Emperor Way. An ADOT&PF crew with the second arriving engine controlled the fire on that property and no damage occurred to those structures.

Fire consumed spruce for several hundred feet along the sunny hillside behind neighboring properties on Emperor. However, the fire did not spread to the surrounding forest, and additional structures in the Neqleq Subdivision were not threatened. Fire spread through grass in the open creek valley toward the Nerka Subdivision. Spruce on a steep bank burst into flame and fire raced up the wooded bank and into forest in the direction of houses on the Nerka Road and a power line feeding the subdivision.

City firefighters, ADOT&PF personnel and more than 50 other volunteers from the community cut and bulldozed a fire break by widening an existing gravel-pit access road between the fire and houses in Nerka. But the fire ceased to spread from tree to tree once it reached a few hundred feet into cooler woods on a less dramatic slope. It continued to crawl from the fire front and from spot fires ignited by falling embers, spreading through ground cover on the floor of the mixed birch and spruce forest and igniting the lower branches of some trees. Teams using hand tools extinguished the fire before it reached the fire-break or any structures in Nerka. State fire officials were alerted and an aerial tanker was en route to dump retardant on Nerka, but the plane was turned around once the fire was deemed under control.

The fire started during the hottest part of the afternoon at the height of an unusually warm and dry early summer that followed a winter with an unusually low snowpack. New grass had not yet sprouted through the previous year's high dry grass and the ground, especially in the woods, was uncommonly dry.

Spruce trees on the sunny edges of open areas were very flammable, and fire raced to their tops, often igniting the tops of neighboring trees. On hillsides where spruce were close but still exposed to the sun, fire spread immediately from the branches of one tree to the next along the whole height of the tree. In these areas, embers from the burning trees fell hundreds of feet down-wind of the fire, sometimes igniting spot fires. Once the branches were consumed, the trunks smoldered and eventually went out.

In the deeper woods where there was less sun and birch and other vegetation were mixed with the spruce, fire was only able to crawl through dry grass in the ground cover, and did not climb the trees beyond the lower branches.

Two wildland fires, other than the Nerka fire reported, caused requests to be made to Division of Forestry for standby wildland fire assistance. They were successfully suppressed by DVFD personnel.

> 05/18/05 - 10-15 acres of brush, grass, and scrub burned at the perimeter of the HUD apartment complex, and;
>
> 03/06/03 - Unknown acreage of grass and brush on Bradford Point at the Kanakanak Hospital compound perimeter.

With the exception of the aforementioned instance, wildfires in Dillingham's urban/wildland interface have involved grass and brush and have been of very limited extent. Most of these have occurred in warm dry springs, between break-up and green-up. Most property loss has been outbuildings, vehicles or other non-residential, non-critical facilities that were surrounded by dry grass and ignited before the firefighters arrived.

Table 5-7 identifies the Fire Name/ID, Fire Year, and the estimated number of acres burned (The Alaska Fire Service, 2007).

Table 5-7 Wildland Fires within 50 miles of Dillingham

Fire Name	Fire Year	Estimated Acres
Aleknagik	1942	12,000
Dillingham	1952	45,000
Kvichak	1952	10,000
Cormick	1957	4,500
Koktuli	1957	3,200
Dillingham	1957	5,000
Okstakuk	1980	1,164
Rocky Pt	1991	3
Togiak	1991	20
Twin	1991	12,400
New Stuyahk	1992	12
Crystal	1992	20
Alagnak	1993	2
Kvichak R.	1993	1
Kokwok	1993	4
High	1994	25
Koliganek	1994	18
Half Moon	1996	60
Mosquito Point	1996	1
Naknek	1996	2
Iowithla	1996	1
Aleknagik	1996	0
Kvichak	1996	0
Igushik	1997	0
Kokwok	1997	35
Naknek - south	1997	300
Low Cone	1997	10
Koggiling #2	1997	140
Nerka	1997	0
Dillingham	1997	20
Kok 25	1997	35
Nakeen	1997	2
Koklong Creek	1997	90
Kok 35	1997	185
Tvativak	1997	2,450
Tuklung	1997	250
Ualik Lake	1997	30
Muklung	1997	2
Little Muklung	1997	2
Koggiling	1997	25
Kokwok #2	1997	3
Koliganek	1997	6
Quigmy	1997	0

Table 5-7 Wildland Fires within 50 miles of Dillingham

Fire Name	Fire Year	Estimated Acres
Ekuk	1997	57
Marsh	1997	30
Keefer	1997	3
Klut Creek	1997	1,000
N/A	2001	N/A
N/A	2001	N/A
N/A	2001	N/A
Clover	2002	1
Kanakanak	2002	0
new stu #2	2003	15
Kanakanak	2003	1
New Stu	2003	5
DLG VFD	2005	0
FA #4- No Seeum	2005	0
Kvichak	2005	0
Narogurum	2005	56
Tuklung	2005	1
Naknek	2006	1

5.3.7.3 Location, Extent, Impact, and Probability of Future Events

Location

Under certain conditions wildland fires may occur in any area with fuel surrounding the City of Dillingham. Since fuels data is not readily available, for the purposes of this plan, all areas outside City limits are considered to be vulnerable to wildland fire impacts. Since 1942, 39 wildland fire events have occurred within 50 miles of Dillingham (Figure 5-8. Fire History within 50 miles of Dillingham).

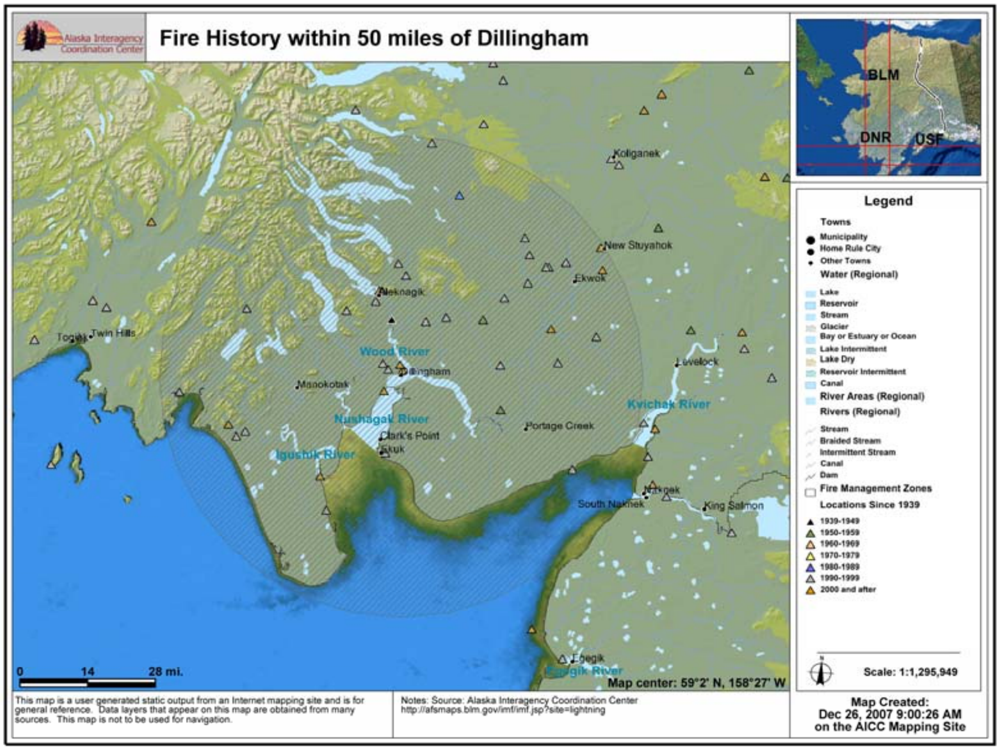

Figure 5-8 Dillingham Fire History (AICC, 2008)

Dillingham lies on the coast. Its primary climatic influence is maritime, though the arctic climate of the Interior also has an effect. Average summer temperatures range from 37 to 66 degrees Fahrenheit. Average winter temperatures range from 4 to 30 degrees Fahrenheit. Annual precipitation is 26 inches, and annual snowfall is 65 inches. Heavy fog is common in July and August.

The terrain consists of low wooded hills and ridges interspersed with tundra. Most tundra is peat bog, but some hills are covered with drier upland tundra. The forest consists of mixed spruce and birch, with some cotton wood, alder, scrub willow and other species.

At times warm weather with low relative humidity last long enough to dry out light fuels and create a moderate likelihood of grass fires in open areas. Occasionally brush fires of very limited scope occur.

Winter snowpack usually leaves the forest floor damp and therefore not subject to lurking fire in spruce duff. Similarly, ground in open areas is usually damp or sodden beneath the surface. Following winters with little or no snow, forest floors and upland tundra have some potential for harboring “underground” fires.

Spruce bark beetle and other infestations have been documented in Dillingham and the surrounding area. The Division of Forestry found 4,800 acres of light, scattered activity just northwest of Dillingham in 2006.

Extent

Generally, fire susceptibility dramatically increases in the late summer and early fall as vegetation dries out, decreasing plant moisture content and increasing the ratio of dead fuel to living fuel. However, various other factors, including humidity, wind speed and direction, fuel load and fuel type, and topography, can contribute to the intensity and spread of wildland fires. The common causes of wildland fires in Alaska include lightening strikes and negligence.

Fuel, weather, and topography influence wildland fire behavior. Fuel determines how much energy the fire releases, how quickly the fire spreads and how much effort is needed to contain the fire. Weather is the most variable factor. High temperatures and low humidity encourage fire activity while low temperatures and high humidity retard fire spread. Wind affects the speed and direction of fire spread. Topography directs the movement of air, which also affects fire behavior. When the terrain funnels air, as happens in a canyon, it can lead to faster spreading. Fire also spreads up slope faster than down slope.

Spruce bark beetle kill is accelerating with generally warmer weather. However, with high oil prices, wood is an increasingly popular heating fuel and standing dead or dry downed spruce are regularly harvested in the wild-land-urban interface.

To the extent that there has been loss of structures, vehicles or other property as a result of wildland fire in Dillingham, it has occurred when grass fires went unnoticed or were reported late. In the past 60 years a total of 98,188 acres have burned within 50 miles of Dillingham.

Based on past wildland fire events and the criteria identified in Table 5-3, the magnitude and severity of impacts in the City of Dillingham are considered negligible with minor injuries, the potential for critical facilities to be shutdown for less than 24 hours, less than 10% of property or critical infrastructure being severely damaged, and little to no permanent damage to transportation or infrastructure or the economy.

Impact

Impacts of a wildland fire to the City of Dillingham could grow into an emergency or disaster if not properly controlled. Even a small fire can threaten lives and resources and destroy property. In addition to impacting people, wildland fires may severely impact livestock and pets. Such events may require emergency watering and feeding, evacuation and alternative shelter.

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

Probability of Future Events

Dillingham's weather is generally too cool and damp to create conditions for extensive wildland fires. During unusually hot and dry summers, grass fires in open areas become likely, with the possibility of extension into forest edges. Such fires are self-limiting, in that they do not produce enough energy to spread significantly into shady mixed growth woods.

These local conditions may change as the planet's climate changes. If average summer temperatures increase and snow pack decreases, the likelihood and severity of wildfires may increase.

In the future, small grass fires are likely to continue to occur with the possibility of larger but limited fires in both the wildland/urban interface and in the undeveloped portions of Dillingham.

Sensitive critical facilities at significant risk from wildland fire are power lines, which might be damaged, temporarily denying electricity to neighboring facilities. This could, in turn, hamper homeowners' ability to protect their own property. The risk is greatest when flammable vegetation in power-line rights-of-way is allowed to overgrow, and particularly when vegetation is cut but not removed from the vicinity of the poles.

Some residences and other non-critical facilities are at some risk due to choice of building materials and site, proximity of flammable vegetation or inadequate access for structural fire-fighting apparatus. Most of these situations can be easily corrected. As more development occurs in wooded areas, more property will be vulnerable, however, this can be easily mitigated through choice of building materials, site, landscaping, and access.

Fire risk has also been increasing in recent years due to the spruce bark beetle infestation. The beetles lay their eggs under the bark of the trees and the emerging larvae eat the phloem, which is what trees use to transport nutrients from their needles to their roots. If the phloem loss is significant, the tree will die. The dead trees are very dry and therefore highly flammable. As these trees start to fall, they will also litter the forest floor with flammable material. However much of this dry wood is regularly harvested in the wild-land-urban interface and on the forest edges. This harvest is likely to increase as fuel oil prices rise, driving up the demand for wood for heating.

Wildland fires in unpopulated areas do not present a threat to people or property (leaving aside whatever value is placed on the trees themselves). Fire is recognized as a critical feature of the natural history of many ecosystems. It is essential to maintain the biodiversity and long-term ecological health of the land.

While conditions in the City of Dillingham are generally wet, the possibility of a dry season combined with high winds could lead to a catastrophic wildland fire event.

