City of Dillingham

2016 Hazard Mitigation Plan

Prepared by
The City of Dillingham
Hazard Mitigation Planning Team
August 2016

This document was prepared under a grant from the Federal Emergency Management Agency (FEMA)'s Grant Programs Directorate, U.S. Department of Homeland Security, and the Alaska Division of Homeland Security and Emergency Management. Points of view or opinions expressed in this document are those of the authors and do not necessarily represent the official position or policies of FEMA's Grant Programs Directorate, the U.S. Department of Homeland Security, or the State of Alaska.

Table of Contents

Tables

Figures

Appendices

This page intentionally left blank.

Acronyms/Abbreviations

°F	Degrees Fahrenheit
ACCIMP	Alaska Climate Change Impact Mitigation Program
ACIA	Arctic Climate Impact Assessment
ACWF	Alaska Clean Water Fund
ADWF	Alaska Drinking Water Fund
AEA	Alaska Energy Authority
AEEE	Alternative Energy And Energy Efficiency
AFG	Assistance to Firefighters Grant
AICC	Alaska Interagency Coordination Center
AIDEA	Alaska Industrial Development And Export Authority
AK	Alaska
ANA	Administration For Native Americans
ARC	American Red Cross
AVEC	Alaska Village Electric Cooperative
BBAHC	Bristol Bay Area Health Corporation
BBNA	Bristol Bay Native Corporation
BIA	Bureau of Indian Affairs
CCP	Citizen Corps Program
CDBG	Community Development Block Grant
CDQ	Community Development Quota
CEHHWG	Climate, Ecosystems & Human Health Work Group
CFR	Code of Federal Regulations
CFP	Community Forestry Program
CGP	Comprehensive Grant Program
City	City of Dillingham
CIG	Conservation Innovation Grant
CO-OP	Cooperative
Corp	Corporation
CP	City of Dillingham's Comprehensive Plan
CRS	Community Rating System
CTA	Conservation Technical Assistance
CVRF	Coastal Villages Region Fund
CWSRF	Clean Water State Revolving Fund
DCCED	Department of Commerce, Community, And Economic Development
DCRA	Division of Community And Regional Affairs
DEC	Department of Environmental Conservation
Denali	Denali Commission
DHS	Department of Homeland Security
DHS&EM	Division of Homeland Security And Emergency Management
DHSS	Department of Health And Social Services
DGGS	Division of Geological And Geophysical Survey
DMA 2000	Disaster Mitigation Act Of 2000

Acronyms/Abbreviations

DMVA	Department of Military And Veterans Affairs
DNR	Department of Natural Resources
DOE	Department of Energy
DOF	Division of Forestry
DOI	Division of Insurance
DOL	Department of Labor
DOT/PF	Department of Transportation and Public Facilities
DSS	Division of Senior Services
EOC	Emergency Operations Center
EMPG	Emergency Management Performance Grant
EPA	US Environmental Protection Agency
EQ	Earthquake
ER	Erosion
EWP	Emergency Watershed Protection Program
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FWS	Fish and Wildlife Services
FL	Flood
FMA	Flood Mitigation Assistance
FP&S	Fire Prevention and Safety
ft	Feet/Foot
FY	Fiscal Year
g	Gravity
GF	Ground Failure
GIS	Geospatial Information System
Hazus	Hazard United States – Multi-Hazard Software
Inc	Incorporated
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HSGP	US Homeland Security Grant Program
HUD	US Housing And Urban Development
IBHS	Institute For Business and Home Safety
ICDBG	Indian Community Development Block Grant
IGAP	Indian General Assistance Program
IHBG	Indian Housing Block Grant
IHLGP	Indian Home Loan Guarantee Program
IHS	Indian Health Service
INAP	Indian And Native American Programs
IRS	Internal Revenue Service
Kts	Knots
LEG	Legislative Energy Grant

Acronyms/Abbreviations

LEPC	Local Emergency Planning Committee
M	Magnitude
MAP	Mitigation Action Plan
MGL	Municipal Grants and Loans
MHHW	Mean High High Water
MMI	Modified Mercalli Intensity
mph	Miles Per Hour
msl	Mean Sea Level
NAHASDA	Native American Housing Assistance and Self Determination Act
NFIP	National Flood Insurance Program
NGO	Nongovernment Organization
NIMS	National Incident Management System
NOAA	National Oceanic And Atmospheric Administration
NRF	National Response Framework
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
PCR	Parks Culture & Recreation Center
PDM	Pre-Disaster Mitigation
PGA	Peak Ground Acceleration
PHS	US Public Health Service
PNP	Private Non-Profits
RCASP	Remote Community Alert Systems
RD	Rural Development
RFC	Repetitive Flood Claim
RL	Repetitive Loss
RurALCAP	Rural Alaska Community Action Program Incorporated
SAFER	Staffing For Adequate Fire And Emergency Response
SBA	US Small Business Administration
SHMP	Alaska State Hazard Mitigation Plan
SHSP	State Homeland Security Program
SOA	State Of Alaska
SOI	Southern Oscillation Index
Sq.	Square
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
Tribe	Curyung Tribe of Dillingham
TRI	Toxic Release Inventory
US or U.S.	United States
USACE	US Army Corps of Engineers
USC	United States Code
USDA	US Department of Agriculture

Acronyms/Abbreviations

USGS	US States Geological Survey
USDOI	US Department of Interior
VFA-RFA	Volunteer Fire Assistance And Rural Fire Assistance Grant
Village	Native Village of Dillingham
VSW	Village Safe Water
WARN	Warning, Alert, And Response Network
WUI	Wildland Urban Interface

1

Section One provides a brief introduction to hazard mitigation planning, the grants associated with these requirements, and a description of this Multi-Jurisdictional Hazard Mitigation Plan (MJHMP).

1.1 OVERVIEW

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 with subsequent updates. The planning requirements for local entities are described in detail in Section 2 and are identified in their appropriate sections throughout this HMP.

In October 2007 and July 2008, FEMA combined and expanded flood mitigation planning requirements with local hazard mitigation plans (44 CFR §201.6). Furthermore, all hazard mitigation assistance program planning requirements were combined eliminating duplicated mitigation plan requirements. This change also required participating National Flood Insurance Program (NFIP) communities' risk assessments and mitigation strategies to identify and address repetitively flood damaged properties. Local hazard mitigation plans now qualify communities for several Federal Hazard Mitigation Assistance (HMA) grant programs.

This HMP complies with Title 44 CFR current as of January 1, 2014 and applicable guidance documents.

1.2 GRANT PROGRAMS WITH MITIGATION PLAN REQUIREMENTS

FEMA HMA grant programs provide funding to States, Tribes, and local entities that have a FEMA-approved State, Tribal, or Local 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. Excerpts from FEMA's 2015 HMA Guidance, Part I is as follows:

> *"The U.S. Department of Homeland Security (DHS) FEMA HMA programs present a critical opportunity to reduce the risk to individuals and property from natural hazards, while simultaneously reducing reliance on Federal disaster funds. On March 30, 2011, the President signed Presidential Policy Directive 8 (PPD-8): National Preparedness, and the National Mitigation Framework was finalized in May 2013. The National Mitigation Framework comprises seven core capabilities, including:*
>
> - *Threats and Hazard Identification*
> - *Risk and Disaster Resilience Assessment*
> - *Planning*
> - *Community Resilience*

- *Public Information and Warning*
- *Long-Term Vulnerability Reduction*
- *Operational Coordination*

HMA programs provide funding for eligible activities that are consistent with the National Mitigation Framework's Long-Term Vulnerability Reduction capability. HMA programs reduce community vulnerability to disasters and their effects, promote individual and community safety and resilience, and promote community vitality after an incident. Furthermore, HMA programs reduce response and recovery resource requirements in the wake of a disaster or incident, which results in a safer community that is less reliant on external financial assistance.

Hazard mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects. This definition distinguishes actions that have a long-term impact from those that are more closely associated with immediate preparedness, response, and recovery activities. Hazard mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage, reconstruction, and repeated damage. Accordingly, States, territories, federally-recognized tribes, and local communities are encouraged to take advantage of funding that HMA programs provide in both the pre- and post-disaster timelines.

In addition to hazard mitigation, FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) Program provides communities with education, risk communication, and outreach to better protect its citizens. The Risk MAP project lifecycle places a strong emphasis on community engagement and partnerships to ensure a whole community approach that reduces flood risk and builds more resilient communities. Risk MAP risk assessment information strengthens a local community's ability to make better and more informed decisions. Risk MAP allows communities to better invest and determine priorities for projects funded under HMA. These investments support mitigation efforts under HMA that protect life and property and build more resilient communities.

The whole community includes children, individuals with disabilities, and others with access and functional needs; those from religious, racial, and ethnically diverse backgrounds; and people with limited English proficiency. Their contributions must be integrated into mitigation/resilience efforts, and their needs must be incorporated as the whole community plans and executes its core capabilities.

WHOLE COMMUNITY

A. HMA Commitment to Resilience and Climate Change Adaptation

FEMA is committed to promoting resilience as expressed in PPD-8: National Preparedness; the President's State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience; the Administrator's 2011 FEMA Climate Change Adaptation Policy Statement (Administrator Policy 2011-OPPA-01); and the 2014–2018 FEMA Strategic Plan. Resilience refers to the ability to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies. The concept of resilience is closely related to the concept of hazard mitigation, which reduces or eliminates potential losses by breaking the cycle of damage, reconstruction, and repeated damage. Mitigation capabilities include, but are not limited to, community-wide risk reduction projects, efforts to improve the resilience of critical infrastructure and key resource lifelines, risk reduction for specific vulnerabilities from natural hazards and climate change, and initiatives to reduce future risks after a disaster has occurred.

FEMA is supporting efforts to streamline the HMA programs so that these programs can better respond to the needs of communities nationwide that are addressing the impacts of climate change. FEMA, through its HMA programs:

- *Develops and encourages adoption of resilience standards in the siting and design of buildings and infrastructure*
- *Modernizes and elevates the importance of hazard mitigation*

FEMA has issued several policies that facilitate the mitigation of adverse effects from climate change on the built environment, structures and infrastructure. Consistent with the 2014–2018

FEMA Strategic Plan, steps are being taken by communities through engagement of individuals, households, local leaders, representatives of local organizations, and private sector employers and through existing community networks to protect themselves and the environment by updating building codes, encouraging the conservation of natural and beneficial functions of the floodplain, investing in more resilient infrastructure, and engaging in mitigation planning. FEMA plays an important role in supporting community-based resilience efforts, establishing policies, and providing guidance to promote mitigation options that protect critical infrastructure and public resources.

FEMA encourages better integration of Sections 404 and 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended (Stafford Act), Title 42 of the United States Code (U.S.C.) 5121 et seq., to promote more resilience during the recovery and mitigation process. FEMA regulations that implement Sections 404 and 406 of the Stafford Act allow funding to incorporate mitigation measures during recovery activities. Program guidance and practice limits Section 406 mitigation to the damaged elements of a structure. This limitation to Section 406 mitigation may not allow for a comprehensive mitigation solution for the damaged facility; however, Section 404 funds may be used to mitigate the undamaged portions of a facility.

Recognizing that the risk of disaster is increasing as a result of multiple factors, including the growth of population in and near high-risk areas, aging infrastructure, and climate change, FEMA promotes climate change adaptation by:

- *Incorporating sea level rise in the calculation of Benefit-Cost Analysis (BCA)*
- *Publishing a new HMA Job Aid on pre-calculated benefits for hurricane wind retrofit measures, see HMA Job Aid (Cost Effectiveness Determination for Residential Hurricane Wind Retrofit Measures Funded by FEMA)*
- *Encouraging floodplain and wetland conservation associated with the acquisition of properties in green open space and riparian areas*
- *Reducing wildfire risks*
- *Preparing for evolving flood risk*
- *Encouraging mitigation planning and developing mitigation strategies that encourage community resilience and smart growth*
- *Encouraging the use of building codes and standards (the American Society of Civil Engineers/Structural Engineering Institute [ASCE/SEI] 24-14, Flood Resistant Design and Construction) wherever possible.*

For additional information, see http://www.fema.gov/climate-change" (FEMA 2015).

1

1.2.1 Hazard Mitigation Assistance (HMA) Grant Programs

HMA grant program activities include:

Table 1-1 HMA Eligible Activities

Activities	HMGP	PDM	FMA
1. Mitigation Projects	✓	✓	✓
Property Acquisition and Structure Demolition	✓	✓	✓
Property Acquisition and Structure Relocation	✓	✓	✓
Structure Elevation	✓	✓	✓
Mitigation Reconstruction	✓	✓	✓
Dry Floodproofing of Historic Residential Structures	✓	✓	✓
Dry Floodproofing of Non-residential Structures	✓	✓	✓
Generators	✓	✓	
Localized Flood Risk Reduction Projects	✓	✓	✓
Non-localized Flood Risk Reduction Projects	✓	✓	
Structural Retrofitting of Existing Buildings	✓	✓	✓
Non-structural Retrofitting of Existing Buildings and Facilities	✓	✓	✓
Safe Room Construction	✓	✓	
Wind Retrofit for One- and Two-Family Residences	✓	✓	
Infrastructure Retrofit	✓	✓	✓
Soil Stabilization	✓	✓	✓
Wildfire Mitigation	✓	✓	
Post-Disaster Code Enforcement	✓		
Advance Assistance	✓		
5 Percent Initiative Projects	✓		
Miscellaneous/Other[(1)]	✓	✓	✓
2. Hazard Mitigation Planning	✓	✓	✓
Planning Related Activities	✓		
3. Technical Assistance			✓
4. Management Cost	✓	✓	✓

[(1)] Miscellaneous/Other indicates that any proposed action will be evaluated on its own merit against program requirements. Eligible projects will be approved provided funding is available.

(FEMA 2015)

The Hazard Mitigation Grant Program (HMGP) is a competitive, disaster funded, grant program. Whereas the other Unified Mitigation Assistance Programs: Pre-Disaster Mitigation (PDM) and Flood Mitigation Assistance (FMA) programs although competitive, rely on specific pre-disaster grant funding sources, sharing several common elements. The 2015 HMA Guidance Provides the following programmatic information:

> *"HMGP is authorized by Section 404 of the Stafford Act, 42 U.S.C. 5170c. The key purpose of HMGP is to ensure that the opportunity to take critical mitigation measures to reduce*

the risk of loss of life and property from future disasters is not lost during the reconstruction process following a disaster.

HMGP funding is available, when authorized under a Presidential major disaster declaration, in the areas of the State requested by the Governor. Federally-recognized tribes may also submit a request for a Presidential major disaster declaration within their impacted areas (see http://www.fema.gov/media-library/assets/documents/85146). The amount of HMGP funding available to the Applicant is based on the estimated total Federal assistance, subject to the sliding scale formula outlined in Title 44 of the Code of Federal Regulations (CFR) Section 206.432(b) that FEMA provides for disaster recovery under Presidential major disaster declarations. The formula provides for up to 15 percent of the first $2 billion of estimated aggregate amounts of disaster assistance, up to 10 percent for amounts between $2 billion and $10 billion, and up to 7.5 percent for amounts between $10 billion and $35.333 billion. For States with enhanced plans, the eligible assistance is up to 20 percent for estimated aggregate amounts of disaster assistance not to exceed $35.333 billion.

The Period of Performance (POP) for HMGP begins with the opening of the application period and ends no later than 36 months from the close of the application period.

PDM is designed to assist States, territories, federally-recognized tribes, and local communities to implement a sustained pre-disaster natural hazard mitigation program to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding in future disasters. Congressional appropriations provide the funding for PDM.

The total amount of funds distributed for PDM is determined once the appropriation is provided for a given fiscal year. It can be used for mitigation projects and planning activities.

The POP for PDM begins with the opening of the application period and ends no later than 36 months from the date of subapplication selection.

FMA is authorized by Section 1366 of the National Flood Insurance Act of 1968, as amended (NFIA), 42 U.S.C. 4104c, with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). FMA was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994. The Biggert-Waters Flood Insurance Reform Act of 2012 (Public Law 112-141) consolidated the Repetitive Flood Claims and Severe Repetitive Loss grant programs into FMA. FMA funding is available through the National Flood Insurance Fund (NFIF) for flood hazard mitigation projects as well as plan development and is appropriated by Congress. States, territories, and federally-recognized tribes are eligible to apply for FMA funds. Local governments are considered subapplicants and must apply to their Applicant State, territory, or federally-recognized tribe.

The City of Dillingham actively participates in FEMA's National Flood Insurance Program (NFIP) and is therefore eligible for Flood Mitigation Assistance (FMA) associated grant funding opportunities.

The POP for FMA begins with the opening of the application period and ends no later than 36 months from the date of subapplication selection" (FEMA 2015).

1

As the State Hazard Mitigation plan states:

> *"The [FMA] provides pre-disaster grants to State and Local Governments for planning and flood mitigation projects. Created by the National Flood Insurance Reform Act of 1994, its goal is to reduce or eliminate NFIP claims. It is an annual nationally competitive program. Residential and non-residential properties may apply for FMA grants through their NFIP community and are required to have NFIP insurance to be eligible. FMA grant funds may be used to develop the flood portions of hazard mitigation plans or to do flood mitigation projects. FMA grants are funded 75% Federal and 25% applicant.*
>
> *The Biggert-Waters Flood Insurance Reform Act of 2012 eliminated the Repetitive Flood Claims (RFC) and Severe Repetitive Loss (SRL) grant programs. Elements of these flood programs have been incorporated into FMA. The FMA program now allows for additional cost share flexibility:*
>
> - *Up to 100-percent Federal cost share for severe repetitive loss properties.*
> - *Up to 90-percent Federal cost share for repetitive loss properties.*
> - *Up to 75-percent Federal cost share for NFIP insured properties.*
>
> *The FMA program is available only to communities participating in the NFIP. In the State of Alaska, the Department of Commerce, Community, and Economic Development (DCCED) manages this program" (DHS&EM 2013).*

HMP Layout Description

The HMP consists of the following sections and appendices:

Section 1 Introduction

Defines what a hazard mitigation plan is, delineates federal requirements and authorities, and introduces the Hazard Mitigation Assistance program listing the various grant programs and their historical funding levels.

Section 2 Community Description

Provides a general history and background of the City of Dillingham (City), including historical trends for population and the demographic and economic conditions that have shaped the area.

Section 3 Planning Process

Describes the HMP update's planning process, identifies the Planning Team Members, the meetings held as part of the planning process, and the key stakeholders within the Dillingham and its jurisdictional area. This section documents public outreach activities (support documents are located in Appendix D); the review and incorporation of relevant plans, reports, and other appropriate information; actions the City plans to implement to assure continued public participation; and their methods and schedule for keeping the plan current.

This section also describes the Planning Team's formal plan maintenance process to ensure that the HMP remains an active and applicable document throughout its 5-year lifecycle. The process includes monitoring, reviewing, evaluating (Appendix G – Maintenance Documents), updating the HMP; and implementation initiatives.

Section 4 Jurisdictional Adoption

Describes the community's HMP adoption process (support documents are located in Appendix C).

Section 5 Hazard Analysis

Describes the process through which the Planning Team identified, screened, and selected the hazards for profiling in this version of the HMP. The hazard analysis includes the nature, previous occurrences (history), location, extent, impact, and recurrence probability for each hazard. In addition, historical impact and hazard location figures are included when available.

Section 6 Vulnerability Assessment

Identifies the Dillingham's potentially vulnerable assets—people, residential and nonresidential buildings (where available), critical facilities, and critical infrastructure. The resulting information identifies the full range of hazards that the City could face and potential social impacts, damages, and economic losses. Land use and development trends are also discussed.

Section 7 Mitigation Strategy

Defines the mitigation strategy which provides a blueprint for reducing the potential losses identified in the vulnerability analysis. This section lists the community's governmental authorities, policies, programs and resources.

The Planning Team developed a list of mitigation goals and potential actions to address the risks facing the City. Mitigation actions include preventive actions, property protection techniques, natural resource protection strategies, structural projects, emergency services, and public information and awareness activities. Mitigation strategies were developed to address NFIP insured properties (if applicable) while encouraging participation with the NFIP and the reduction of flood damage to flood-prone structures.

Section 8 References

Lists reference materials and resources used to prepare this HMP.

Appendices

Appendix A: Delineates Federal, State, and other potential mitigation funding sources. This section will aid the community with researching and applying for funds to implement their mitigation strategy.

Appendix B: Provides the FEMA Local Mitigation Plan Review Tool, which documents compliance with FEMA criteria.

Appendix C: Provides the adoption resolution for the City of Dillingham.

Appendix D: Provides public outreach information.

Appendix E: Social, Technical, Administrative, Political, Legal, Economic, and Environmental considerations for prioritizing mitigation actions or projects

Appendix F: Contains the Benefit-Cost Analysis Fact Sheet used to prioritize mitigation actions.

Appendix G: Provides the plan maintenance documents, such as an annual review sheet and the progress report form.

This page intentionally left blank

Section Two provides the City of Dillingham's location, geography, history, and demographic information.

2.1 LOCATION, GEOGRAPHY, AND HISTORY

Dillingham is located at the head of Nushagak Bay at the confluence of the Wood and Nushagak Rivers (Figure 2-1). 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 6,600 square miles of tundra wetlands, rivers, jagged peaks, glacial valleys, as well as rugged sea cliffs and beaches.

Figure 2-1 Dillingham's Location Map

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. Steep coastal bluffs occur at several locations along the Nushagak River below the core town site, most notably at the end of Squaw Creek Road, extending through Kanakanak Beach and adjacent to the Bristol Bay Area Health Corporation facility. Other steep bluffs occur beyond the end of Wood River Road, along the western bank of the Wood River. 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 back-slopes 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.

2.2 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 Athabascan peoples. Approximately 66 percent of the population possesses a Native heritage. Population growth has fluctuated over the years, with the highest growth beginning in the 1960s with a steady climb to today's population of approximately 2,431. This population grows to nearly double during the summer commercial fishing and tourism months.

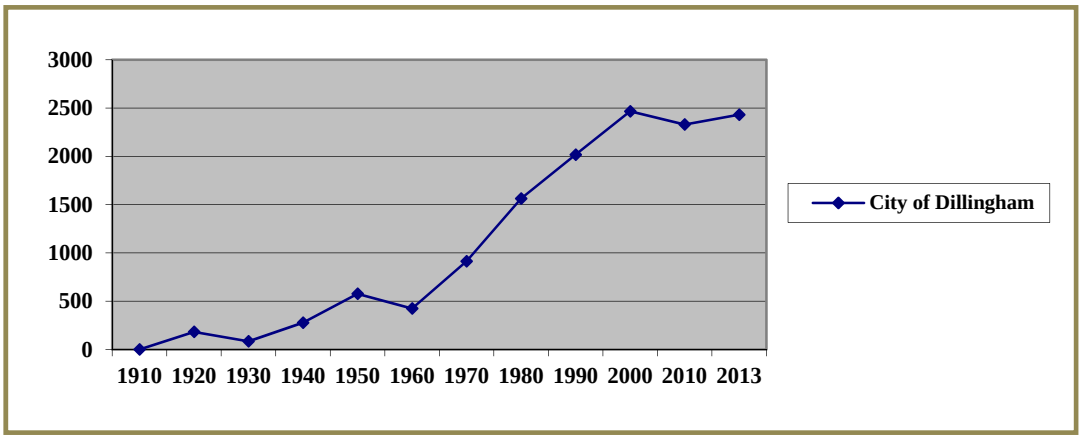


Figure 2-2 Dillingham's Historic Population

According to the 2010 U.S. Census, 69 percent of the population is 16 years and older, approximately 1,171 residents are employed.

According to the 2010 Census, Dillingham's median household income was $68,036 with a per capita income of $31,870. Approximately 12.9 % were reported to be living below the poverty level. The potential work force (those aged 16 years or older) in the City was estimated to be 1,607, of which 1,059 were actively employed. In 2010 the unemployment rate was 9.6 percent; however, this rate included part-time and seasonal jobs, and practical unemployment or underemployment is likely to be significantly higher.

2.3 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.

The 2010 Dillingham Comprehensive Plan, Part 2 defines the City employment:

> *"**Employment Opportunities & Workforce Development***
>
> *Employment in Dillingham is largely centered in federal, state, regional and local (City and Tribal) government. The two largest employers in the area are the Bristol Bay Area Health Corporation and the Bristol Bay Native Association, each with about 250 employees, and the Dillingham City School District (100). The workforce in these sectors*

and in Dillingham in general is aging. Workers over the age of 50 make up at least 15 percent or more of the workforce in eight industries. Industries that attract younger workers are natural resources and mining, trade, transportation and utilities, professional and business services, and leisure and hospitality.[7] However, many of these industries provide a lower than average monthly wage. For example, leisure and hospitality ($1,355) and trade, transportation and utilities ($1,795) are industries both below the average monthly wages for the Dillingham Census Area in 2008 ($2,770).[8] If Dillingham's youth and young adults are to replace the aging workforce in higher paying positions, local entities must work together to give young people the necessary skills to compete for opportunities created as older workers retire and leave the workforce" (CP 2010).

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. However in 2013 there were only 8 halibut permit holders; but there were 38 Herring and 209 salmon permit holders.

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 and 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 2. The pavement was extended to Aleknagik Lake and the bike path finished from the Dillingham Townsite to the Lake Road in 2004.

2.4 INDUSTRY

In 2016, fifteen (15) different fish processors operated in the Nushagak District, southeast of Dillingham. Of those, two major processors Peter Pan Seafoods & Icicle Seafoods operates processing plants onshore in Dillingham. Six other major processors, Ocean Beauty, Trident, and Leader Creek, Copper River, Ekuk Fisheries, Alaska's Best, Silver Bay and Red Salmon, coordinated their operations on floating processors in the fishing district. Additionally, five catcher-processors had direct marketing out of the Nushagak District.

Table 2-1 Dillingham's 2013 Top Occupations
(2014 Census Estimates)

Occupations	No. of workers
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	60
Managers, All Other	48
Cashiers	34
Teacher Assistants	33
First-Line Supervisors of Office and Administrative Support Workers **TOP JOB**	26
Construction and Related Workers, All Other	25
Personal Care and Service Workers, All Other	23
Laborers and Freight, Stock, and Material Movers, Hand	22
Maids and Housekeeping Cleaners	20
Office and Administrative Support Workers, All Other	19
Bookkeeping, Accounting, and Auditing Clerks	19
Construction Laborers	18
Maintenance and Repair Workers, General	18
Receptionists and Information Clerks	17
Stock Clerks and Order Fillers	17
Teachers and Instructors, All Other	17
Elementary School Teachers, Except Special Education **TOP JOB**	17
Retail Salespersons	16
General and Operations Managers **TOP JOB**	15
Registered Nurses **TOP JOB**	14
Office Clerks, General	13
Healthcare Support Workers, All Other	12
Waiters and Waitresses	11
Chief Executives **TOP JOB**	11
Property, Real Estate, and Community Association Managers	11

means the occupation has been identified as an important occupation involved in the oil and gas industry. Read more.
means the occupation has been identified as an important occupation involved in the maritime industry. Read more.
means the occupation has been identified as green. Read more.
TOP JOB means the occupation is projected to have a high growth rate and numerous openings, and has an above average wage. Read more.

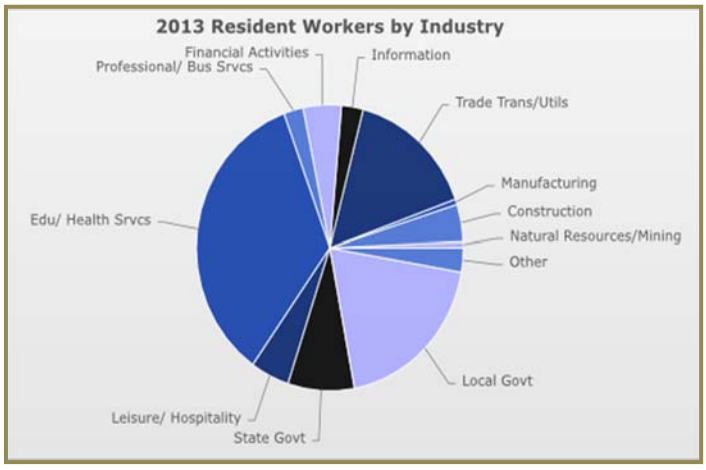
Dillingham Refuse Inc., a private firm, collects refuse three times a week. The Senior Center collects aluminum for recycling, and NAPA recycles used batteries. The Curyung Tribal Council coordinates an electronic equipment and fishing web recycling program.

Nushagak Cooperative owns and operates a diesel-generated electric plant in Dillingham which supplies power to Dillingham and Aleknagik. The Cooperative also provides residential telephone, cable television and internet services to both communities. GCI is the local cell phone service provider.

There are 2 public schools in the community, attended by 526 students; there is also one private school however we do not have data on their enrollment numbers. Local hospitals or health clinics include Kanakanak Hospital and the Dillingham Health Center. The hospital is a qualified acute care facility.

The hospital also offers addiction treatment at Jakes Place and mental health services at the Bristol Bay Area Health Corporation (BBAHC) Community Mental Health Center.

Figure 2-3 Workers by Industry (Census 2014)



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 and BBAHC Medevac. Medical Services are also provided to 22 villages in the region. The BBAHC also runs the Community Health Aide Program which operates 21 clinics in the region.

Figure 2-4 depicts an aerial photograph of the City.

Figure 2-4 Aerial Photograph of the City of Dillingham (DCRA 2004)

This page intentionally left blank

Section Three 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 HMP. Outreach support documents and meeting information regarding the Planning Team and public outreach efforts are provided in Appendix G.

DMA 2000 and its implementing regulations for the planning process:

DMA 2000 Requirements
Local Planning Process §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: Element §201.6(b)(1): An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval; §201.6(b)(2): An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and nonprofit interests to be involved in the planning process; and §201.6(b)(3): Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information. §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. §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. §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.
1. REGULATION CHECKLIST
ELEMENT A. Planning Process
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1)) A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2)) A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1)) A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3)) A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii)) A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle?) (Requirement §201.6(c)(4)(i))
Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?
Source: FEMA, March 2015.

3.1 OVERVIEW

The State of Alaska, Division of Homeland Security and Emergency Management (DHS&EM) provided funding and project oversight to the consulting firm, AECOM to facilitate and guide Planning Team and HMP development.

The planning process for the 2016 HMP revisions began on December 16, 2014 with a teleconference with Ms. Jody Seitz, former Dillingham City Planner to explain how their community was selected by the Division of Homeland Security and Emergency Management

20142 Pre-Disaster Mitigation Grant award. AECOM staff described the HMP development requirement to enable the City to qualify for Hazard Mitigation Grant Program grants and the overall HMP development process.

The Dillingham HMP Update continues to focus on the community's efforts to mitigate damage from natural hazards. Ms. Seitz quickly contacted their Planning Team to once again focus the community's efforts to identifying available resources and capabilities for updating their 2008 HMP to ensure they maintain momentum with mitigating their more prolific hazards and to maintain future grant funding eligibility. The Planning Team will continue to act as an advocate for the planning process, assist with gathering information, and provide support during public participation opportunities. AECOM briefly discussed existing hazards that affect the community such as flood impacts and sediment deposition which are increasing in intensity due to climate changes.