Fire is recognized as a critical feature of the natural history of many ecosystems. It is essential to maintain the biodiversity and long-term ecological health of the land. The role of wildland fire as an essential ecological process and natural change agent has been incorporated into the fire management planning process and the full range of fire management activities is exercised in Alaska to help achieve ecosystem sustainability, including its interrelated ecological, economic, and social consequences on firefighter and public safety and welfare, natural and cultural resources threatened, and the other values to be protected dictate the appropriate management response to the fire. In Alaska, the natural fire regime is characterized by a return interval of 50 to 200 years, depending on the vegetation type, topography, and location. Recorded wildland fires occurring within 50 miles of Dillingham have an average recurrence rate of approximately 1.5 years.

Given the history of wildland fires in the Dillingham area, combined with the criteria identified in Table 5-2, the probability they will occur in the future is high. In addition, more spruce trees are dying due to spruce bark beetle infestation. As the trees die, they dry, and fall to the forest floor. This situation provides highly flammable fuel for wildland fire. Currently, much of the fallen beetle-killed spruce is harvested by locals, which helps to reduce the potential fuel for wildland fire.

This section provides an overview of the vulnerability analysis and describes the five specific steps: asset inventory, methodology, data limitations and exposure analysis for current assets, and areas of future development.

6.1 OVERVIEW OF A VULNERABILITY ANALYSIS

A vulnerability analysis predicts the extent of exposure that may result from a hazard event of a given intensity in a given area. The analysis provides quantitative data that may be used to identify and prioritize potential mitigation measures by allowing communities to focus attention on areas with the greatest risk of damage. A vulnerability analysis is divided into five steps: including asset inventory, methodology, data limitations and exposure analysis for current assets, and areas of future development.

The requirements for a vulnerability analysis as stipulated in DMA 2000 and its implementing regulations are described below.

- A summary of the community's vulnerability to each hazard that addresses the impact of each hazard on the community.

DMA 2000 and FMA Requirements: Risk Assessment, Assessing Vulnerability, Overview

Assessing Vulnerability: Overview

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

FMA Requirement §78.5(b): Description of the existing flood hazard and identification of the flood risk, including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential.

Element

- Does the plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- Does the plan address the impact of each hazard on the jurisdiction?

Source: FEMA, March 2004.

- An identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, *if possible*, the types and numbers of vulnerable future development.

DMA 2000 and FMA Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures

Assessing Vulnerability: Identifying Structures

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

FMA Requirement §78.5(b): Description of the existing flood hazard and identification of the flood risk, including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential.

Element

- Does the plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
- Does the plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

DMA 2000 and FMA Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures
Source: FEMA, March 2004.

- Estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.

DMA 2000 and FMA Recommendations: Risk Assessment, Assessing Vulnerability, Estimating Potential Losses

Assessing Vulnerability: Estimating Potential Losses

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

Element

- Does the plan estimate potential dollar losses to vulnerable structures?
- Does the plan describe the methodology used to prepare the estimate?

Source: FEMA, March 2004.

6.2 VULNERABILITY ANALYSIS: SPECIFIC STEPS

6.2.1 Asset Inventory

Asset inventory is the first step of a vulnerability analysis. Assets that may be affected by hazard events include population (for community-wide hazards), residential buildings (where data is available), and critical facilities and infrastructure. The assets and associated values throughout the City of Dillingham are identified and discussed in detail below.

6.2.1.1 Population and Building Stock

Population data for the City of Dillingham were obtained from the 2000 U.S. Census. The City of Dillingham's total population for 2000 was 2,466 and 2006 data reported a population of 2,491 (Table 6-1).

Table 6-1 Estimated Population and Building Inventory

Population		Residential Buildings	
2000 Census	City 2006 Data	Total Building Count	Total Value of Buildings ($)[1]
2,466	2,491	1,000	130,400,000

Sources: City of Dillingham, U.S. Census 2000, and the State of Alaska Department of Commerce, Community, and Economic Development.
[1] Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc.) is $130,400 per structure.

Estimated numbers of residential buildings and replacement values for those structures, as shown in Table 6-1, were obtained from the City of Dillingham, the 2000 U.S. Census, and the State of Alaska Department of Commerce, Community, and Economic Development. A total of 1,000 residential buildings were considered in this analysis, including single-family dwellings, mobile homes, multifamily dwellings, temporary lodgings, and institutional dormitory facilities.

6.2.1.2 Repetitive Loss Properties

RL properties are properties that suffer from repeated flooding. FEMA defines a RL property as a property with at least two $1,000 claims within any 10-year period since 1978. SRL properties have been identified by FEMA as most at risk for repeat flooding. These properties include every property that since 1978 has experienced: four or more separate building and content claims each exceeding $5,000 with cumulative claims exceeding $20,000, or at least two separate building claims with cumulative losses exceeding the value of the property (that is, the value of the structure). There are no RL or SRL properties located in the City of Dillingham. There are a total of four flood insurance policies held in the City of Dillingham, and to date, no claims have ever been submitted for flood loss. Addresses for the flood policy holders are not included in this plan, but are kept on file with the floodplain manager with the State of Alaska.

6.2.1.3 Critical Facilities and Infrastructure

A critical facility is defined as a facility that provides essential products and services to the general public, such as preserving the quality of life in the City of Dillingham and fulfilling important public safety, emergency response, and disaster recovery functions. The critical facilities profiled in this plan include the following:

- Government facilities, such as departments, agencies, and administrative offices
- Emergency response facilities, including police and fire
- Educational facilities, including K-12
- Care facilities, such as congregate living health, residential care, and continuing care retirement facilities
- Community gathering places, such as parks, museums, libraries, and senior centers

The total number of critical facilities is listed in Table 6-2 and shown on Figures 5-1a through 5-1e.

Table 6-2 City of Dillingham Critical Facilities

Facility ID	Occupancy Class	Facility Name	Contents Value	Structure Value
1	Commercial	A.C.	$ 1,143,901	$ 819,100
2	Government	Airport Firehouse	$ 2,700,000	$ 1,800,000
3	Government	ADF&G	$ 1,425,000	$ 950,000
4	Utilities	Bristol Alliance Fuels	$ 2,951,179	$ 2,799,300
5	Religious/Non-Profit	First Avenue Cemetery	$ 20,000	$ 20,000
6	Government	City Hall	$ 2,593,470	$ 1,728,980
7	Utilities	Delta Western Tank Farm	$ 1,106,027	$ 1,268,100
8	Government	DLG Dept. of Public Safety	$ 2,817,771	$ 1,878,514
9	Government	DLG Airport	$ 13,109,321	$ 8,739,547
10	Educational	High School	$ 11,250,000	$ 7,500,000
11	Educational	Elementary School	$ 11,250,000	$ 7,500,000
12	Educational	Territorial School Bldg. (MAP)	$ 85,937	$ 57,291

Table 6-2 City of Dillingham Critical Facilities

Facility ID	Occupancy Class	Facility Name	Contents Value	Structure Value
13	Commercial	Dock Office	$ 45,239	$ 30,159
14	Government	Downtown Fire Station	$ 2,773,176	$ 1,848,784
15	Utilities	Harbor Bath House	NA	$ 500,000
16	Industrial	Harbor Land	$ 150,000	$ 100,000
17	Industrial	Harbor Master's Office	$ 177,158	$ 118,105
18	Commercial	Kanakanak Hospital Compound	$ 109,800,000	$ 73,200,000
19	Utilities	KDLG Studio	NA	$ 400,000
20	Utilities	KDLG Tower and Transmitter	NA	$ 600,000
21	Commercial	L&M Supplies	$ 489,560	$ 867,600
22	Government	Lake Road Fire Station	$ 3,000,000	$ 2,000,000
23	Commercial	Bristol Express	$ 62,158	$ 96,600
24	Educational	Library	$ 1,639,368	$ 1,092,912
25	Commercial	N&N - Omni Enterprises	$ 1,042,792	$ 267,800
26	Commercial	NAPA Auto Parts	$ 151,295	$ 370,400
28	Commercial	Neqleq Variety	$ 60,936	$ 165,000
29	Utilities	Nushagak Electric Plant	$ 7,609,452	NA
29	Utilities	Nushagak Telephone & Electric Buildings	NA	$ 4,879,262
29	Utilities	Nushagak Telephone Infrastructure	$ 4,623,050	NA
30	Commercial	Peter Pan Seafoods	$ 943,568	$ 4,524,700
31	Industrial	Port of DLG office (Pollock Warehouse)	$ 128,979	$ 85,986
32	Government	Post Office	$ 1,627,500	$ 1,085,000
33	Government	SAFE	$ 1,125,000	$ 750,000
34	Government	Senior Center	$ 2,383,100	$ 1,588,733
35	Utilities	Sewer Bldg.	NA	$ 562,483
36	Government	ADOT Shop	$ 1,910,499	$ 1,273,666
37	Government	City of DLG Public Works Shop	$ 547,500	$ 365,000
38	Industrial	Small Boat Harbor - South Ramp	NA	$ 200,000
39	Government	SWRS Offices	$ 120,000	$ 80,000
40	Commercial	Squaw Creek Boat Movers	$ 75,000	$ 50,000
41	Industrial	T dock	$ 5,579,510	$ 3,719,673
42	Industrial	All Tide dock	$ 8,925,000	$ 5,950,000
43	Educational	UAF	$ 5,625,000	$ 3,750,000
44	Government	Curyung Tribal Offices	$ 945,000	$ 630,000
45	Utilities	Water Tank	NA	$ 565,093
46	Utilities	Water Tank	NA	$ 440,199
47	Utilities	Water Treatment Facility	NA	$ 565,093
48	Industrial	Wood River Boat Launch	$ 229,896	$ 153,264
49	Government	HUD	$ 3,000,000	$ 2,000,000
50	Government	Trooper Bldg.	$ 180,000	$ 120,000
51	Commercial	Wells Fargo	$ 42,162	$ 549,100
52	Government	Kongigatuk Building (FWS, LIO)	$ 933,000	$ 622,000
53	Religious/Non-Profit	Wood River Cemetery	$ 20,000	$ 20,000
54	Industrial	Boat Harbor	NA	NA
55	Utilities	Sewage Lift Station - 1 Airport	NA	$ 26,000
56	Utilities	Sewage Lift Station - 2 Tubbs apts	NA	$ 26,000
57	Utilities	Sewage Lift Station - 3	NA	$ 26,000

Table 6-2 City of Dillingham Critical Facilities

Facility ID	Occupancy Class	Facility Name	Contents Value	Structure Value
		Tennysons		
58	Utilities	Sewage Lift Station - 4 Smalls	NA	$ 26,000
59	Utilities	Sewage Lift Station - 5 harbor	NA	$ 26,000
60	Utilities	Sewage Lift Station - 6 dock	NA	$ 42,000
61	Religious/Non-Profit	Second Ave. West Cemetery	$ 20,000	$ 20,000
62	Utilities	Sewage Lift Station - 7 HUD	NA	$ 26,000
63	Government	AMHTA Behavioral health Facility	$ 5,569,262	$ 3,712,841
64	Government	Dillingham Coastal Trail	$ 2,791,500	$ 1,861,000
65	Commercial	BBNA Building	$ 500,000	$ 2,150,000
66	Educational	BBNA Head Start	$ 30,000	$ 4,300,000
67	Industrial	Landfill	$ 10,212,450	$ 6,808,300
68	Government	Animal Shelter	$ 180,000	$ 120,000
69	Government	Marrulut-eniit "Granma's House"	$ 1,988,805	$ 1,325,870
70	Government	Dillingham Health Clinic Renovation	$ 360,000	$ 240,000
71	Government	Youth Center	$ 103,248	$ 68,832
72	Government	National Guard Armory	$ 184,965	$ 123,310
73	Religious/Non-Profit	Russian Orthodox Church	NA	NA
74	Religious/Non-Profit	Catholic Church	NA	NA
75	Religious/Non-Profit	Seventh Day Adventist Church Buildings	$ 310,200	$ 310,200
76	Religious/Non-Profit	Moravian Church	NA	NA
77	Religious/Non-Profit	Assembly of God	NA	NA
78	Religious/Non-Profit	Baptist Church	$ 128,000	$ 128,000
79	Religious/Non-Profit	Trinity Lutheran Church	NA	NA
80	Religious/Non-Profit	Dillingham Bible Fellowship	NA	NA
81	Religious/Non-Profit	Evergreen Memorial Cemetery	$ 20,000	$ 20,000
82	Government	Kleepuk Hill Road	NA	NA
83	Religious/Non-Profit	Russian Orthodox Church Cemetery	$ 20,000	$ 20,000
84	Religious/Non-Profit	Kanakanak Cemetery	$ 20,000	$ 20,000
85	Industrial	PAF Boatyard	$ 75,429	$ 643,000
86	Government	Scandinavian Creek Bridge	NA	NA
87	Commercial	Bristol Eagle Restaurant	$ 27,503	$ 44,800
88	Commercial	Alaska Net Supply	$ 21,752	$ 42,600
89	Government	Squaw Creek Bridge	NA	NA
90	Government	Kanakanak Road	NA	NA
91	Government	VORDME	$ 750,000	$ 500,000
92	Government	SACOM	$ 1,500,000	$ 1,000,000
93	Government	Flight Service Station	NA	NA

Sources: FEMA HAZUS-MH, City of Dillingham.
Values for known critical facilities and contents were used where available. Contents estimates were calculated based on FEMAs HAZUS-MH occupancy classes – see following table.
NA = Not Available.

Total building stock in Dillingham, by occupancy class, are provided in Table 6-3.

Table 6-3 City of Dillingham Building Stock by Occupancy Class

Type of Structure (Occupancy Class)	Number	Estimated Value of Structure	HAZUS Contents Value (%) by Occupancy Class	HAZUS Contents Value ($) by Occupancy Class
Residential	1,000	$ 130,400,000	50%	$ 65,200,000
Commercial	14	$ 83,177,859	150%	$ 114,405,865
Industrial	10	$ 17,778,328	150%	$ 25,478,421
Religious/Non-Profit	14	$ 558,200	100%	$ 558,200
Government	31	$ 36,412,077	150%	$ 54,618,115
Education	6	$ 24,200,203	150%	$ 29,880,304
Utilities	19	$ 12,777,530	**	$ 16,289,708
Total	**194**	**$ 305,304,197**		**$ 306,430,613**

*** HAZUS-MH does not provide estimates for utility contents - actual data was used where available*
Native allotments and associated values for structures are not recorded by the City of Dillingham. Estimates for those structures and contents will be identified in future plan updates as data becomes available.

6.2.2 Methodology

A conservative exposure-level analysis was conducted to assess the risks of the identified hazards. This analysis is a simplified assessment of the potential effects of the hazards on values at risk without consideration of probability or level of damage.

Using GIS, locations of critical facilities were compared to locations of where hazards are likely to occur. If any portion of the critical facility fell within a hazard area, it was counted as impacted.

Replacement values or insurance coverage were developed for physical assets. These values were obtained from HAZUS-MH or provided by the City of Dillingham. For facilities that didn't have specific values per building in a multi-building scenario (e.g., schools), the buildings were grouped together and assigned one value. For each physical asset located within a hazard area, exposure was calculated by assuming the worst-case scenario (that is, the asset would be completely destroyed and would have to be replaced). Finally, the aggregate exposure, in terms of replacement value or insurance coverage, for each category of structure or facility was calculated. A similar analysis was used to evaluate the proportion of the population at risk. However, the analysis simply represents the number of people at risk; no estimate of the number of potential injuries or deaths was prepared.

6.2.3 Data Limitations

The vulnerability estimates provided herein use the best data currently available, and the methodologies applied result in an approximation of risk. These estimates may be used to understand relative risk from hazards and potential losses. However, uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning hazards and their effects on the built environment as well as the use of approximations and simplifications that are necessary for a comprehensive analysis.

It is also important to note that the quantitative vulnerability assessment results are limited to the exposure of people, buildings, and critical facilities and infrastructure to the identified hazards. It was beyond the scope of this MHMP to develop a more detailed or comprehensive assessment of risk (including annualized losses, people injured or killed, shelter requirements, loss of facility/system function, and economic losses). Such impacts may be addressed with future updates of the MHMP.

6.2.4 Exposure Analysis

The results of the exposure analysis for loss estimations in the City of Dillingham are summarized in Table 6-4 and in the following discussion.

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Table 6-4. City of Dillingham Potential Hazard Exposure Analysis														
			Residential Structures				Critical Facilities				Total		
Hazard		Population (a)	Number	Structure Value	Contents Value	Value	Number	Structure Value	Contents Value	Value	Structure Value	Contents Value	Value
Erosion	USACOE Coastal Erosion Zone (c)	43	17	$ 2,216,800	$ 1,108,400	$ 3,325,200	15	$ 94,227,256	$ 132,246,783	$ 226,474,039	$ 96,444,056	$ 133,355,183	$ 229,799,239
Earthquake	* Descriptive	2,491	1,000	$ 130,400,000	$65,200,000	$195,600,000	94	$ 174,904,197	$ 241,230,615	$ 416,134,812	$ 305,304,197	$ 306,430,615	$ 611,734,812
Flood	100-year flood zone	25	10	$ 1,304,000	$ 652,000	$ 1,956,000	32	$ 29,198,875	$ 38,701,629	$ 67,900,505	$ 30,502,875	$ 39,353,629	$ 69,856,505
	500-year flood zone	0	0	$ -	$ -	$ -	1	$ 30,159	$ 45,239	$ 75,398	$ 30,159	$ 45,239	$ 75,398
Severe Weather	* Descriptive	2,491	1,000	$ 130,400,000	$65,200,000	$195,600,000	94	$ 174,904,197	$ 241,230,615	$ 416,134,812	$ 305,304,197	$ 306,430,615	$ 611,734,812
Urban Conflagration	High	63	25	$ 3,260,000	$ 1,630,000	$ 4,890,000	21	$ 27,951,986	$ 37,707,221	$ 65,659,207	$ 31,211,986	$ 39,337,221	$ 70,549,207
Volcano	* Descriptive	2,491	1,000	$ 130,400,000	$65,200,000	$195,600,000	94	$ 174,904,197	$ 241,230,615	$ 416,134,812	$ 305,304,197	$ 306,430,615	$ 611,734,812
Wildland Fire	Descriptive (b)	2,268	908	$ 118,403,200	$59,201,600	$177,604,800	9	$ 86,711,362	$ 110,783,568	$ 197,494,930	$ 205,114,562	$ 169,985,168	$ 375,099,730

** All people, critical facilities, and residential structures are equally vulnerable to this hazard.*

(a) total population based on City of Dillingham 2006 data - population estimates were extrapolated based on 2.491 persons per residential structure.

(b) residential estimates based on non-HUD (low risk for wildland fire) housing - 92

(c) residential estimates based on 1981 DCCED Community Profile, Sheet 2

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Erosion

Based on studies completed by the USACOE, a conservative estimate of 0.20 acres per year is expected in the low-lying coastal areas of Dillingham. A portion of Dillingham population, residences, and critical facilities located in coastal areas may be vulnerable to the effects of erosion due to extreme wave run-up from large storm events. As such 43 residents, 17 residential structures worth $3,325,200 and 15 critical facilities worth $226,474,039, including Peter Pan Seafoods, Kanakanak Hospital Compound, Dillingham Coastal Trail, Scandinavian Creek and Squaw Creek Bridges, Kanakanak Road, the boat harbor and associated land, the small boat harbor, T Dock, All Tide Dock, Bristol and Delta Western fuel facilities, the sewage treatment facility, and sewage lift station #6 are vulnerable to the effects of erosion.

Impacts associated with this hazard include loss of land and any development on the land as well as increased sedimentation in the harbor area. Impacts to future populations, residences, critical facilities and infrastructure are not anticipated as development in erosion hazard areas is prohibited through the use of land use planning and enforced zoning within the City of Dillingham.

Earthquake

Earthquake Probability Mapping model maps produced by the USGS show that the entire Dillingham area has a low probability (or 0.05%) of a greater than 5.0 magnitude earthquake occurring over the next 10 years. Impacts to the community such as significant ground movement that may result in infrastructure damage are not expected. The entire existing and future Dillingham population, residences, and critical facilities are equally at risk from the effects of an earthquake. This includes 2,491 people, 1,000 residences worth $195,600,000, and 94 critical facilities worth $416,134,812.

Flood

According to the FIRM, last updated for the City of Dillingham in 1982, 25 residents, 10 residential structures worth $1,956,000, and 31 critical facilities worth $67,900,505 are within the 100-year floodplain. This includes 5 commercial facilities (Peter Pan, Bristol Eagle, Alaska Net, the Dock Office, and Squaw Creek Boat Movers), 9 government facilities (Dillingham Coastal Trail, Scandinavian and Squaw Creek Bridges, Kanakanak and Kleepuk Hill Roads, the animal shelter, the downtown fire station, the youth center, and the National Guard Armory); 9 industrial facilities (the boat harbor and associated land, the small boat harbor, T Dock, All Tide Dock, the harbormaster's office, Wood River boat launch, PAF boatyard, and the Port of Dillingham Office), and 8 utilities (Bristol and Delta Western fuel facilities, sewage lift stations # 5 and 6, Nushagak Telephone and Electric buildings and associated infrastructure, and the harbor bath house) also located in the 100-year floodplain.

There are no RL properties located in the 100-or 500-year floodplains. Facilities, utilities, infrastructure, and other buildings within the 100-year floodplain have a 1 percent probability of occurrence in any given year and are considered to be at high risk of flooding.

There is only 1 critical facility, the Dock Office, located in the 500-year floodplain, worth $75,398.

Impacts associated with flooding in the City of Dillingham include boat strandings, overflowing septic systems, and localized areas of standing water in parking lots and roadways. As described in Section 5.3.3.2, flood hazard events in Dillingham have results in flood levels exceeding MHHW by 10 ft. Impacts to future populations, residences, critical facilities, and infrastructure are not anticipated as development in flood hazard areas is prohibited through the use of land use planning and enforced zoning within the City of Dillingham.

Severe Weather

Using information provided by the City of Dillingham and the National Weather Services, the entire existing and future Dillingham population, residences, and critical facilities are equally at risk from the effects of a severe weather event. Impacts associated with severe weather events are described in Section 5.3.4. This includes 2,491 people, 1,000 residences worth $195,600,000, and 94 critical facilities worth $416,134,812.

Urban Conflagration

Intensity of development, determined by the percentage of impervious surfaces, determines the risk of urban conflagration. Impervious surfaces accounting for 20 to 49 percent of total cover is considered low developed density and facilities, infrastructure, and other buildings categorized as such are at low risk to this hazard. Moderate developed density includes areas with impervious surfaces accounting for 50 to 79 percent of total cover and facilities, infrastructure, and other buildings categorized as such are at moderate risk to this hazard. Areas with a high risk to urban conflagration include high density areas with large numbers of people who reside and/or work in areas with impervious surfaces that account for 80 to 100 percent of total cover. There are 25 residences valued at $4,890,000 and an estimated population of 63 in the high risk area for this hazard. Critical facilities and infrastructure at high risk to this hazard includes 6 commercial (Peter Pan Seafoods, Bristol Eagle, Alaska Net, L&M Supplies, Bristol Express and Neqleq Variety), 3 educational (elementary school, territorial school, and the University of Fairbanks facility), 3 government (animal shelter, senior center, and SWRS office), 1 industrial (boat harbor), 3 religious/non-profit (First Avenue and Second Avenue West Cemeteries, and the Baptist Church), and 5 utilities (Bristol and Delta Western fuel facilities, and Nushagak Telephone & Electric buildings and infrastructure) worth $65,659,207.

Impacts associated with urban conflagration in the City of Dillingham have the potential to include loss of critical infrastructure and utilities as well as loss of life. Impacts to future population, residences, and critical facilities are anticipated to be minimal as building codes requiring the use of fire protection technology, and land use planning are used to plan development.

Volcano

Using information provided by the City of Dillingham, the USGS, and the Alaska Volcano Observatory, the entire existing and future Dillingham population, residences, and critical facilities are equally at risk from the effects of a volcanic eruption. This includes 2,491 people, 1,000 residences worth $195,600,000, and 94 critical facilities worth $416,134,812.

Impacts associated with a volcanic eruption include strain on resources should other hub communities be significantly affected by volcanic eruption. An eruption of significant size in southcentral Alaska will certainly affect air routes, which in turn affects the entire state. Other impacts include respiratory problems from airborne ash, displaced persons/ lack of shelter, and personal injury. Other potential impacts include general property damage (electronics and unprotected machinery), structural damage from ash loading, state/regional transportation interruption, loss of commerce, and contamination of water supply.

Wildland Fire

Wildland fire hazard areas were identified by the Dillingham Assistant Fire Chief for this plan by determining those facilities at risk to wildland fire, taking into account slope, aspect, and fuel to determine the risk.

There are approximately 2,268 people with 908 residences (worth $177,604,800) vulnerable to the risk of wildland fire. Critical facilities include 2 commercial facilities (Peter Pan Seafoods and Kanakanak Hospital compound), 1 industrial facility (boat harbor), 5 religious/non-profit facilities (Wood River and Evergreen Memorial Cemeteries, Dillingham Bible Fellowship, and the Catholic and Russian Orthodox Churches), and 1 utility (Nushagak Telephone and Electric Building) worth $197,494,930.

Impacts associated with a wildland fire event include the potential for loss of life and property damage. It can also impact livestock and pets and destroy forest resources and contaminate water supplies. Risk to future population, residences, and critical facilities and infrastructure depend on a variety of factors including weather, fuel sources, and choice of building materials, site, landscaping, and access.

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This section outlines the four-step process for preparing a mitigation strategy including: developing mitigation goals, identifying mitigation actions, evaluating mitigation actions, and implementing mitigation action plans. Within this section the planning team developed the mitigation goals and potential mitigation actions for the City of Dillingham.

7.1 DEVELOPING MITIGATION GOALS

The requirements for the local hazard mitigation goals, as stipulated in DMA 2000 and its implementing regulations, are described below.