The Planning Team identified applicable City resources and capabilities during the meeting. AECOM explained how the HMP differed from current emergency plans. The Planning Team then discussed the City's rolls such as: acting as an advocate for the planning process, assisting with gathering information, and supporting public participation opportunities. There was also a brief discussion about hazards that affect the community such as erosion, sediment deposition, and permafrost impacts, which are increasing in intensity.

The Planning Team further discussed the hazard mitigation planning process, asking participants to help identify hazards that affect the City, to identify impacts to residential and critical facilities, and for assisting the Planning Team with identifying and prioritizing mitigation actions for potential future mitigation project funding

In summary, the following five-step process took place from December 2014 through May 2016.

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. Monitor, evaluate, and update the plan: The Planning Team developed a process to ensure the plan was monitored to ensure it was used as intended while fulfilling community needs. The team then developed a process to evaluate the plan to compare how their decisions affected hazard impacts. They then outlined a method to share their successes with community members to encourage support for mitigation activities and to provide data for incorporating mitigation actions into existing planning mechanisms and to provide data for the plans five year update.
3. Assess risks: The Planning Team identified the hazards specific to Dillingham and with the assistance of a hazard mitigation planning consultant (AECOM), developed the risk assessment for seven identified hazards. The Planning Team reviewed the risk assessment, including the vulnerability analysis, prior to and during the development of the mitigation strategy.
4. 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.
5. Develop a mitigation strategy: After reviewing the risks posed by each hazard, the Planning Team developed a comprehensive range of potential mitigation goals and

actions. Subsequently, the Planning Team identified and prioritized the actions for implementation.

3.2 PLANNING TEAM

In 2014 the City of Dillingham's Planning Director, Ms. Jody Seitz kicked-off the beginning phases of the City of Dillingham's 2016 HMP update describing several HMP changes since the 2008 Legacy HMP's approval and implementation. Ms. Seitz organized a Planning Team consisting of City staff: former Fire Department Coordinator, Stephanie McCumber, Chief of Police Dan Pasquariello, Police Sergeant Rodney Etheridge, and Port Director Jean Barrett and included Curyung Tribal First Chief Thomas Tilden**.**

In order to finalize the 2016 HMP update, Ms. Courtenay Carty took over the revision efforts in spring 2016 which were relatively stagnant after Ms. Seitz departure from the City in 2015. The Planning Team was updated with current City staff and three City Council members (Table 3-1). At that time the Curyung Tribal Council began working on their own Tribal HMP with BBNA and chose not to participate in the Planning Team and instead elected to provide comments through the public process. As such, an HMP review workshop was hosted by the Dillingham Planning Commission on May 9, 2016 which included community stakeholders and representatives from the Dillingham Planning Commission, Curyung Tribal Council, Bristol Bay Native Association, Bristol Bay Area Health Corporation, and members of the HMP Planning Team. The following table reflects the 2016 HMP Update's current Planning Team's membership and their respective involvement or responsibilities.

Table 3-1 identifies the complete hazard mitigation Planning Team.

TABLE 3-1 2016 HAZARD MITIGATION PLANNING TEAM

Name	Title	Organization	Key Input
Braden Tinker	Fire Department Coordinator	City of Dillingham	Planning Team Member, data input and HMP review.
Jean Barrett	Port Director - Harbor Master	City of Dillingham	Planning Team Member, data input and HMP review.
Dan Pasquariello	Chief of Police	City of Dillingham	Planning Team Member, data input and HMP review.
Courtenay Carty	Planning Director	City of Dillingham	Planning Team Lead, HMP review, data input and 2016 revisions.
Paul Liedberg	City Council Member	City of Dillingham	Planning Team Member, data input and HMP review.
Holly Johnson	City Council Member	City of Dillingham	Planning Team Member, data input and HMP review.
Misty Savo	City Council Member	City of Dillingham	Planning Team Member, data input and HMP review.
Scott Simmons	Emergency Management, Hazard Mitigation, and Climate Change Planner	AECOM, Alaska	Responsible for initial HMP development, lead writer, project coordination.

3.3 PUBLIC & AGENCY INVOLVEMENT

AECOM extended an invitation to all individuals and entities identified on the project mailing list described the planning process and announced the upcoming communities' planning activities. The announcement was emailed to relevant academia, nonprofits, and local, state, and federal agencies on November 20, 2014. The following agencies were invited to participate and review the HMP:

- University of Alaska Fairbanks, Geophysical Institute, Alaska Earthquake Information Center (UAF/GI/AEIC)
- Alaska Native Tribal Health Consortium-Community Development (ANTHC)
- Alaska Volcano Observatory (AVO)
- Association of Village Council Presidents (AVCP)
- Denali Commission
- Alaska Department of Environmental Conservation (DEC)
- DEC Division of Spill Prevention and Response (DSPR)
- DEC Village Safe Water (VSW)
- Alaska Department of Transportation and Public Facilities (DOT/PF)
- Alaska Department of Community, Commerce, and Economic Development (DCCED)
- DCCED, Division of Community Advocacy (DCRA)
- Alaska Department of Military and Veterans Affairs (DMVA)
- DMVA, Division of Homeland Security and Emergency Management (DHS&EM)
- US Environmental Protection Agency (EPA)
- National Weather Service (NWS) Northern Region
- NWS Southeast Region
- NWS Southcentral Region
- Natural Resources Conservation Service (NRCS)
- US Department of Agriculture (USDA)
- USDA Division of Rural Development (RD)
- US Army Corps Of Engineers (USACE)
- US Bureau of Indian Affairs (BIA)
- US Bureau of Land Management (BLM)
- US Department of Housing and Urban Development (HUD)
- US Fish & Wildlife Service (USFWS)

HMP Planning Team Meetings

Code of Federal Regulations (CFR) Title 44, requires communities to schedule HMP Planning Team meetings and teleconferences to review, discuss, and determine mitigation implementation accomplishments, track data relevance for future HMP update inclusion and document recommendations (Table 3-2) for future HMP updates.

Table 3-2 Planning Team Meeting Summaries or Recommendations

Meeting Date	Meeting Attendees	Summary / Recommendations
Please See Appendix D – Public Outreach Activities		

Table 3-3 lists the community's public involvement initiatives focused to encourage participation and insight for the HMP update effort.

Table 3-3 Public Involvement Mechanisms

Mechanism	Description
Newsletter #1 Distribution (December 14 2014)	In December 2014, the jurisdiction distributed a newsletter introducing the upcoming planning activity. The newsletter encouraged the whole community to provide hazard and critical facility information. It was posted at the City Office, bulletin boards, stores, and the City's website to enable the widest dissemination.
Agency Involvement eMail (November 20, 2014)	Invited agencies to participate in mitigation planning effort and to review applicable newsletters located on the DHS&EM Local All Hazard Mitigation Plan Development website at: http://ready.alaska.gov/plans/localhazmitplans.htm
Newsletter #2 Distribution (September, 2015)	In September, 2015, the jurisdiction distributed a newsletter describing the HMPs availability and present potential HMP projects for review. The newsletter encouraged the whole community to provide comments or input. It was posted at the City Office, bulletin boards, stores, and distributed to each postal box to ensure everyone was aware of the meeting.
Public Meeting Notice	Notice of the meetings were posted on the City's website and at City Hall, the post office, bulletin boards, and stores to encourage communitywide participation.
Public Meeting Notice	Notice of the meeting was posted on the City's website and at City Hall, the post office, bulletin boards, and stores to encourage communitywide participation.

The Planning Team identified five natural hazards (earthquake, flood, ground failure, severe weather, and wildland fire); and four manmade/technological hazards (urban conflagration, hazardous materials, transportation and utility disruptions), which periodically impact or concern the City. A few of the legacy HMP's hazards have been combined within broader categories to better reflect their impacts and relationships.

AECOM described the specific information needed from the Planning Team to assess critical facility vulnerability and population risk by the location, value, and population within residential properties and critical facilities.

The risk assessment was completed after the community asset data was collected by the Planning Team during 2014/2015, which identified potentially exposed and vulnerable City assets from their specific hazards.

The Planning Team evaluated these facilities and their associated risks to expedite creating a viable or realistic risk analysis and subsequent vulnerability assessment.

A Planning Team meeting was held in August, 2015 to review and prioritize the mitigation actions identified based on the results of the risk assessment. A second newsletter was prepared and

delivered in September, 2015 describing the process to date, presenting the prioritized mitigation actions, and announcing the availability of the draft HMP for public review and comment.

The Planning Team reviewed the draft HMP for accuracy during September 2015 – ensuring it meets the City's needs. Their review was productive with the Team highlighting minor corrections or suggesting refinements. The review specifically targeted updating plan content to address legacy initiatives, new hazard impacts, an updated community vulnerability assessment, and mitigation strategy improvements.

Public comment opportunities where available multiple times throughout the spring of 2016 as the HMP was frequently on the agenda for the City Council (March, April, June) and Planning Commission (March, May). In addition to these meetings, the Planning Commission held an HMP workshop on May 9, 2016. Feedback from stakeholders was documented, prioritized and incorporated into the 2016 HMP revision, as well as saved for future revision cycles. Copies of the May 9th workshop and its recommendations are found in Appendix D – Public Outreach Activities.

3.4 2008 LEGACY HMP REVIEW

AECOM described the HMP information needs during the initial December 2014 teleconference that formed the foundation for updating the 2008 legacy HMP.

The Planning Team did not complete their designated annual HMP reviews or plan maintenance activities. Therefore it became a primary consideration to refine all hazards that have, or could potentially have affected the community during the legacy HMP's 5-year lifecycle.

Table 3-4 delineates Planning Team identified HMP components that necessitated information update or reconsideration. The Team determined how community changes, construction and infrastructure conditions, climate change impacts, and population increases or decreases have influenced hazard risks and/or facility vulnerabilities.

The 2016 HMP Update process included inviting new and existing stakeholders to review the legacy HMP to determine what was accomplished, versus what was intended to accomplish. Pertinent section review data are identified within Table 3-4.

Table 3-4 HMP Review and Update Needs Determination

2008 HMP Section	2008 FHMP Items to be Updated	Status: F: Fulfilled NF: Not Fulfilled	2008 HMP Identified items for Deletion	Newly Identified Items to be Added for HMP Compliance	New Action Commitment
Planning Process	• Planning process • Planning team membership • Mitigation resource list • Public outreach initiatives • Plan Maintenance Activities • Review HMP Obligations	• NF: Did not meet or complete annual HMP review • NF: Adding Manmade/ Technological Hazards • NF: Continued Plan Development	• None	• Refine plan maintenance processes and responsibilities	• Planning Team will begin to hold annual review meetings and, • Strive to integrate HMP initiatives into other plans, ordinances, and resolutions to assure NFIP compliance.

Table 3-4 HMP Review and Update Needs Determination

2008 HMP Section	2008 FHMP Items to be Updated	Status: F: Fulfilled NF: Not Fulfilled	2008 HMP Identified items for Deletion	Newly Identified Items to be Added for HMP Compliance	New Action Commitment
Hazard Profile Update	• Update all hazards' profiles to reflect new event history • Profile newly identified hazard risks	• NF: Update hazard profile with new event history or impacts	• Mitigation projects that were deleted or combined due to similarity	• Identify new hazards • Update or develop new Mitigation Action Plan (MAP) • Update legacy hazards' impacts • Include Manmade and Technological Hazards identified in former HMP	• Track Mitigation Action's progress, successes, and barriers to implement
Risk Analysis and Vulnerability Assessment	• Identify development and land use changes • Asset inventory • Vulnerability analysis & summaries	• NF: Identify development and land use changes	• None	• Develop asset inventory • Determine infrastructure vulnerabilities • Determine residential structure vulnerabilities • Identify repetitive loss properties as appropriate	• Fill data gaps • Locate scientific information to augment these data. • Delineate climate change scenario for future development analysis
Mitigation Strategy	• Determine legacy mitigation actions' status • Define legacy mitigation actions' implementation successes or barriers to implement	• NF: Did not track project implementation processes, successes, or roadblocks	• Deleted completed, or combined actions	• New identified mitigation actions for newly developed hazards • Develop community specific capability assessment	• Annually review action's status and feasibility

3.5 EXISTING DATA INCORPORATIION

The Planning Team reviewed and incorporated information from identified plans, studies, reports, and technical reports into the HMP. This includes newly identified information completed during the 5-year lifespan of the legacy HMP.

The following were available, reviewed, information incorporated, and referenced for the jurisdiction information and hazard profiles in the risk assessment of the HMP for the City (Table 3-5).

Table 3-5 Documents Reviewed

Existing plans, studies, reports, ordinances, etc.	Contents Summary (How will this information improve mitigation planning?)
Dillingham HMP, March 2008	Provided historical hazard info foundation to perform the 2016 HMP update
Dillingham Comprehensive Plan (CP) Update & Waterfront Plan, October 2010 with Parts 1, 2, & 3 and Land Use Map	Provided authorities, infrastructure, and land-use data essential for grant management capacity determination and infrastructure vulnerability analysis
City of Dillingham Municipal Code and Ordinances	Defines construction, siting, and land use constraints
Dillingham Capital Improvement Plan (CIP), 2013-2018	Provided information concerning their future infrastructure improvement goals and potential project lists
Dillingham Solid Waste Management Plan (SWMP), June 2006	Provided geological and hazardous materials management data
Dillingham Disaster Response Plan	Provides hazard impact data
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	Explained their shoreline conditions
US Army Corps of Engineers, Alaska Village Erosion Technical Assistance Program report, - April 2006	Defined the community's erosion impacts and associated information
US Army Corps of Engineers, Alaska Baseline Erosion Assessment, 2009	Defined the area's erosion impacts
US Army Corps of Engineers, Floodplain Manager's Reports, October 2011	Defined the area's historical flood impacts
State of Alaska, Department of Commerce, Community and Economic Development Community Profile	Provided historical and demographic information
State of Alaska Hazard Mitigation Plan (SHMP), 2013	Defined statewide hazards and their potential locational impacts

A complete reference list is located in Section 8.

3.6 PLAN MAINTENANCE

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

The following three process steps were addressed in detail:

1. Implementation into existing planning mechanisms
2. Continued public involvement
3. Monitoring, reviewing, evaluating, and updating the HMP

3.6.1 Implementation HMP Precepts

DMA 2000 and its implementing regulation for HMP implementation through existing planning mechanisms:

DMA 2000 Requirements
Incorporation into Existing Planning Mechanisms §201.6(b)(3): Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.
1. REGULATION CHECKLIST
ELEMENT A Planning Process (Continued)
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information?
Source: FEMA, March 2015.

Once the HMP is community adopted and receives FEMA's final approval, the Planning Team ensures that the HMP, in particular each Mitigation Action Project, is incorporated into existing planning mechanisms whenever possible. Each member of the Planning Team will participate in 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 HMP 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

3.6.2 Continued Public Involvement

DMA 2000 and its implementing regulation for continued public involvement:

DMA 2000 Requirements
Continued Public Involvement §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.
1. REGULATION CHECKLIST
ELEMENT A Planning Process (Continued)
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))
Source: FEMA, March 2015.

The City is dedicated to involving the public directly in the continual reshaping and updating the HMP. A paper copy of the HMP and any proposed changes will be available at the City Office. An address and phone number of the Planning Team Leader to whom people can direct their comments or concerns will also be available at the City Office.

The May 2006 Post Office "Box Holder" survey results provided a solid foundation for the 2016 HMP Update process because it involved a wide audience (residents, businesses, and local and Tribal government organizations) for verifying which hazards impact the area. The survey

educated the public about the hazard mitigation planning process, and received public comment regarding hazards and potential mitigation actions.

A summary of the results of the survey are presented in Tables 3-6 and 3-7:

Table 3-6 Summary of Box Holder 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 3-7 Summary of Box Holder 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?)					

Table 3-7 Summary of Box Holder Survey Results – Mitigation Actions

MITIGATION MEASURE	Agree Strongly	Agree	No Opinion	Disagree	Disagree Strongly
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 vulnerability analysis as well as potential mitigation actions addressing each hazard were presented to the public in September, 2015. 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.

The 2006 box holder surveys' hazard information is deemed valid as to general consensus for this HMP update. Other opportunities for public involvement in the hazard mitigation planning process included:

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

The Planning Team will continue to identify opportunities to raise community awareness about the HMP 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 HMP will be collected by the Planning Team Leader, included in the annual report, and considered during future HMP updates.

3.6.3 Monitoring, Reviewing, Evaluating, and Updating the HMP

DMA 2000 and its implementing regulation for monitoring, reviewing, evaluating, and updating the HMP:

DMA 2000 Requirements
Monitoring, Evaluating and Updating the Plan §201.6(c)(4)(i): The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.
1. REGULATION CHECKLIST
ELEMENT A. Planning Process (Continued)
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle?)
Source: FEMA, March 2015.

This section provides an explanation of how Dillingham's Planning Team intends to organize their efforts to ensure that improvements and revisions to the HMP occur in a well-managed, efficient, and coordinated manner.

The following three process steps are addressed in detail here:

1. Review and revise the HMP to reflect development changes, project implementation progress, project priority changes, and resubmit
2. HMP resubmittal at the end of the plan's five year life cycle for State and FEMA review and approval
3. Continued mitigation initiative implementation

3.6.3.1 Monitoring the HMP

The HMP was prepared as a collaborative effort. To maintain momentum and build upon previous hazard mitigation planning efforts and successes, the City will continue to use the Planning Team to monitor, review, evaluate, and update the HMP. Each authority identified in the Mitigation Action Plan (MAP) matrix (Table 7-11) will be responsible for implementing the Mitigation Action Plan and determining whether their respective actions were effectively implemented. The City Planning Director, is the Hazard Mitigation Planning Team Leader and will serve as the primary point of contact for the HMP and is responsible for coordinating local efforts to monitor, evaluate, revise, and tabulate HMP actions' status.

3.6.3.2 Reviewing the HMP

The City will review their success for achieving the HMP's mitigation goals and implementing the Mitigation Action Plan's activities and projects during the annual review process.

During each annual review, each agency or authority administering a mitigation project will submit a Progress Report (Appendix G) to the Planning Team. The report will define the legacy mitigation project's current status, including any project changes, a list of identified implementation barriers (defining an appropriate strategy to overcome them), and a statement of whether or not the project has helped achieve its intended appropriate goal.

3.6.3.3 Evaluating the HMP

The Annual Review Questionnaire (Appendix G) provides the basis for future HMP evaluations by guiding the Planning Team with identifying new or more threatening hazards, adjusting to changes to, or increases in, resource allocations, and garnering additional support for HMP implementation.

The Planning Team Leader will initiate the annual review two 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:

- Determine City authorities, outside agency, stakeholders, and resident's participation in HMP implementation success
- Identify notable risk changes for each identified and newly considered natural or human-caused hazards
- Consider land development activities and related programs' impacts on hazard mitigation
- Mitigation Action Plan implementation progress (identify problems and suggest improvements as necessary)

- Evaluate HMP local resource implementation for HMP identified activities

3.6.3.4 Updating the HMP

In addition to the annual review, the Planning Team will update the HMP every five years. This section explains how they will review, evaluate, and explain implementation successes.

DMA 2000 Requirements
Reviewing, Evaluating, and Implementing the Plan §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit if for approval within 5 years in order to continue to be eligible for mitigation project grant funding.
1. REGULATION CHECKLIST
ELEMENT D. Planning Process (Continued) *Update activities not applicable to the plan version*
D1. Was the Plan revised to reflect changes in development? (Requirement §201.6(d)(3))
D2. Was the Plan revised to reflect progress in local mitigation effort? (Requirement §201.6(d)(3))
D3. Was the Plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))
Source: FEMA, March 2015.

The City of Dillingham's Planning Team did not conduct an annual review the legacy HMP during its five-year life cycle. However, moving forward the City of Dillingham recommitted to annually reviewing the HMP and completing an Annual Review Questionnaire (Appendix G) as described in Section 3.6.3.3. This will facilitate updating the HMP every five years (or when significant changes occur).

A complete Annual Review Questionnaire will enable the Team to identify possible changes (successes, failures, and roadblock experiences) in the HMP Mitigation Action Plan by refocusing on new or more threatening hazards, resource availability, and acquiring stakeholder support for the HMP project implementation.

No later than the beginning of the "third" year following HMP adoption, the Planning Team will undertake the following activities:

- Request grant assistance from DHS&EM to update the HMP (this can take up to one year to obtain and one year to update the plan)
- Ensure that each authority administering a mitigation project will submit a Progress Report to the Planning Team
- Develop a chart to identify those HMP sections that need improvement, the section and page number of their location within the HMP, and describing the proposed changes
- Thoroughly analyze and update the natural hazard risks
  - Determine the status of the City's legacy mitigation projects
  - Identify the proposed Mitigation Plan Actions (projects) that were completed, deleted, or delayed. Each action should include a description of whether the project should remain on the list, be deleted because the action is no longer feasible, or reasons for the delay

  - Describe how each action's priority status has changed since the HMP was originally developed and subsequently approved by FEMA
  - Determine whether or not the project has helped achieve the appropriate goals identified in the plan
  - Describe whether the community has experienced any barriers preventing them from implementing their mitigation actions (projects) such as financial, legal, and/or political restrictions and stating appropriate strategies to overcome them
  - Update ongoing processes, and to change the proposed implementation date/duration timeline for delayed actions the City of Dillingham still desires to implement
  - Prepare a "new" MAP matrix for the 2016 HMP Update
- Prepare a new updated Draft HMP
- Submit the updated draft HMP to the Division of Emergency Management (DHS&EM) and FEMA for review and approval

3.6.3.5 Formal State and FEMA HMP Review

Completed Hazard Mitigation Plans do not qualify the City for mitigation grant program eligibility until they have been initially reviewed by the State and FEMA, adopted by the City Council, and received FEMA final approval.

The City of Dillingham will submit the draft HMP to DHS&EM for initial review and preliminary approval. Once any corrections are made, DHS&EM will forward the HMP to FEMA for their review and conditional approval.

Upon FEMA conditional approval, the City will pass a formal HMP Adoption Resolution. A copy will be sent to FEMA through DHS&EM for final HMP approval.

FEMA's final approval assures the City is eligible for applying for appropriate mitigation grant program funding. AECOM will send a final copy of the FEMA approved HMP to the City.

This page intentionally left blank

Section Four is included to fulfill the City of Dillingham's HMP adoption requirements.

4.1 JURISDICTIONAL ADOPTION

DMA 2000 and its implementing regulations for governing body formal HMP adoption:

DMA 2000 Requirements
Local Plan Adoption
§201.6(c)(5): [The 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). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.
1. REGULATION CHECKLIST
ELEMENT E. Plan Adoption
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval??) (Requirement §201.6(c)(5))
Source: FEMA, March 2015.

The City of Dillingham and the Curyung Tribe of Dillingham's Tribal Council are represented in this HMP; they meet the requirements of Section 409 of the Stafford Act, Section 322 of DMA 2000, and 44 CFR §201.6(c)(5) and 201.7 respectively.

The Dillingham City Council adopted the HMP on August 18, 2016 and submitted the final draft HMP to FEMA for formal approval.

A scanned copy of their formal adoptions are included in Appendix C.

This page intentionally left blank

Section Five identifies and profiles the hazards that could affect the City of Dillingham.

5.1 OVERVIEW

A hazard analysis includes the identification, screening, and profiling of each hazard. Hazard identification is the process of recognizing the natural events that threaten an area. Natural hazards result from unexpected or uncontrollable natural events of sufficient magnitude. The City desired to address human, technological, and terrorism related hazards during their 2008 HMP development process. They were deemed beyond the scope of that planning effort. Even though a particular hazard may not have occurred in recent history in the study area, all natural hazards that may potentially affect the study area were 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, extent, and recurrence probability. Hazards are identified through historical and anecdotal information collection, existing plans, studies, and map reviews, and study area hazard map preparations when appropriate. Hazard maps are used to define a hazard's geographic extent as well as define the approximate risk area boundaries.

DMA 2000 and its implementing regulations for hazard identification:

DMA 2000 Requirements
Identifying Hazards §201.6(c)(2)(i): The risk assessment shall include a] description of the type, 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. §201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.
1. REGULATION CHECKLIST
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction? B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods?
Source: FEMA, March 2015.

5.2 HAZARD IDENTIFICATION AND SCREENING

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

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 were reevaluated; the hazards that are unlikely to occur, or for which the risk of damage is accepted as being very low, were eliminated from future consideration.

Therefore, on December 16, 2014 the Planning Team reviewed 11 possible hazards that could affect the Dillingham area (within the Bristol Bay Borough and the Southwest Region REAA). They then evaluated and screened these hazards based on a range of factors, including prior knowledge or perception of each hazard's threat and the relative risk presented by each hazard, the ability to mitigate their impacts, and the known or expected availability of information on the hazard (Table 5-1).

Four technological hazards were identified during the legacy 2008 HMP's development process but were beyond the scope-of-work at that time. The Planning Team reviewed the 2008 Legacy HMP to determine how to best simplify the HMP. It was deemed appropriate to group hazards that have similar potential impacts and generating conditions. For example to combine flood and erosion to best describe high water flow impacts and damages; all weather related events were combined under severe weather. The flood and weather hazard categories shared instigating event descriptions which may slightly overlap among the two hazard categories.

Three legacy 2008 HMP hazards (urban conflagration, hazardous materials, and utility/transportation systems disruptions) were profiled during this HMP update and are located within the Manmade/Technological Hazards Profile (Section 5.3.2).

It was determined that "Terrorism;" identified during the 2008 Legacy HMP development process is deemed a low hazard probability and will no longer be identified as a potential hazard. The US Department of Homeland Security (DHS), Federal Aviation Administration (FAA), and the US Coast Guard (USCG) and its Transportation Security Agency (TSA) have jurisdiction for these event types. Any mitigation action deemed appropriate for Terrorism mitigation will fall under these governing agencies' guidance. Should the risk from these hazards increase in the future, the HMP 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
Natural Hazards		
Earthquake	Yes	The City of Dillingham is within close proximity to named and un-named earthquake faults (i.e. within 300 miles of the Alaska-Aleutian seismic zone)
Flood (includes coastal and riverine sour, surface run-off, etc.)	Yes	Coastal storm surge and riverine ice jam flooding and high wind events occur regularly which exacerbates high water flow shoreline, bluff, and surface runoff scour (erosion)
Ground Failure (subsidence, avalanche, landslide, etc.)	Yes	Minor ground failure events (includes avalanche, landslide, permafrost, subsidence) could occur within the City from melting permafrost, ground water seepage and scour, and land subsidence
Severe Weather	Yes	Severe weather including heavy snow, ice storms, hail, and extremely high winds are regular seasonally occurring events
Tsunami (Seiche)	*No*	*This hazard does not pose an immediate threat to the community*
Volcano (Volcanic Ash)	Yes	There is historic evidence of volcano-activity that may impact the Dillingham area.
Wildland Fire	Yes	The relatively flat terrain, vegetation fuels, and climate change influenced weather conditions are favorable for wildland fire propagation throughout the area as well as within close proximity to the City
Manmade, Technological, and Other Hazards (*these hazards could potentially impact the City of Dillingham)*		
Urban Conflagration	Yes	Urban Fire (conflagration) in high density areas of downtown Dillingham is a concern. Also includes wildfire/urban interface (WUI) fire
Hazardous Materials	Yes	This hazard is a concern for the City of Dillingham. However it is beyond this HMP's Scope for profiling
Transportation and Utility Disruption	Yes	Volcanic ash and severe weather can disrupt cargo and utility service delivery to area residents
Terrorism	*No*	*This hazard is present in the City of Dillingham. However it is beyond this HMP's Scope for profiling. It will be dropped from future consideration.*
Infectious Disease	*No*	*This hazard is present in the City of Dillingham. However it is beyond this HMP's Scope for profiling. It will be dropped from future consideration.*
Mine Waste	*No*	*This hazard is present in the City of Dillingham. However it is beyond this HMP's Scope for profiling. It will be dropped from future consideration.*
Drug Trafficking	*No*	*This hazard is present in the City of Dillingham. However it is beyond this HMP's Scope for profiling. It will be dropped from future consideration.*
Aquifer Pollution	Yes	This hazard is present in the City of Dillingham.

5.3 HAZARD PROFILES

DMA 2000 and its implementing regulations for hazard profiles:

DMA 2000 Requirements
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.
1. REGULATION CHECKLIST
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction?
Source: FEMA, March 2015.

The Planning Team determined that a few of their previously identified hazards can be combined or separated to better describe a more comprehensive impact range such as placing erosion impacts within the flood hazard profile and placing urban conflagration within manmade hazard category.

The 2016 HMP update will address five natural hazard categories: earthquake, flood, ground failure, severe weather, and wildland fire; and four Technological hazards hazardous materials (HazMat), urban conflagration, transportation disruptions, and utility service disruptions) within the Manmade/Technological Hazards Profile (Section 5.3.2).

They further stated that some of their more recent hazards impacts are influenced recent years by unpredictable and rapidly changing climate conditions such as late ice formation, early thaw and late freeze-up conditions; and increased or inconsistent rain patterns. Table 5-2 delineates the City's reviewed natural hazards and Table 5-3 delineates technological hazards selected for profiling.

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

- Nature (Type)
  - Potential climate change impacts are primarily discussed in the Severe Weather hazard profile but are also identified where deemed appropriate within each hazard profile.
- History (Previous occurrences)
- Location
- Extent (Breadth, magnitude and severity)
- Impact (Section 5 provides general impacts associated with each hazard. Section 6 provides detailed impacts to Dillingham area residents and critical facilities)
- Recurrence Probability

NFIP insured Repetitive Loss Structures (RL) are addressed in Section 6.0, Vulnerability Analysis.

Each hazard is assigned a rating based on the following criteria for magnitude/severity (Table 5-2) and future recurrence probability (Table 5-3). Estimating magnitude and severity are determined based on historic events using the criteria identified in the introductory narrative description of Section 5.3.

Table 5-2 Hazard Magnitude/Severity Criteria

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

Similar to estimating magnitude and severity, recurrence probability is determined based on historic events, using the criteria identified above, to provide the likelihood of event recurrence (Table 5-3).

Table 5-3 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 percent). • History of events is greater than 33 percent 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 percent). • History of events is greater than 20per cent but less than or equal to 33 percent 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 percent). • History of events is greater than 10 percent but less than or equal to 20 percent 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 percent). • History of events is less than or equal to 10 percent likely per year. • Event is "Unlikely" but is possible to occur.

5.3.1 Natural Hazard Profiles

The hazards profiled for the Dillingham area are presented throughout the remainder of Section 5.3. The presentation order does not signify their importance or risk level.

5.3.1.1 Earthquake

5.3.1.1.1 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 only 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. An earthquake causes waves in the earth's interior (i.e., seismic waves) and along the earth's surface (i.e., 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). There are also two types of surface waves: Raleigh waves and Love waves. These waves travel more slowly and typically are significantly less damaging than seismic waves.