DMA 2000 and FMA Requirements: Mitigation Strategy – Local Hazard Mitigation Goals

Local Hazard Mitigation Goals

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

FMA Requirement §78.5(c): The applicant's floodplain management goals for the area covered by the plan**.**

Element

- Does the plan include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards? (GOALS are long-term; represent what the community wants to achieve, such as "eliminate flood damage," and are based on the risk assessment findings.)

Source: FEMA, March 2004.

During public and planning team meetings held on December 27, 2007 and January 15, 2008, the planning team reviewed preliminary vulnerability analysis results as a basis for developing the mitigation goals and actions. Mitigation goals are defined as general guidelines that describe what a community wants to achieve in terms of hazard and loss prevention. Goal statements are typically long-range, policy-oriented statements representing community-wide visions. As such, the planning team developed 10 goals to reduce or avoid long-term vulnerabilities to the identified hazards (Table 7-1).

Table 7-1 Mitigation Goals

Goal Number	Goal Description
1	Reduce possibility of damage and losses from erosion
2	Reduce the possibility of damage and losses from flooding
3	Promote recognition of wildland fire and preparation for impacts from wildland fire
4	Reduce possibility of damage and losses from wildland fires
5	Reduce vulnerability of structures to earthquake damage
6	Promote public education regarding earthquake hazards
7	Promote public access to severe weather emergency advisory information and public education regarding severe winter storm hazards
8	Reduce vulnerability of structures to severe winter storm damage
9	Reduce possibility of damage and losses from urban conflagaration
10	Reduce the possibility of damage and losses from volcano

7.2 IDENTIFYING MITIGATION ACTIONS

The requirements for the identification and analysis of mitigation actions, as stipulated in DMA 2000 and its implementing regulations, are described below.

DMA 2000 and FMA Requirements: Mitigation Strategy - Identification and Analysis of Mitigation Actions
Identification and Analysis of Mitigation Actions
Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.
FMA Requirement §78.5(d): Identification and evaluation of cost-effective and technically feasible mitigation actions considered.
Element
▪ Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?
▪ Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?
▪ Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?
Source: FEMA, March 2004.

After establishing the mitigation goals, the planning team assessed and revised a list of potential mitigation actions. Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Mitigation actions are usually grouped into six broad categories: prevention, property protection, public education and awareness, natural resource protection, emergency services, and structural projects. As listed in Table 7-2, the planning team developed 53 potential mitigation actions, with a particular emphasis placed on projects and programs that reduce the effects of hazards on both new and existing buildings and infrastructure.

Table 7-2 Mitigation Goals and Potential Actions

Goals			
Number	**Description**	**ID/Priority**	**Description**
1	Reduce possibility of damage and losses from erosion	A – **H**	Construct breakwater and seawalls to protect the Dillingham harbor from further erosion
		B – **H**	Extend seawall in front of the harbor east toward the Peter Pan dock
		C – **H**	Construct the extension of the North Shore Bulkhead (construct west and east seawalls)
		D – **H**	Replace riprap removed by storms at the north end of the Snag Point sheetpile bulkhead
		E	Identify assets (buildings/facilities/graves) that are at risk of impact from erosion through updated hazard mapping
		F	Work with agencies, Native corporations, and organizations to identify new and emerging riverbank protection methods and grants (or other types of funding mechanisms) that are available for these strategies
		G	Relocate assets that are at risk of erosion
		H	Hold a series of community meetings to provide information to residents regarding erosion mitigation methods
		I	Provide information on riverbank erosion and ways to halt and prevent it in a format that can be distributed to all residents
2	Reduce the possibility of damage and losses from flooding	A – **H**	Public education regarding City of Dillingham participation in NFIP and use and availability of flood insurance
		B – **H**	Establish a legislative priority to persuade the Governor to boost ADEC funding to do code enforcement.
		C – **H**	Support updates to the FEMA Flood Insurance Rate Maps
		D – **H**	Update and enforce floodplain management ordinances
		E	Complete a detailed inventory of assets (buildings, infrastructure, graves) through GIS and identify and assess repetitively flooded properties
		F – **H**	Educate residents about safe well and sewer/septic installation
		G – **H**	Develop new water source in Neqleq Subdivision
		H	Relocate, acquire, elevate, or otherwise flood-proof identified properties
		I	Resume maintenance of elevation certificates to facilitate floodplain mapping updates.
		J	Fund City Land Manager training for Floodplain Management Certification
		K	Construct Tower Road extension to facilitate evacuation of downtown during flood events
3	Promote recognition of wildland fire and preparation for impacts from wildland fire	A	Educate community regarding the impacts that can result from excessive wildland fire smoke and ways to guard yourself against those impacts
		B	Support training for fire department volunteers
		C	Identify funding sources for training

Table 7-2 Mitigation Goals and Potential Actions

Goals			
Number	**Description**	**ID/Priority**	**Description**
4	Reduce possibility of damage and losses from wildland fires	A - **H**	Hold workshop on subdivision design with BBNA Realty to promote awareness of Fire Prevention and Dillingham EMS
		B - **H**	Tie new water source in Neqleq Subdivision to the rest of the city water system
		C - **H**	Identify proposed locations of underground water tanks and property ownership
		D - **H**	Obtain MOA or agreements with property owners to install underground water tanks
		E - **H**	Purchase underground water supply tanks
		F - **H**	Install underground water supply tanks
		G - **H**	Hold FireWise Workshop
		H - **H**	Conduct residential audits for wildland and building fire hazards
		I - **H**	Public Education “info-mercials” on local radio
		J	Build Teal Lane, a .2 mile road connecting North Emperor Way to Nerka Loop Road to facilitate an escape route out of Nerka Subdivision
		K	Enforce fire protection building regulations and requirements
5	Reduce vulnerability of structures to earthquake damage	A	Encourage use of earthquake resistant materials and construction practices
		B - **H**	Implement Uniform International and State Building Codes to ensure that all future development meets all requirements for seismic protection
		C	Inspect or have certified all new construction
6	Promote public education regarding earthquake hazards	A	Educate community about what to do in the event of an earthquake
		B	Educate community about ways to mitigate damages (structural [buildings/fuel tanks] and non structural [bookcases and filing cabinets])
7	Promote public access to severe weather emergency advisory information and public education regarding severe winter storm hazards	A	Install additional FM transmitter in Dillingham
		B - **H**	Conduct community alert tests for NOAA warning tones (contact NOAA, City Police and Fire Departments, and Volunteer Fire Departments to coordinate test)
		C - **H**	Provide two annual weather safety talks
8	Reduce vulnerability of structures to severe winter storm damage	A - **H**	Complete Storm Readiness Program
		B - **H**	Complete MOU with KDLG regarding communication in the event of an emergency
		C - **H**	Finalize Community Siren System Project
9	Reduce possibility of damage and losses from urban conflagration	A - **H**	Improve water lines to south side of the harbor
		B - **H**	Design an evacuation plan for the core townsite
		C	Identify buildings that are at risk of impact from urban conflagration
		D	Update city ordinances
		E – **H**	Promote FireWise building design, siting, and materials for construction

Table 7-2 Mitigation Goals and Potential Actions

Goals			
Number	Description	ID/Priority	Description
10	Reduce possibility of damage and losses from volcano hazards	A	Provide information to the public about volcanic ash, including instructions for keeping ash out of buildings, the danger to public and animal health; and participating in clean-up operations
		B	Ensure that emergency vehicles carry extra air and oil filters, extra oil, windshield wiper blades and windshield washer fluid to be used during and after an ash fall.

7.3 EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The requirements for the evaluation and implementation of mitigation actions, as stipulated in DMA 2000 and its implementing regulations, are described below.

DMA 2000 and FMA Requirements: Mitigation Strategy - Implementation of Mitigation Actions
Implementation of Mitigation Actions **Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs. **FMA Requirement: §78.5(d):** Identification and evaluation of cost-effective and technically feasible mitigation actions considered **FMA Requirement: §78.5(e):** Presentation of the strategy for reducing flood risks and continued compliance with the NFIP, and procedures for ensuring implementation, reviewing progress, and recommending revisions to the plan. Element ▪ Does the mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?) ▪ Does the mitigation strategy address how the actions will be implemented and administered? (For example, does it identify the responsible department, existing and potential resources, and timeframe?) ▪ Does the prioritization process include an emphasis on the use of a cost-benefit review (see page 3-36 of *Multi-Hazard Mitigation Planning Guidance*) to maximize benefits? ▪ Does the mitigation strategy emphasize cost-effective and technically feasible mitigation actions? Source: FEMA, March 2004.

Once a list of mitigation actions had been approved, the planning team evaluated and prioritized each of the mitigation actions to determine which actions would be included in the mitigation action plan. The mitigation action plan represents mitigation projects and programs to be implemented through the cooperation of multiple entities in Dillingham. To complete this task, the planning team reviewed the simplified STAPLE+E evaluation criteria (shown in Table 7-3) and the Benefit-Cost Analysis Fact Sheet (Appendix D) to consider the opportunities and constraints of implementing each particular mitigation action.

Table 7-3 Evaluation Criteria for Mitigation Actions

Evaluation Category	Discussion "It is important to consider…"	Considerations
Social	The public support for the overall mitigation strategy and specific mitigation actions.	Community acceptance Adversely affects population
Technical	If the mitigation action is technically feasible and if it is the whole or partial solution.	Technical feasibility Long-term solutions Secondary impacts
Administrative	If the community has the personnel and administrative capabilities necessary to implement the action or whether outside help will be necessary.	Staffing Funding allocation Maintenance/operations
Political	What the community and its members feel about issues related to the environment,	Political support Local champion

Table 7-3 Evaluation Criteria for Mitigation Actions

Evaluation Category	Discussion "It is important to consider…"	Considerations
	economic development, safety, and emergency management.	Public support
Legal	Whether the community has the legal authority to implement the action, or whether the community must pass new regulations.	Local, State, and Federal authority Potential legal challenge
Economic	If the action can be funded with current or future internal and external sources, if the costs seem reasonable for the size of the project, and if enough information is available to complete a FEMA Benefit-Cost Analysis.	Benefit/cost of action Contributes to other economic goals Outside funding required FEMA Benefit-Cost Analysis
Environmental	The impact on the environment because of public desire for a sustainable and environmentally healthy community.	Effect on local flora and fauna Consistent with community environmental goals Consistent with local, State, and Federal laws

Upon review, the planning team assigned a high priority ranking to actions that best fulfill the goals of the MHMP and are appropriate and feasible for the City of Dillingham to implement during the 5-year lifespan of this version of the MHMP. As such, the planning team determined that only the mitigation actions that received a high priority ranking would be included the mitigation action plan.

7.4 IMPLEMENTING A MITIGATION ACTION PLAN

Table 7-4 shows the City of Dillingham Mitigation Action Plan matrix that describes how the mitigation actions were prioritized, how the overall benefit/costs were taken into consideration, and how each mitigation action will be implemented and administered by the planning team.

Table 7-4 City of Dillingham Mitigation Action Plan Matrix

Action Number	Description	Ranking/Prioritization	Administering Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
1A	Construct breakwater and seawalls in Dillingham harbor	High Priority	City of Dillingham – City Manager, City Planner, and Harbormaster	USACOE, FEMA, DHS&EM	0-5 years	This effort will prevent future damage and losses due to severe storm induced erosion loss.
1B	Extend seawall in front of the harbor east toward the Peter Pan dock	High Priority	City of Dillingham – City Manager, City Planner, and Harbormaster	USACOE, FEMA, DHS&EM	0-5 years	This effort will prevent future damage and losses due to severe storm induced erosion loss.
1C	Construction the extension of the North Shore Bulkhead (construct west and east seawalls)	High Priority	City of Dillingham – City Manager, City Planner, and Harbormaster	USACOE, FEMA, DHS&EM	0-5 years	This effort will prevent future damage and losses due to severe storm induced erosion loss.
1D	Replace riprap removed by storms at the north end of the Snag Point sheetpile bulkhead	High Priority	City of Dillingham – City Manager, City Planner, and Public Works Director	USACOE, FEMA, ADEC, and DHS&EM	0-5 years	This effort will prevent future damage and losses due to severe storm induced erosion loss.
2A	Public education regarding City of Dillingham participation in NFIP and use and availability of flood insurance	High Priority	City of Dillingham, City Planner	FMA, PDM, or HMGP funding for additional floodplain management activities	Ongoing	Additional floodplain management activities (i.e.: public outreach material, enhanced floodplain mapping, etc.) can be identified and implemented throughout the area, allowing resources to be shared.

Table 7-4 City of Dillingham Mitigation Action Plan Matrix

Action Number	Description	Ranking/Prioritization	Administering Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
2B	Establish a legislative priority to persuade the Governor to boost ADEC funding to re-implement code enforcement.	High Priority	City of Dillingham, City Manager, City Council	City of Dillingham	Starting September 2008	Benefits is protection of city's water supply and reduction of risk from improperly installed septic systems.
2C	Support updates to the FEMA Flood Insurance Rate Maps	High Priority	City of Dillingham, City Planner	FMA, PDM, or HMGP funding for additional floodplain management activities	Ongoing	Additional floodplain management activities (i.e.: public outreach material, enhanced floodplain mapping, etc.) can be identified and implemented throughout the area, allowing resources to be shared.
2D	Update and enforce floodplain management ordinances	High Priority	City of Dillingham, City Planner	FMA, PDM, or HMGP funding for additional floodplain management activities	Ongoing	Additional floodplain management activities (i.e.: public outreach material, enhanced floodplain mapping, etc.) can be identified and implemented throughout the area, allowing resources and specific hazard data to be shared between City departments and local agencies involved in development.
2F	Educate residents about safe well and sewer/septic installation	High Priority	ADEC/ City of Dillingham, City Planner	FMA, PDM or HMGP funding	Ongoing	A sustained mitigation outreach program will help build and support area-wide capacity to enable the public to prepare for, respond to, and recover from disasters.
2G	Develop new water source in Neqleq Subdivision	High Priority	City of Dillingham, City Manager and City Planner	PDM or HMGP funding	0-5 years	This program will help mitigate urban conflagration and wildland fire hazards

Table 7-4 City of Dillingham Mitigation Action Plan Matrix

Action Number	Description	Ranking/Prioritization	Administering Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
			City of Dillingham, Public Works Director			around vulnerable populations. Protecting vulnerable populations from a disaster is FEMA and CDC goal.
4A	Hold workshop on subdivision design with BBNA Realty to promote awareness of Fire Prevention and Dillingham EMS	High Priority	City of Dillingham City Planner	PDM or HMGP funding	Ongoing	A sustained mitigation outreach program will help build and support area-wide capacity to enable the public to prepare for, respond to, and recover from disasters.
4B	Tie new water source in Neqleq Subdivision to the rest of the city water system	High Priority	City of Dillingham, City Manager and City Planner City of Dillingham, Public Works Director	Assistance to Firefighters Grant (AFG) Program's Fire Prevention and Safety Grant, PDM or HMGP funding	0-5 years	This program will help mitigate fire hazards throughout the city.
4C	Identify possible locations of underground water tanks and property ownership	High Priority	City of Dillingham Volunteer Fire Department Staff	AFG Program's Fire Prevention and Safety Grant, PDM or HMGP funding	0-5 years	This low cost program will help mitigate wildland fire hazards around vulnerable populations. Protecting vulnerable populations from a disaster is FEMA and CDC goal.
4D	Obtain MOA or agreements with property owners to install underground water tanks	High Priority	City of Dillingham, City Planner and Volunteer Fire Department Staff	AFG Program's Fire Prevention and Safety	0-5 years	This low-cost program will help mitigate wildland fire hazards around vulnerable populations

Table 7-4 City of Dillingham Mitigation Action Plan Matrix

Action Number	Description	Ranking/Prioritization	Administering Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
				Grant, PDM or HMGP funding		
4E	Purchase underground water supply tanks	High Priority	City of Dillingham, City Manager, City Planner, and Volunteer Fire Department Staff	AFG Program's Fire Prevention and Safety Grant, PDM or HMGP funding	0-5 years	This program will help mitigate wildland fire hazards around vulnerable populations.
4F	Install underground water supply tanks	High Priority	City of Dillingham, Public Works Manager and Volunteer Fire Department Staff	AFG Program's Fire Prevention and Safety Grant, PDM or HMGP funding	0-5 years	This low-cost program will help mitigate wildland fire hazards around vulnerable populations.
4G	Hold FireWise Workshop	High Priority	City of Dillingham Volunteer Fire Department, City of Dillingham Planning Department	Citizen Corps grants	0-1 year	A sustained community-initiative mitigation program will help build and support area-wide capacity to enable the public to prepare for, respond to, and recover from disasters.
4H	Conduct residential audits for wildland and building fire hazards	High Priority	City of Dillingham Volunteer Fire Department, City of Dillingham Planning Department	AFG Program's Fire Prevention and Safety Grant, PDM or HMGP funding	0-2 years, then ongoing	This low-cost program will help mitigate wildland fire hazards around vulnerable populations

Table 7-4 City of Dillingham Mitigation Action Plan Matrix

Action Number	Description	Ranking/Prioritization	Administering Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
4I	Public Education "info-mercials" on local radio	High Priority	City of Dillingham Volunteer Fire Department, City of Dillingham Planning Department	PDM or HMGP funding	Ongoing	This low-cost mitigation outreach program will help build and support area-wide capacity to enable the public to prepare for, respond to, and recover from disasters.
5B	Implement Uniform International and State Building Codes to ensure that all future development meets all requirements for seismic protection and fire protection	High Priority	City of Dillingham Volunteer Fire Department Coordinator (Enforcement); DPS Chief (Enforcement); Planning Director (Enforcement); State Fire Marshall's Office (assist with reviewing codes for implementation)	City of Dillingham	0-5 years	This low-cost program will help reduce damage and losses due to earthquake events and to prevent urban fires.
7B	Conduct community alert tests for NOAA warning tones (contact NOAA, City Police and Fire Departments, and Volunteer Fire Departments to coordinate test)	High Priority	City of Dillingham Volunteer Fire Department, City of Dillingham Planning Department	City of Dillingham PDM or HMGP funding	Ongoing	This low-cost mitigation outreach program will help build and support area-wide capacity to enable the public to prepare for, respond to, and recover from disasters.
7C	Provide two annual weather safety talks	High Priority	City of Dillingham Volunteer Fire Department, City of Dillingham Planning Department	City of Dillingham PDM or HMGP funding	Ongoing	This low-cost mitigation outreach program will help build and support area-wide capacity to enable the public to prepare for, respond to, and recover from disasters.
8A	Complete Storm Readiness Program	High Priority	Dillingham Department of Public	PDM or HMGP	0-1 year	The implementation of national mitigation program is

Table 7-4 City of Dillingham Mitigation Action Plan Matrix

Action Number	Description	Ranking/Prioritization	Administering Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
			Safety – Chief	funding		a cost-effective and established way to help build and support local capacity to enable the public to prepare for, respond to, and recover from severe storm events.
8B	Complete MOU with KDLG regarding communication in the event of an emergency	High Priority	Dillingham Department of Public Safety – Chief	PDM or HMGP funding	0-1 year	As part of the Storm Readiness Program, the MOU with KDLG will facilitate the implementation this national mitigation program. This is a cost-effective and established way to help build and support local capacity to enable the public to prepare for, respond to, and recover from severe storm events.
8C	Finalize Community Siren System Project	High Priority	City of Dillingham Volunteer Fire Chief – Norman Heyano	PDM or HMGP funding	0-1 year	As part of the Storm Readiness Program, the completion of the community siren system will facilitate the implementation this national mitigation program. This is a cost-effective and established way to help build and support local capacity to enable the public to prepare for, respond to, and recover from severe storm events.
9A	Improve water lines to south side of the harbor	High Priority	City of Dillingham, Public Works Director and Harbormaster	AFG Program's Fire Prevention and Safety Grant, PDM	0-2 years, then ongoing	The probability of future damage from urban conflagration or wildland fires could be high if this mitigation action is not implemented.

Table 7-4 City of Dillingham Mitigation Action Plan Matrix

Action Number	Description	Ranking/Prioritization	Administering Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
				or HMGP funding		
9B	Design an evacuation plan for the core townsite	High Priority	Dillingham Fire Department – Coordinator	PDM or HMGP funding	0-5 years	This initial mitigation action is low cost, but has the potential to protect a large number of people. Components of designing an evacuation plan may include recommendations for infrastructure upgrades, which will further reduce damages to critical assets.
9E	Promote FireWise building design, siting, and materials for construction	High Priority	City of Dillingham Volunteer Fire Department Coordinator; Planning Director; State Fire Marshall's Office	PDM or HMGP funding	0-1 year	The implementation of national mitigation program is a cost-effective and established way to help build and support local capacity to enable the public to prepare for, respond to, and recover from severe storm events.

This section describes a formal plan maintenance process to ensure that the MHMP remains an active and applicable document. It includes an explanation of how the City of Dillingham planning team intends to organize their efforts to ensure that improvements and revisions to the MHMP occur in a well-managed, efficient, and coordinated manner.

The following three process steps are addressed in detail below:

- Monitoring, evaluating, and updating the MHMP
- Implementation through existing planning mechanisms
- Continued public involvement

8.1 MONITORING, EVALUATING, AND UPDATING THE MHMP

The requirements for monitoring, evaluating, and updating the MHMP, as stipulated in the DMA 2000 and its implementing regulations, are described below.

DMA 2000 and FMA Requirements: Plan Maintenance Process - Monitoring, Evaluating, and Updating the Plan
Monitoring, Evaluating and Updating the Plan
Requirement §201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.
Element
▪ Does the plan describe the method and schedule for monitoring the plan? (For example, does it identify the party responsible for monitoring and include a schedule for reports, site visits, phone calls, and meetings?)
▪ Does the plan describe the method and schedule for evaluating the plan? (For example, does it identify the party responsible for evaluating the plan and include the criteria used to evaluate the plan?)
Does the plan describe the method and schedule for updating the plan within the five-year cycle?
Source: FEMA, March 2004.

The MHMP was prepared as a collaborative effort among the planning team, comprising the Dillingham Emergency Services authorities, and URS. To maintain momentum and build upon previous hazard mitigation planning efforts and successes, the City of Dillingham will use the planning team to monitor, evaluate, and update the MHMP. Each authority identified in Table 7-4 will be responsible for implementing the Mitigation Action Plan. Jody Seitz, the hazard mitigation planning team leader, will serve as the primary point of contact and will coordinate local efforts to monitor, evaluate, and revise the MHMP.

Each member of the planning team will conduct an annual review to monitor the progress in implementing the MHMP, particularly the Mitigation Action Plan. As shown in Appendix E, the Annual Review Worksheet will provide the basis for possible changes in the MHMP Mitigation Action Plan by refocusing on new or more threatening hazards, adjusting to changes to or increases in resource allocations, and engaging additional support for the MHMP implementation. The planning team leader will initiate the annual review 2 months prior to the scheduled planning meeting date to ensure that all data is assembled for discussion with the planning team. The findings from these reviews will be presented at the annual planning team meeting. Each review, as shown on the Annual Review Worksheet, will include an evaluation of the following:

- Participation of authorities and others in the MHMP implementation
- Notable changes in the risk of natural or human-caused hazards
- Impacts of land development activities and related programs on hazard mitigation
- Progress made with the Mitigation Action Plan (identify problems and suggest improvements as necessary)
- The adequacy of local resources for implementation of the MHMP

A system of reviewing the progress on achieving the mitigation goals and implementing the Mitigation Action Plan activities and projects will also be accomplished during the annual review process. During each annual review, each authority administering a mitigation project will submit a Progress Report to the planning team. As shown in Appendix E, the report will include the current status of the mitigation project, including any changes made to the project, the identification of implementation problems and appropriate strategies to overcome them, and whether or not the project has helped achieved the appropriate goals identified in the plan.

In addition to the annual review, the planning team will update the MHMP every 5 years. To ensure that this update occurs, in the fourth year following adoption of the MHMP, the planning team will undertake the following activities:

- Thoroughly analyze and update the risk of natural and human-made hazards.
- Provide a new annual review (as noted above), plus a review of the three previous annual reviews.
- Provide a detailed review and revision of the mitigation strategy.
- Prepare a new Mitigation Action Plan for the City of Dillingham.
- Prepare a new draft MHMP.
- Submit an updated MHMP to the ADH&EM and FEMA for approval.
- Submit the FEMA approved plan for adoption by the City of Dillingham.

8.2 IMPLEMENTATION THROUGH EXISTING PLANNING MECHANISMS

The requirements for implementation through existing planning mechanisms, as stipulated in the DMA 2000 and its implementing regulations, are described below.

DMA 2000 Requirements: Plan Maintenance Process - Incorporation into Existing Planning Mechanisms

Incorporation into Existing Planning Mechanisms

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

Element

- Does the plan identify other local planning mechanisms available for incorporating the requirements of the mitigation plan?
- Does the plan include a process by which the local government will incorporate the requirements in other plans, when appropriate?

Source: FEMA, March 2004.

After the adoption of the MHMP, each planning team member will ensure that the MHMP, in particular each Mitigation Action Project, is incorporated into existing planning mechanisms. Each member of the planning team will achieve this incorporation by undertaking the following activities.

- Conduct a review of the community-specific regulatory tools to assess the integration of the mitigation strategy. These regulatory tools are identified in the following capability assessment section.
- Work with pertinent community departments to increase awareness of the MHMP and provide assistance in integrating the mitigation strategy (including the Mitigation Action Plan) into relevant planning mechanisms. Implementation of these requirements may require updating or amending specific planning mechanisms.

8.3 CITY OF DILLINGHAM CAPABILITY ASSESSMENT

The City of Dillingham capability assessment reviews the technical and fiscal resources available to the community.