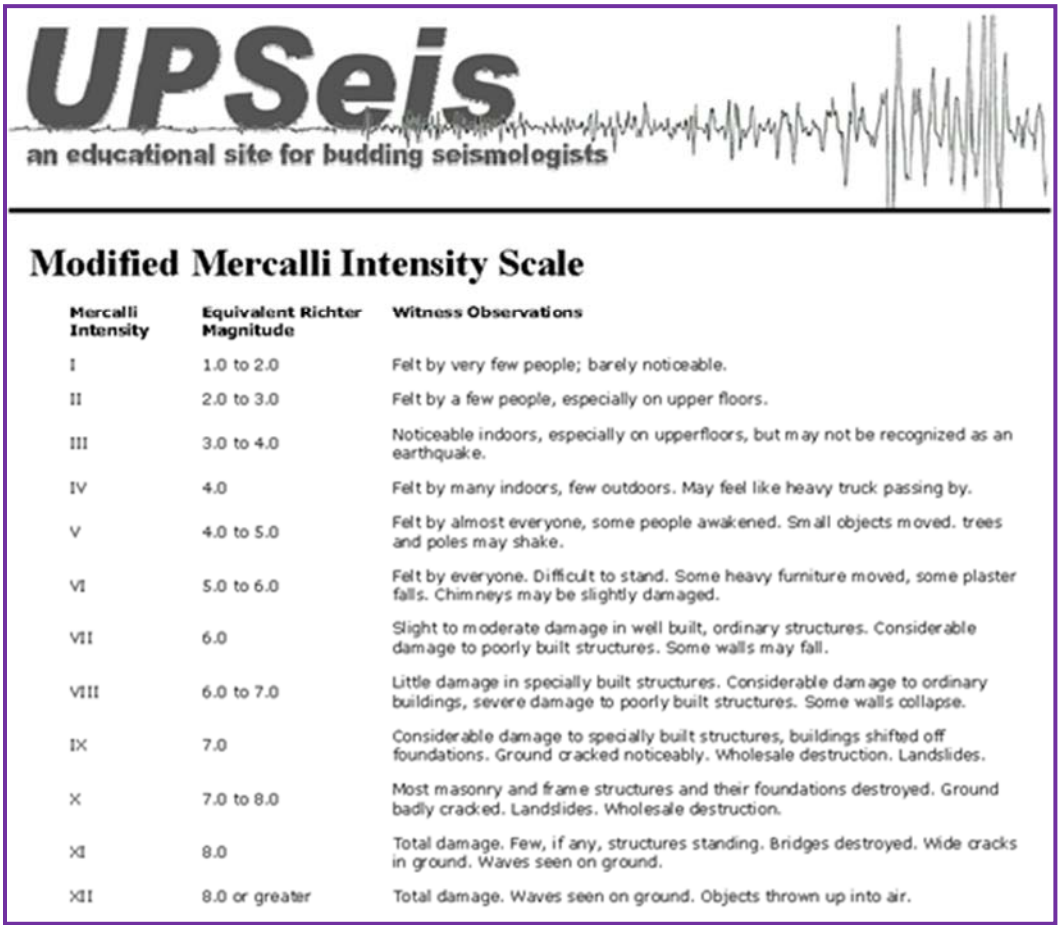
In addition to ground motion, several secondary natural hazards can occur from earthquakes such as:

- **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 feet [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 ft, 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.

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 Intensity (MMI) Scale. As shown in Table 5-4, the MMI 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 as acceleration due to gravity (g) (MMI 2006).

Magnitude (M) 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 (Figure 5-1).



Modified Mercalli Intensity Scale

Mercalli Intensity	Equivalent Richter Magnitude	Witness Observations
I	1.0 to 2.0	Felt by very few people; barely noticeable.
II	2.0 to 3.0	Felt by a few people, especially on upper floors.
III	3.0 to 4.0	Noticeable indoors, especially on upperfloors, but may not be recognized as an earthquake.
IV	4.0	Felt by many indoors, few outdoors. May feel like heavy truck passing by.
V	4.0 to 5.0	Felt by almost everyone, some people awakened. Small objects moved. trees and poles may shake.
VI	5.0 to 6.0	Felt by everyone. Difficult to stand. Some heavy furniture moved, some plaster falls. Chimneys may be slightly damaged.
VII	6.0	Slight to moderate damage in well built, ordinary structures. Considerable damage to poorly built structures. Some walls may fall.
VIII	6.0 to 7.0	Little damage in specially built structures. Considerable damage to ordinary buildings, severe damage to poorly built structures. Some walls collapse.
IX	7.0	Considerable damage to specially built structures, buildings shifted off foundations. Ground cracked noticeably. Wholesale destruction. Landslides.
X	7.0 to 8.0	Most masonry and frame structures and their foundations destroyed. Ground badly cracked. Landslides. Wholesale destruction.
XI	8.0	Total damage. Few, if any, structures standing. Bridges destroyed. Wide cracks in ground. Waves seen on ground.
XII	8.0 or greater	Total damage. Waves seen on ground. Objects thrown up into air.

Figure 5-1 Modified Mercalli Intensity (MMI 2015)

Each year Alaska has approximately 5,000 earthquakes, including 1,000 that measure above 3.5 on the Modified Mercalli Scale. Alaska is vulnerable to three types of earthquakes. One type is called a subduction zone earthquake; 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 1964 "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 intra-plate earthquakes which occur within a tectonic plate, sometimes at great distance from the plate boundaries. They can have magnitudes into the M7s. Shallow earthquakes in the Fairbanks area would be considered intra-plate earthquakes.

Earthquakes felt in the Dillingham area have not exceeded M6.6 in the past 35 years, and damage has never been reported due to an earthquake event.

5.3.1.1.2 History

Accurate seismology for Alaska is relatively young with historic data beginning in 1978 for most locations. Therefore data is limited for acquiring long-term earthquake event data. The HMP's Alaska earthquake data is based on best available data; obtained from the US Geological Survey (USGS) which lists 106 earthquakes with a magnitude greater than M2.5; three of which exceeded M5.0 located within 100 miles of the City since 1979 with an average magnitude of M3.3.

The Planning Team determined that based on available recorded data, the City of Dillingham has a minor concern for earthquake damages as they have not experienced damaging impacts from their historical earthquake events and only need to be concerned with earthquakes with a magnitude > M5.0. (SWMP 2006)

Therefore Table 5-4 lists 18 earthquakes that exceeded M4.0; with the largest being M5.4 (May 9, 1998), M5.5 (February 27, 2003), and an M6.6 (May 1, 1990).

Table 5-4 Dillingham Area Historical Earthquakes

Date	Time	Latitude	Longitude	Depth (Miles)	Magnitude	Location
6/13/2010	1:43:03 PM	58.12	-157.049	14.9	4.9	Alaska Peninsula
3/25/2006	9:38:11 AM	58.763	-156.423	191.9	4.2	Alaska Peninsula
1/13/2004	9:55:55 PM	58.658	-156.658	198	4.2	Alaska Peninsula
5/20/2003	3:30:47 PM	58.427	-156.218	156.5	4.2	Alaska Peninsula
2/27/2003	3:35:31 PM	58.706	-156.867	202	5.5	Alaska Peninsula
9/25/2001	11:26:30 PM	58.103	-158.527	1.2	4.2	Bristol Bay
5/9/1998	4:58:34 AM	57.985	-156.93	0	4.9	Alaska Peninsula
5/9/1998	3:55:52 AM	57.983	-156.963	0	5.4	Alaska Peninsula
2/10/1994	9:35:43 PM	59.856	-159.327	10	4.4	Southern Alaska
2/9/1994	7:55:50 AM	59.771	-159.614	0	4	Southern Alaska
6/30/1993	6:17:56 AM	58.628	-156.088	163.5	4.4	Alaska Peninsula
5/16/1992	2:56:00 AM	58.987	-160.279	0	4.2	Bristol Bay
5/1/1990	4:12:23 PM	58.802	-156.789	217.6	6.6	Alaska Peninsula
11/10/1989	2:12:02 AM	58.426	-157.105	46.6	4	Alaska Peninsula
9/2/1988	9:11:47 AM	58.551	-156.257	188	4.2	Alaska Peninsula
1/27/1986	11:29:59 AM	57.966	-157.98	146.3	4.1	Alaska Peninsula
11/19/1984	12:44:27 AM	58.567	-156.702	205.7	4.6	Alaska Peninsula
4/20/1983	10:18:33 AM	59.023	-155.972	208.7	4.5	Southern Alaska

(USGS 2015)

North America's strongest recorded earthquake occurred on March 27, 1964 in Prince William Sound measuring M9.2 and was felt by many residents throughout Alaska. Dillingham experienced moderate ground motion from this historic event. Planning Team members further stated they did not experience ground shaking from very distant November 3, 2002 M7.9 Denali Earthquake.

5.3.1.1.3 Location, Extent, Impact, and Recurrence Probability

Location

The entire geographic area of Alaska is prone to earthquake effects. According to the Earthquake UBC Zone Map in the SHMP, Dillingham is located in Zone 1 where Zone 0 is at the lowest and Zone 4 having the highest recurrence risk. The Uniform Building Code Seismic Zones in Alaska Map, and the SHMP, classify Dillingham in Zone 2 with Zone 0 being the lowest - and Zone 4 being the highest-risk. This indicates a low recurrence probability.

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 60 miles from an active fault lined western extension of the Denali Fault.

As such the Dillingham area has experienced 106 earthquakes since 1979 with an average of approximately 3.3 earthquakes per year. However, history shows that future significant events are likely to impact the area. Figure 5-2 shows the locations of active and potentially active faults in Alaska.

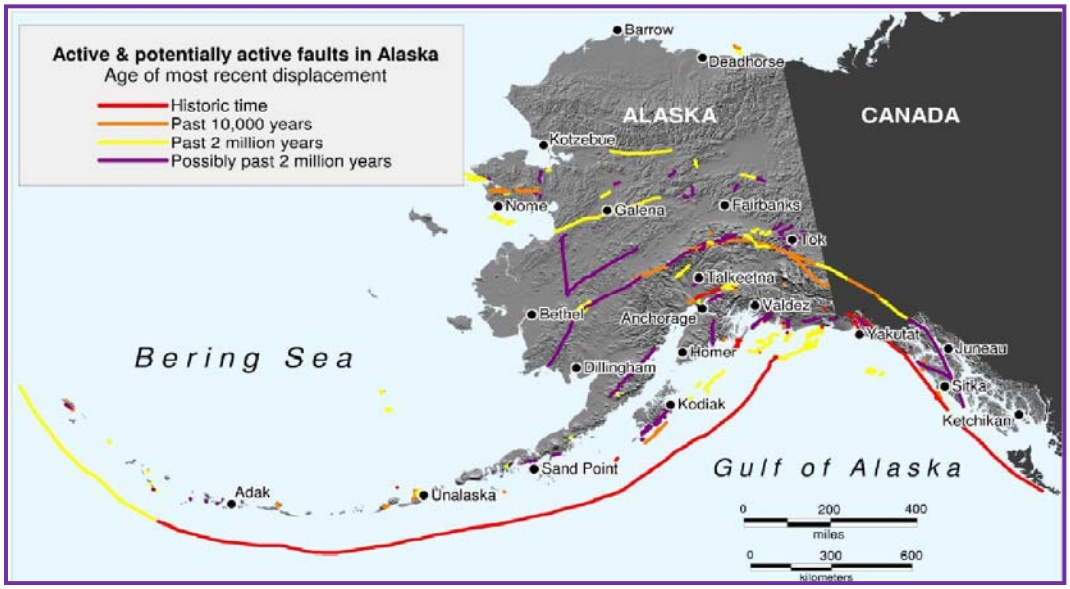


Figure 5-2 Active and Potentially Active Faults in Alaska (DGGS 2009a)

Extent

The City is located in close proximity to several earthquake faults as depicted in a clip of the Division of Geological and Geophysical Survey's 1994 Neotectonic Map of Alaska. Figure 5-3:

- Denali Fault-Togiak-Tikchik
- Denali Fault-Holitna
- Ataskaksovluk-Holokuk Fault Zone (yellow lines)
- Bruin Bay Fault-Becharof-Inlakin
- Lake Clark Fault to Dillingham's north east (blue lines)
- Many unnamed faults (smaller black lines)

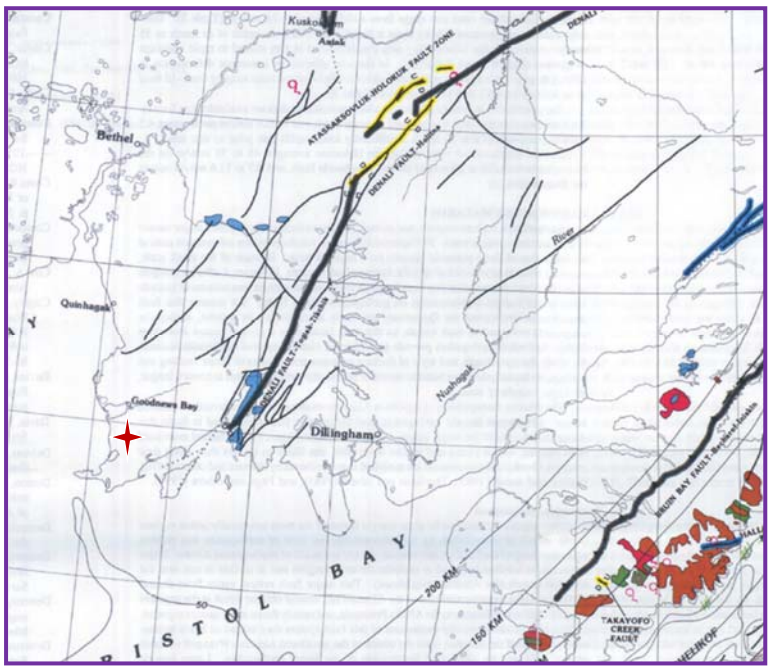


Figure 5-3 Neotectonic Map of Alaska, Dillingham Area (DGGS 1994)

Based on historic earthquake events and the criteria identified in Table 5-2, and the USGS Shake Map (Figure 5-4) the magnitude and severity of earthquake impacts in the City are considered "Limited" with potential injuries and/or illnesses that do not result in permanent disability; critical facilities could expect to be shut-down for more than two weeks; and more than 10 percent of property is severely damaged with limited long-term damage to transportation, 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. The City of Dillingham 2006 Solid Waste Management Plan (SWMP) states, "Dillingham has not experienced any recent structural damage from earthquakes."

However, significant ground movement impacts is possible. The community may experience infrastructure damage from earthquakes in excess of M5.0. Moderate shaking may be seen or felt

based on past events. Impacts to future populations, residences, critical facilities, and infrastructure are anticipated to remain the same.

Recurrence Probability

This USGS Alaska Shake Map (Figure 5-4), and more localized Dillingham area Shake Map (Figure 5-5), and an AECOM generated vulnerability assessment map (Figure 5-6) displays current seismicity for the area as well as the areas indicated earthquake with associated magnitude scale.

Peter Haeussler, USGS, Alaska Region states, a Shake Map is a viable representation to support probability inquiries.

> *"The occurrence of various small earthquakes does not change earthquake probabilities. In fact, in the most dramatic case, the probability of an earthquake on the Denali fault was/is the same the day before the 2002 earthquake as the day afterward. Those are time-independent probabilities. The things that change the hazard maps is changing the number of active faults or changing their slip rate" (Haeussler, 2009).*

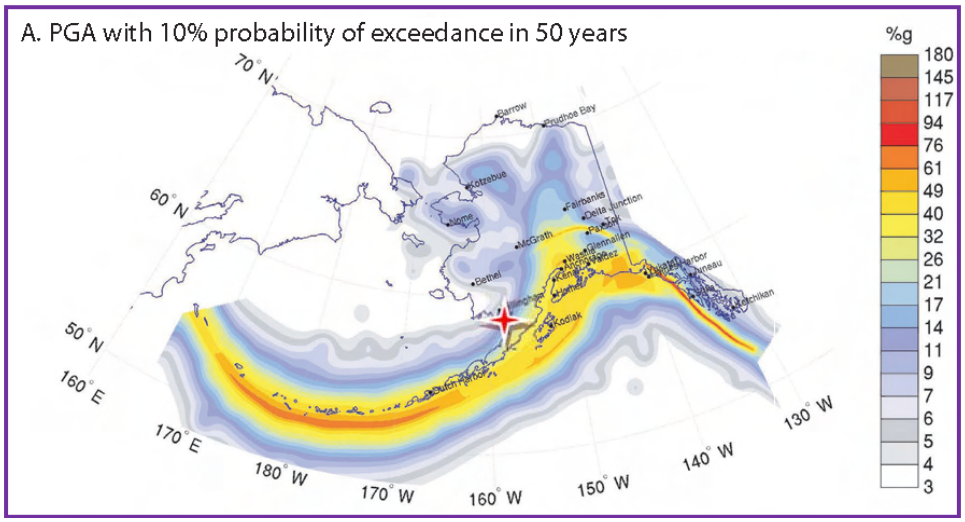


Figure 5-4 Alaska Seismic Zone Map (USGS 2014)

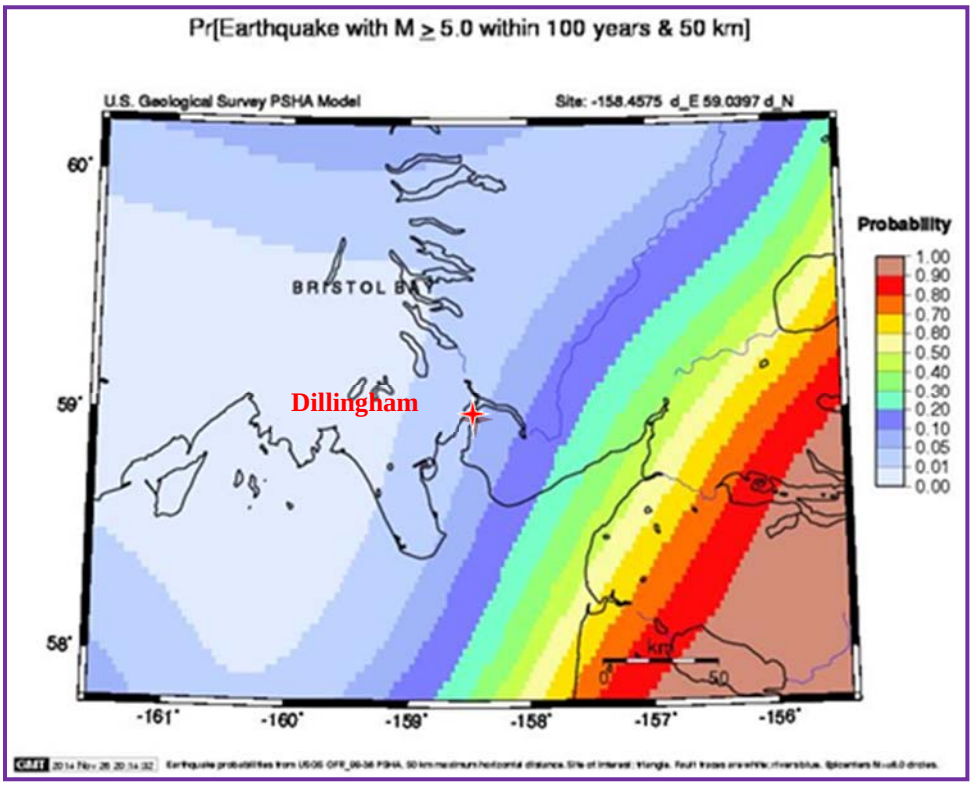


Figure 5-5 Dillingham's Earthquake Probability (USGS 2014)

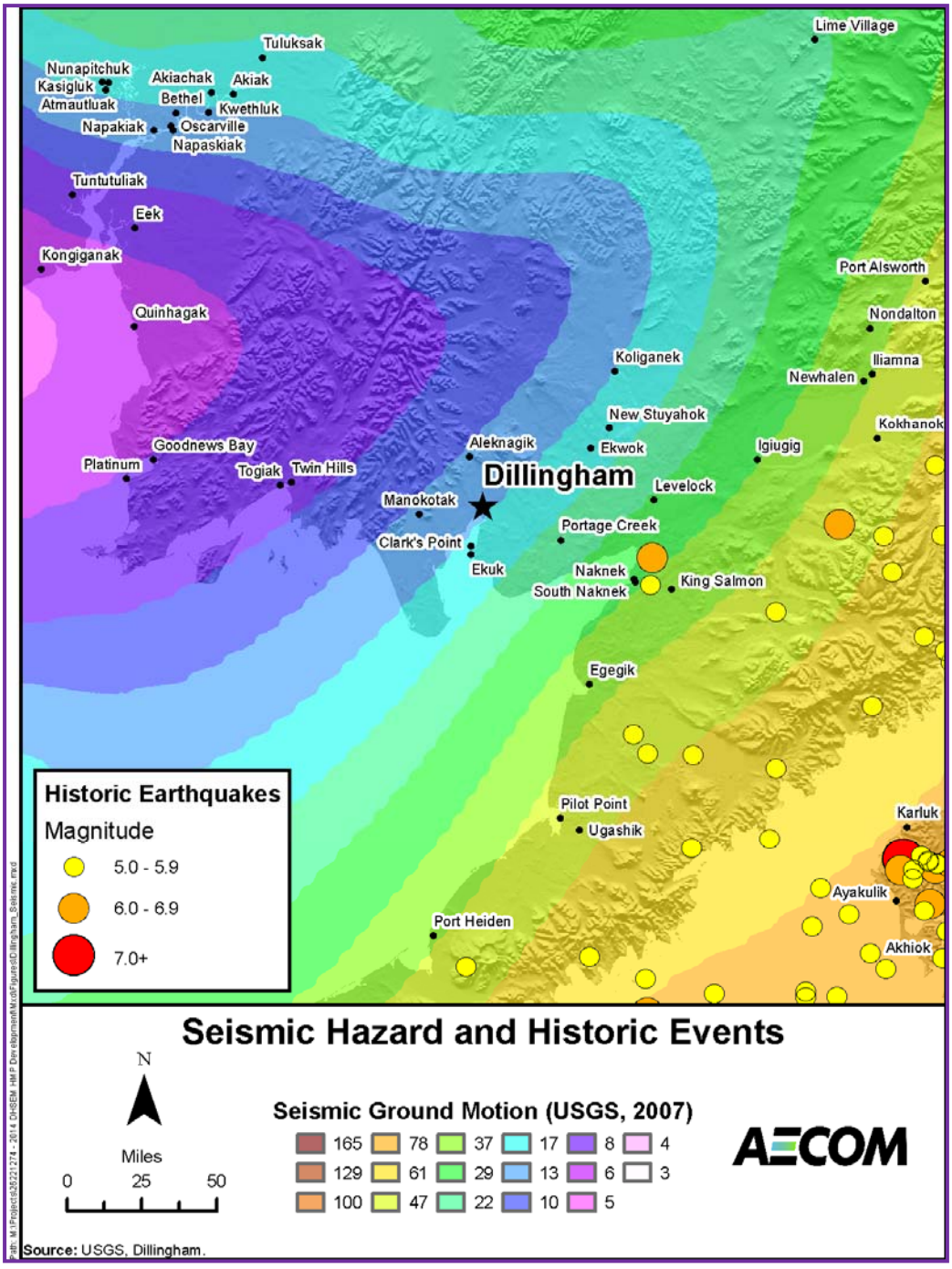


Figure 5-6 Dillingham's Earthquake Vulnerability Assessment Map (AECOM 2015)

Therefore, while it is not possible to predict when an earthquake will occur; the Shake Map (Figure 5-4) indicates a M5.0 or greater earthquake occurring within 100 years and 33 miles of the City as having a .005 percent recurrence probability. It is classified as "Unlikely" that an earthquake would be centered in an area around Dillingham.

5.3.1.2 Flood

5.3.1.2.1 Nature

Flooding is the accumulation of water where usually none occurs or the overflow of excess water from a stream, river, lake, reservoir, glacier, 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.

Flood events not only impact communities with high water levels, or fast flowing waters, but sediment transport also impacts infrastructure and barge and other river vessel access limitations. Dredging may be the only option to maintain an infrastructure's viability and longevity.

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

- Structure inundation, causing water damage to structural elements and contents.
- Stream bank, roadway embankment, foundation, bridge pier footings, and other feature's scouring and erosion.
- 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.
- Crops, topsoil loss, and debris and sediment deposition where unwarranted.
- Sewage and hazardous or toxic materials releases 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 and utility service deliveries such as water and sewer service exacerbating emergency response expenditures and normal function disruptions throughout a community.

Four primary types of flooding occur in the City: rainfall-runoff, snowmelt, ice jam, storm surge, and ice override floods.

Rainfall-Runoff Flooding occurs in late summer and early fall. The rainfall intensity, duration, distribution, and geomorphic characteristics of the watershed all play a role in determining the magnitude of the flood. Rainfall runoff flooding is the most common type of flood. This type of flood event generally results from weather systems that have associated prolonged rainfall.

Snowmelt Floods typically occur from April through June. The depths of the snowpack and spring weather patterns influence the magnitude of flooding.

Ice-Jam floods occur when warming temperatures and rising water flows causes the ice to break-up and disconnect from the embankment. The large ice chunks begin to flow and move down river. The ice does not flow easily, often impacting with adjacent blocks resulting in occasional ice jams. Some ice jams quickly break apart, however, larger jams occur which create small dams causing the water to exert increasing pressure on the jam creating a damming effect. Water subsequently begins to build depth and often overtops adjacent embankments which flood upstream communities.

When the ice-jam breaks the built-up water rushes downstream with great force. Ice blocks scour the embankment, destroying infrastructure such as fuel headers, barge landings, and boat mooring structures. Large house sized ice blocks may even be driven above the embankment destroying any structure in its path. Communities are virtually helpless against such devastation.

Storm Surge 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-flooding water's force. The conditions that cause coastal floods also can cause significant shoreline erosion as the flood waters undercut roads and other structures. Storm surge is a leading cause of property damage in Alaska.

Communities that are situated on low-lying coastal lands with gradually sloping bathymetry near the shore and exposure to strong winds with a long fetch over the water are particularly susceptible to coastal flooding. 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 season in these locations. As shore-fast ice forms along the coast before winter, the risk of coastal flooding abates, but, later freeze-ups greatly increase the risk of scour, storm surge flooding, and ice override events.

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.

Coastal Scour (used interchangeably with erosion) rarely causes death or injury. However, severe scour causes property destruction, prohibits development, and impacts community infrastructure. Erosion is typically gradual land loss through wind or water scour. However, erosion can occur rapidly as the result of floods, storms or other event or slowly as the result of long-term environmental changes such as melting permafrost. Erosion is a natural process, but its effects can be easily exacerbated by human activity.

Coastal and riverine high water flow impacts threaten the Dillingham area's infrastructure, built environment, and utilities adjacent embankments and shorelines.

Coastal scour, sometimes referred to as tidal, bluff, or beach erosion, may other times encompass different categories altogether. For this profile, tidal, bluff and beach erosion will be nested within the term coastal scour.

Scour is land loss impacts to beach, shoreline, or dune material from natural activity or human influences. Coastal scour occurs over the area roughly from the top of the bluff out into the near-shore region to about the 30 feet 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 scour because of the dramatic change it causes to the landscape. As a result, this scour aspect usually receives the most attention.

Scour force impacts are embodied in waves, currents, and winds; surface and ground water flow; freeze-thaw cycles may also play a role. Not all of these forces may be present at any particular location. Coastal scour 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 damages often occurs during storms, particularly because the highest energy waves are generated under storm conditions.

Land loss often occurs from 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. Attempts to control erosion using shoreline protective measures such as groins, jetties, seawalls, or revetments can lead to increased erosion.

Riverine Scour results from the force of flowing water and ice formations in, and adjacent to, river channels. This scouring affects the river the channel, river bed and banks, and can alter or preclude any channel navigation or riverbank development. In less stable braided channel reaches, scour, and material deposition are constant issues. In more stable meandering channels, scour episodes may only occasionally occur from human activities including boat wakes and dredging.

Attempts to control scour using shoreline protective measures such as groins, jetties, levees, or revetments can lead to increased embankment loss or damage.

Land surface loss results from high flowing surface water across roads or other landscapes due to poor or improper drainage. These events typically occur from rain and snowmelt run-off.

Event Recurrence Intervals

Many flood damages are predictable based on seasonal weather patterns such as sea storms, rainfall, and freeze/thaw patterns. Most of the annual precipitation is received from April through October with August being the wettest. This rainfall leads to flooding in early/late summer and/or fall. Spring snowmelt increases runoff, which can cause excessive surface flooding. It also breaks riverine winter ice cover, exacerbating localized ice-jam flood or coastal ice override damage impacts.

Three flood types occur in the City of Dillingham:

1. Riverine flooding (also known as overbank flooding), due to excessive rainfall and minor ice-jams,
2. Coastal flooding due to wave run-up; and combination of snowmelt and rain on top of frozen ground,
3. Storm surge in conjunction with high tides and strong winds can cause significant wave run-up.

5.3.1.2.2 High Water Flow History

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

- **1929** A coastal flood, concurrent with high tides, and was classified as the City's worst historical flood. It flooded Dillingham's lower areas 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.

- **1981** A coastal storm caused some wave action damage to the city dock, but no significant flooding was reported.
- **2005** A storm in August 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.

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. Additionally, very high tides frequently combine with onshore winds to temporary flooding along low-lying portions of the main road, impeding traffic.

Spring snowmelt causes flooding on the north side of the core town site. Septic systems in this area have been known to flood and backup when the ground is frozen and it rains or warms enough for snow to melt. Hank Boggs, former Maintenance Foreman for SAFE, the shelter for victims of violence, says that facility had to replace their septic system because of this problem. He indicated the septic overflowed and sewage reached the nearby City Public Works shop. Ramon Roque, former Public Works Director, stated that every spring they have to pump out the septic to keep it from flooding. The septic for the Boggs-owned duplex in that area has had problems annually as long as he's owned it. At least one additional residence has had flooded septic systems because of snow melt induced flooding.

The floodprone area is less than a half mile from the City's main well. The Alaska Rural Water Association ranked the well's contamination susceptibility as High. This indicates that while the well has low contamination susceptibility; the aquifer has very highly susceptibility to contamination.

Several factors influence public drinking water contamination susceptibility such as

- Domestic wastewater collection systems,
- Aircraft maintenance shops,
- Gas stations, car repair shops, above and underground fuel drums and tanks, and leaking underground storage tanks,
- Large septic systems and injection wells,
- Seafood and meat processing facilities,
- Boatyards, floatplane dock and adjacent refueling area,
- The airport and numerous other sources.

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

The bridge and adjacent bike path over Scandinavian Creek are the only ingress and egress to and from Dillingham's core town site and the HUD housing complex. This area contains the City's highest population density. The bridge and path are threatened by flooding when high tides combine with a wind driven storm surge. Water repeatedly covers the bridge during such events.

City docks receive river ice flow damage during break-up; but the City is not directly impacted.

The USACE Floodplain Manager's October 2011 report for Dillingham noted their worst flood event was "A November 1929 storm, concurrent with high tides, flooded the lower areas of Dillingham to an elevation of 30 ft." The community's last coastal flood event occurred in 1980 or 1981. Table 5-5 lists a few of Dillingham's historical flood events.