Regulatory Tools (ordinances, codes, plans)	Local Authority	Comments (Year of most recent update; problems administering it, etc)
Building code	Yes	Needs updating
Zoning ordinances	Yes	Planning commission should explore use of zoning
Subdivision ordinances or regulations	Yes	Need updating. Do not reflect changes in state law
Special purpose ordinances r	Yes	Floodplain ordinances
Comprehensive plan	Yes	In progress, needs a lot of work
Economic Development Plan	No	Needs development
Emergency Response Plan	Yes	Needs georeference 911 system
Land Use Ordinance	Yes	DMC Title 18
Land Use Plan	No	Could use workshop with all governmental entities to develop

This section outlines the resources available to the City of Dillingham for mitigation and mitigation related funding and training.

First and foremost, the City of Dillingham uses local planning mechanisms such as land use planning to identify areas subject to damage from natural hazards. Most recently the City of Dillingham created flood and erosion hazard maps based on FEMA flood insurance rate maps to identify suitable, undeveloped land to relocate structures out of the erosion and flood impact areas and to allow for community growth.

Federal Resources

The federal government requires local governments to have a hazard mitigation plan 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 also 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 describe the four major phases of hazard mitigation planning. 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 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 a wealth of 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 a community's industries and businesses located in hazard prone areas.

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. 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's 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 Web sites 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.

State Resources

DHS&EM is responsible for improving hazard mitigation technical assistance for local governments for the State of Alaska. Providing hazard mitigation training, current hazard information, and the facilitation of communication with other agencies will enhance local hazard mitigation efforts. DHS&EM provides resources for mitigation planning on their Web site at http://www.ak-prepared.com.

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 Veteran's Affairs: Provides damage appraisals and settlements for VA-insured homes, and assists with filing of survivor benefits.

The Community Health and Emergency Medical Services (CHEMS) is a section within Division of Public Health within the Dept. of Health and Social Services (DHSS). DHSS is charged with promoting and protecting the public health and one of CHEMS' responsibilities is developing, implementing, and maintaining a statewide comprehensive emergency medical services system. The department's statutory mandate (AS 18.08.010) requires it to:

> (1) Coordinate public and private agencies engaged in the planning and delivery of emergency medical services, including trauma care, to plan an emergency medical services system;
>
> (2) Assist public and private agencies to deliver emergency medical services, including trauma care, through the award of grants in aid;
>
> (3) Conduct, encourage, and approve programs of education and training designed to upgrade the knowledge and skills of health personnel involved in emergency medical services, including trauma care; and
>
> (4) Establish and maintain a process under which hospitals and clinics can represent themselves to be trauma centers because they voluntarily meet criteria adopted by the department which are based on an applicable national evaluation system.

In addition to these responsibilities, the section is heavily involved in planning and responding to bioterrorist events.

Department of Commerce, Community and Economic Development. The Department of Commerce, Community, and Economic Development administers the Community Development Block Grant (CDBG) program funds and administers various flood mitigation projects, including the acquisition of flood-prone homes and businesses, throughout the State. This department also administers programs for State "distressed" and "targeted" communities.

Division of Environmental Conservation (DEC). The Department of Environmental Conservations (DEC) primary roles and responsibilities concerning hazards mitigation are ensuring safe food and safe water, and pollution prevention and pollution response. ADEC ensures water treatment plants, landfills, and bulk fuel storage tank farms are safely constructed and operated in communities. Agency and facility response plans include hazards identification and pollution prevention and response strategies.

Division of Forestry (DOF). The Department of Forestry participates in a statewide wildfire control program in cooperation with the forest industry, rural fire departments and other agencies. Prescribed burning may increase the risks of fire hazards; however, prescribed burning reduces the availability of fire fuels and therefore the potential for future, more serious fires.

Department of Transportation and Public Facilities (DOT/PF). DOT/PF personnel provide technical assistance to the various emergency management programs, to include mitigation. This assistance is addressed in the DHS&EM-DOT/PF Memorandum of Agreement and includes, but is not limited to: Environmental reviews; Archaeological surveys; and Historic preservation reviews.

In addition, DOT/PF and DHS&EM coordinate buyout projects to ensure that there are no potential right-of-way conflicts with future use of land for bridge and highway projects, and collaborate on earthquake mitigation.

Additionally, DOT/PF provides safe, efficient, economical and effective operation of the State's highways, harbors and airports. The Department uses it's Planning, Design & Engineering, Maintenance & Operations and Intelligent Transportation Systems resources to identify the hazard, plan and initiate mitigation activities to meet the transportation needs of Alaskans and make Alaska a better place to live and work. The Department budgets for the temporary replacement bridges and materials necessary to make the multi-model transportation system operational following a natural disaster.

Alaska Department of Natural Resources (DNR). DNR administers various projects designed to reduce stream bank erosion, reduce localized flooding, improve drainage, and improve discharge water quality through the storm water grant program funds. Within DNR, the Division of Geology and Land Survey is responsible for the use and development of Missouri's mineral, land and water resources, and collaboration on earthquake mitigation.

Other Funding Sources and Resources

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.

Local Resources

The City of Dillingham 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 hazard mitigation planning team, and are summarized below.

Staff/Personnel Resources	Y/N	Department/Agency and Position
Planner or engineer with knowledge of land development and land management practices	Yes	City Planner
Engineer or professional trained in construction practices related to buildings and/or infrastructure	No	City does not have an engineer on staff but utilizes engineering consulting services.
Planner or Engineer with an understanding of natural and/or human-caused hazards	Yes	Chief of Police, Fire Chief, Harbormaster, City Planner and consulting services as needed
Floodplain Manager	N	Tauunie Boothby, State Floodplain Manager/ City Planning
Surveyors	Y	Consultants
Staff with education or expertise to assess the jurisdiction's vulnerability to hazards	Y	City Planner, Fire Department Staff; VFD Fire Chief, Department of Public Safety Chief
Personnel skilled in GIS and/or HAZUS	N	City utilizes GIS consulting services. City personnel need training in using the city database; GIS needs updating and functionality needs improving and broadening
Scientists familiar with the hazards of the jurisdiction	N	USFWS local office; ADF&G local office
Emergency manager	Y	Per ICS/NIMS protocol and City of Dillingham Emergency Operations Plan
Grant writers	Y	Various, in house
Financial Resources		**Accessible or Eligible to Use (Yes/No/DK-Don't Know)**
Community Development Block grants		Y
Capital Improvement Projects Funding		Y
Authority to levy taxes for specific purposes		Y
Fees for water, sewer, gas, or electric service		Y
Impact fees for homebuyers or developers for new developments/homes		N
Withhold spending in hazard-prone areas		N

8.4 CONTINUED PUBLIC INVOLVEMENT

The requirements for continued public involvement, as stipulated in the DMA 2000 and its implementing regulations, are described below.

DMA 2000 Requirements: Plan Maintenance Process - Continued Public Involvement
Continued Public Involvement
Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.
Element
▪ Does the plan explain how continued public participation will be obtained? (For example, will there be public notices, an ongoing mitigation plan committee, or annual review meetings with stakeholders?)
Source: FEMA, March 2004.

The City of Dillingham is dedicated to involving the public directly in the continual reshaping and updating of the MHMP. A downloadable copy of the MHMP and any proposed changes will be posted on City of Dillingham's Web site. This site will also contain an e-mail address and phone number to which people can direct their comments or concerns.

The planning team will also identify opportunities to raise community awareness about the MHMP and the hazards that affect the area. This effort could include attendance and provision of materials at city-sponsored events, outreach programs, and public mailings. Any public comments received regarding the MHMP will be collected by the planning team leader, included in the annual report, and considered during future MHMP updates.

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Bristol Bay Area Health Corporation Emergency Preparedness Plan

City of Dillingham Comprehensive Plan and Land Use Maps

City of Dillingham Municipal Code

Dillingham Disaster Response Plan

Dillingham Emergency Management Strategic Plan. 2001.

Dillingham Water and Sewer Master Plan

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Appendix A

Crosswalk

Appendix B
Adoption Resolution

(To be completed following adoption by the City of Dillingham).

Appendix C

Public Outreach

CITY OF DILILNGHAM – PLANNING DEPARTMENT
PO BOX 889
DILLINGHAM, AK 99576

PRSRT STD
US Postage
PAID
Anchorage, AK
Permit #537

HAZARD MITIGATION PLANNING - PUBLIC OPINION SURVEY

CITY OF DILLINGHAM – PLANNING DEPARTMENT
PO BOX 889
DILLINGHAM, AK 99576

Place
Stamp
Here

CITY OF DILLINGHAM
HAZARD AWARENESS AND MITIGATION SURVEY - SPRING 2006

The Disaster Mitigation Act of 2000 requires each community in the nation to have a Hazard Mitigation Plan adopted in order to be eligible for Federal Emergency Management Agency (FEMA) disaster relief funds and funding for future mitigation projects. Mitigation is action taken to limit damage due to natural or man-made hazards. The hazard mitigation plan will help us prepare for any future natural event. Your responses and comments will help us set priorities and decide what mitigation actions should be included in the plan.

Please complete the survey, re-fold so the City of Dillingham address is showing. Tape the edge closed, apply first class postage and mail back to us.

Thank you for your participation.

PLEASE RESPOND BY MAY 15TH

1. How concerned are you about each of the following natural and man-made hazards directly affecting your local community? Please check one box for each hazard listed.

HAZARD	Very Concerned	Somewhat Concerned	No Opinion	Not Very Concerned	Not At All Concerned
Earthquake					
Flood					
Fire/Wildfire					
Severe weather					
Erosion					
Wind					
Terrorist attack					
Epidemic of infectious disease					
Extended power outage					
Highway hazardous material accident					
(other?)					

2. Has one or more of these natural or man-made hazards directly affected you while living in the City of Dillingham? If yes, which one (s)?

____

____

3. What could be done to limit damage from these hazards? Write your ideas here:

____

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4. In your opinion, what steps should the City of Dillingham take to reduce possible damage or loss of life from natural and man-made hazards?

MITIGATION MEASURE	Agree Strongly	Agree	No Opinion	Disagree	Disagree Strongly
Review potential hazards during land use permit application process (A land use permit must be applied for when anyone constructs a new building, driveway, or fence within city limits)					
Review potential hazards during subdivision process					
Increase recruitment, incentives, and training for emergency response personnel					
Restrict construction in areas with high risk for natural hazards such as flooding or erosion					
Adopt updated building codes for all structures					
Enforce building codes for residential housing that is a three-plex or smaller; require building permits and review plans					
Institute a citizen emergency response program					
Increase accuracy of floodplain mapping					
Identify and replace undersized culverts at road crossings					
Encourage the creation of firebreaks					
Promote FireWise and FireWise building practices					
Clear spruce bark beetle killed standing deadwood around residential structures					
(other?)					

Any other comments or suggestions?

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____

____

5. How long have you lived in the City of Dillingham?

____

6. In what part of Dillingham do you live?

____

THANKS FOR YOUR INPUT! - PLEASE RETURN COMPLETED SURVEY BY MAY 12 TO:

City Hall – Planning Department | PO Box 889 | Dillingham, AK 99576 | Fax: 842-2060

CITY OF DILLINGHAM - HAZARD AWARENESS AND MITIGATION SURVEY - SPRING 2006

The Disaster Mitigation Act of 2000 requires each community in the nation to have a Hazard Mitigation Plan adopted in order to be eligible for Federal Emergency Management Agency (FEMA) disaster relief funds and funding for future mitigation projects. Mitigation is action taken to limit damage due to natural or man-made hazards. The hazard mitigation plan will help us prepare for any future natural event. Your responses and comments will help us set priorities and decide what mitigation actions should be included in the plan.

How concerned are you about each of the following natural and man-made hazards directly affecting your local community? Please check one box for each hazard listed.

Table 4-2 Summary of Boxholder Survey Results

HAZARD	Very Concerned	Somewhat Concerned	No Opinion	Not Very Concerned	Not At All Concerned
Earthquake	2	13	3	19	4
Flood	4	18	1	13	6
Fire/Wildfire	14	16	1	9	2
Severe weather	7	20	2	6	5
Erosion	11	15	4	7	4
Wind	3	15	5	14	4
Terrorist attack	0	1	3	11	24
Epidemic of infectious disease	3	21	2	9	5
Extended power outage	10	19	2	7	4
Highway hazardous material accident	1	8	4	16	10
(other?) No Flights	1	0	0	0	0
Tsunami	0	1	0	0	0
Mine Waste	1	0	0	0	0
Drug Trafficking	2	0	0	0	0
Aquifer Pollution	2	0	0	0	0

2. Has one or more of these natural or man-made hazards directly affected you while living in the City of Dillingham? If yes, which one (s)?

Power outages; flooding; severe weather; wind; wildfire; erosion

3. What could be done to limit damage from these hazards? Write your ideas here:

Community get involved with Nushagak operations. Homes have their own generator. Winterize homes better. Build Harbor walls higher. Increase Sea walls. Fix the roads. Have trained traffic control and responders when need arises

4. In your opinion, what steps should the City of Dillingham take to reduce possible damage or loss of life from natural and man-made hazards?