Table 5-5 Historic Flood Events and impacts

Date	Event Type	Magnitude
November 1929	Coastal Storm Surge	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)
1962	Coastal Storm Surge	Storms also damaged anchored vessels, leading to development of the small boat harbor on Scandinavian Creek
1980	Coastal Storm Surge	Severe erosion and damage to the municipal dock and cold storage facilities
1981	Coastal Storm Surge	Some wave action damage to the city dock
1993	Coastal Storm Surge	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
August 2005	Coastal Storm Surge	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).

(WRCC 2015)

Flood or High Water Flow Induced Scour Events

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.

- **1980** A serious storm 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.
- **1993** A series of storms in the fall 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.
- **2005** A storm combined with a high tide in August 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.
- **2008** An October 4 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.

During recent 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 City is also experiencing dramatic erosion along the Wood River, adjacent to the Sewer Lagoon. In Spring 2016 the City of Dillingham went out to bid for surveying services to document the rates of erosion occurring in this location. A contract was awarded to Edge Surveying & Design to conduct this work over through 2019. The City has updated it's section on Critical Infrastructure (Table 6-6) to include the Sewer Lagoon. Once the data is available and the threats to the Sewer Lagoon is measurable, mitigation activities will be updated to secure this facility.

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

- **1995 to 1998** A sheet-pile seawall was constructed 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.
- **1999** A 429-foot sheet-pile seawall was built 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.
- **2004-2005** An 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.
- **2005** The USACE issued a Concept Design Report in November 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 flood scour loss has taken up to 10 feet of bank in a single event.

The Army Corp of Engineers (USACE) *Alaska Village Erosion Technical Assistance (AVETA) Report Summary– Dillingham, Alaska – 2006* explained how the community has nearly contained their erosion threat. The report provides the following details:

View of downtown Dillingham

Corps shore protection at Snag Point

"What are the costs associated with continued erosion?

There are three elements related to costs associated with erosion: past protection endeavors, the cost of ongoing repair and maintenance, and future damages. These are discussed in more detail in the following paragraphs.

Erosion Protection Costs

Previous efforts to control riverbank erosion near the small boat harbor consisted of timber plank and pile bulkheads built in 1983 by the City of Dillingham at Snag Point, about ¾ mile east of the small boat harbor; 1,600 feet of sheet-pile bulkhead built by the Corps at Snag Point between 1995 and 1998 (COE 1995, 1997); and about 600 feet of sheet-pile bulkhead built by the Corps immediately east of the harbor entrance in 1999 (COE 1998). In addition, Bristol Alliance Fuels has installed a sheet-pile wall to protect their mooring facilities. Erosion control efforts by the Corps to date total more than $6 million.

Storm waves entering Dillingham Harbor

Corps protection on harbor east bank

A project to protect Dillingham Harbor and the surrounding facilities is nearing completion of the planning phase and the beginning of the design phase. Typical annual storms are causing land to erode along the west bank of Dillingham Harbor. As seen in the photos above, the waves enter the harbor and continually erode the west bank. The east bank has already been protected by a Corps project. Erosion at the west side of the harbor entrance is also fueled by wave action in conjunction with high tides. Currently, the west bank of Dillingham Harbor is eroding at an average rate of 11 feet per year. If left unchecked, the continued erosion would lead to a significant decrease of harbor protection. In addition to reduced bank protection for the harbor, floats, and commercial fishing fleet, land as well as the majority of the fuel supply for the area would be lost.

Future Damages

It is expected that future erosion damages are expected to be minimal because of the existing bank stabilization seawall and the proposed erosion protection project at the east and west bank of the harbor.

What is the expected time line for a complete failure of the usable land?

Complete failure of the Dillingham property is not expected in the foreseeable future. Some erosion control measures are already in place, removal and reburial of grave sites is already occurring, and other measures are underway" (USACE 2006).

The AVETA Report Summary provided the following "Historical and Predicted Shorelines" aerial photo depicting the City's potential shoreline loss spanning from 1972 to 2030. (Provided as Figure 5-7)

**** Please note this depicted estimation is based on conditions prior to currently installed embankment protective - mitigation measures.***

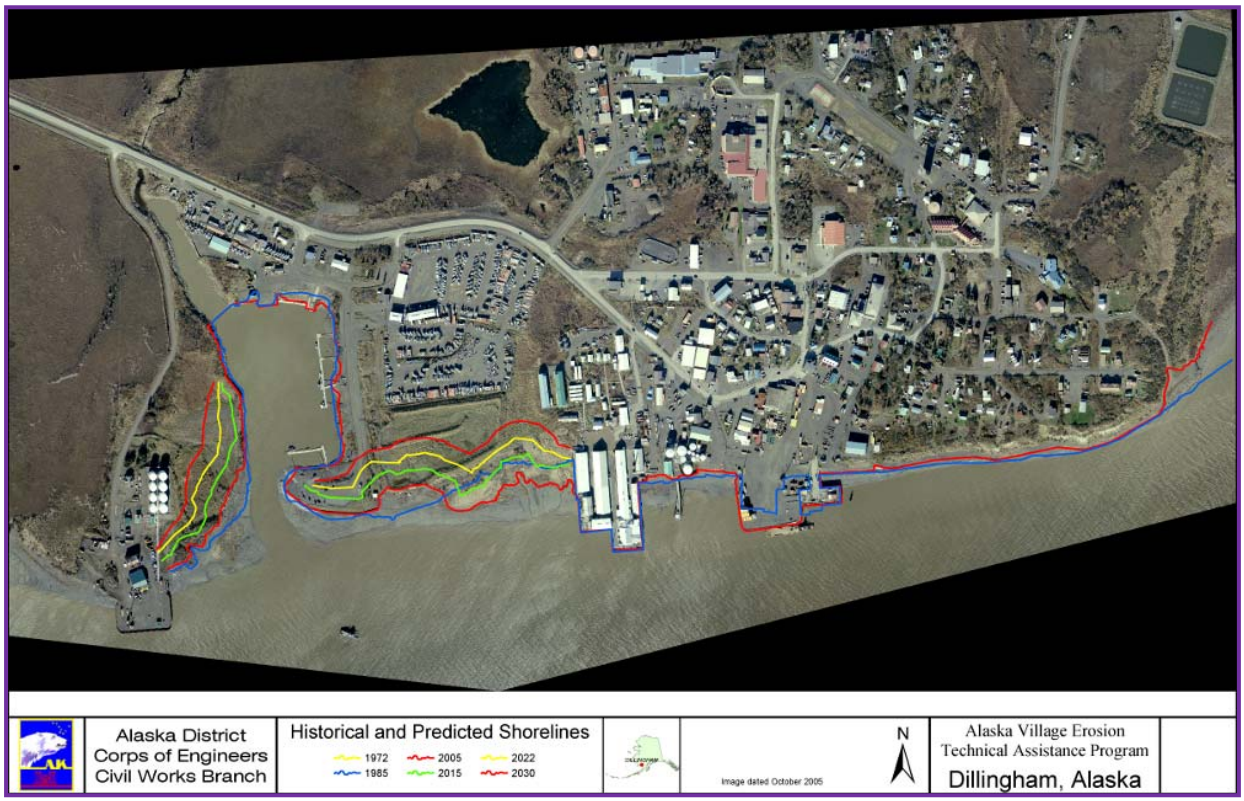


Figure 5-7 Dillingham's Projected Shoreline Recession (USACE 2006)

5.3.1.2.3 Location, Extent, Impact, and Recurrences Probability

Location

The most readily available information for Dillingham is FEMA's Flood Insurance Rate Maps (FIRMs). The FIRMs show 100-year floodplain boundaries for identified flood hazards. These areas are also referred to as Special Flood Hazard Areas (FHAs) 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. The City of Dillingham's original FIRMs were created in 1982.

The City of Dillingham contracted with Blue Sky Solutions to have the FIRMS digitized for the purposes of the 2008 HMP. FEMA Region X has yet to update their digital FIRMS.

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

AECOM's FIRM based floodplain vulnerability analysis depicts the City's threatened infrastructure (Figure 5-8) This figure define Dillingham's 1 percent of occurring in any given year (known as the 100-year flood) and three small 0.02 percent chance of occurring

(500-year flood) locations. Critical facilities and residential structures are called out within this map.

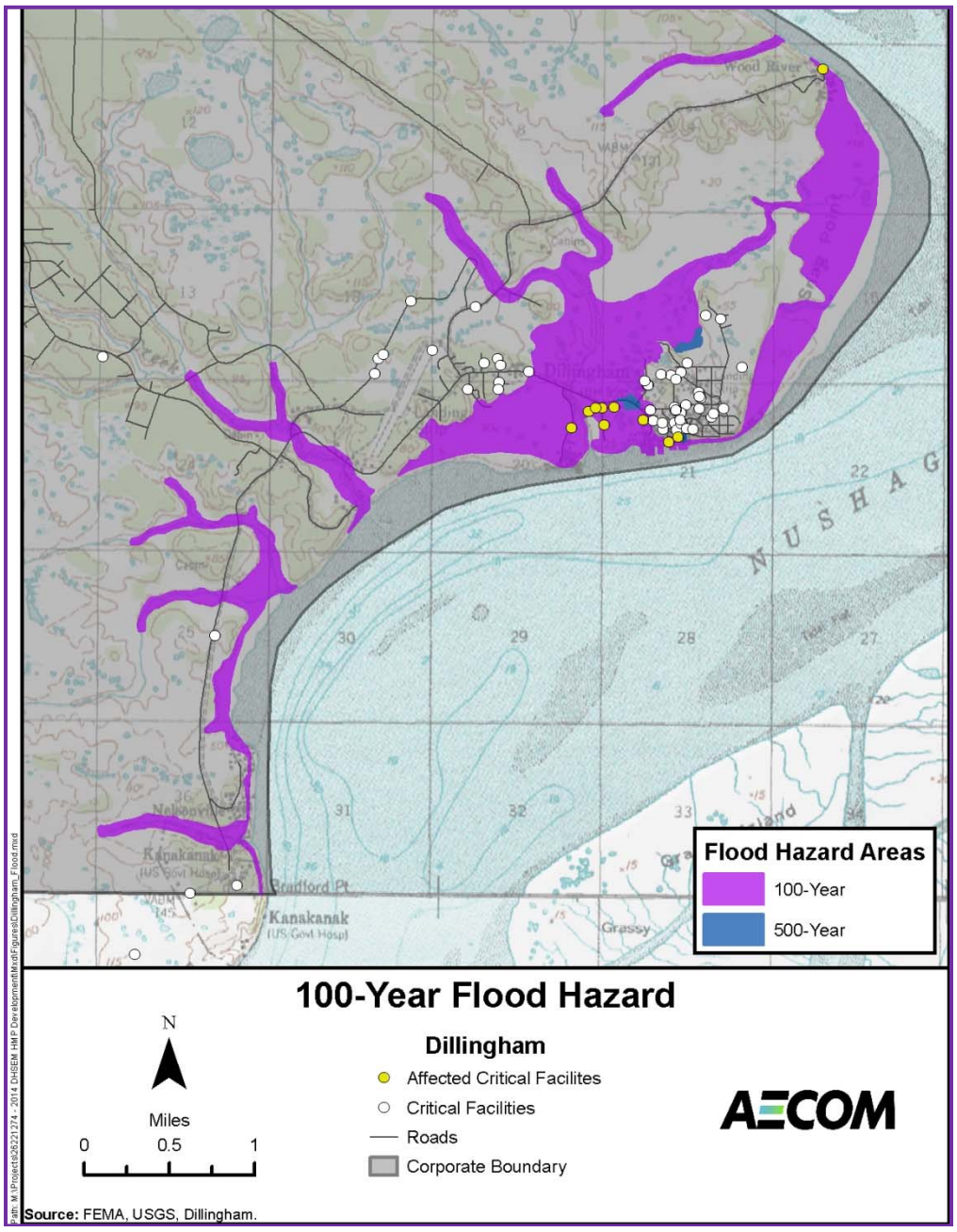


Figure 5-8 City of Dillingham's Identified Flood Areas (AECOM 2015)

The 2006 SWMP describes the City's floodplain and potential threats:

> *"2.8 SURFACE WATER*
>
> *The Dillingham area is bounded on three sides by rivers: the Wood River to the east, the Snake River to the west, and the Nushagak River to the south. The Nushagak is the largest river in the area, with a drainage area of 12,400 square miles. Smaller drainage systems*

in the area include Scandinavian Creek and Squaw Creek. Wetlands are prevalent throughout the area.

Flooding in Dillingham is generally coastal in nature and is caused by storm surges. The City is classified as being in a low flood hazard area. Minor flooding has been reported at the mouths of Scandinavian Creek and Squaw Creek, and at the intersections of Scandinavian Creek and Wood River Road. The worst recent flood was in 1981, and was caused by wind-driven waves. One public facility was flooded during this event. A 1929 storm, in conjunction with high tides, flooded the lower areas of Dillingham to an elevation of 30 feet…" (SWMP 2006).

Extent

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

The following factors contribute to riverine flooding frequency and severity:

- Rainfall intensity and duration
- Antecedent moisture conditions
- Watershed conditions, including terrain steepness, soil types, amount, vegetation type, and development density
- The attenuating feature existence in the watershed, including natural features such as swamps and lakes and human-built features such as dams
- The flood control feature existence, such as levees and flood control channels
- Flow velocity
- Availability of sediment for transport, and the bed and embankment watercourse erodibility
- Community location related to identified-historical flood elevation

The FIRMs indicate that an area totaling 2.36 square miles within the City of Dillingham is within the 100-year floodplain with 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 Plant
- City Dock
- Bristol Alliance Bulk Fuel Facility
- Tank Farm Access Road
- Tank Farm Parking Lot
- Harbor Parking Lot
- Kanakanak Road
- Harbor Office & Animal Shelter
- LFS
- Squaw Creek Bridge

- Kleepuk Hill Road
- City of Dillingham Public Works Department
- SAFE

The City does not regularly experience severe riverine flooding and/but they experience severe high water flow coastal storm erosive scour impacts. Therefore, based on past high water flow event history and the criteria identified in Table 5-2, the extent of flooding and resultant damages to infrastructure and their protective embankments in the City/Village are considered "Negligible" where critical facilities would shut-down for 24 hours or less with less than 10 percent of property is severely damaged.

Impact

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

- Structure flood inundation, causing water damage to structural elements and contents
- High water flow storm surge floods scour (erode) coastal embankments, coastal protection barriers, and result in infrastructure and residential property losses. Additional impacts can include roadway embankment collapse, foundations exposure, and damaging impacts
- Damage to structures, roads, bridges, culverts, and other features from high-velocity flow and debris carried by floodwaters. Such debris may also accumulate on bridge piers and in culverts, decreasing water conveyance and increasing loads which may cause feature overtopping or backwater damages
- Sewage, hazardous or toxic materials release, materials transport from wastewater treatment plant or sewage lagoon inundation, storage tank damages, and/or severed pipeline damages can be catastrophic to rural remote communities

Floods also result in economic losses through business and government facility closure, communications, utility (such as water and sewer), and transportation services disruptions. Floods result in excessive expenditures for emergency response, and generally disrupt the normal function of a community.

Impacts and problems also related to flooding are deposition as well as embankment, coastal erosion, and/or wind. Deposition is the accumulation of soil, silt, and other particles on a river bottom or delta. Deposition leads to the destruction of fish habitat, presents a challenge for navigational purposes, and prevents access to historical boat and barge landing areas. Deposition also reduces channel capacity, resulting in increased flooding or bank erosion. Embankment erosion involves material removal from the stream or river banks, coastal bluffs, and dune areas. When bank erosion is excessive, it becomes a concern because it results in loss of embankment vegetation, fish habitat, and land, property, and essential infrastructure (BKP 1988).

Recurrence Probability

The City's FIRMs depict the City has a 100 year as well as a 500 year flood impact threat.

Based on previous occurrences, USACE Floodplain Manager's report, FEMA FIRMs, and criteria in Table 5-3, it is "Likely" with a 1 in 5 year (1/5=20 percent) chance of a flood occurring within the mapped floodplain. History of events is greater than 10 percent but less than or equal to 20 percent likely per year.

5.3.1.3 Ground Failure

5.3.1.3.1 Nature

Ground failure describes avalanche, landslide, subsidence, and unstable soils gravitational or other soil movement mechanisms. Soil movement influences can include rain, snow, and/or water saturation induced avalanches or landslides; as well as from seismic activity, melting permafrost, river or coastal embankment undercutting, or in combination with steep slope conditions.

Landslides are a dislodgment and fall of a mass of soil or rocks along a sloped surface, or for the dislodged mass itself. The term is used for varying phenomena, including mudflows, mudslides, debris flows, rock falls, rockslides, debris avalanches, debris slides, and slump-earth flows. The susceptibility of hillside and mountainous areas to landslides depends on variations in geology, topography, vegetation, and weather. Landslides may also be triggered or exacerbated by indiscriminate development of sloping ground, or the creation of cut-and-fill slopes in areas of unstable or inadequately stable geologic conditions.

Additionally, avalanches and landslides often occur secondary to other natural hazard events, thereby exacerbating conditions, such as:

- Earthquake ground movement can trigger events ranging from rock falls and topples to massive slides
- Intense or prolonged precipitation can cause slope over-saturation and subsequent destabilization failures such as avalanches and landslides.
- Climate change related drought conditions may increase wildfire conditions where a wildland fire consumes essential stabilizing vegetation from hillsides significantly increasing runoff and ground failure potential

Development, construction, and other human activities can also provoke ground failure events. Increased runoff, excavation in hillsides, shocks and vibrations from construction, non-engineered fill places excess load to the top of slopes, and changes in vegetation from fire, timber harvesting and land clearing have all led to landslide events. Broken underground water mains can also saturate soil and destabilize slopes, initiating slides. Something as simple as a blocked culvert can increase and alter water flow, thereby increasing the potential for a landslide event in an area with high natural risk. Weathering and decomposition of geologic material, and alterations in flow of surface or ground water can further increase the potential for landslides.

The USGS identifies ground failure types, distinguished by material type and movement mechanism including:

Landslides:

- **Slides,** the more accurate and restrictive use of the term landslide, refers to a mass movement of material, originating from a discrete weakness area that slides from stable underlying material. A *rotational slide* occurs when there is movement along a concave surface; a *translational slide* originates from movement along a flat surface.
- **Debris Flows** arise from saturated material that generally moves rapidly down a slope. A debris flow usually mobilizes from other types of landslide on a steep slope, then flows through confined channels, liquefying and gaining speed. Debris flows can travel at speeds

of more than 35 mph for several miles. Other types of flows include debris avalanches, mudflows, creeps, earth flows, debris flows, and lahars.

- **Lateral Spreads** are a type of landslide generally occurs on gentle slope or flat terrain. Lateral spreads are characterized by liquefaction of fine-grained soils. The event is typically triggered by an earthquake or human-caused rapid ground motion.
- **Falls** are the free-fall movement of rocks and boulders detached from steep slopes or cliffs.
- **Topples** are rocks and boulders that rotate forward and may become falls.
- **Complex** is any combination of landslide types.

Additional factors that define locational ground failure events include:

- **Terrain Factors** that influence ground failure conditions, with the main ones being slope angle, slope aspect, and terrain. Other factors include slope shape, vegetation cover, elevation, and path history.
- **The Slope Angle** directly influences ground failure potential where slopes have a 35 to 60 degree angles and can occur on slopes of 25-35 degrees, but are not as likely at that slope angle because gravity does not sufficiently stress the weak layers of the moisture-laden soils or snowpack. As slope angles above 70 degrees, materials tend to slough off and do not have the opportunity to accumulate. Ground failure can occur outside the optimum slope angle range, but are not as common.
- **Slope Aspect** also termed orientation, describes the direction a slope faces with respect to the wind and sun. Leeward slopes (slopes facing away from wind and steep terrain) loaded by wind-transported rain or snow are problematic because the wind-deposited moisture or snow increases the stress and enhances dangerous conditions. Intense direct sunlight can weaken and lubricate the bonds between the moisture and snow grains, weakening the soils or snowpack. Shaded slopes are also potentially unstable because the weak layers may be held for a longer time in an unstable state.
- **Local Terrain** (topographic) features determine an landslide's, mudslide's and an avalanche's path. The path has three parts: the starting zone, the track, and the run-out zone.
- **The starting zone** is where the materials break loose and starts sliding. It's generally near the top of a canyon, bowl, ridge, etc., with steep slopes between 25 and 50 degrees. Rain laden soils and snowfall are usually significant in this area.
- **The track** is the actual path followed by sliding materials. The track can have milder slopes, between 15 and 30 degrees, but it is where the ground failure materials will reach maximum velocity and mass. Tracks can branch or converge, creating successive runs that increase the threat, especially when multiple releases share a run-out zone.
- **The run-out zone** is a gentler slope at the path base where the material flows slows down, resulting in materials and structural debris deposition.
- **The impact pressure** determines the amount of damage caused by a ground failure event. The impact pressure is related to the density, volume (mass) and a slides velocity.

- **Urban ground failure event** fatalities are common in areas where winter sports are popular. The most well-known avalanche deaths are those involving skiers, snowmobilers, and snowboarders; however urban infrastructure interface locations also experience significant ground failure events that have proven to be particularly deadly and have occurred with relative frequency around the world. In many events, the ground failure danger was well known by both residents and officials before or even during construction. However the ground failure events occur before any decisive action is taken to protect the population from building in an unsafe location.

Urban ground failure events that do not prove fatal are also significant as they can result in interrupted utility services, emergency response delays, and roads and other infrastructure damages.

Land Subsidence:

Land subsidence is a gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials. Subsidence in the United States has directly affected more than 17,000 square miles in 45 states, and associated annual costs are estimated to be approximately $125 million. The principal causes of subsidence are aquifer-system compaction, drainage of organic soils, underground mining, hydrocompaction, natural compaction, sinkholes, and thawing permafrost … (USGS 2015d)

In Alaska, earthquakes, seasonally frozen ground, and permafrost are often ground failure agents. Permafrost is defined as soil, sand, gravel, or bedrock that has remained below 32°F for two or more years. Permafrost can exist as massive ice wedges and lenses in poorly drained soils or as relatively dry matrix in well-drained gravel or bedrock. During the summer, the surficial soil material thaws to a depth of a few feet, but the underlying frozen materials prevent drainage. The surficial material that is subject to annual freezing and thawing is referred to as the *active layer*.

Seasonal freezing can cause frost heaves and frost jacking. Frost heaves occur when ice forms in the ground and separates sediment pores, causing ground displacement. Frost jacking causes unheated structures to move upwards. Permafrost is frozen ground in which a naturally occurring temperature below 32ºF has existed for two or more years. (DHS&EM 2013).

Indicators of a possible ground failure include:

- Springs, seeps, or wet ground that is not typically wet
- New cracks or bulges in the ground or pavement
- Soil subsiding from a foundation
- Secondary structures (decks, patios) tilting or moving away from main structures
- Broken water line or other underground utility
- Leaning structures that were previously straight
- Offset fence lines
- Sunken or dropped-down road beds
- Rapid increase in stream levels, sometimes with increased turbidity
- Rapid decrease in stream levels even though it is raining or has recently stopped and
- Sticking doors and windows, visible spaces indicating frames out of plumb

The State of Alaska 2013 State Hazard Mitigation Plan provides additional ground failure information defining mass movement types, topographic and geologic factors which influence ground failure which may pertain to Dillingham.

5.3.1.3.2 History

There are few written records defining ground failure impacts. This following sections will present best available information for Dillingham's historic ground failure impacts.

5.3.1.3.3 Location, Extent, Impact, and Recurrence Probability

Location

There are various ground failure locations throughout Dillingham. Sources include City planning documents, USACE, NRCS, USGS, as well as other agencies' developed plans and studies. Land subsidence such as melting permafrost and floodwater soil saturation are the most common ground failure impacts.

Dillingham's Solid Waste Management Plan describes their geologic conditions as:

> *"**2.4 TOPOGRAPHY***
>
> *Dillingham is in an area of rolling topography consisting of irregularly shaped glacial moraine knolls and ridges separated by muskeg. Elevations range from about 20 to 170 feet above sea level.*
>
> ***2.5 GEOLOGY***
>
> *The geology of the area consists primarily of sands and gravels overlain in the uplands by windblown silt derived from unvegetated floodplains and volcanic ash. Swamp deposits of thick organics ranging in thickness from less than 2 to more than 20 feet typically mantle the silts in the lowlands. Fine-grained soils beneath north-facing slopes have been found to be perennially frozen. Shallow bedrock has been reported in one location, at approximately 11 feet below ground surface (bgs) at the high school parking lot.*
>
> ***2.6 SOILS***
>
> *Dillingham lies on a moraine and outwash-mantled lowland with hills 50 to 100 feet high and wide expanses of wetlands and lakes. The area is underlain by a complex sequence of primarily fine-grained glacial, fluvial, and marine sediments that are several hundred feet thick. The upland moraine hills generally consist of a thick layer of silty loess underlain by coarse-grained sands and gravel. The lower wetland areas generally consist of an organic mat of peat or muskeg with depths ranging from several inches to several feet in thickness and underlain by wet, stiff clays (Glass, 1987). Spring breakup usually occurs from mid-April to late May. Heavy surface runoff usually occurs throughout May, during which time trench excavations could be difficult and dangerous. The ground begins to freeze around mid-October. Gravel for trench backfill is available from a number of pits in the area, the preferred site generally being the pit run by Choggiung, Limited, at milepost 9.5 of Aleknagik Lake Road" (SMP 2006).*

The USGS's 1994 *"Overview of Environmental and Hydrogeologic Conditions at Dillingham, Alaska Open-File Report 94-482"* describes area soil and permafrost conditions. The Planning Team formatted the following direct quote to best identify the differing soil types and their characteristics:

> *"**Soils***
>
> *Because of the cool, humid climate of the Dillingham area, rates of evapotranspiration are low. A large proportion of the annual precipitation percolates through the soil and is*

effective in leaching. As a result, well-drained soils are extremely acidic and have well-developed horizons. Poorly drained soils also are very acidic but have characteristics commonly associated with wet conditions (Rieger, 1965).

Five distinct soils series have been mapped in the Dillingham area (Rieger, 1965; Rieger and others, 1979).

***Aleknagik soils (approximately one-fourth of the total area)** are commonly found on moraine hills and are generally well drained, extremely acidic soils in silty deposits overlying a gravelly substratum;*

***Aleknagik soils** are generally less than about 1 m thick.*

***Kanakanak soils (approximately one-tenth of the total area)** are generally well drained, extremely acidic, dark soils that are typically thick deposits over moraine hills near the rivers.*

Nushagak soil**s (approximately one-tenth of the total area) are very strongly acidic, silty soils, similar in composition to the Aleknagik and Kanakanak soils but poorly drained. These soils are generally frozen until midsummer, but permafrost does not develop in them. The water table is close to the surface. Nushagak soils occupy the lower slopes of moraine hills and ridges. A few small areas of **Hyer soils** are found on steep, north-facing slopes. These soils, which consist largely of poorly drained organic matter and peat are **perennially frozen at depths below about 40 to 80 cm.

***Salamatof soils are the dominant soils** in the Dillingham area **(slightly more than half of the total area)** and occupy nearly all of the low-lying areas. Salamatof soils consist of deep peat layers and muskegs and are generally more than 1 m thick. These soils are wet and are associated with many small lakes and ponds. Salamatof soils are generally frozen until midsummer, but permafrost does not develop in them. A detailed description of representative profiles of the soil series is given by Rieger (1965) and Rieger and others (1979).*

***The Dillingham area is underlain by isolated masses of permafrost** (Ferrians, 1965), which, where present, generally are at considerable depth and have been reported to be more than 50 m thick (Hartman and Johnson, 1984).*

Permeability of the uncompacted materials of the Aleknagik and Kanakanak soils ranges from about 2.0 to 6.4 cm,. The gravelly material underlying the Alegnagik soils and, at greater depths, the Kanakanak soils, is more permeable than either soil type (Rieger, 1965" (USGS 1994).

According to the 1994 *"Permafrost characteristics of Alaska – A new permafrost map of Alaska"* (Figure 5-9) developed for the National Snow and Ice Data Center/World Data Center for Glaciology, Dillingham has isolated permafrost as supported by soil investigations during the FAA's environmental studies mandated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or "Superfund Act") and the Resource Conservation and Recovery Act (RCRA) site investigation. (DGGS 1994)

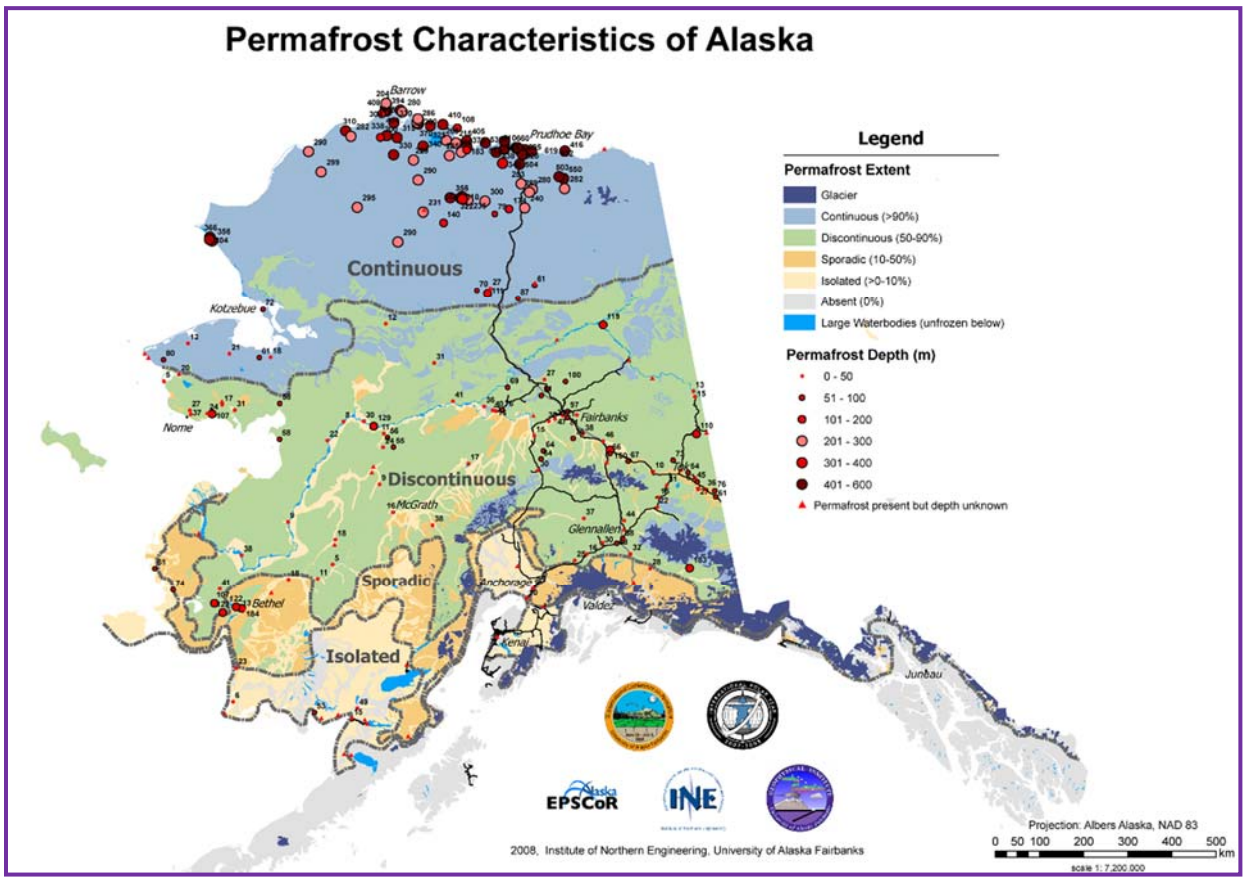


Figure 5-9 Permafrost Characteristics of Alaska (Jorgenson et al 2008)

Figure 5-10 contains the AECOM developed Dillingham areas slope instability map delineating slope instability locations.