Table 4-3 Summary of Boxholder Survey Results – Mitigation Actions

MITIGATION MEASURE	Agree Strongly	Agree	No Opinion	Disagree	Disagree Strongly
Review potential hazards during land use permit application process (A land use permit must be applied for when anyone constructs a new building, driveway, or fence within city limits)	13	16	3	4	3
Review potential hazards during subdivision process	15	18	3	1	2
Increase recruitment, incentives, and training for emergency response personnel	11	21	5	2	2
Restrict construction in areas with high risk for natural hazards such as flooding or erosion	19	13	4	3	2
Adopt updated building codes for all structures	13	10	8	3	6
Enforce building codes for residential housing that is a three-plex or smaller; require building permits and review plans	12	10	5	6	7
Institute a citizen emergency response program	15	19	4	1	2
Increase accuracy of floodplain mapping	14	15	5	4	1
Identify and replace undersized culverts at road crossings	13	21	4	0	1
Encourage the creation of firebreaks	12	16	8	3	1
Promote FireWise and FireWise building practices	15	21	5	0	1
Clear spruce bark beetle killed standing deadwood around residential structures	13	18	5	3	2
(other?)					
Support EMS & Fire Volunteers	1	0	0	0	0
Increase trained traffic control responders & response equip	1	0	0	0	0
Survey soils re: H20 saturation	1	0	0	0	0

Any other comments or suggestions? _____The people would like to see that homeowners given the choice to cut down spruce trees that are on their property at their own expense and time. Do not want more codes or regulations as they are paying a lot in taxes already.____________

5. How long have you lived in the City of Dillingham?
Average of 19 years____________

6. In what part of Dillingham do you live?

__Aleknagik Lake Road, Woodriver Road, Kanakanak Road, Nerka Subdivision, & Downtown__

THANKS FOR YOUR INPUT! - PLEASE RETURN COMPLETED SURVEY BY MAY 12 TO:
City Hall – Planning Department | PO Box 889 | Dillingham, AK 99576 | Fax: 842-2060

CITY OF DILILNGHAM – PLANNING DEPARTMENT
PO BOX 889
DILLINGHAM, AK 99576

HAZARD MITIGATION PLANNING - PUBLIC OPINION SURVEY

City of Dillingham
Hazard Mitigation Plan
Public Meeting Sign-in Sheet

Please Print Name	Address	Email Address	Would you like to be on the project mailing list?
Tracy Hightower	Nina Way	thightow1350@excite.com	
Ron Bowers	3166 Wood River Rd.		SURE
Teresa Sypert	Box 384 Dlg, AK	tsypert@bbahc.org	No
Eileen Goode	Po Box 801	eileen-goodee@gmail ~~[illegible]~~	Yes
Todd Radenbaugh			
Paul Liedberg			
Sheila Neketa			
Carol Shade			
Dave Becker			

Page ____________ of ______________ Date: 12-27-07

City of Dillingham HAZARD MITIGATION PLAN

Presented by:

Jody Seitz, Planning Team Leader

Laura Young, URS Consultant

PLANNING TEAM

- Jody Seitz, Planning Team Leader
- Malcolm Wright
- John Dunson
- Norman Heyano
- Teresa Seybert
- Richard Thompson
- Dennis Varner
- Laura Young (URS – Mitigation Planning Consultant)

WHAT IS HAZARD MITIGATION?

- The purpose of hazard mitigation is to take actions that eliminate the risk or reduce the severity of hazards on people and property (examples include)
  - Relocate buildings
  - Develop or strengthen building codes
  - Educate residents and building owners

WHY DO WE NEED A PLAN?

- Preparing a plan will make the City of Dillingham eligible to receive Pre-Disaster Mitigation (PDM) grant money for mitigation programs
- The City plans to apply for PDM funds after the plan is complete

THE PLANNING PROCESS

- Hazard Identification
- Risk Assessment
- Planning Goals
- Mitigation programs, actions, and projects
- A resolution from the community adopting the plan

HAZARD IDENTIFICATION

CITY OF DILLINGHAM HAZARD WORKSHEET		
Hazard	**Southwest Region REAA**	**Dillingham**
Flood	Y – limited	Yes
Erosion	Not identified	Yes
Wildland Fire	Y – limited	Yes
Urban Conflagaration	Not identified	Yes
Weather - Severe Storm	Y – limited	Yes
Earthquake	Not identified	Yes
Volcano	Not identified	*Yes
Tsunami & Seiche	Not identified	*Yes
Technological	Y - limited	**Yes
Snow Avalanche	Not identified	No
Ground Failure	Not identified	No

** Hazard presents a low risk of occurance and a detailed analysis will be performed in the next plan update*
*** Hazard has been identified, however a detailed analysis will be performed in the next plan update*

RISK ASSESSMENT

- Now that we have identified which hazards impact the City of Dillingham, we need to determine who and what is vulnerable to each hazard
  - Critical facilities
  - Non-critical facilities

CRITICAL FACILITIES

- Critical facilities are those facilities that a community relies upon for their existence.

Facility Type	Facility Name
Airport	DLG Airport
Cemetery	Wood River Cemetery
Cemetery	Evergreen Memorial Cemetery
Cemetery	Cemetery by airport runway
Cemetery	First Avenue Cemetery
Cemetery	Second Ave. West Cemetery
Cemetery	Russian Orthodox Church Cemetery
Cemetery	Kanakanak Cemetery
Church	Russian Orthodox Church
Church	Catholic Church
Church	Dillingham Bible Fellowship
Church	Baptist Church
Church	Seventh Day Adventist Church
Church	Moravian Church
Church	Assembly of God
Church	Trinity Lutheran Church
Community Hall	City Hall
Emergency Shelter	SAFE
Emergency Shelter	Youth Center*
Fire Station	Downtown Fire Station
Fire Station	Airport Firehouse
Fire Station	Lake Road Fire Station
Fuel Storage Tanks	Bristol Alliance Fuels
Fuel Storage Tanks	Delta Western Tank Farm
Harbor/Dock/Port	Harbor Land
Harbor/Dock/Port	Small Boat Harbor - South Ramp
Harbor/Dock/Port	Harbormaster's Office
Harbor/Dock/Port	Wood River Boat Launch
Harbor/Dock/Port	Port of DLG office (Pollock warehouse)
Harbor/Dock/Port	T dock
Harbor/Dock/Port	All tide dock
Hospital/Clinic/ER	Kanakanak Hospital
Hospital/Clinic/ER	Dillingham Health Clinic Renovation
Landfill/Incinerator	Landfill
Library	Library
National Guard	National Guard Armory
Offices	Nushagak Cooperative - Electric
Offices	SWRS Offices
Offices	Animal shelter
Offices	Dock Office
Offices	ADF&G
Offices	Curyung Tribal Offices
Offices	HUD
Offices	Kongigatuk building (FWS, LIO)
Offices	AMHTA Behavioral health facility
Offices	BBNA Building
Park	Dillingham Coastal Trail
Police Station	DLG Dept. of Public Safety
Police Station	Trooper Bldg.
Post Office	Post Office
Radio Transmitter	KDLG Studio
Radio Transmitter	KDLG Tower
School	High School
School	Elementary School
School	Territorial School Bldg. (MAP)
School	UAF
School	BBNA Head Start
Senior Center	Senior Center
Senior Center	Marrulut-eniit "Granma's House"
Shop	ADOT Shop
Shop	City of DLG Public Works Shop
Store	Peter Pan Seafoods
Store	L&M Supplies
Store	Neqleq Variety
Store	A.C.
Store	N&N
Store	NAPA Auto Parts
Store	Squaw Creek Boat Movers
Store	Wells Fargo
Telephone	Nushagak Telephone
Washeteria	Harbor Bath House
Wastewater Treatment Facility	Sewer Bldg.
Wastewater Treatment Facility	Sewage Lift Station - 1 Airport
Wastewater Treatment Facility	Sewage Lift Station - 2 Tubbs apts
Wastewater Treatment Facility	Sewage Lift Station - 3 Tennysons
Wastewater Treatment Facility	Sewage Lift Station - 4 Smalls
Wastewater Treatment Facility	Sewage Lift Station - 5 Harbor
Wastewater Treatment Facility	Sewage Lift Station - 6 Dock
Wastewater Treatment Facility	Sewage Lift Station - 7 HUD
Water Reservoir/Supply	Water Tank
Water Reservoir/Supply	Water Tank
Water Reservoir/Supply	Water Treatment Facility

CRITICAL FACILITIES

- Fire Station
- Police Station
- Emergency Operations Center
- Hospital/Emergency Room
- Potable Water Production/Treatment
- Waste Water Treatment
- Power Generation
- Fuel Tanks
- Park
- Civic Center
- Cemetery
- Offices
- Emergency Shelter
- Oil and Natural Gas Pipeline
- Airport
- School
- Telephone
- Satellite
- Washeteria
- Harbor/Dock/Port
- Landfill/Incinerator
- Museum
- Library
- Road
- Community Hall
- Tannery
- Sewage Lagoon
- Teachers Quarters
- Store
- Service/Maintenance Building
- Bridge
- Post Office
- Radio Transmitter
- Reservoir/Water Supply
- Senior Center
- Church
- Community Freezer
- Generator
- National Guard (Armory)
- Community Storage Shed

Exposure Analysis

- Now that we know which hazards impact our community, and the critical facilities that are impacted, we can identify the overall vulnerability in terms of dollars.

Potential Hazard Exposure Analysis

Hazard	Population	Critical Facilities			
		Number	Structure Value	Contents Value	Value
Erosion	-	8	$ 27,142,110	$ 35,369,441	$ 62,511,551
Flooding	-	9	$ 9,349,096	$ 4,948,644	$ 14,297,740
Urban Conflagaration	-	17	$ 35,980,952	$ 44,951,428	$ 80,932,380
Wildland Fire	-	10	$ 22,478,627	$ 32,187,941	$ 54,666,568
*Earthquake	2,397	82	$ 88,418,549	$ 107,827,187	$ 196,245,736
*Severe Winter Storm	2,397	82	$ 88,418,549	$ 107,827,187	$ 196,245,736

** All people, critical facilities, and residential structures are equally vulnerable to this hazard.*

Mitigation Strategy

- Based on the results of the risk assessment we can now focus our efforts on protecting those critical facilities at risk from hazard events. We have identified goals, objects and associated projects, programs, and actions that will reduce or mitigate the impacts of a hazard.

Goals and Objectives

City of Dillingham Mitigation Goals, Objectives, and Projects		
Goal Number	**Goal**	**Objective**
1	Reduce possibility of damage and losses from erosion	Identify buildings that are at risk of impact from erosion
		Work with agencies, Native corporations, and organizations to identify new and emerging riverbank protection methods and grants (or other type of funding mechanism) that are available for these strategies
2	Promote erosion prevention education	Research information regarding riverbank erosion problems, prevention, and mitigation
3	Reduce the possibility of damage and losses from flooding	Adopt and enforce floodplain management ordinances
		Identify and assess repetitively flooded properties
		Enhance warning and response activities to increase warning time for the community
4	Promote recognition of wildland fire and preparation for impacts from wildland fire	Identify impacts that can result from excessive wildland fire smoke and the ways to guard yourself against those impacts
5	Reduce possibility of damage and losses from wildland fires	Identify methods of alerting the community if wildfire threat develops
		Develop an evacuation plan for the community
		Promote FireWise building design, siting, and materials for construction
		Support training for volunteers on the on fire department
		Identify funding sources for training
6	Reduce vulnerability of structures to earthquake damage	Encourage use of earthquake resistant materials and construction practices
		Ensure that all future development meets all requirements for seismic protection
7	Promote public education regarding earthquake hazards	Educate community about what do to in the event of an earthquake
		Educate community about ways to mitigate damages (structural {buildings/fuel tanks} & non structural {book cases & filing cabinets})
8	Promote public access to severe weather emergency advisory information	Provide access to a current weather watch and advisory information
		Investigate emergency broadcast capabilities in western Alaska
		Investigate opportunities to participate in National Warning System to receive weather warning information from the National Weather Service
		Obtain more accurate flood warning information
9	Promote public education regarding severe winter storm hazards	Participate in winter weather awareness week and flood awareness week
		Conduct community alert tests for NOAA warning tones
10	Reduce vulnerability of structures to severe winter storm damage	Encourage use of weather resistant materials and construction practices
11	Reduce possibility of damage and losses from urban conflagaration	Identify buildings that are at risk of impact from urban conflagaration
		Promote FireWise building design, siting, and materials for construction
		Support training for volunteers on the on fire department
		Identify funding sources for training