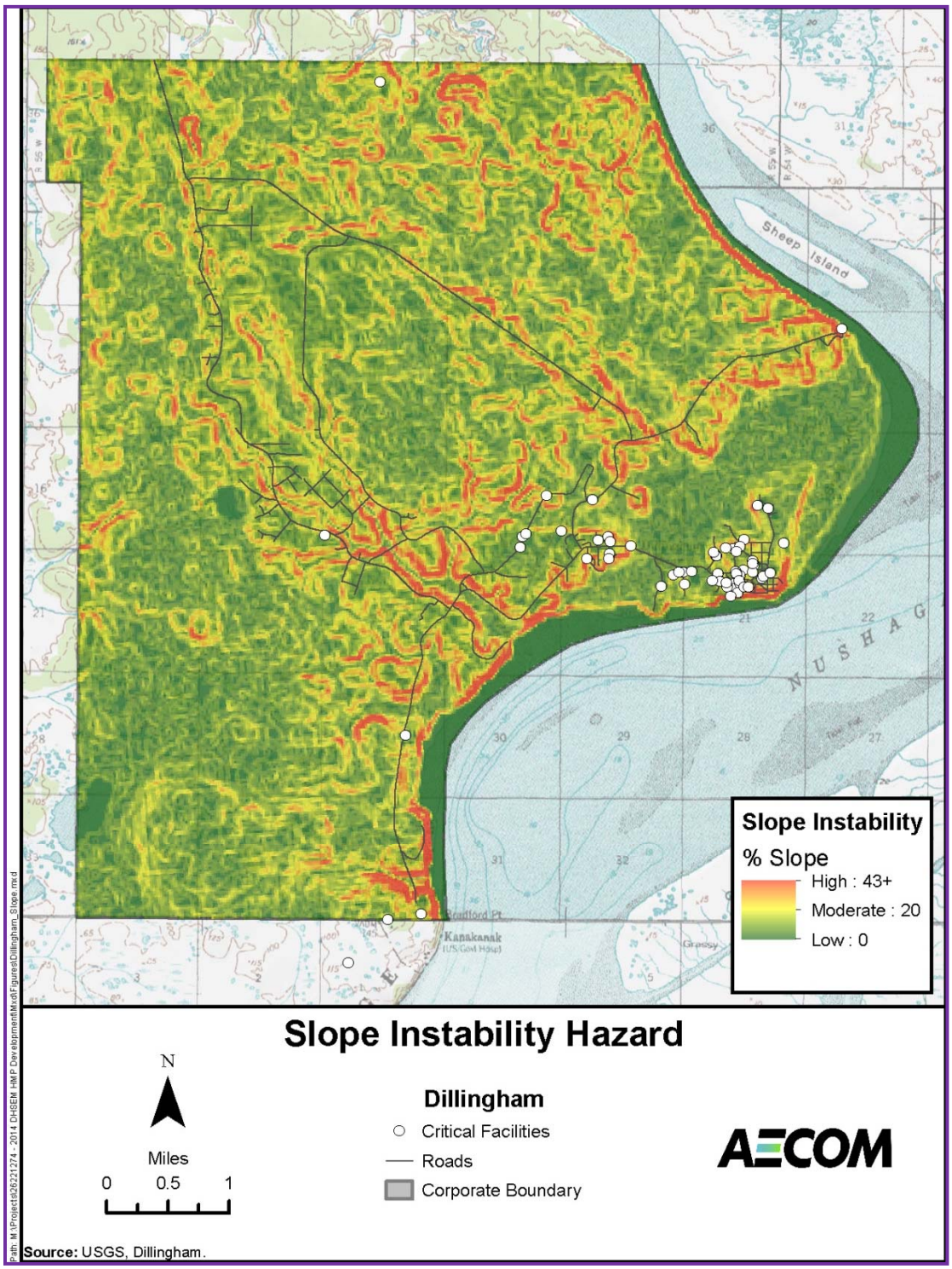


Figure 5-10 Dillingham's Slope Stability Hazard Areas (AECOM 2015)

Extent

The damage magnitude could range from minor with some repairs required and little to no damage to transportation, infrastructure, or the economy to major if a critical facility (such as the airport) were damaged and transportation was effected.

Based on research and the Planning Team's knowledge of past ground failure and various degradation events and the criteria identified in Table 5-2, the extent of "isolated" ground failure impacts in the City are considered "Limited". Impacts would not occur quickly but over time with warning signs. Therefore this hazard would not likely to cause injuries or death, neither would it shutdown critical facilities and services. However, 10 percent of property is could be severely damaged.

Impact

Impacts associated with ground failure include surface subsidence, infrastructure, building, and/or road damage. Ground failure does not typically pose a sudden and catastrophic hazard; however landslides and avalanches may. Ground failure damage occur from improperly designed and constructed buildings that settle as the ground subsides, resulting in structure loss or expensive repairs. It may also impact buildings, communities, pipelines, airfields, as well as road and bridge design costs and location. To avoid costly damage to these facilities, careful planning and location and facility construction design is warranted.

Recurrence Probability

The Planning Team determined their recurrence probability for isolated permafrost related ground failure follows the criteria in Table 5-3, the future damages resulting from ground failure is "Unlikely" in the next 1-10 years (1/10=10 percent) chance of occurring as the history of events is less than 10 percent likely per year.

5.3.1.4 Severe Weather

5.3.1.4.1 Nature

Severe weather occuring throughout Alaska with extremes experienced by Dillingham includes thunderstorms, lightning, hail, heavy and drifting snow, freezing rain/ice storm, extreme cold, and high winds. The City experiences periodic severe weather events such as the following:

Climate Change influences the environment, particularly historical weather patterns. Climate change and El Niño/La Niña Southern Oscillation (ENSO) influences create increased weather volatility such as hotter summers (drought) and colder winters, intense thunderstorms, lightning, hail, snow storms, freezing rain/ice storms, high winds and even a few tornadoes within and around Alaska.

ENSO is comprised of two weather phenomena known as El Niño and La Niña. While ENSO activities are not a hazard, they can lead to severe weather events and large-scale damage throughout Alaska's varied jurisdictions. Direct correlations were found linking ENSO events to severe weather across the Pacific Northwest, particularly increased flooding (riverine, coastal storm surge) and severe winter storms. Therefore, increased awareness and understanding how ENSO events potentially impact Alaska's vastly differing regional weather.

Climate change is described as a phenomenon of water vapor, carbon dioxide, and other gases in the earth's atmosphere acting like a blanket over the earth, absorbing some of the heat of the sunlight-warmed surfaces instead of allowing it to escape into space. The more gasses – the thicker

the blanket – the warmer the earth. Trees and other plants cannot absorb carbon dioxide through photosynthesis if foliage growth is inhibited. Therefor carbon dioxide builds up and changes precipitation patterns, increases storms, wildfires, and flooding frequency and intensity; and substantially changes flora, fauna, fish, and wildlife habitats.

The Governor's Alaska's Climate, Ecosystems & Human Health Work Group is tasked with determining how the changing ecosystems may impact human health and to identify, prioritize, and educate Alaskan's about the connection between their health and changing environmental patterns.

The National Oceanic and Atmospheric Administration (NOAA) has been producing the Arctic Report Card since 2006, providing peer reviewed climate change data describing the current arctic environmental system and as an indication of climate change impacts. The 2014 Arctic Report Card states:

> *"… Mean annual air temperature continues to increase in the Arctic, at a rate of warming that is more than twice that at lower latitudes… In Alaska this led to statewide temperature anomalies of +10°C in January, due to warm air advection from the south, while temperature anomalies in eastern North America and Russian were -5°C, due to cold air advection from the North…*
>
> *As the sea ice retreats in summer and previously ice-covered water is exposed to solar radiation, sea surface temperature (SST) and upper ocean temperatures in all the marginal seas of the Arctic Ocean are increasing; the most significant linear trend is in the Chukchi Sea, where SST is increasing at a rate of 0.5°C/decade. In summer of 2014, the largest SST anomalies, as much as 4°C above the 1982-2010 average, occurred in the Barents Sea and the Bering Strait region, which includes the Chukchi Sea.*
>
> *Declining summer sea ice extent is also leading to increasing ocean primary production due to solar radiation being available over a larger area of open water. The greatest increases in primary production during the period of [Seaviewing Wide Field-of-view Sensor]SeaWiFS and MODIS satellite observation (1998-2010) occurred in the East Siberian Sea (+112.7%), Laptev Sea (+54.6%) and Chukchi Sea (+57.2%)…*
>
> *In August 2014, the warmest SST anomalies were observed in the vicinity of the Bering Strait and the northern region of the Laptev Sea. SSTs in those regions were the warmest since 2007, with values as much as -4°C warmer than the 1982-2010 August mean…*
>
> *Cold anomalies have also been observed in some regions in recent summers (Timmermans et al. 2013, 2014). For example, cooler SSTs in the Chukchi and East Siberian seas in August 2012 and August 2013 were linked to later and less-extensive sea-ice retreat in these regions in those years. In addition, a strong cyclonic storm during the first week of August 2012 (Simmonds 2013), which moved eastward across the East Siberian Sea and the Chukchi and Beaufort seas, caused anomalously cool SSTs as a result of mixing of warm surface waters with cooler deeper waters (Zhang et al. 2013)…*
>
> *Recent declines in minimum Arctic sea ice extent (see the essay on Sea Ice) have contributed substantially to shifts in primary productivity throughout the Arctic Ocean. Studies using… SeaWiFS and Moderate Resolution Imaging Spectroradiometer (MODIS) across the entire Arctic Ocean reveal that the Barents and Greenland seas are the most productive marine environments in the Arctic, whereas the East Siberian and Chukchi seas are the least productive (Petrenko et al. 2013). However, the greatest increases in primary*

production during 1998-2010 occurred in the East Siberian Sea (+112.7%), Laptev Sea (+54.6%) and Chukchi Sea (+57.2%) (Petrenko et al. 2013)…

Loss of sea ice, facilitating the increased availability of solar radiation will not affect primary productivity rates in the absence of sufficient nutrients for production. Better knowledge of nutrient distributions across the Arctic Ocean is critical for understanding how climate warming,

Recent seasonal sea ice retreat has shown important impacts on the timing of phytoplankton blooms across the Arctic, including the remarkable inter-annual differences in small-cell phytoplankton community structure across the northern Chukchi Sea (Fujiwara et al. 2014), where haptophytes (e.g., unicellular algae, including coccolithophorids) dominated in warm surface waters during 2008 1 while prasinophytes (e.g., unicellular green algae, including flagellates) dominated in cold water during 2009 and 2010 (when sea ice retreated -1-2 months later than in 2008). Interestingly, Ji et al. (2013) have found that the timing of sea ice retreat has a strong effect on the timing of pelagic phytoplankton peaks over a large portion of the Arctic marginal seas, but weak or no impact on the timing of ice-algae peaks in the same regions.

Recent observed shifts in the timing of phytoplankton blooms also include the unexpected development of a secondary bloom in the autumn (Ardyna et al. 2014). This secondary bloom coincides with delayed formation of sea ice and longer exposure of the sea surface to wind stress, which presumably weakened vertical stratification and allowed nutrients to return to the euphotic zone" (Jeffries et al. 2014).

Heavy Rain occurs rather frequently over the coastal areas along the Bering Sea and the Gulf of Alaska.

Heavy Snow generally means snowfall accumulating to four inches or more in depth in 12 hours or less or six inches or more in depth in 24 hours or less.

Drifting Snow 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 and Ice Storms occur when rain or drizzle freezes on surfaces, accumulating 12 inches in less than 24 hours. Ice accumulations can damage trees, utility poles, and communication towers which disrupts transportation, power, and communications.

Extreme Cold is the definition of extreme cold and 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°F. Excessive cold may accompany winter storms, be left in their wake, or can occur without storm activity. Extreme cold accompanied by wind exacerbates exposure injuries such as frostbite and hypothermia.

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 effect of the terrain as storms move inland.

Winter Storms include a variety of phenomena described above and as previously stated may include several components; wind, snow, and ice storms. Ice storms, which include freezing rain, sleet, and hail, 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 in the accumulation of ice from freezing rain, which coats every surface it falls on with a glaze of ice. Freezing rain is most commonly found in a narrow band on the cold side of a warm front, where surface temperatures are at or just below freezing temperatures. Typically, ice crystals high in the atmosphere grow by collecting water vapor molecules, which are sometimes supplied by evaporating cloud droplets. As the crystals fall, they encounter a layer of warm air where they particles melt and collapse into raindrops. As the raindrops approach the ground, they encounter a layer of cold air and cool to temperatures below freezing. However, since the cold layer is so shallow, the drops themselves do not freeze, but rather, are supercooled, that is, in liquid state at below-freezing temperature. These supercooled raindrops freeze on contact when they strike the ground or other cold surfaces.

Snowstorms happen when a mass of very cold air moves away from the polar region. As the mass collides with a warm air mass, the warm air rises quickly and the cold air cuts underneath it. This causes a huge cloud bank to form and as the ice crystals within the cloud collide, snow is formed. Snow will only fall from the cloud if the temperature of the air between the bottom of the cloud and the ground is below 40 degrees Fahrenheit. A higher temperature will cause the snowflakes to melt as they fall through the air, turning them into rain or sleet. Similar to ice storms, the effects from a snowstorm can disturb a community for weeks or even months. The combination of heavy snowfall, high winds and cold temperatures pose potential danger by causing prolonged power outages, automobile accidents and transportation delays, creating dangerous walkways, and through direct damage to buildings, pipes, livestock, crops and other vegetation. Buildings and trees can also collapse under the weight of heavy snow.

Winter storm floods are discussed in Section 5.3.3.

Thunderstorms are 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. Thunderstorm Types include:

- Single Cell. Short-lived storms (20 to 30 minutes) that cover a limited area (a few square miles).
- 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.
- 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 results from a buildup of charged ions within the thundercloud. It occurs in all thunderstorms.

Bureau of Land Management (BLM) 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 is 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.

Figure 5-11 displays Alaska's annual rainfall map based on Parameter-elevation Regressions on Independent Slopes Model (PRISM) that combines climate data from NOAA and Natural Resources Conservation Service (NRCS) climate stations with a digital elevation model to generate annual, monthly, and event-based climatic element estimates such as precipitation and temperature.

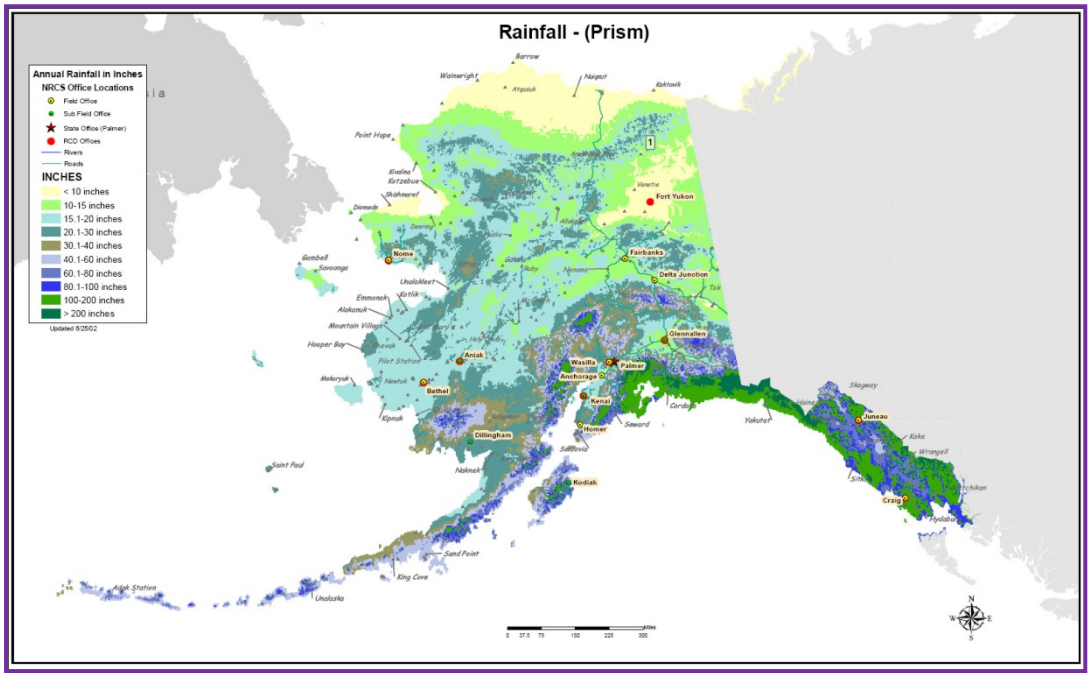


Figure 5-11 Statewide Rainfall Map (PRISM 2012)

5

5.3.1.4.2 History

The City of Dillingham is continually impacted by severe weather events. Hurricane force wind, storm surge, and cold typically have long-term consequences.

Climate Change. The University of Alaska Fairbanks (UAF) Arctic Climate Impact Assessment describes recent weather changes and how they impact Alaska:

> ***"18.3.3.1. Changes in climate***
>
> *Alaska experienced an increase in mean annual temperature of about 2 to 3 ºC between 1954 and 2003…Winter temperatures over the same period increased by up to 3 to 4 ºC in Alaska and the western Canadian Arctic, but Chukotka experienced winter cooling of between 1 and 2 ºC…*
>
> *The entire region, but particularly Alaska and the western Canadian Arctic, has undergone a marked change over the last three decades, including a sharp reduction in snow-cover extent and duration, shorter river- and lake ice seasons, melting of mountain glaciers, sea-ice retreat and thinning, permafrost retreat, and increased active layer depth. These changes have caused major ecological and socio-economic impacts, which are likely to continue or worsen under projected future climate change. Thawing permafrost and northward movement of the permafrost boundary are likely to increase slope instabilities, which will lead to costly road replacement and increased maintenance costs for pipelines and other infrastructure. The projected shift in climate is likely to convert some forested areas into bogs when ice-rich permafrost thaws. Other areas of Alaska, such as the North Slope, are expected to continue drying. Reduced sea-ice extent and thickness, rising sea level, and increases in the length of the open-water season in the region will increase the frequency and intensity of storm surges and wave development, which in turn will increase coastal erosion and flooding…*

18.3.3.4. Impacts on people's lives

Traditional lifestyles are already being threatened by multiple climate-related factors, including reduced or displaced populations of marine mammals, seabirds, and other wildlife, and reductions in the extent and thickness of sea ice, making hunting more difficult and dangerous. Indigenous communities depend on fish, marine mammals, and other wildlife, through hunting, trapping, fishing, and caribou/reindeer herding. These activities play social and cultural roles that may be far greater than their contribution to monetary incomes. Also, these foods from the land and sea make significant contributions to the daily diet and nutritional status of many indigenous populations and represent important opportunities for physical activity among populations that are increasingly sedentary…" (ACIA 2014)

DHS&EM's Disaster Cost Index records the following severe weather disaster events which may have affected the area:

*"**10. Bristol Bay, September 2, 1980:** Following a storm which generated high winds and heavy sea waves, causing damage to the equipment of numerous commercial fishermen, canneries and approximately 15 to 20 private houses, the Governor proclaimed a Disaster Emergency extending from Dillingham to Port Heiden. The State provided both public assistance to communities and grants to individuals and families; the SBA provided disaster loans to residents of the area. In addition, the State provided temporary housing assistance to one of the residents who were forced to relocate due to damage to his home.*

***83. Omega Block Disaster, January 28, 1989 & FEMA declared (DR-00826) on May 10, 1989:** The Governor declared a statewide disaster to provide emergency relief to communities suffering adverse effects of a record breaking cold spell, with temperatures as low as -85 degrees. The State conducted a wide variety of emergency actions, which included: emergency repairs to maintain & prevent damage to water, sewer & electrical systems, emergency resupply of essential fuels & food, & DOT/PF support in maintaining access to isolated communities.*

***00-191 Central Gulf Coast Storm declared February 4, 2000 by Governor Murkowski. Murkowski then FEMA declared (DR-1316) on February 17, 2000:** On Feb 4 2000, the Governor declared a disaster due to high impact weather events throughout an extensive area of the state. The State began responding to the incident since the beginning of December 21, 1999. The declaration was expanded on February 8 to include City of Whittier, City of Valdez, Kenai Peninsula Borough, Matanuska-Susitna Borough and the Municipality of Anchorage. On February 17, 2000, President Bill Clinton determined the event disaster warranted a major disaster declaration under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288 as amended ("the Stafford Act). On March 17, 2000, the Governor again expanded the disaster area and declared that a condition of disaster exists in Aleutians East, Bristol Bay, Denali, Fairbanks North Star, Kodiak Island, and Lake and Peninsula Boroughs and the census areas of Dillingham, Bethel, Wade Hampton, and Southeast Fairbanks, which is of sufficient severity and magnitude to warrant a disaster declaration. Effective on April 4, 2000, Amendment No. 2 to the Notice of a Major Disaster Declaration, the Director of FEMA included the expanded area in the presidential declaration. Public Assistance, for 64 applicants with 251 PW's, totaled $12.8 million. Hazard Mitigation totaled $2 million. The total for this disaster is $15.66 million.*

02-200 02 Interior Floods (AK-DR-1423) Declared May 29, 2002 by Gov. Knowles then FEMA Declared (DR-1423) on June 26 2002: *Flooding occurred in various interior and western Alaska river drainages, including the Tanana, Kuskokwim, Nushagak, Susitna and Yukon River drainages beginning on April 27, 2002 and continuing. The floods caused widespread damage to and loss of property in the Fairbanks North Star Borough (Tanana River drainage); in McGrath, Lime Village, Sleetmute, Red Devil, Crooked Creek, Aniak and Kwethluk (Kuskokwim River drainage); Ekwok and New Stuyahok (Nushagak River drainage); in the Susitna River drainage from Chase to Montana Creek; and in Emmonak (Yukon River drainage). The following conditions exist as a result of this disaster: widespread damage to public facilities and infrastructure, including damage to public airports, roads, and buildings; to public utilities, including water , sewer, and electrical utilities; to personal residences, in some areas requiring evacuation and sheltering of residents; to commercial operations; and to other public and private real and personal property. Public & Individual Assistance provided as well as the 404 Mitigation Program. Added: Gov. amendment dated July 12, 2002 added Alakanuk to the State Declaration. Gov. declaration dated July 12, 2002 was also made for DOTPF to access FHWA Emergency Relief Funds for damages to roads in the State. Individual Assistance totaled $238K for 60. Public Assistance totaled $4.42 million for 29 applicants with 55 PW's. Hazard Mitigation totaled $419K. The total for this disaster is $$5.1 million.*

06-214 2005 Bristol Bay Storm (AK-06-214) declared October 03, 2005 by Governor Murkowski: *On August 23, 2005, a strong storm with high winds combined with high tides produced storm surges of 2 to 3 feet above the high tide levels and caused widespread coastal flooding in the upper Bristol Bay area. Public infrastructure, commercial property, and personal property damages were reported in the City of Clark's Point, the nearby unincorporated community of Ekuk, and the City of Togiak. Damages were also reported in Lake and Peninsula Borough, Bristol Bay Borough and the City of Dillingham. Lake and Peninsula Borough, Bristol Bay Borough and the City of Dillingham elected not to declare local disasters and are not seeking assistance. Clark's Point and Togiak have each signed local disaster declarations and are asking for state Individual Assistance and Public Assistance in response and recovery from this storm. Individual Assistance totaled $157,465 for 39 applicants. Public Assistance totaled $106,539 for 3 applicants and 11 PW's. The total for this disaster is $264,004" (DHSEM 2014).*

Dillingham has suffered damage from severe weather 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. Additional severe weather impacts include:

- 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 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.

The Dillingham area is continually impacted by severe weather. Figures 5-12 and 5-13 depict the City's historic and future predicted precipitation and temperatures. Note, Figure 5-12's projected decreasing precipitation which may be linked to changing climatic weather patterns. Decreased rain and snow could dramatically increase wildland fire potential as well as adversely impact wildlife habitat.

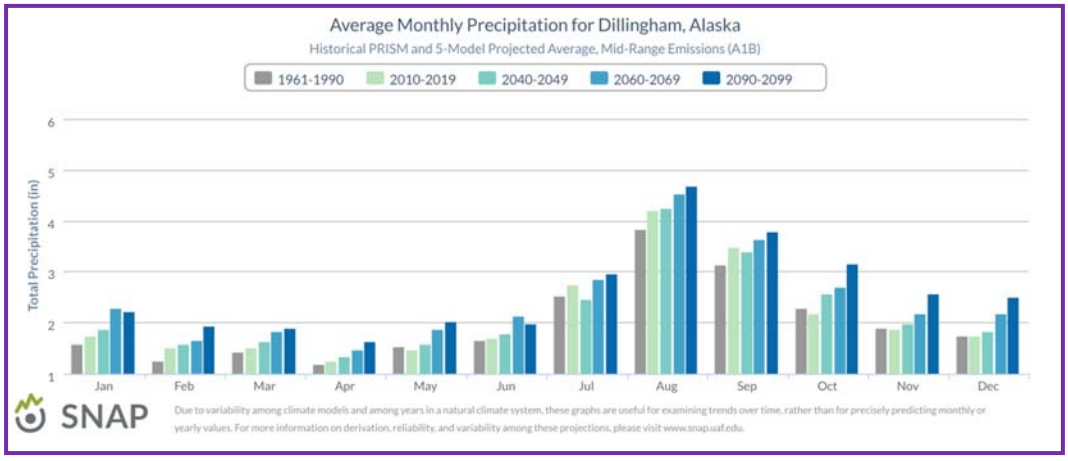


Figure 5-12 Dillingham's Historic and Predicted Precipitation (SNAP 2014).

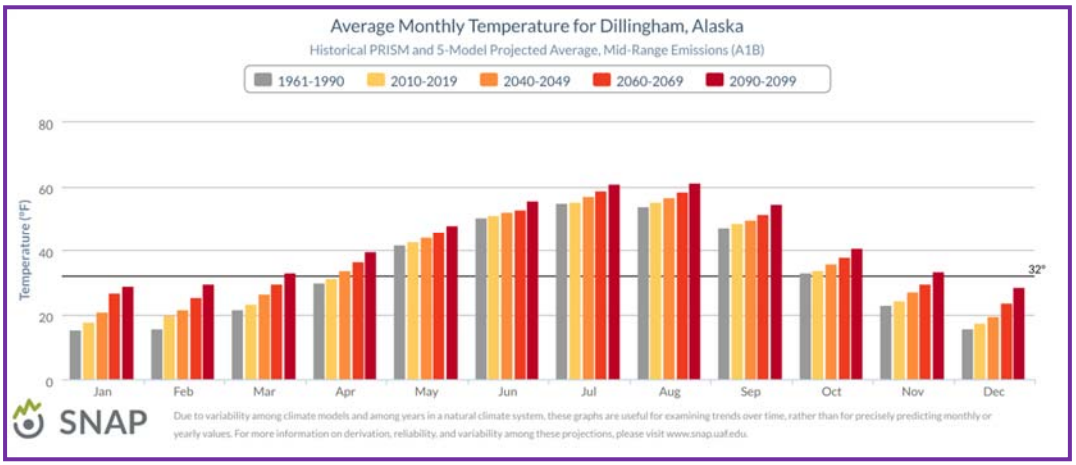


Figure 5-13 Dillingham's Historic and Predicted Temperatures (SNAP 2014)

Figure 5-14 delineates the Dillingham Weather Service Office's (WSO) weather data summaries.

5

DILLINGHAM AP, ALASKA (502457)

Period of Record Monthly Climate Summary

Period of Record : 02/01/1919 to 05/31/2005

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	22.1	23.0	29.3	38.2	50.3	58.7	62.5	60.6	53.9	39.7	28.7	20.7	40.6
Average Min. Temperature (F)	10.1	9.8	14.9	24.6	34.9	43.2	47.4	46.6	40.3	26.5	16.7	8.1	26.9
Average Total Precipitation (in.)	1.79	1.35	1.49	1.01	1.47	1.93	2.79	3.92	3.47	2.21	2.19	1.87	25.48
Average Total SnowFall (in.)	17.1	11.2	13.2	5.4	0.3	0.0	0.0	0.0	0.1	2.1	15.5	18.1	82.9
Average Snow Depth (in.)	5	5	4	5	5	3	3	3	4	5	5	4	4

Percent of possible observations for period of record.
Max. Temp.: 82.6% Min. Temp.: 82.8% Precipitation: 77.2% Snowfall: 68.2% Snow Depth: 66.6%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 5-14 Dillingham Weather Summaries (WRCC 2015)

5.3.1.4.3 Location, Extent, Impact, and Recurrence Probability

Location

The entire Dillingham area experiences periodic severe weather impacts. The most common to the area are high winds and severe winter storms with strong, damaging storm surge.

Extent

The entire City is equally vulnerable to the severe weather effects. The City experiences severe storm conditions with moderate snow depths; wind speeds exceeding 90 mph; and extreme low temperatures that reach -60ºF.

Based on past severe weather events and the criteria identified in Table 5-2, the extent of severe weather in the City are considered "Limited" where injuries do not result in permanent disability, complete shutdown of critical facilities occurs for more than one week, and more than 10 percent of property is severely damaged.

Impact

The intensity, location, and the land's topography influence a severe weather event's impact within a community. Hurricane force winds, rain, snow, and storm surge can be expected to impact the entire Dillingham area.

Heavy snow can immobilize a community by bringing transportation to a halt. Until the snow can be removed, airports and 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 and or snow machine accidents. Casualties also occur due to overexertion while shoveling snow and hypothermia caused by overexposure to the cold weather.

Extreme cold can also bring transportation to a halt. Aircraft may be grounded due to extreme cold and ice fog conditions, cutting off access as well as the flow of supplies to communities. 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 the proper functioning of a community's infrastructure by causing 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.

Recurrence Probability

Based on previous occurrences and the criteria identified in Table 5-3, it is "Highly Likely" a severe storm event will occur as there is a one in one year (1/1=100 percent) chance of occurring

as the history of events is greater than 20 percent but less than or equal to 33 percent likely per year.