Potential Mitigation Projects

Potential Mitigation Actions							
Hazard	**Goal**	**Objective**	**Action / Project**	**Potential Funding Source**	**Duration (long / short)**	**Rank**	**Potential Participants**
Erosion	Reduce possibility of damage and losses from erosion	Identify buildings that are at risk of impact from erosion	1 - Update Erosion hazard mapping	PDM, HMGP Grants Program	Short-term		
			2 - Relocate buildings that are at risk of being affected by erosion	PDM, HMGP, Department of Homeland Security Preparedness Technical Assistance Program	Short-term		
		Work with agencies, Native corporations, and organizations to identify new and emerging riverbank protection methods and grants (or other type of funding mechanism) that are available for these strategies	3 – Fund extending the seawall in front of the harbor east toward the Peter Pan Dock	USACOE, PDM, HMGP, Department of Homeland Security Preparedness Technical Assistance Program	Short-term		
			4 – Construct the extension of the North Shore Bulkhead (construct west and east seawalls)	USACOE, PDM, HMGP, Department of Homeland Security Preparedness Technical Assistance Program	Short-term		
			5 – Replace riprap removed by storms at the north end of the Snag Point sheetpile bulkhead	USACOE, PDM, HMGP, Department of Homeland Security Preparedness Technical Assistance Program	Short-term		
	Promote erosion prevention education	Research information regarding riverbank erosion problems, prevention, and mitigation	6 - Hold a series of community meetings to provide information to residents	PDM, Lindbergh Grants Program	Short-term		
			7 - Provide information on riverbank erosion and ways to halt and prevent it in a format that can be distributed to all residents	PDM, Lindbergh Grants Program	Short-term		

Potential Mitigation Projects

Hazard	Goal	Objective	Action / Project	Potential Funding Source	Duration (long / short)	Rank	Potential Participants
Flooding	Reduce the possibility of damage and losses from flooding	Adopt and enforce floodplain management ordinances	1 - Join the National Flood Insurance Program, which regulates development in floodplains and provides federally-backed insurance to individuals who live in communities that have joined the program	None needed	Short-term		
		Protect drinking water quality	2 – Educate residents about safe well and sewer installation and improve and enforce ordinances		Short-term		
			3 – Develop new water source		Long-term		
		Identify and assess repetitively flooded properties	4 - Relocate, acquire, elevate, or otherwise flood-proof identified properties	PDM, HMGP, FMA, Lindbergh Grants Program	Short-term		
			5 - Relocate, acquire, elevate, or otherwise flood-proof critical facilities	PDM, HMGP, FMA, Lindbergh Grants Program	Short-term		
			6 - Complete a detailed inventory of community structures and infrastructure, including all critical facilities that are susceptible to flooding in GIS	PDM, HMGP Grants Program	Short-term		
			7 – Resume maintenance of elevation certificates to facilitate floodplain mapping updates.		Short-term		
			8 – Fund City Land Manager Training for Floodplain management certification.		Short-term		
		Develop an evacuation plan for the community	9 – Construct the Tower Road extension to connect Tower Road to Wood River Road to prevent people from being trapped in the downtown area due to a washout of the bridge over Scandinavian Creek.		Long-term		

Potential Mitigation Projects

Hazard	Goal	Objective	Action / Project	Potential Funding Source	Duration (long / short)	Rank	Potential Participants
Wildland fire	Promote recognition of wildland fire and preparation for impacts from wildland fire	Identify impacts that can result from excessive wildland fire smoke and the ways to guard yourself against those impacts	1 - Provide information in a format that can be distributed to residents	PDM, Lindbergh Grants Program, HMGP, AFG Program's Fire Prevention and Safety Grant	Short-term		
	Reduce possibility of damage and losses from wildland fires	Identify methods of alerting the community if wildfire threat develops	2 - Schedule and perform "fire drills" at least twice per year	PDM, Lindbergh Grants Program, HMGP, AFG Program's Fire Prevention and Safety Grant	Long-term		
		Develop an evacuation plan for the community			Long-term		
			3 – Build Teal Land, a .2 mile road connecting North Emperor Way to Nerka Loop Road to facilitate and escape route out of Nerka Subdivision		Long-term		
		Promote FireWise building design, siting, and materials for construction	4 – Enforce fire protection building regulations and requirements	PDM, Lindbergh Grants Program, HMGP, AFG Program's Fire Prevention and Safety Grant	Long-term		
			5 – Encourage revision or development of building codes and requirements	PDM, Lindbergh Grants Program, HMGP, AFG Program's Fire Prevention and Safety Grant	Long-term		

Potential Mitigation Projects

Hazard	Goal	Objective	Action/Project	Potential Funding Source	Duration (long/short)	Rank	Potential Participants
Urban Conflagaration	Reduce possibility of damage and losses from urban conflagaration	Promote FireWise building design, siting, and materials for construction	1 – Identify high risk structures and install / upgrade fire protection systems	PDM, Lindbergh Grants Program, HMGP, AFG Program's Fire Prevention and Safety Grant	Long-term		
Earthquake	Reduce vulnerability of structures to earthquake damage	Encourage use of earthquake resistant materials and construction practices	1 - Implement Uniform International and State Building Codes	PDM, Lindbergh Grants Program	Short-term		
		Ensure that all future development meets all requirements for seismic protection	2 - Inspect or have certified all new construction	PDM, Lindbergh Grants Program	Long-term		
	Promote public education regarding earthquake hazards	Educate community about what do to in the event of an earthquake	3 - Train earthquake safety and hold drills at schools	PDM, Lindbergh Grants Program	Short-term		
		Educate community about ways to mitigate damages (structural {buildings/fuel tanks} & non structural {book cases & filing cabinets})	4 - Hold workshop to identify household mitigation measures	PDM, Lindbergh Grants Program	Short-term		

Potential Mitigation Projects

Severe Winter Storm	Promote public access to severe weather emergency advisory information	Provide access to a current weather watch and advisory information	1 - Purchase NOAA radios and develop web portal (NWS, FEMA, The Weather Channel)	PDM, Lindbergh Grants Program	Short-term		
		Investigate emergency broadcast capabilities in western Alaska	2 - Contact NOAA and request NWS station installation in Alakanuk (or similar western Alaska community to provide coverage between Bethel and Nome)	PDM, Lindbergh Grants Program	Long-term		
		Investigate opportunities to participate in National Warning System to receive weather warning information from the National Weather Service	3 - Send at least two volunteers to NWS storm spotter training	PDM, Lindbergh Grants Program	Short-term		
		Obtain more accurate flood warning information	4 - Install new streamflow and rainfall measuring gauges	HMGP, PDM Grants	Long-term		
	Promote public education regarding severe winter storm hazards	Participate in winter weather awareness week and flood awareness week	5 - Develop workshop at school and have students display mitigation projects	PDM, Lindbergh Grants Program	Short-term		
		Conduct community alert tests for NOAA warning tones	6 - Contact NOAA, City Police and Fire Departments, and Volunteer Fire Department and to coordinate test	PDM, Lindbergh Grants Program	Short-term		
	Reduce vulnerability of structures to severe winter storm damage	Encourage use of weather resistant materials and construction practices	7 - Implement Uniform International and State Building Codes	PDM, Lindbergh Grants Program	Short-term		

Next Steps

- Finalize the plan based on your comments and input
- Submit the plan for DHS&EM and FEMA review
- Adopt the plan
- Implement the actions and monitor the progress
- Update the plan in 5 years

Appendix D

Benefit–Cost Analysis Fact Sheet

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Benefit-Cost Analysis Fact Sheet

Hazard mitigation projects are specifically aimed at reducing or eliminating future damages. Although hazard mitigation projects may sometimes be implemented in conjunction with the repair of damages from a declared disaster, the focus of hazard mitigation projects is on strengthening, elevating, relocating, or otherwise improving buildings, infrastructure, or other facilities to enhance their ability to withstand the damaging impacts of future disasters. In some cases, hazard mitigation projects may also include training or public-education programs if such programs can be demonstrated to reduce future expected damages.

A Benefit-Cost Analysis (BCA) provides an estimate of the "benefits" and "costs" of a proposed hazard mitigation project. The benefits considered are avoided future damages and losses that are expected to accrue as a result of the mitigation project. In other words, benefits are the reduction in expected future damages and losses (i.e., the difference in expected future damages before and after the mitigation project). The costs considered are those necessary to implement the specific mitigation project under evaluation. Costs are generally well determined for specific projects for which engineering design studies have been completed. Benefits, however, must be estimated probabilistically because they depend on the improved performance of the building or facility in future hazard events, the timing and severity of which must be estimated probabilistically.

All Benefit-Costs must be:

- Credible and well documented
- Prepared in accordance with accepted BCA practices
- Cost-effective (BCR $\geq$ 1.0)

General Data Requirements:

- All data entries (other than Federal Emergency Management Agency [FEMA] standard or default values) MUST be documented in the application.
- Data MUST be from a credible source.
- Provide complete copies of reports and engineering analyses.
- Detailed cost estimate.
- Identify the hazard (flood, wind, seismic, etc.).
- Discuss how the proposed measure will mitigate against future damages.
- Document the Project Useful Life.
- Document the proposed Level of Protection.
- The Very Limited Data (VLD) BCA module cannot be used to support cost-effectiveness (screening purposes only).
- Alternative BCA software MUST be approved in writing by FEMA HQ and the Region prior to submittal of the application.

Damage and Benefit Data

- Well documented for each damage event.
- Include estimated frequency and method of determination per damage event.
- Data used in place of FEMA standard or default values MUST be documented and justified.
- The Level of Protection MUST be documented and readily apparent.
- When using the Limited Data (LD) BCA module, users cannot extrapolate data for higher frequency events for unknown lower frequency events.

Building Data

- Should include FEMA Elevation Certificates for elevation projects or projects using First Floor Elevations (FFEs).
- Include data for building type (tax records or photos).
- Contents claims that exceed 30 percent of building replacement value (BRV) MUST be fully documented.
- Method for determining BRVs MUST be documented. BRVs based on tax records MUST include the multiplier from the County Tax Assessor.
- Identify the amount of damage that will result in demolition of the structure (FEMA standard is 50 percent of pre-damage structure value).
- Include the site location (i.e., miles inland) for the Hurricane module.

Use Correct Occupancy Data

- *Design occupancy* for Hurricane shelter portion of Tornado module.
- *Average occupancy per hour* for the Tornado shelter portion of the Tornado module.
- *Average occupancy* for Seismic modules.

Questions to Be Answered

- Has the level of risk been identified?
- Are all hazards identified?
- Is the BCA fully documented and accompanied by technical support data?
- Will residual risk occur after the mitigation project is implemented?

Common Shortcomings

- Incomplete documentation.
- Inconsistencies among data in the application, BCA module runs, and the technical support data.
- Lack of technical support data.
- Lack of a detailed cost estimate.
- Use of discount rate other than FEMA-required amount of 7 percent.

- Overriding FEMA default values without providing documentation and justification.
- Lack of information on building type, size, number of stories, and value.
- Lack of documentation and credibility for FFEs.
- Use of incorrect Project Useful Life (not every mitigation measure = 100 years).

Appendix E

Plan Maintenance Documents

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Annual Review Questionnaire

PLAN SECTION	QUESTIONS	YES	NO	COMMENTS
PLANNING PROCESS	Are there internal or external organizations and agencies that have been invaluable to the planning process or to mitigation action			
	Are there procedures (e.g., meeting announcements, plan updates) that can be done more efficiently?			
	Has the Task Force undertaken any public outreach activities regarding the MHMP or implementation of mitigation actions?			
HAZARD PROFILES	Has a natural and/or human-caused disaster occurred in this reporting period?			
	Are there natural and/or human-caused hazards that have not been addressed in this HMP and should be?			
	Are additional maps or new hazard studies available? If so, what have they revealed?			
VULNERABILITY ANALYSIS	Do any new critical facilities or infrastructure need to be added to the asset lists?			
	Have there been changes in development patterns that could influence the effects of hazards or create additional risks?			
MITIGATION STRATEGY	Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning within the			
	Are the goals still applicable?			
	Should new mitigation actions be added to the a community's Mitigation Action Plan?			
	Do existing mitigation actions listed in a community's Mitigation Action Plan need to be reprioritized?			
	Are the mitigation actions listed in a community's Mitigation Action Plan appropriate for available resources?			

Mitigation Action Progress Report

Progress Report Period:________________ to________________
(date) (date)

Project Title: ____________________ Project ID# ________________

Responsible Agency: ____________________

Address: ____________________

City: ____________________

Contact Person: ____________________ Title: ________________

Phone #(s): ________________ email address: ________________

List Supporting Agencies and Contacts:

____

____

Total Project Cost: ____________________

Anticipated Cost Overrun/Underrun: ____________________

Date of Project Approval: ________________ Start date of the project:________________

Anticipated completion date:____________________

Description of the Project (include a description of each phase, if applicable, and the time frame for completing each phase): ____________________

____

____

____

Milestones	Complete	Projected Date of Completion

Plan Goal (s) Addressed:

Goal: ______________________________

Indicator of Success: ______________________________

____

____

____

Project Status

☐ Project on schedule

☐ Project completed

☐ Project delayed*

*explain: ______________________________

____

☐ Project canceled

Project Cost Status

☐ Cost unchanged

☐ Cost overrun*

*explain: ______________________________

____

☐ Cost underrun*

*explain: ______________________________

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Summary of progress on project for this report:

A. What was accomplished during this reporting period?

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B. What obstacles, problems, or delays did you encounter, if any?

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C. How was each problem resolved?

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Next Steps: What is/are the next step(s) to be accomplished over the next reporting period?

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Other Comments:

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