5.3.1.5 Volcano

5.3.1.5.1 Nature

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 volcano types:

- Lava domes are formed when lava erupts and accumulates near the vent
- Cinder cones are shaped and formed by cinders, ash, and other fragmented material accumulations that originate from an eruption
- Shield volcanoes are broad, gently sloping volcanic cones with a flat dome shape that usually encompass several tens or hundreds of square miles, built from overlapping and inter-fingering basaltic lava flows
- Composite or stratovolcanoes are typically steep-sided, large dimensional symmetrical cones built from alternating lava, volcanic ash, cinder, and block layers. Most composite volcanoes have a crater at the summit containing a central vent or a clustered group of vents.

Along with the different volcano types there are different eruption classifications. Eruption types are a major determinant of the physical impacts 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 poses a potential volcanic hazard to the City of Dillingham because, unlike other secondary eruption effects such as lahars and lava flows, ash fall can travel thousands of miles from the eruption site.

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, livestock, and wildlife. Ash imparts catastrophic damage to flying jet aircraft, operating electronics and machinery, and interrupts 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 risk. Special concern is extended to aircraft because volcanic ash completely destroys aircraft engines.

Ash clouds have caused catastrophic aircraft engine failure, 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 traveling directly over or near Alaska's volcanoes, has necessitated developing strong communication and warning links between the Alaska Volcano Observatory (AVO), other government agencies with responsibility for aviation management, and the airline and air cargo industry (AVO 2012a, USGS 2002).

The AVO's identified volcanoes with the greatest potential of impacting the City of Dillingham are listed in Table 5-6 due to their relative location to the Dillingham Census area and the airline flight corridors.

Table 5-6 Volcanoes Nearest To Dillingham

Volcano Names			
Akutan Volcano	Fisher Volcano	Katmai Volcano	Redoubt Volcano
Augustine Volcano	Griggs Volcano	Martin Volcano	Ugashik-Peulik Volcano
Cleveland Volcano	Illiamna Volcano	Novarupta Volcano	Ukinrek-Maars Volcano
Dutton Volcano	Isanotski Volcano	Pavlov Volcano	Westdahl Volcano

(AVO 2015)

5.3.1.5.2 History

The AVO, and its constituent organizations (USGS, DNR, and UAF), has volcano hazard identification and assessment responsibility for Alaska's active volcanic centers. The AVO monitors active volcanoes several times each day using Advanced Very High Resolution Radiometers (AVHRR) and satellite imagery.

DHS&EM's Disaster Cost Index records the following volcanic eruption disaster events:

5

> ***103. Mt. Redoubt Volcano, December 20, 1989*** *When Mt. Redoubt erupted in December 1989, posing a threat to the Kenai Peninsula Borough, Mat-Su Borough, and the Municipality of Anchorage, and interrupting air travel, the Governor declared a Disaster Emergency. The Declaration provided funding to upgrade and operate a 24-hr. monitoring and warning capability.*
>
> ***104. KPB-Mt. Redoubt, January 11, 1990*** *The Kenai Peninsula Borough, most directly affected by Mt. Redoubt, experienced extraordinary costs in upgrading air quality in schools and other public facilities throughout successive volcanic eruptions. The Borough also sustained costs of maintaining 24-hr. operations during critical periods. The Governor's declaration of Disaster Emergency supported these activities.*
>
> ***161. Mt. Spurr, September 21, 1992*** *Frequent eruptions and the possibility of further eruptions has caused health hazards and property damage within the local governments of the Municipality of Anchorage, Kenai Peninsula Borough and Mat-Su Borough. These eruptions caused physical damage to observation and warning equipment. Funds to replace equipment for AVO.*

The AVO's Service Review, Mount Redoubt Volcanic Eruptions, March – April 2009 (Figure 5-15) states,

> *"Mount Redoubt volcano in continuous eruption on March 31, 2009. Plume height is no more than 15,000 feet above sea level. The small amount of ash in plume is creating a haze layer downwind of the volcano and dustings of fine ash are falling out of the plume. View is from the northwest…*

Photo Credit: Kristi Wallace, AVO…

Figure 5-15 2009 Eruption Cloud (AVO 2009b)

On March 22, 2009, Mount Redoubt volcano, 106 miles southwest of Anchorage, Alaska, began a series of eruptions after persisting in Orange or "Watch" status since late January

2009. Plume heights were observed at or above 60,000 feet during two of the six significant eruptions. Ashfall occurred over south central Alaska, including in Anchorage, with amounts ranging from a trace to one-half inch in depth.

The Redoubt eruptions also disrupted air traffic in the region. Hundreds of commercial flights were cancelled and cargo companies were significantly impacted. This resulted in employees being placed on unpaid leave during periods when airport operations were shut down. Anchorage is Alaska's major population center; its airport serves as a critical strategic transportation hub as the third busiest cargo airport in the world" (AVO 2009b).

Recent volcano eruption impacts demonstrate modern community vulnerability to volcanic ash dispersal and travel distance.

Alaska's volcanoes have very diverse eruption histories spanning thousands of years. Activity spanning such an extensive timeline is nearly impossible to define. However modern science has enabled the AVO with determining fairly recent historical eruption dates. Table 5-7 lists the AVO's identified Aleutian Chain volcano's historical eruption dates with explanatory symbols to designate the data's accuracy.

Table 5-7 Aleutian Volcano Eruption Events Since 1740

Aleutian Volcanoes and Their Respective Eruption Dates			
Akutan	Fisher	Martin	Ugashik-Peulik
30: 1848-1992	0:	0:	:
10: 1765-1953	3: 1795-1830	3: 1776-1900	2: 1814-1852
Aniakchak	Griggs	Novarupta	Ukinrek-Maars
1: 1912	0:	1: 1912	1: 1977
0:	0:	0:	0:
Augustine	Illiamna	Pavlof	Westdahl
9: 1812-2005	0:	7: 1762-1980	7: 1795-1991
4: 1885-1908	13:	33: 1817-2014	3: 1820-1979
Cleveland	Isanotski	Pavlof Sister	
21: 1828-2014	:	0:	
7: 1774-2010	:	1: 1762	
Dutton	Katmai	Redoubt	
0:	1: 1912	4: 1902-2009	
0:	0:	2: 1881-1933	
Key: Eruption Questionable eruption Non-eruptive activity			

(AVO 2015)

5.3.1.5.3 Location, Extent, Impact, and Recurrence Probability

Location

Figure 5-16 delineates the AVO monitoring program's active and inactive volcanoes.

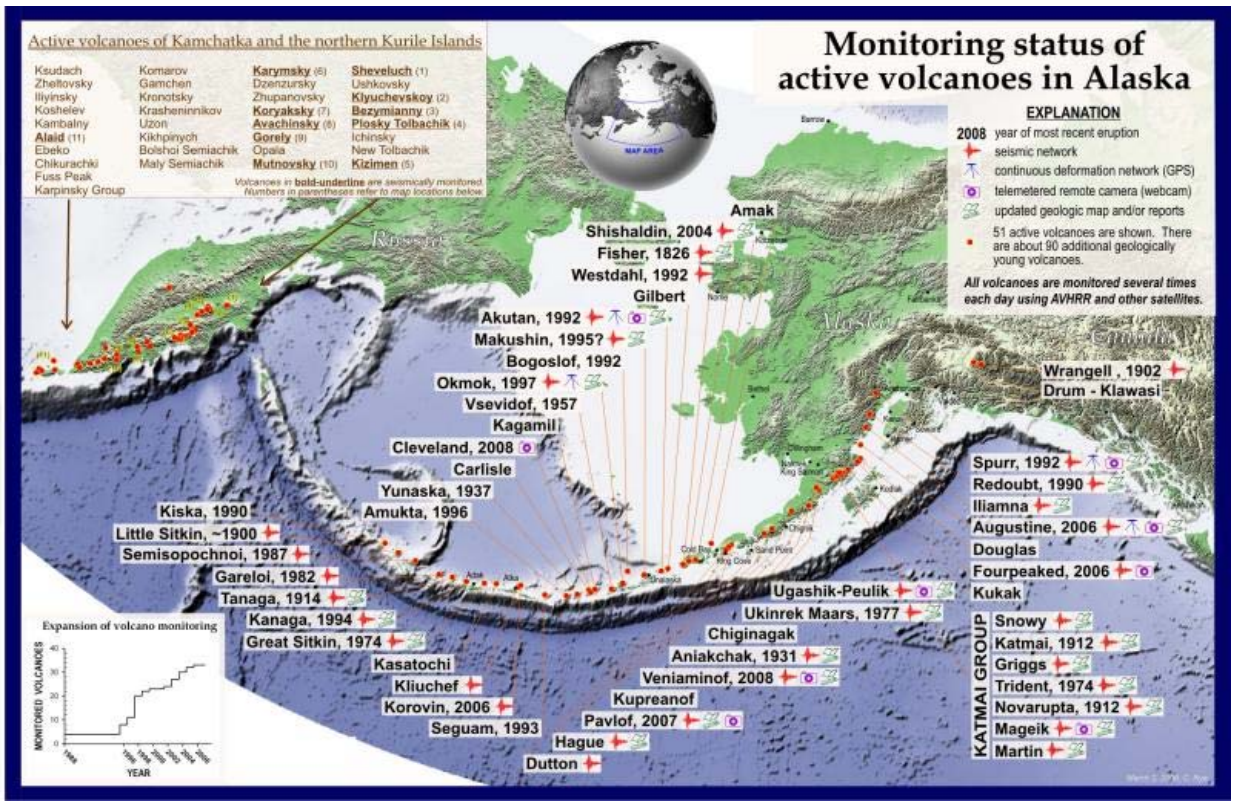


Figure 5-16 AVO's Volcano Monitoring Status Map (AVO 2008)

The AVO publishes individual hazard assessments for each active volcano in Alaska. Table 5-8 provides a representative sample of available preliminary reports and hazard assessments.

Table 5-8 List of Published Aleutian Volcano Hazard Assessments

Volcano Names			
Akutan Volcano	Great Sitkin Volcano	Makushin Volcano	Shishaldin Volcano
Aniakcahak Volcano	Hayes Volcano	Okmok Volcano	Tanaga Island Volcanic Cluster
Gareloi Volcano	Kanaga Volcano	Pavlof Volcano	

Each report contains a description of the eruptive history of the volcano, the hazards they pose, and the likely effects of future eruptions to populations, facilities, and ecosystems.

Figure 5-17 indicates the most likely volcanoes to impact the Dillingham area.

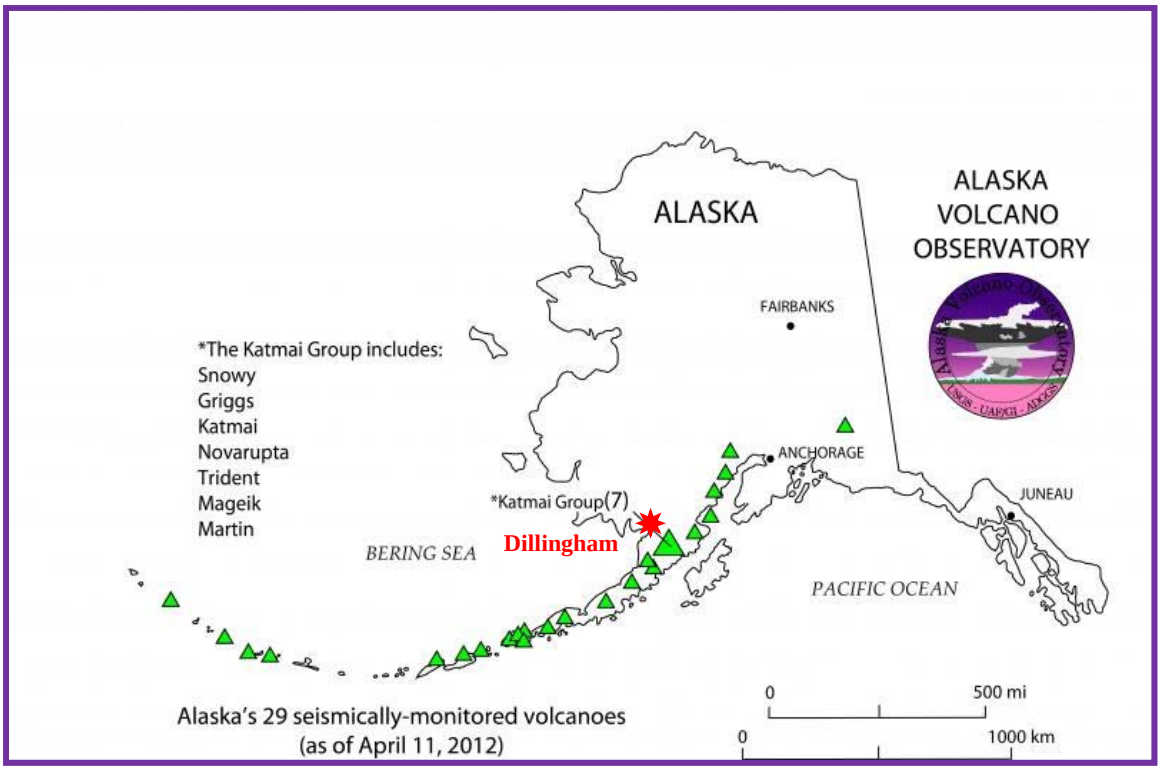


Figure 5-17 Alaska's Seismically Monitored Volcanoes (AVO 2015)

Alaska contains approximately 80 volcanic centers and is at continual risk for volcanic eruptions. 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 to 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" (USGS 1998)*

Many of the volcanoes in Alaska are capable of producing eruptions that can affect Dillingham. City residents are concerned that significant volcanic ash falls could impact the City. A large ash plume has the capability of shutting down air, and potentially, shipping and commercial fishing operations because tephra damages all engine types.

USGS Bulletin 1028-N explains that Mount Katmai's eruption on June 5, 1912 was up to that point "the greatest volcanic catastrophe in the recorded history of Alaska. More than six cubic miles of ash and pumice were blown into the air from Mount Katmai and the adjacent vents in the Valley of Ten Thousand Smokes." The eruption lasted for 3 days. The USGS Fact Sheet 075-98, Version 1.0 states,

> *"The ash cloud, now thousands of miles across, shrouded southern Alaska and western Canada, and sulfurous ash was falling on Vancouver, British Columbia; and Seattle,*

Washington. The next day the cloud passed over Virginia, and by June 17th it reached Algeria in Africa."

Figure 5-18 displays four ash cloud impact areas. The 1912 Katmai ash cloud is gray; the Augustine (blue plume), Redoubt (orange plume), and Spurr (yellow plume) were each dwarfed by the Katmai event.

"Volcanologist's discovered that [this] 1912 [Katmai] eruption was actually from Novarupta, not Mount Katmai" (USGS 1998).

- 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.

Figure 5-18 1912 Katmai Volcano Impact (USGS 1998)

- The 1989-90 eruption of Mt. Redoubt seriously affected the population commerce, and oil production and transportation throughout the Cook Inlet region.

  "Redoubt Volcano is a strato-volcano located within a few hundred kilometers of more than half of the population of Alaska. This volcano has erupted explosively at least six times since historical observations began in 1778. The most recent eruption occurred in 1989-90 and similar eruptions can be expected in the future. The early part of the 1989-90 eruption was characterized by explosive emission of substantial volumes of volcanic ash to altitudes greater than 12 kilometers above sea level and widespread flooding of the Drift River valley. Later, the eruption became less violent, as developing lava domes collapsed, forming short-lived pyroclastic flows associated with low-level ash emission. Clouds of volcanic ash had significant effects on air travel as they drifted across Alaska, over Canada, and over parts of the conterminous United States causing damage to jet aircraft, 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" (USGS 1998).

- Mt. Spurr's 1992 eruption brought business to a halt and forced a 20 hour Anchorage International Airport closure. Communities 400 miles away reported light ash dustings.

  "Eruptions from Crater Peak on June 27, August 18, and September 16–17, 1992, produced ash clouds (fig. 11) that reached altitudes of 13 to 15 kilometers [8-9 miles] above sea level. These ash clouds drifted in a variety of directions and were tracked in satellite images for thousands of kilometers beyond the volcano (Schneider and others, 1995). One ash cloud that drifted southeastward over western Canada and over parts of the conterminous United States and eventually out across the Atlantic Ocean [Figure. 11] significantly disrupted air travel over these regions but caused no direct damage to flying aircraft" (USGS 2002)

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 similar air traffic disruption (Figure 5-19).

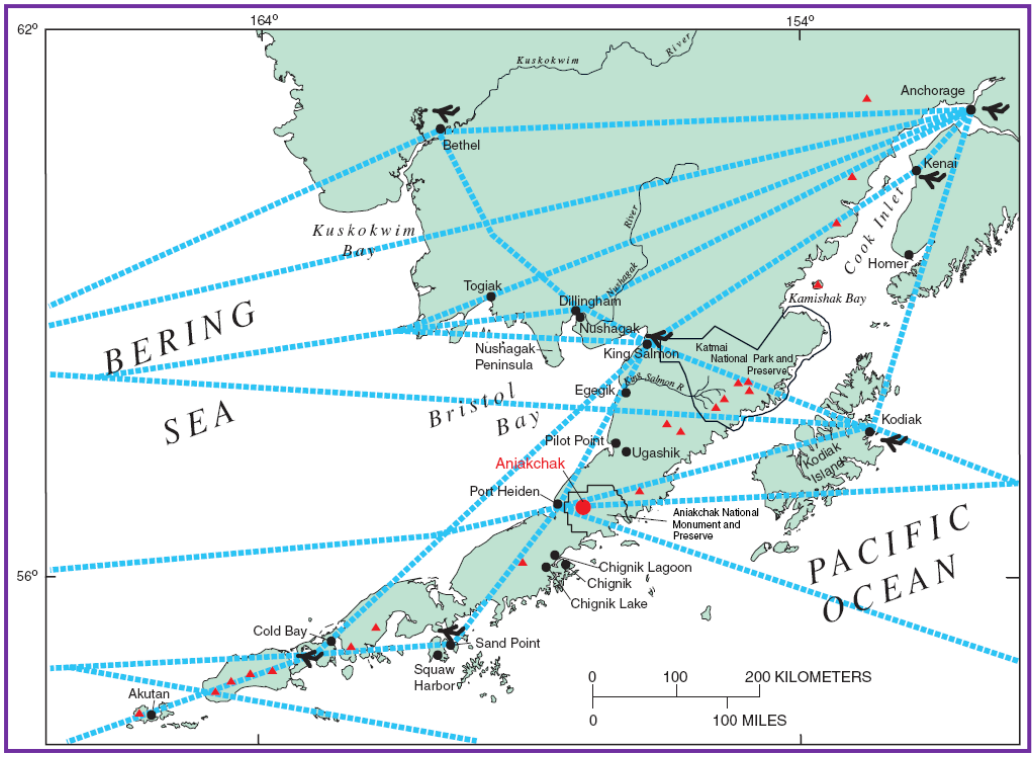


Figure 5-19 North Pacific Air Travel Routes (USGS 2001)

- 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.
- 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).

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.

Extent

Volcanic effects include severe blast, turbulent ash and gas clouds, lightning discharge, volcanic mudflows, pyroclastic flows, corrosive rain, flash flood, outburst floods, earthquakes, and

tsunamis. Some of these activities include ash fallout in various communities, air traffic, road transportation, and maritime activity disruptions.

Dillingham might receive very limited ash fall during a massive volcanic eruption from Russian or Aleutian Chain volcanoes. A much more likely impact would be prolonged traffic disruptions (air, land, or rail) preventing essential community resupply e.g. food and medicine delivery, and medical evacuation service capabilities to full service hospitals (Figure 5-12).

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

Significant ash fall events could potentially be devastating to Dillingham by straining its resources as well as transportation (air, ocean, land, and rail routes); especially if other hub communities are also significantly affected by a volcanic eruption. Residents would likely experience respiratory problems from airborne ash, personal injury, and potential residential displacement or lack of shelter with general property damage (electronics and unprotected machinery), structural damage from ash loading, state/regional transportation interruptions, loss of commerce, as well as water supply contamination.

These impacts can range from inconvenience – a few days with no transportation capability; to disastrous – heavy, debilitating ash fall throughout the state, forcing Dillingham to be completely self-sufficient.

Recurrence Probability

Geologists can make general forecasts of long-term activity associated with individual volcanoes by carefully analyzing past activity, but these are on the order of trends and likelihood, rather than specific events or timelines. 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 measurable carbon dioxide and compounds of sulfur and chlorine emissions increases. Shifts in magma depth and location can cause ground level elevation changes that can be detected through ground instrumentation or remote sensing.

The Planning Team has determined that volcanic impacts do not directly threaten Dillingham. However, the City states that intense or long-term volcanic ash discharges would create a critical "economic" hardship for rural community inhabitants. Dillingham residents rely heavily on air, ocean, and rover shipping and transportation. All transportation, to-and from Dillingham stops during severe volcanic activity. This stoppage could adversely impact their sustainability if they were unable to receive critical supplies and medical assistance during such an event.

Therefore, considering 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.

5.3.1.6 Wildland Fire

5.3.1.6.1 Nature

A wildland fire is a wildfire type that spreads through vegetation consumption. 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 unattended burns 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 wildland, wildland/urban interface or intermix fires, tundra fires, and prescribed burns.

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

Topography describes slope increases, which influences 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, ridge tops may mark the end of wildland fire spread since fire spreads more slowly or may even be unable to spread downhill.

Fuel is 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. Climate change is deemed to increase wildfire risk significantly during periods of prolonged drought as the moisture content of both living and dead plant matter decreases. The fuel load continuity, both horizontally and vertically, is also an important factor.

Weather is 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. Climate change increases the susceptibility of vegetation to fire due to longer dry seasons. 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 water/food, 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 rivers and stream siltation, thereby enhancing flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow hazards.

Urban Interface Fires

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 structure damages occurred 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. A DOT/PF crew with the second arriving engine controlled the fire on that property preventing structures damages.

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

Dillingham Volunteer Fire Department (DVFD), DOT/PF personnel, and more than 50 community volunteers 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. However the fire 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 some lower tree branches. Teams using hand tools extinguished the fire before it reached the fire-break or any Nerka structures. State fire officials were alerted and an aerial tanker was en route to dump retardant on Nerka, returned to base once the fire was deemed under control.

Fire Conditions

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 along 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 main 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 urban interface wildland fires, other than the Nerka fire, caused requests to the Division of Forestry (DOF) for standby wildland fire assistance. They were successfully suppressed by DVFD personnel.

05/18/05: Brush, grass, and scrub burned at the perimeter of the HUD apartment complex, 10-15 acres

03/06/03: Grass and brush on Bradford Point at the Kanakanak Hospital compound perimeter; Unknown acreage

5.3.1.6.2 History

Previous wildland fires have been documented in close proximity to Dillingham's city limits; none of which caused significant damaging structural impacts.

There has been approximately 84 historical fires started by environmental events and human actions. The most frequent human cause has been children playing with fire, out-of-control trash, debris or brush burning, and camp or cooking fires. Lightning fires from thunderstorms are becoming more frequent fire initiators however, lightning strikes within city limits are rare and there is no record of an urban fire being caused by such an event.

With the exception of the aforementioned instance, wildfires in Dillingham's urban/wildland interface have involved grass and brush and had very limited damage extent. Most of these have occurred during warm dry spring seasons; between break-up and green-up. Most property loss occurred to outbuildings, vehicles or other non-residential – non-critical facilities, surrounded by dry grass ignited before the firefighter arrival.

The Alaska Interagency Coordination Center (AICC) provides historical and location specific data for Alaska Wildland fires. Table 5-9 lists significant fire events that consumed over 100 acres within Dillingham's 50 mile radius.

Table 5-9 Dillingham's Historical Wildland Fires Located Within 50 Miles

Fire Name	Fire Year	Estimated Acres	Latitude	Longitude	Specific Cause
Snake River	2012	16,566	58.99222	-158.558	Human-Grass Fire
Tvativak	1997	2,450	58.81667	-159.383	Lightning
Klut Creek	1997	1,000	59.4	-157.533	Lightning
Naknek - South	1997	300	58.71667	-156.883	Exhaust
Tuklung	1997	250	58.83333	-159.333	Lightning
Kok 35	1997	185	59.38334	-157.65	Lightning
Koggiling #2	1997	140	59.18333	-157.333	Lightning
Twin	1991	12,400	59.16667	-160.2	Lightning
Okstakuk	1980	1,164	59.58333	-158.183	Lightning
Lower Nushagak	1959	750	59.21667	-157.55	Lightning
Dillingham	1957	5,000	58.95	-157.867	Lightning
Cormick	1957	4,500	59.51667	-157	Lightning
Naknek Fire	1953	200	58.73333	-157.033	Debris Burning
Dillingham	1952	45,000	59.21667	-158	Miscellaneous
Kvichak	1952	10,000	59.21667	-156.783	Smoke Bomb
Naknek	1945	100,000	58.85	-156.667	Smoking
Koggiung-Naknek	1943	192,000	58.8	-156.95	Miscellaneous
Aleknagik	1942	12,000	59.2	-158.533	Debris Burning
Stuyahok	1941	5,000	59.81667	-156.717	Unknown

(AICC 2014)

5.3.1.6.3 Location, Extent, Impact, and Recurrence Probability

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.

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 lasts 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.

Figure 5-20 portrays the AICC identified fires and their location relative to Dillingham.

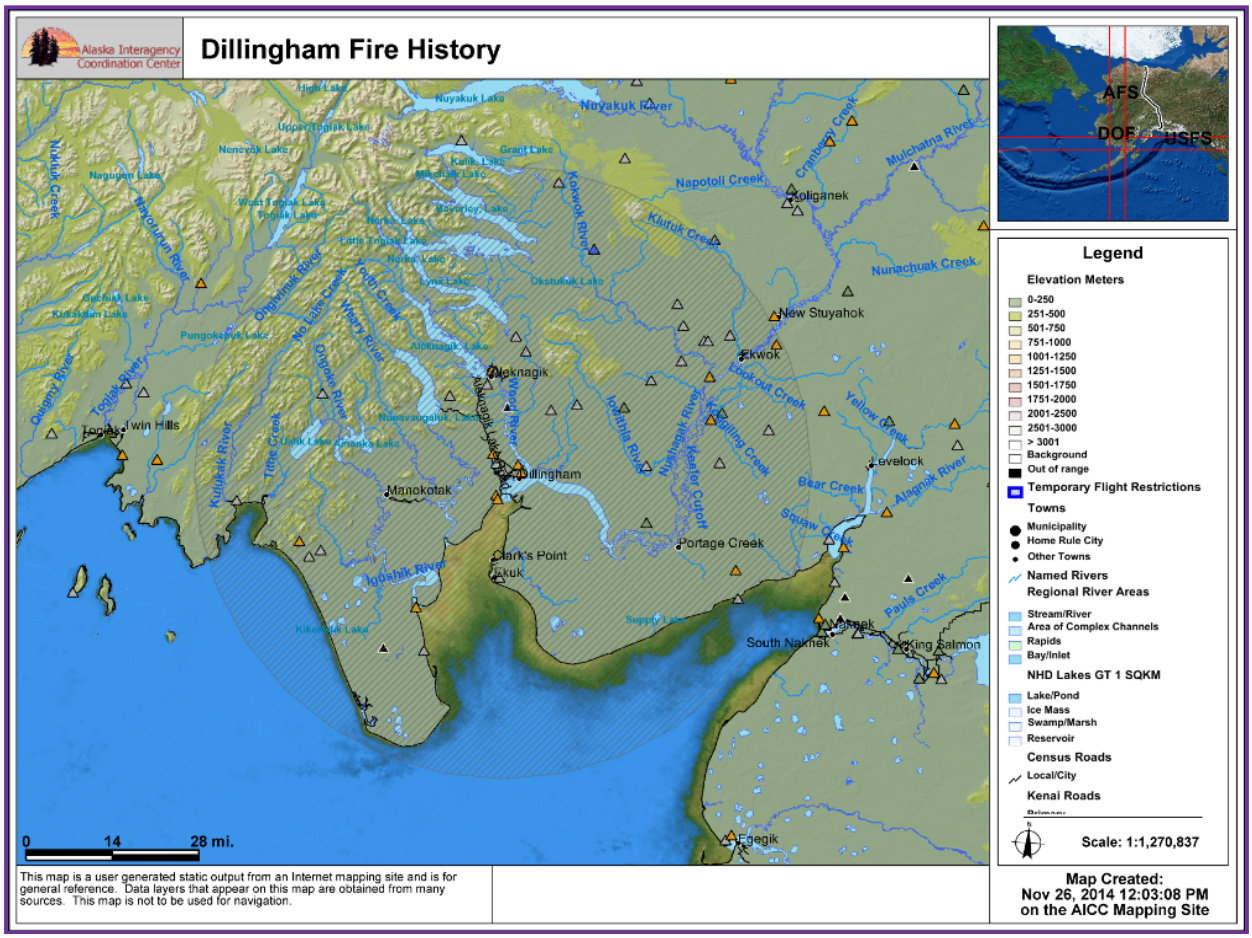


Figure 5-20 Dillingham Fire History (AICC, 2015)

Extent

Generally, fire vulnerability 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 lightning strikes and human 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 75 years a total of 409,000 acres have burned within 50 miles of Dillingham.

The 1943 Koggiung-Naknek fire burned approximately 192,000 acres and the 1945 Naknek fire burned 100,000 acres. Fire causes were classified as "Miscellaneous" and "Smoking" respectively. It is difficult to determine the average number of acres burned as the fires were vastly different for each of the identified wildland fire events identified in Table 5-9 (AICC 2015). An average based on such diverse data would easily be overstated.

Based on past wildland fire events and the criteria identified in Table 5-2, the magnitude and severity of impacts in the City of Dillingham are considered "Negligible" with minor injuries, the potential for critical facilities to be shut down 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.

Recurrence Probability

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.

An important issue related to the wildland or tundra fire probability in the interface fire is increased development along the community's perimeter, accumulation of hazardous wildfire fuels, and the uncertainty of weather patterns that may accompany climate change. These three combined elements are reason for concern and heightened mitigation management of each community's wildland interface areas, natural areas, and open spaces.

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 future wildland fires. Currently, much of the fallen beetle-killed spruce is harvested by locals, which helps to reduce the potential fuel for wildland fire.

Climate change and flammable vegetation species susceptibility to wildland fires throughout Alaska's forests and tundra locations is increasing. Therefore, based on the Dillingham's wildland fire history and applying the criteria identified in Table 5-3, it is "Likely" a wildland fire event will occur within in the next three years. The event has up to 1 in 3years (1/3=33 percent) chance of occurring and the history of events is greater than 20 percent but less than or equal to 33 percent likely each year.

5.3.2 Manmade and Technological Hazards

These hazards possess unique causes; distinctly separate from natural events. Manmade hazards result from human activities such as urban conflagration and events or activities that result in wildland interface fires. 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.

5.3.2.1 Urban Conflagration

5.3.2.1.1 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, shared 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:

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.

5.3.2.1.2 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 effective fire suppression.

Structure fires and boat fires have killed at least seven people in Dillingham during past events. These deaths and nearly all the injuries occurred within the originating structure.

The Dillingham Department of Public Safety records management system indicates that Dillingham Volunteer Fire personnel responded to 199 calls for fire related services since November 2008.

Call categories include the follows:

- Structure fires
- False alarm/other
- Vehicle fires
- Wildland/grass fires
- Boat fires

- Unknown

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.

The Dillingham Department of Public Safety records management system indicates that five boats in, and around, the harbor have reported fires since 2008. 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 in extremely close proximity, in a dry hole that does not have adequate, or occasionally even operational, first response firefighting capabilities. A fire occurring in the harbor would be catastrophic to Dillingham's fishing industry, crippling the community's economy for years to come.

5.3.2.1.3 Location, Extent, Impact, and Recurrence Probability

Location

Within Dillingham's 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 that 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.

Figure 5-21 displays an aerial view of City infrastructure potentially threatened by urban conflagration.

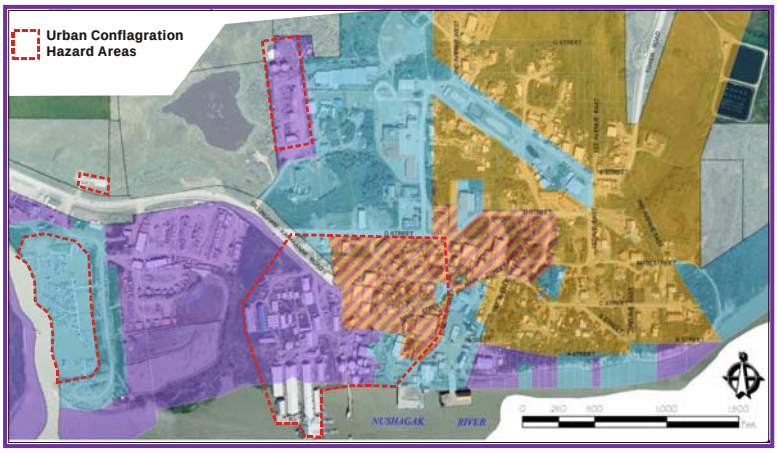


Figure 5-21 Dillingham Identified Conflagration Hazard Areas (Dillingham 2015)

5

Figure 22 shows specific facilities located in the City core that is most likely to be impacted by an urban conflagration fire that rapidly spreads due to structural density or in close proximity to each other.

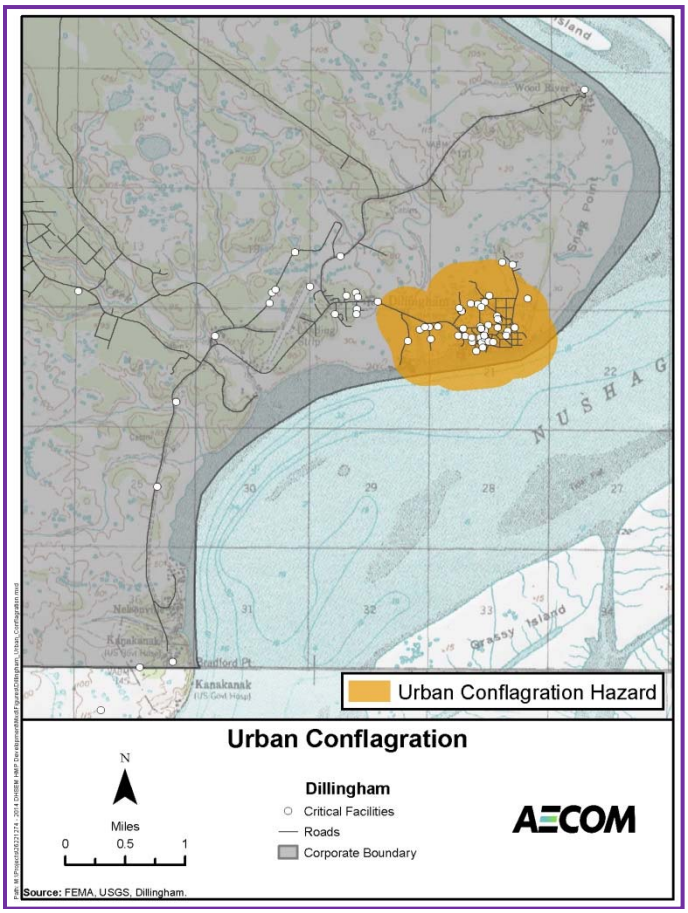


Figure 5-22 City Core Urban Conflagration Area (AECOM 2015)

It is important to note that criteria used to develop the Hazard Vulnerability Assessment did not take into account the structures' ages or types. 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.

Extent

Based on past urban conflagration events and the criteria identified in Table 5-2, the magnitude and severity of impacts in the City of Dillingham are considered "Negligible" with minor injuries, the potential for critical facilities to be shut down 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.

Recurrence Probability

Based on previous occurrences, the community's aging infrastructure, and the criteria identified in Table 5-2 it is "Possible" for a significant urban conflagration event to occur in Dillingham's core area. An event has up to 1 in 5 years (1/8=20 percent) chance of occurring) even though the history of events is less than 10 percent likely per year.

5.3.2.2 Hazardous Materials

5.3.2.2.1 Nature

Hazardous materials are substances that may have negative effects on health or the environment. Exposure to hazardous materials may cause injury, illness, or death. Effects may be felt over seconds, minutes or hours (short-term), or not emerge until days, weeks, or even years after exposure (long-term). Also, some substances are harmful after single exposures of short duration, while others require long episodes of exposure or repeated exposure over time to create harm.

Hazardous materials can be found nearly everywhere in our society. Paints, solvents, adhesives, gasoline, household cleaners, batteries, pesticides and herbicides, and even medicines are all potential sources of hazardous materials. While many people are beginning to question the wisdom of surrounding ourselves with so many potential toxins, this plan does not focus on the hazards in everyday products, but rather on the larger quantities of hazardous materials that are transported through the region by rail and highway, as well as on potential releases of extremely hazardous substances (EHS) from facilities within, or within contamination range of, a planning area.

The toxicity of a specific substance is one important factor in determining the risk it poses, but there are other factors that can be just as, if not more, significant. Factors affecting the severity of an accidental release include:

- Toxicity
- Quantity
- Dispersal characteristics

- Location of release in relation to population and sensitive environmental areas
- Efficacy of response and recovery actions

Hazardous materials are generally classified by their primary health effects on humans. Some common types include the following:

- Anesthetics and narcotics are substances that depress the central nervous system.
- Asphyxiants are substances that interfere with normal breathing and can cause suffocation.
- Explosives are substances that pose a risk of exploding; fires and chemical effects may also be a danger.
- Flammable materials are substances that catch fire easily, although they may pose other dangers such as explosion or chemical effects. Gasoline, propane, and diesel fuel are common examples in this category.
- Irritants cause burns or irritation to body tissues such as eyes, nose, throat, lungs, or skin.

Exposure to hazardous substances generally takes place by one, or a combination of, the following mechanisms:

- Direct contact with skin or eyes
- Ingestion via contaminated food or water
- Inhalation of particles or gas in contaminated air

Unless exempted, facilities that use, manufacture, or store hazardous materials in the U.S. fall under the regulatory requirements of the Emergency Planning and Community Right to Know Act, and must report to the U.S. Environmental Protection Agency (EPA). Hazardous materials that pose the greatest risk for causing catastrophic emergencies, as identified by the EPA, are classified as EHSs. Releases of EHSs and other hazardous substances can occur at facilities or during transport. Transportation-related releases are generally more troublesome because they may occur anywhere, including close to human populations, critical facilities, or environmentally sensitive areas. Transportation-related EHS releases can also be more difficult to mitigate due to the great area over which any given incident might occur, and the potential distance from response resources.

In addition to accidental, human-caused hazardous material events, natural phenomena may cause the release of hazardous materials and complicate response activities. Earthquakes pose a particular risk, because they can damage or destroy facilities containing hazardous substances. The threat of any hazardous material event may be amplified by restricted access, reduced fire suppression and spill containment capability, and even complete cutoff of response personnel and equipment.

Hazardous materials events or releases can also cause a host of secondary effects, depending on the nature and size of the incident. Fuel spills can create fires, incidents on highways or railroads can halt or impede transportation, and releases of EHSs can trigger evacuation and short or long-term displacement and social disruption.

5.3.2.2.2 History

The Department of Environmental Conservation's, Division of Spill Prevention and Response's Contaminated Site Program identified 39 historical contaminated site incidents for Dillingham (Table 5-10).

Table 5-10 Dillingham's Historical Contaminated Sites

Hazard ID	Date	Site Name	Location	Status	File ID
682	12/1/1990	Indian Health Service (IHS) Kanakanak Hospital - Area 4 & Sitewide Record	6000 Kanakanak Road, Dillingham, AK 99576,	Open	2540.38.005
1563	10/15/1994	Wood River Lodge	Nerka Lake, Dillingham, AK 99576,	Cleanup Complete	2662.38.001
1573	12/04/1992 1	Pen Air Hangar - Dillingham	Dillingham Airport, Dillingham, AK 99576,	Open	2540.38.015
1574	12/22/1992	Mark Air - Dillingham	Dillingham Airport, Dillingham, AK 99576,	Cleanup Complete - Institutional Controls	2540.38.006
1880	1/15/1994	Moody Oil Sales	333 Main Street, Dillingham, AK 99576,	Cleanup Complete	Undefined
1889	9/1/1994	Yute Air Terminal Dillingham	Airport Runway R.O.W., Dillingham, AK 99576,	Cleanup Complete - Institutional Controls	2540.38.009
2128	11/15/1994	Dillingham Storm Drain - Nushagak E	Unknown, Dillingham, AK 99576,	Cleanup Complete	2540.38.003
2463	1/3/1996	Dillingham Health Clinic	West 1st Avenue, Dillingham, AK 99576,	Cleanup Complete	2540.38.002
2464	5/15/1996	UAF Bristol Bay Campus Spill	Seward Street; Northwest of the D Street Intersection, Dillingham, AK 99576,	Cleanup Complete	2540.38.008
2613	9/22/2006	Moody Oil Facility	On Nushagak Bay / River, Dillingham, AK 99576,	Cleanup Complete	2540.38.007
3937	7/26/2002	Curyung Native Village Council	134 1st Avenue West, Dillingham, AK 99576,	Cleanup Complete - Institutional Controls	2540.38.012
3938	11/26/2002	SAFE Women's Shelter	21 G Street West, Dillingham, AK 99576,	Cleanup Complete - Institutional Controls	2540.38.013
4279	8/18/2006	Justice Residence HHO Release	5027 Alder Street, Dillingham, AK 99576,	Cleanup Complete	2540.38.016
4442	8/7/2007	IHS Kanakanak Hospital - Area 3 STP	6000 Kanakanak Road, Dillingham, AK 99576,	Open	2540.38.005
4443	8/7/2007	IHS Kanakanak Hospital - Area 8	6000 Kanakanak Road, Dillingham, AK 99576,	Open	2540.38.005
4444	8/7/2007	IHS Kanakanak Hospital - Area 9	6000 Kanakanak Road, Dillingham, AK 99576,	Open	2540.38.005
4445	8/7/2007	IHS Kanakanak Hospital RTA-Area 10	6000 Kanakanak Road, Dillingham, AK 99576,	Open	2540.38.005
22891	3/31/2005	Federal Aviation Administration (FAA) Dillingham Flight Service Station	Dillingham Airport, Dillingham, AK 99576,	Cleanup Complete	2540.38.001
23203	9/21/1992	Armstrong Air	Dillingham Airport; , Dillingham, AK 99576,	Cleanup Complete	2540.26.001
23204	9/30/1992	City of Dillingham Public Works	*, Dillingham, AK 99576,	Cleanup Complete	2540.26.010

Table 5-10 Dillingham's Historical Contaminated Sites

Hazard ID	Date	Site Name	Location	Status	File ID
23481	9/5/1991	Peter Pan Seafoods-Dillingham	; , Dillingham, AK 99576,	Cleanup Complete	2540.26.006
23484	9/18/1991	Stelling Enterprises	1/8 mile, Wood River Rd.; , Dillingham, AK 99576,	Cleanup Complete	2540.26.007
23486	9/18/1991	Wren Air, Inc.-Dillingham	Dillingham Airport, Dillingham, Alaska (AK) 99576	Cleanup Complete	2540.26.008
23487	9/18/1991	Dillingham Auto	Main Street, Dillingham, AK 99576	Open	2540.26.003
23622	10/15/1995	Dillingham Convenience Store	Mi. 5.5 Aleknagik Rd., Dillingham, AK 99576	Cleanup Complete	2540.26.005
23726	9/30/1992	Dillingham City of - Public Safety Building	D Street, Dillingham, AK 99576	Cleanup Complete	2540.26.004
25151	3/7/2000	Department of Transportation (DOT)/ Public Facilities (PF) - Dillingham	Kenny Wren Road and East Main Street, Dillingham, AK 99576	Cleanup Complete - Institutional Controls	2540.26.002
25291	12/16/2008	IHS Kanakanak Hospital - Area 1	6000 Kanakanak Road, Near Water Treatment Plant Building (Bldg) 312, Dillingham, AK 99576	Cleanup Complete - Institutional Controls	2540.38.005
25464	11/5/2009	IHS Kanakanak Hospital - Area 2	6000 Kanakanak Road, Dillingham, AK 99576	Cleanup Complete - Institutional Controls	2540.38.005
25465	11/20/2009	IHS Kanakanak Hospital - Area 5	6000 Kanakanak Road, Dillingham, AK 99576	Open	2540.38.005
25466	11/20/2009	IHS Kanakanak Hospital - Area 6	6000 Kanakanak Road, Dillingham, AK 99576	Cleanup Complete	2540.38.005
25467	11/20/2009	IHS Kanakanak Hospital - Area 7	6000 Kanakanak Road, Dillingham, AK 99576	Cleanup Complete - Institutional Controls	2540.38.005
25613	7/16/2010	FAA Dillingham Utility Bldg 300	3.5 Miles South of Dillingham Airport, Dillingham, AK 99576	Open	2540.38.001
25770	11/17/2011	Delta Western Tank Farm - Dillingham	309 Main Street, Dillingham, AK 99576	Open	2540.38.017
25874	5/16/2012	Former Snopac Seafood Processing Facility - Dillingham	3700 Yako Road, Dillingham, AK 99576	Cleanup Complete - Institutional Controls	2540.38.018
26115	9/25/2013	Icicle Seafoods Wood River Facility - Dillingham	3700 Yako Road, Dillingham, AK 99576	Open	2540.38.019
26135	10/11/2013	C & L Tesoro	1610 Kanakanak Road, Dillingham, AK 99576	Open	2540.26.012
26218	3/3/2014	ADOT/PF Dillingham Airport Maintenance Facility	Dillingham Airport; N Side of ADOT&PF Storage Bldg Near N End of Taxiway C, Dillingham, AK 99576	Open	2540.38.020
26239	3/11/2008	Residence - 5455 Kanakanak Road	5455 Kanakanak Road, Dillingham, AK 99576	Open	2540.38.021

(DEC 2015)

5.3.2.2.3 Location, Extent, and Recurrence Probability

Location

The community's road system is subject to hazardous or toxic materials spills as depicted in Figure 5-23.

Many of Dillingham's regulated facilities lie along these routes and include facilities permitted to discharge to water:

- Alaska Best Seafood
- Dillingham Airport
- Dillingham Landfill
- Peter Pan Seafoods Inc.
- South Dillingham Cold Storage
- Wood River Seafood Processing Facility

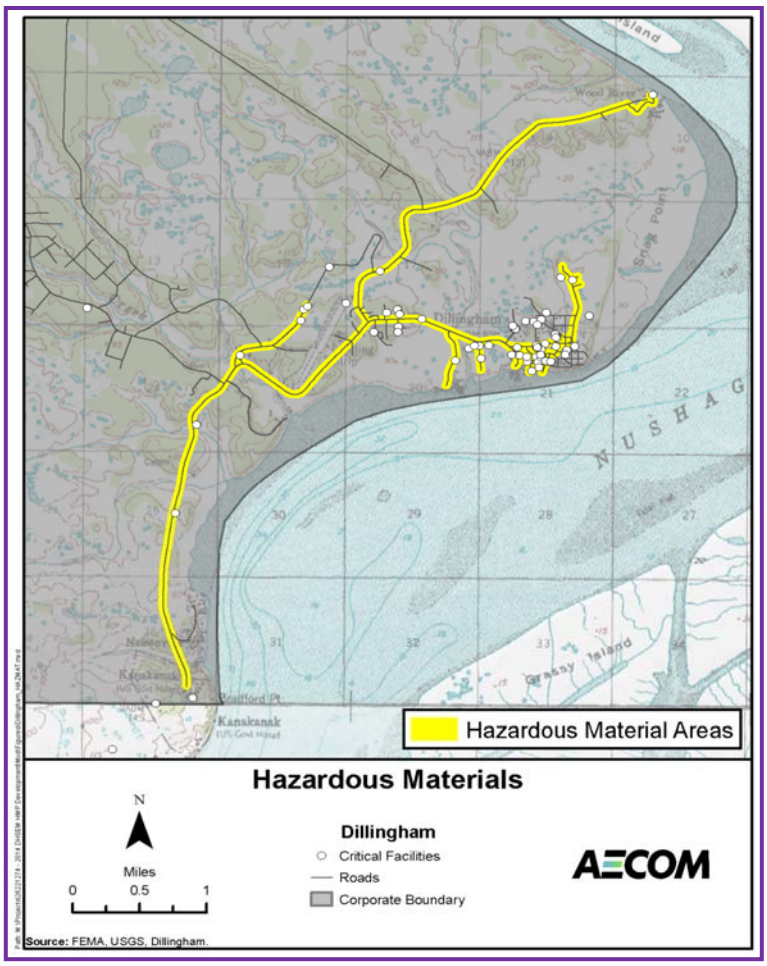


Figure 5-23 Dillingham's Hazardous Materials Routes
(AECOM 2015)

There are eight facilities that are hazardous waste handlers. Generally, the small, fixed facilities (drycleaners, auto body shops, etc.) have varying uses of hazardous chemicals, but in general do not pose a significant risk to the Planning Area. EPA Region 10 report (Table 5-11) lists eight Dillingham regulated handlers.

Table 5-11 EPA Region 10, Regulated Handlers - Dillingham

Handler Name	Handler ID	Location Address	TSD	Gen Type	Transporter	Used Oil
Bennett Enterprises Limited Liability Corporation (LLC) – New Shop	AKR000202713	Mile Marker 4	No	None	No	Yes
Bristol Bay Area Health Corporation (Corp).	AKR000002709	Kanakanak Hospital Compound	No	CEG	No	No
Coastal Marine Transport Incorporated (Inc.)	AKR000003517	135 Main Street	No	none	Yes	No
Delta Western Dillingham	AKD000834754	309 Main Street	No	CEG	No	No

Table 5-11 EPA Region 10, Regulated Handlers - Dillingham

Handler Name	Handler ID	Location Address	TSD	Gen Type	Transporter	Used Oil
Nushagak Electric Cooperative (CO-OP) Inc.	AKD041333717	569 Kenny Wren Road	No	CEG	No	Yes
Department of Health And Social Services (DHHS) Public Health Service (PHS) Hospital Kanakanak Bristol Bay Area Health Corporation (BBAHC) AK Native	AK1750390006	7 Miles S of City	No	CEG	No	No
Department of Interior (DOI), Fish and Wildlife Services (FWS) Snow Gulch Mining Site	AKR000201103	Lat 59 32 32.76 N	No	CEG	No	No
Peter Pan Seafoods Inc.	AKR000003350	1 Denny Way	No	CEG	No	Yes

(DEC 2015)

5

On behalf of several federal agencies including the EPA and Department of Transportation, the National Response Center serves as the point of contact for reporting oil, chemical, radiological, biological, and etiological discharges within the U.S.

> *"The Freedom of Information Act (FOIA) requires that all federal agencies make available in electronic form, data that will serve the public interest. The National Response Center supports an on-line query system that makes all oil and chemical spill data reported to the Center available via the World Wide Web. Data received via the National Railroad Hotline (1-800-424-0201) is also available as are reports taken during drills or spill exercises. This system provides full query capability on all non-Privacy Act data collected by the NRC since 1990 using a web browser and a connection to our Web Server. Searches can be done based on suspected responsible company, location, material involved, state, county, etc., and can be customized for each request. Additionally, yearly data from 1982 to 2012 can be downloaded for viewing off line" (NRC 2015)*

The WRAP Emissions Forum is responsible for compiling emissions inventories data to survey estimate how rural Alaska is meeting regional haze requirements. The survey was conducted to capture gather small (population of less than 2,000) and mid-sized (population of 2,000 to 59,332) communities. This data is not readily available.

The survey gathers data concerning fuel emission activities from non-residential facilities such as:

- Municipal offices
- Airports
- Schools
- Hospitals and clinics
- Marinas and ports
- Landfills
- Fuel Suppliers
- Utilities (electricity generation, water treatment etc.

Collected information included activity duration and applicable distances (hours, miles, and fuel use) being tabulated in predetermined quantities for consistency. Fuel categories included wood (cords), fuel oil (gallons), propane (gallons), and other which may include gasoline, diesel, and other combustibles. Tables 5-12 to 5-14 contains this title specific Toxic Release Inventory (TRI) data for the City of Dillingham.

Table 5-12 WRAP Program Response Summary

Community	Residential		Non-Residential	
	Summer	Winter	Summer	Winter
Dillingham	25	29	• City Operations • Refuse • Wastewater Treatment Facility	None

Collected data was then gathered and tabulated to determine annual emissions for each surveyed community. The City of Dillingham's total annual emissions were estimated to be:

Table 5-13 Dillingham's Annual Emissions

Community	Total Annual Emissions (tons/day)			
	Hydrocarbons (HC)	Carbon Monoxide (CO)	Nitrogen Oxide (NOx)	Particulate Matter (PM10)
Dillingham	13.35	13.01	1.83	5.10

City's residential fuel use quantities (Table 5-14).

Table 5-14 Dillingham's Annual Residential Fuel Use

Community	Annual Residential Use				
	Wood (cord)	Fuel Oil (gal)	Propane (gal)	Gasoline (gal)	Diesel (gal)
Dillingham	14,156	649,957	157,352	2,008,764	495,583

It is important to note that the City of Dillingham has 34 TRI facilities. However, the EPA's Toxic Release Inventory titled: *"2013 National Analysis dataset (released October 2014) (Updated Nov 24, 2014),"* states they experienced no TRIs and account for *"0% of Alaska's total TRI, "On- and Off-site, Releases of 970,610,034 lbs."*

Extent

As shown in Table 5-11, eight EHS handler sites have been documented in Dillingham. These include one electric utility, two health organizations, one mining operation, one sea food processing facility, one repair shop or facility, and two petroleum handlers. The vast majority of these sites would be places where an unintentional release would create a localized event. The greatest exceptions to this being bulk tank farm(s) and EHS facilities where site specific accidents at, or while large quantities of EHS are being transported would create a more far reaching impact and potential site specific contamination.

Dillingham has few facilities required to file an annual EPA Tier II Material Inventory Report. More comprehensive information on site specific hazardous material event magnitudes from all source types (such as fixed facilities or transport vehicles) is not available. Wide variations among the various hazardous material source characteristics and among the materials themselves make such an evaluation difficult. While it is beyond the scope of this HMP to evaluate detailed Dillingham area hazardous material event's magnitudes for each location, it is possible to determine buildings and critical facilities exposure should such an event occur.

Impact

In addition to fixed facilities, hazardous material events have the potential to occur along Dillingham's road system, waterways, and during airport activities. Vehicles used to transport EHS materials commonly carry a variety of hazardous materials including gasoline, diesel fuel, propane, other crude oil derivatives, and other chemicals, such as chlorine, known to cause human health problems. A defined quantity is transported through the Planning Area annually.

Recurrence Probability

Wide hazardous material source characteristic variations make such an evaluation difficult. It is possible to determine buildings and critical facilities exposure should such events occur. Eight EHS handlers were identified from their annual EPA Tier II Material Inventory Report as having reportable hazardous materials.

Based on previous occurrences, it is "Likely" a small petroleum product or chemical spill occurring within the Dillingham area would occur every 2.5 years. However, more comprehensive hazardous material events recurrence probability is not available.

5.3.2.3 Transportation and Utility System Disruptions

5.3.2.3.1 Nature

Transportation and utility system disruptions are a potential or subsequent impact of each of the identified natural hazards; their ramifications are far-reaching and much broader than direct damage and direct service loss.

It is important to remember, in considering any of the other hazards profiled in this plan, that transportation and utility system disruptions should be viewed in addition to other impacts. The duration, extent, risk, and recurrence probability associated with system disruptions are described below, and in some cases quantified. Electric power outages are dealt with in more detail than other disruptions because loss of electric power has the most widespread effects on other utilities.

Road, airport, and harbor closures are the most significant manmade or technological disruptive events to Dillingham All are subject to disruption from the various hazards profiled in this plan: earthquake, flood, ground failure, (avalanche and landslide), volcano, severe weather, and hazardous materials incidents.

The ramifications of transportation system disruption range from effects on life, health, and safety (emergency vehicle mobility, access to hospitals, evacuation routes, and vital supplies if transport is unavailable for extended time periods); to the economic effects of delays, lost commerce, and lost time.

Utility System disruptions can affect the City at the commerce and recreation levels as well as at the impacting fundamental health and safety. Analyzing potential utilities disruptions is complicated because utilities like electric power, potable water, wastewater, and telecommunications are all networks, which may or may not have built-in redundancy at the rural community level. The nature of these redundancies determines their sustainability to a particular hazard's impacts.

City water treatment plants are by nature located in flood-prone areas. Floodwater inundation can cause raw water to circumvent and contaminate source wells and infiltration galleries or treatment systems. Earthquakes can damage water storage, treatment, and transport systems. Water systems are also extremely vulnerable to power outages. Storage tanks are usually located a distance away

from their source. Water is pumped into these tanks using electricity. Storage tanks typically contain a finite number of days' water supply. Long duration power outages can cause water shortages.

Wastewater management is also crucial for public health, and wastewater systems are similarly vulnerable to floods, earthquake damages, and power outages. Floods may cause collection pipes to overflow that in-turn could cause inflow that exceeds treatment plant capacity, resulting in untreated or partially treated wastewater releases. Treatment plants are often located in low-lying areas, which facilitate collected wastewater gravity flow to the plant. However, this means that treatment plants are often found in flood zones. Wastewater pipes and plants are subject to earthquake damage, and power loss can adversely impact the plant such as a complete shutdown or subsequent untreated or partially treated water releases. Public health hazards can be posed by wastewater and sewage backed-up, as well as by untreated or incompletely treated wastewater releases.

Fuel and Oil Distribution systems are vulnerable to seismic and severe storm events as well as being vulnerable to flood and associated damages and power losses. Landslide can affect fuel delivery systems. Community fuel delivery disruption will create difficulties especially to critical facilities such as local power generation and vehicular transportation. Fuel spill areas are a particular hazard as it takes time to transport large volume clean-up and containment equipment to remote locations.

Telecommunication Systems(including telephone, broadcast radio, and satellite systems) are generally somewhat less vulnerable to hazards than other services as they are typically located away from flood or landslide areas. Above-ground lines are vulnerable to utility pole failure, but disruptions are about 10 times less common than electrical line failures – partly because the much lower communications line voltage makes them much less vulnerable to arcing or shorting between close proximity line. Telecommunications failures can have devastating impacts to Dillingham due to its isolated location. Routine emergency response (fire, police, and ambulance) as well as disaster-response rely on immediate access and electricity for timely communications.

Electrical Power Distribution Systems, power plants, and transmission lines are vulnerable to most of the hazards covered in this Plan. Earthquake, flood, and severe weather events are all power, transmission, and distribution line threats. Dillingham has only one small electric power generation plant. Electric power is pivotal to modern life. Critical infrastructure, public, and commercial facilities, and residents all rely heavily on electricity. Emergency facilities such as hospitals, clinic, and emergency response operations typically are equipped with backup generators for critical life-support and communications functions. Nonetheless, there are significant consequences to long-term and widespread electrical power outages. Other utility systems, discussed above, also depend on electricity for normal operations. Subsequently, electric power loss can cause serious secondary impacts.

5.3.2.3.2 History

Transportation and Utility System disruptions typically result from a primary manmade or natural hazard event and are therefore treated as secondary hazards.

5.3.2.3.3 Location, Extent, Impact, and Recurrence Probability

Location

Dillingham has and relies upon modern infrastructure. Transportation and utility systems are the basis of everyday life in both urban as well as rural Alaska. Dillingham has identified essential infrastructure which may experience critical failure from individual or as secondary impacts form natural and manmade and/or technological hazards.

The Nushagak Cooperative supplies, electric, telephonic, cable television, and internet services. They have recently installed five new "dual fuel" diesel generators, improving hot water heat delivery system, and refurbishing the bulk fuel storage, containment area, and associated underground piping. The Coop continues to plan for mitigating power line failure, improving fuel distribution, and considering water and waste treatment alternatives. The Coop is also pursuing alternative power generation options to ensure community sustainability and facilitate resiliency to hazard impacts.

Figure 5-24 depicts the City's most threatened transportation and utility disruptions areas that are mainly located in the City core area.

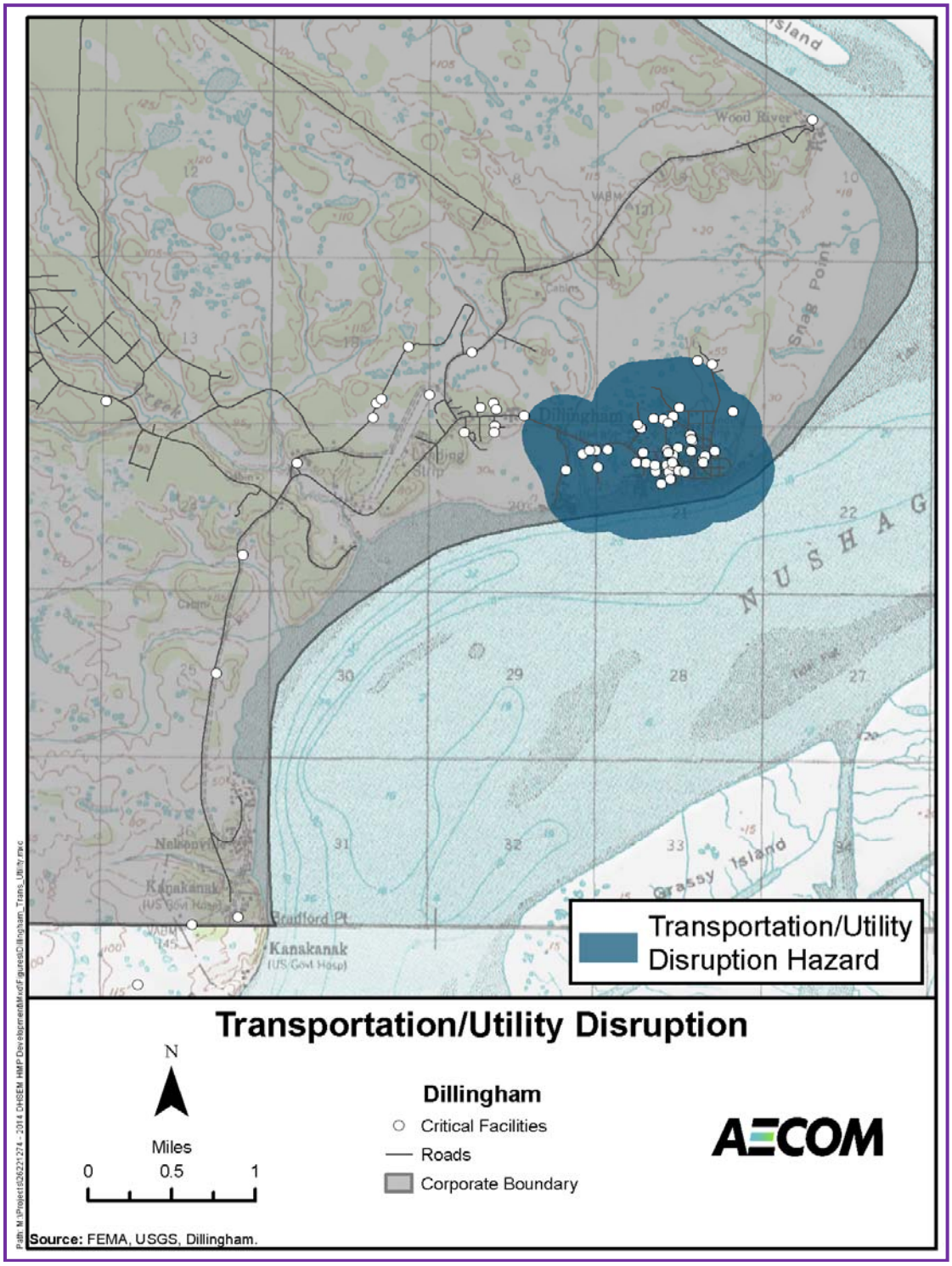


Figure 5-24 City's Transportation and Utility Disruption Area (AECOM 2015)

Extent

The extent of transportation or utility service disruptions directly depends on the nature and magnitude of a hazard's impacts. Minor hazard events may cause minor disruptions, while significant hazard events may cause long-term transportation and utility failures.

Impact

The intensity, location, topography, and the age of an infrastructure all influence damages experienced. For example, earthquakes, floods, hurricane force winds, rain, and snow in and of themselves may not adversely affect a critical facility. However, combine any of these events in any combination could create catastrophic impacts. Compounded hazard impacts would potentially cripple the City's response capabilities.

These impacts can range from inconvenience – a few days with no transportation capability; to disastrous – heavy, debilitating damages with no capability to communicate their plight beyond their adjacent communities.

Utility functionality would directly determine the rapidity for response, construction, and repairs because communication and computer systems, and emergency response equipment is essential for modern operational capability.

The City's land, marine, and air transportation capabilities as well as utility system malfunctions would hamper, even close down operations completely, stopping the flow of supplies and disrupting emergency operations and medical services. Accumulations of snow or ash can cause roof collapse and other hazard impacts could further hamper response and recovery processes.

Recurrence Probability

Inclement weather, topography, and human influence are the usual cause for transportation and utility system failure events. Increased usage (portrayed by heavy traffic periods or increased utility needs such as winter heating) can exacerbate or accelerate these systems' failure rate. Consequently, Dillingham may periodically experience episodic systems' failure.

This page intentionally left blank

Section Six outlines the vulnerability process for determining potential losses for the community from various hazard impacts.

6.1 OVERVIEW

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 eight steps:

1. Asset Inventory
2. Exposure Analysis For Current Assets
3. Repetitive Loss Properties
4. Land Use and Development Trends
5. Vulnerability Analysis Methodology
6. Data Limitations
7. Vulnerability Exposure Analysis
8. Future Development

DMA 2000 and its implementing regulations for current assets, and area future development initiative vulnerability assessment:

DMA 2000 Recommendations
Assessing Risk and Vulnerability, and Analyzing Development Trends §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. *All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods.* The plan should describe vulnerability in terms of: §201.6(c)(2)(ii)(A): The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; §201.6(c)(2)(ii)(B): An estimate of the potential dollar losses to vulnerable structures identified in … this section and a description of the methodology used to prepare the estimate. §201.6(c)(2)(ii)(C): Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions. §201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.
1. REGULATION CHECKLIST
ELEMENT B. Risk Assessment, Assessing Vulnerability, Analyzing Development Trends
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))
B4. Does the Plan address NFIP insured structures within each jurisdiction that have been repetitively damaged by floods?
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))
Source: FEMA, March 2015.

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

- A summary of the community's vulnerability to each hazard that addresses the impact of each hazard on the community.
- Identification of the types and numbers of RL properties in the identified hazard areas.
- 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.
- Estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.

Table 6-1 lists the City of Dillingham's infrastructures' hazard vulnerability.

Table 6-1 Vulnerability Overview

Hazard	Area's Hazard Vulnerability			
	Percent of Jurisdiction's Geographic Area	Percent of Population	Percent of Building Stock	Percent of Critical Facilities and Utilities
Natural Hazards				
Earthquake	100	100	100	100
Flood	10	3	7	5
Ground Failure	5	10	3	10
Weather	100	100	100	100
Wildland Fire	20	10	10	5
Technological Hazards				
Urban Conflagration	35	50	50	75
Hazardous Materials	50	15	50	75
Transportation and Utility Disruptions	100	100	100	100

6.2 LAND USE AND DEVELOPMENT TRENDS

6.2.1 Land Use

Land use in the City is predominately residential with limited area for commercial services and community (or institutional) facilities. Suitable developable vacant land is in short supply within the boundaries of the City, and open space and various hydrological bodies surround the community. One area of town is classified as airport land use.

Current land use is shown on Figure 6-1. The City of Dillingham has platting authority as a First Class City under Alaska Statutes. All subdivisions governance, which are not restricted by Native allotments, must be brought before the Planning Commission.

The City of 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. The community's comprehensive plan is a living document under continuous review and revision.

Dillingham 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 beginning to implement its 2015 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:

- Downtown & Lake Road Fire Stations Improvements
- Downtown Streets Rehabilitation
- Harvey Samuelsen Community Center
- Small Boat Harbor Improvements
- Wood River Boat Ramp
- Renovate Senior Center & Library
- Community Pavilion
- Expand Dillingham Jail
- Bayside Drive Sewer System
- Confined Disposal Facility

The 2013-2018 Comprehensive Plan Part 3 provides a clear description of the City capacity to regulate or control land usage:

> *"**Introduction***
>
> *Many of the goals identified through this planning process have been high community priorities in the past. These include goals improving downtown, expanding the economy, improving housing, protecting the natural environment, and dedicating land for future industrial, commercial and other uses. While there has been progress towards these goals, in many cases the City will need to use new methods and resources for these goals to be achieved.*
>
> *Currently, Dillingham has few of the land use planning and regulatory tools used by most small communities in Alaska. For example, the City has few controls over the location of new uses. The City does not require a review process for major new uses, and it has very limited standards for development on individual properties.*[1]
>
> *Some residents are content with the current lack of land use controls; others are concerned that without some guidance, development could harm the community. Examples given include damage to the natural environment and increased costs to the City to build and maintain public infrastructure. Respecting both these views, this plan proposes*

incremental steps to improve the community's capacity to guide future growth. The initial steps will equip the community with a few basic land management tools. Even these steps will be taken slowly, to provide both landowners and City staff time to test any new policies, and to find an acceptable balance between no rules and the right, limited set of practical, enforceable rules.

[1] In some Dillingham subdivisions, Codes, Covenants and Restrictions (CCR's) are used to guide certain activities and uses, with varying degrees of success. The main challenge with CCR's is the difficulty of enforcement, particularly if the homeowners' association responsible for enforcement is not constantly vigilant. The City has a requirement for a land use permit (see the discussion under Goal 8)" (CP 2010).

Part 3 further stresses the need for developing "Advisory Guidelines" designed to provide a land use development philosophy to educate land owners enabling them to use land as needed, but to look beyond their personal use; but to consider their neighbors and to maintain a healthy community. They define this as "Conditional Use" in the plan's objectives:

"Objective 8D: Develop and widely publicize Good Neighbor Advisory Land Use Guidelines. These guidelines are suggested guidelines and are not legal requirements. Guidelines should address the following:

Water Quality & Erosion

1. *Land uses adjoining water bodies should be designed to minimize impacts on water quality by, for example, minimizing the removal of natural vegetation along the edge of lakes, streams and wetlands to keep runoff from driveways, oil and gas, silt, and septic effluents out of the watershed, to reduce bank erosion and provide habitat for wildlife.*
2. *Where appropriate, use drainage swales, holding basins and similar practices to ensure that runoff from developed areas does not degrade water quality in adjoining water bodies.*
3. *Maintain sufficient setbacks of buildings from streams, lakes, wetlands and other water bodies to have minimal environmental and visual impact on the adjoining waterway or wetland.*
4. *Establish buffer zones as needed to reduce the sensory impact on residential areas and roads.*
5. *Septic systems (see Objective 7B above).*
6. *Development should not disrupt drainage patterns (for example, by diverting or blocking a small stream). The general form of natural contours should be retained.*

Natural Vegetation/Site Disturbance

7. *Encourage the retention of existing natural vegetation and replant disturbed areas.*

Hazards and Sensitive Areas" (CP 2010).

What is a Conditional Use?

A conditional use is a category of use identified in a zoning code.

Most Alaska communities and boroughs have a conditional use process, with the specific goal of guiding land uses that have potential for significant off-site impacts, such as adult oriented businesses, or autowrecking yards. Elements of a conditional use process typically include:

A. A list of uses that require such a permit (which can vary by location),

B. A list of general conditions for consideration in the approval of specified uses (e.g. ,standards for traffic or safety impacts),

C. A review process, typically including a public hearing, where the specific conditions of approval are tied to the planned use.

Figure 6-1 depicts the City's land ownership categories which designates government oversight. Each governing body may guide land acquisition as well as authorized usage.

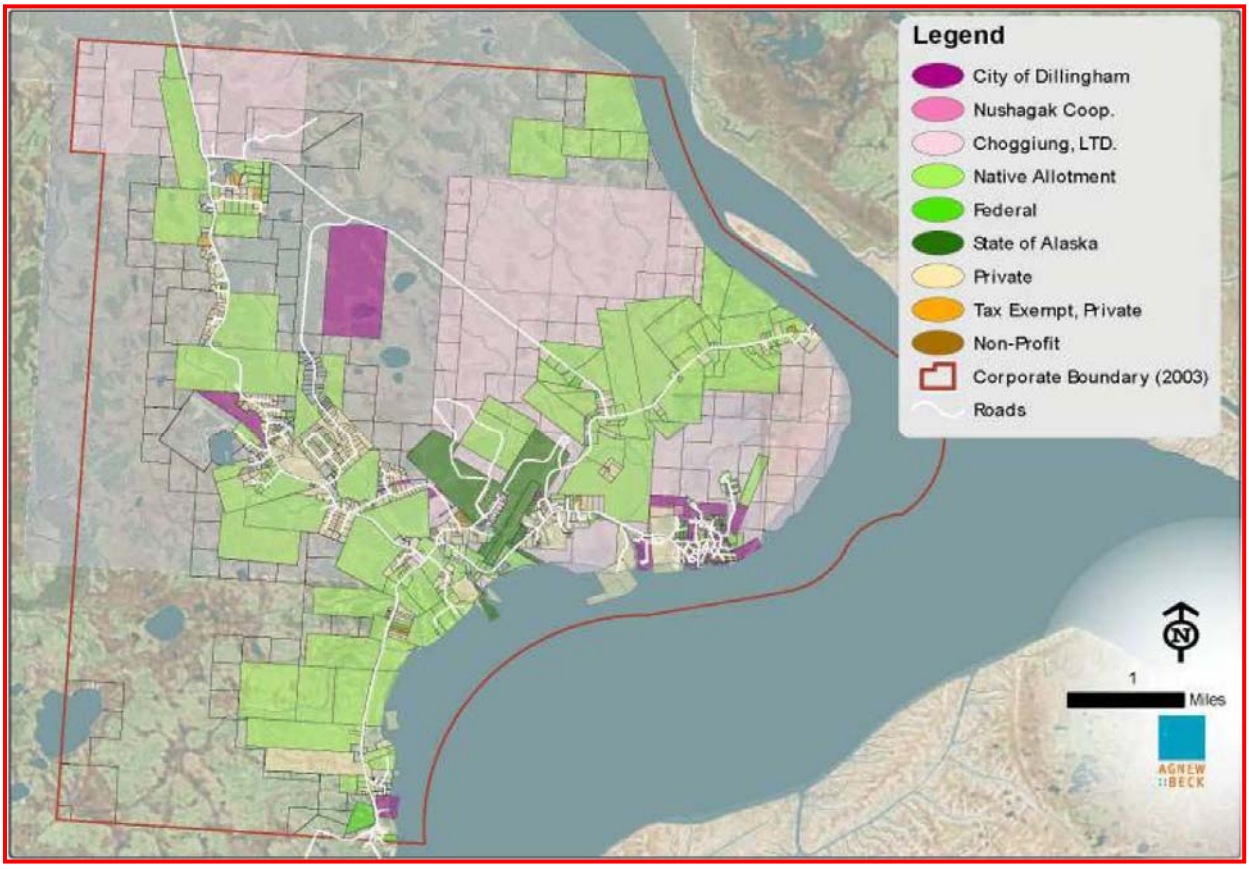


Figure 6-1 Dillingham Land Use Map (DLP 2013-2018)

6.3 EXPOSURE ANALYSIS FOR CURRENT ASSETS

6.3.1 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.

6.3.1.1 Population and Building Stock

Population data for the City were obtained from the 2010 U.S. Census and the Alaska Department of Labor (DOL). The U.S. Census reports the City's total population for 2010 as 2,329 while the 2014 DOL data reported a population of 2,431 (Table 6-2).

Table 6-2 Estimated Population and Building Inventory

Population		Residential Buildings	
2010 Census	DOL 2014 Data	Total Building Count	Estimated Total Structure Values
2,396	2,431	1,047	U.S. Census[1]: $261,226,500 City[2]: $314,100,000

[1] Sources: U.S. Census 2010; listed average estimated residential structure value at $249,500.
[2]The Project Team determined that the average structural replacement value of all single-family residential buildings is $300,000.

A total of 1,047 single-family residential buildings were considered in this analysis. The Dillingham Planning Team stated that the U.S. Census generally understates residential replacement values because replacement materials acquisition, barge or airplane delivery, and construction in rural Alaska costs far exceed U.S. Census structure estimates.

The U.S. Census estimates the average residential structure value is $249,500 however, the Planning Team estimates that actual housing costs are closer to $300,000 with an additional 50 percent added for contents value to all residential, commercial, and public infrastructure costs. Table 6-2 displays a viable comparative difference between U.S. Census and City estimates.

6.3.1.2 Existing Infrastructure

Dillingham has benefited from numerous funding opportunities to assist them with maintaining and upgrading their infrastructure.

Table 6-3 list the City's identified "completed" infrastructure improvement projects that have been completed since the 2008 HMP's initial approval date. These projects provide a depiction of the community's ongoing development trends and focus towards continually seeking to improve their aging infrastructure.

Table 6-3 Dillingham's Completed Capital Improvement Project List

Recipient	Award Year	Project Description/Comments	Project Status	Award Amount	End Date
Nushagak Electric & Telephone Cooperative	2013	Bulk Fuel Tank for Power Generation	Closed	$1,000,000	6/30/2013
Safe and Fear-free Environment	2013	SAFE Shelter Life, Health, Safety Repairs	Closed	$45,000	8/20/2012
Safe and Fear-free Environment	2013	Facility Repairs & Upgrades	Closed	$42,500	8/19/2018
Safe and Fear-free Environment	2012	Walkway and Deck at SAFE Shelter Repair	Closed	$26,000	10/27/2011
City of Dillingham	2010	Purchase Heating Fuel	Closed	$70,532	4/30/2010
City of Dillingham	2009	Dillingham High School Fire and Safety Upgrades	Closed	$58,377	6/30/2013
Nushagak Electric & Telephone Cooperative	2009	Power Generation Upgrade Phase I	Closed	$0	9/19/2010
City of Dillingham	2008	Dillingham School Emergency Fire Alarm Sprinkler System	Closed	$600,000	9/30/2009
City of Dillingham	2006	Dillingham City Schools, Dillingham Elementary School Fire and Safety Upgrades	Closed	$141,623	6/30/2008
City of Dillingham	2006	Senior Center Planning and Renovation	Closed	$16,174	2/29/2008
Curyung Tribal Council	2005	Design - Harvey Samuelsen Community Center	Closed	$98,640	9/30/2008
City of Dillingham	2005	Expenses Incurred on or after April 1, 2004, for Middle School Roof Replacement and High School Design, Engineering & Roof & Structural Repairs	Closed	$1,560,000	6/30/2007
City of Dillingham	2004	Direct Aid to Fisheries-Impacted Communities	Closed	$119,145	Undefined
City of Dillingham	2004	Temporary Fiscal Relief Grant	Closed	$53,621	Undefined

(DCRA 2013)

6.3.1.3 *Existing Critical Facilities*

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 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 city and tribal administrative offices, departments, or agencies
- Emergency response facilities, including police department and firefighting equipment
- Educational facilities, including K-12
- Care facilities, such as medical clinics, congregate living health, residential and continuing care, and retirement facilities
- Community gathering places, such as community and youth centers
- Utilities, such as electric generation, communications, water and waste water treatment, sewage lagoons, landfills.

The Planning Team determined that legacy 2008 HMP critical facilities and infrastructure values (Table 6-4) have changed somewhat in the past five years. The majority of the data was carried forward as representative sample values for planning purposes and will be used throughout the remainder of Section Six. However, we have included the City Sewer Lagoon, Snag Point Bulk Head, Dillingham Small Boat Harbor, and Kanakanak Beach. As previously published in the 2008 HMP, facility occupancy classes remain grouped to better determine ownership or use. The next revision cycle will attempt to incorporate updated content and structural values to this table as it is apparent that some of these facilities have been completed and/or upgraded since the 2008 publication.

Table 6-4 City of Dillingham Critical Facilities

Facility ID	Occupancy Class	Facility Name	Contents Value ($)	Structure Value ($)
2	Government	Airport Firehouse	2,700,000	1,800,000
3		ADF&G	1,425,000	50,000
6		City Hall	2,593,470	1,728,980
8		DLG Dept. of Public Safety	2,817,771	1,878,514
9		DLG Airport	13,109,321	8,739,547
14		Downtown Fire Station	2,773,176	1,848,784
22		Lake Road Fire Station	3,000,000	2,000,000
32		US Post Office	1,627,500	1,085,000

Table 6-4 City of Dillingham Critical Facilities

Facility ID	Occupancy Class	Facility Name	Contents Value ($)	Structure Value ($)
33		SAFE Shelter & Offices	1,125,000	750,000
34		Dillingham Senior Center	2,383,100	1,588,733
36		ADOT Shop	1,910,499	1,273,666
37		City of DLG Public Works Shop	547,500	365,000
39		SWRSD Offices	120,000	80,000
44		Curyung Tribal Council Building	945,000	630,000
		Ekuk Tribal Council Building	Unknown	Unknown
49		Bristol Bay Housing Authority - HUD	3,000,000	2,000,000
50		Alaska State Trooper Post	180,000	120,000
52		Kongigatuk Building (FWS, LIO)	933,000	622,000
63		AMHTA Behavioral Health Facility	5,569,262	3,712,841
64		Dillingham Coastal Trail	2,791,500	1,861,000
68		Dillingham Animal Shelter	180,000	120,000
69		Marrulut-eniit "Granma's House"	1,988,805	1,325,870
70		Dillingham Public Health Clinic	360,000	240,000
71		Dillingham Bingo Hall – Youth Center	103,248	68,832
72		Dillingham Boat Harbor Office	184,965	123,310
82		Kleepuk Hill Road	Unknown	Unknown
86		Scandinavian Creek Bridge	Unknown	Unknown
89		Squaw Creek Bridge	Unknown	Unknown
90		Kanakanak Road	Unknown	Unknown
91		VORDME	750,000	500,000
92		SACOM	1,500,000	1,000,000
93		Dillingham FAA - Flight Service Station	Unknown	Unknown
10	Educational	Dillingham High School	11,250,000	7,500,000
11		Dillingham Elementary School	11,250,000	7,500,000
12		Territorial School Building	85,937	57,291
24		Dillingham Public Library & Sam Fox Museum	1,639,368	1,092,912
		Dillingham Adventist School	Unknown	Unknown
43		UAF Bristol Bay Campus	5,625,000	3,750,000
66		BBNA Head Start	30,000	4,300,000

Table 6-4 City of Dillingham Critical Facilities

Facility ID	Occupancy Class	Facility Name	Contents Value ($)	Structure Value ($)
5	Religious/Non-Profit	First Avenue Cemetery	20,000	20,000
53		Wood River Cemetery	20,000	20,000
61		Second Ave. West Cemetery	20,000	20,000
73		Russian Orthodox Church	Unknown	Unknown
74		Catholic Church	Unknown	Unknown
75		Seventh Day Adventist Church Buildings	310,200	310,200
76		Moravian Church	Unknown	Unknown
77		Assembly of God	Unknown	Unknown
78		Baptist Church	128,000	128,000
79		Trinity Lutheran Church	Unknown	Unknown
80		Dillingham Bible Fellowship	Unknown	Unknown
81		Evergreen Memorial Cemetery	20,000	20,000
83		Russian Orthodox Church Cemetery	20,000	20,000
84		Kanakanak Cemetery	20,000	0,000
1	Commercial	A.C. Store	1,143,901	819,100
		Bigfoot Grocery Warehouse	Unknown	Unknown
13		Dillingham Dock Office	45,239	30,159
18		Kanakanak Hospital Compound	109,800,000	73,200,000
21		L&M Supplies	489,560	867,600
23		Bristol Express	62,158	96,600
25		N&N Market	1,042,792	67,800
26		NAPA Auto Parts	151,295	370,400
28		Neqleq Variety	60,936	165,000
30		Peter Pan Seafoods	943,568	4,524,700
40		Squaw Creek Boat Movers	75,000	50,000
		Icicle Seafoods – Wood River	Unknown	Unknown
51		Wells Fargo	42,162	549,100
65		BBNA Building	500,000	2,150,000
87		Spruce Kitchen Restaurant	27,503	44,800
88		Alaska Net Supply	21,752	42,600
16	Industrial	Harbor Land	150,000	100,000
17		Harbor Building	177,158	118,105

Table 6-4 City of Dillingham Critical Facilities

Facility ID	Occupancy Class	Facility Name	Contents Value ($)	Structure Value ($)
31		Port of DLG office	128,979	85,986
38		Small Boat Harbor	Unknown	Unknown
41		T dock	5,579,510	3,719,673
42		All Tide dock	8,925,000	5,950,000
48		Wood River Boat Launch	229,896	153,264
54		Kanakanak Beach	Unknown	Unknown
		Snag Point Bulk Head	Unknown	Unknown
67		Landfill	10,212,450	6,808,300
85		PAF Boatyard	75,429	643,000
4	Utilities	Bristol Alliance Fuels	2,951,179	2,799,300
7		Delta Western Tank Farm	1,106,027	1,268,100
15		Harbor Bath House	Unknown	500,000
19		KDLG Studio	Unknown	400,000
20		KDLG Tower and Transmitter	Unknown	600,000
29		Nushagak Electric Plant	7,609,452	Unknown
29		Nushagak Cooperatives Buildings	Unknown	4,879,262
29		Nushagak Telephone Infrastructure	4,623,050	Unknown
35		Sewer Building	Unknown	562,483
		City Sewer Lagoon	Unknown	Unknown
45		Water Tank	Unknown	565,093
46		Water Tank	Unknown	440,199
47		Water Treatment Facility	Unknown	565,093
55		Sewage Lift Station - 1 Airport	Unknown	26,000
56		Sewage Lift Station - 2 Tubbs apts	Unknown	26,000
57		Sewage Lift Station - 3 Tennysons	Unknown	26,000
58		Sewage Lift Station - 4 Smalls	Unknown	26,000
59		Sewage Lift Station - 5 harbor	Unknown	26,000
60		Sewage Lift Station - 6 dock	Unknown	42,000
62		Sewage Lift Station - 7 HUD	Unknown	26,000

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 Table 6-5.
NA = Not Available.

Table 6-4 City of Dillingham Critical Facilities

Facility ID	Occupancy Class	Facility Name	Contents Value ($)	Structure Value ($)

Table 6-5 Provides Dillingham's total building stock values; summarized by occupancy class.Table 6-5 City of Dillingham Building Stock by Occupancy Class

Structure Type	Number	Structure Estimated Values ($)	HAZUS Contents Value (%)	HAZUS Contents Value ($)
Residential	1,047	391,839,750	50%	195,919,875
Government	31	36,412,077	150%	54,618,116
Commercial	14	83,177,859	150%	124,766,789
Industrial	10	17,778,328	150%	26,667,492
Religious/Non-Profit	14	558,200	100%	558,200
Education	6	24,200,203	150%	36,300,305
Utilities	19	12,777,530	**	16,289,708
Total	**194**	**$566,743,947**		**$455,120,485**

*** 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

Table 6-6 Provides Dillingham's current critical facilities and their potential hazard threats.

Note: Use the following code key to determine applicable hazard threat level.

Key *(All hazards except flood)*		Flood
L	Low	
M	Moderate	**500-Year**
H	High	**100 Year**
X	Threat is present	

Table 6-6 Critical Facilities and Infrastructure

Facility Type	Estimated No. of Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Earthquake	Flood	Ground Failure	Severe Weather	Volcanic Ash	Wildland Fire	Urban Conflagration	HAZMAT	Transportation/ Utility Disruption
Government	25	Dillingham City Hall	141 Main Street	59.03948	-158.46292	$4,322,450	M		L	X	X	M	X	X	X
	25	Curyung Tribal Offices	531 D Street	59.04048	-158.46385	$1,575,000	M		L	X	X	L	X	X	X
	10	Ekluk Tribal Council Office	372 Aleknagik Lake Road	Undefined	Undefined	Undefined	M			X	X	X			
	15	Bristol Bay Housing Authority (HUD)	1244 Lil Larry Rd.	59.04826	-158.45656	$5,000,000	M		L	X	X	M		X	
	25	Kongigatuk Building (FWS & Legislative Info Office)	6 Main Street	59.04027	-158.45766	$1,555,000	M		L	X	X	M	X		X
	15	Alaska Dept of Fish & Game (ADF&G) Office	546 Kenny Wren Road	59.04263	-158.46852	$2,375,000	M		L	X	X	M	X		X
	25	Post Office	9998 D Street	59.04098	-158.46215	$2,712,500	M		L	X	X	L	X	X	X
Emergency Response	2	Airport Firehouse	820 Airport Rd.	59.0447	-158.51282	$4,500,000	M		L	X	X	L		X	
	20	DLG Dept. of Public Safety	404 W D Street	59.04056	-158.46803	$4,696,285	M		L	X	X	M	X	X	X
	7	Downtown Fire Station	514 Main Street	59.03967	-158.46753	$4,621,960	M		L	X	X	L	X	X	X
	7	Lake Road Fire Station	1335 Aleknagik Lake Rd.	59.04469	-158.55812	$5,000,000	M		L	X	X	M			
	20	Alaska State Trooper Building	536 Kenny Wren Road	59.04263	-158.46853	$300,000	M		L	X	X	M	X		X

Table 6-6 Critical Facilities and Infrastructure

Facility Type	Estimated No. of Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Earthquake	Flood	Ground Failure	Severe Weather	Volcanic Ash	Wildland Fire	Urban Conflagration	HAZMAT	Transportation / Utility Disruption
	0	Dillingham Harbor Office Building	3005 Kanakanak Rd	Undefined	Undefined	$308,275	M			X	X	X			
Education	30	Southwestern Regional Schools (SWRS) Offices	574 Kenny Wren Road	59.04263	-158.46854	$200,000	M		L	X	X	M	X		X
	294	Dillingham Middle/High School (6 to 12)	565 Wolverine Lane	59.04349	-158.46462	$18,750,000	M		L	X	X	M	X		X
	279	Dillingham Elementary School (K thru 5)	711 Seward Street	59.04355	-158.46633	$18,750,000	M		L	X	X	L	X		X
	5	Territorial School Bldg.	141 Main Street	Undefined	Undefined	$143,228	M			X	X	X			
	20	Library	306 D Street West	59.04079	-158.46403	$2,732,280	M		L	X	X	M	X	X	X
	40	University of Alaska Fairbanks (UAF)	527 Seward Street	59.04315	-158.46389	$9,375,000	M		L	X	X	L	X		X
	50	Valerie Larson Family Resource Center (childcare & Head Start)	1500 Kanakanak Road	59.04423	-158.49271	$4,330,000	M		L	X	X	M			
Medical Care	100	Kanakanak Hospital and Primary Care Clinic-Compound	6000 Kanakanak Road	59.00007	-158.53532	$183,000,000	M		L	X	X	M			
	20	AMHTA Behavioral health Facility	3832 Berrypicker's Lane	58.9994	-158.54319	$9,282,103	M		L	X	X	M			
	10	Marrulut Eniit Assisted Living Facility	426 D Street	59.04069	-158.45621	$3,314,675	M		L	X	X	M	X		X
	5	Dillingham Health Clinic	125 Main Street West	59.03917	-158.46228	$600,000	M		L	X	X	L	X	X	X

Table 6-6 Critical Facilities and Infrastructure

Facility Type	Estimated No. of Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Earthquake	Flood	Ground Failure	Severe Weather	Volcanic Ash	Wildland Fire	Urban Conflagration	HAZMAT	Transportation/ Utility Disruption
Community	15	Nitaput Child Advocacy Center	3832 Berrypicker's Lane	Undefined	Undefined	Undefined	M			X	X	X			
	10	Dental Clinic	6000 Kanakanak Road	Undefined	Undefined	Undefined	M			X	X	X			
	3	Private physician's practice	Lake Road	Undefined	Undefined	Undefined	M			X	X	X			
	30	Jake's Place	Undefined	Undefined	Undefined	Undefined	M			X	X	X			
	20	Community Health Center	Undefined	Undefined	Undefined	Undefined	M			X	X	X			
	20	Safe & Fear Free Shelter (SAFE)	21 G Street	59.04457	-158.46213	$1,875,000	M		L	X	X	L			
	2	Church Russian Orthodox	1637 Wood River Road	59.04916	-158.49686	Undefined	M		L	X	X	M		X	
	2	Church Catholic	509 Airport Road	59.0496	-158.50746	Undefined	M		L	X	X	M			
	30	Church Seventh Day Adventist Buildings	New Windmill Road	59.04283	-158.49288	$620,400	M		L	X	X	M			
	2	Church Moravian	306 1st Avenue East	59.04001	-158.458	$0	M		L	X	X	M	X		X
	5	Church Assembly of God	Undefined	59.02122	-158.53926	Undefined	M		L	X	X	M		X	
	4	Church Baptist	New Windmill Road	59.04282	-158.4929	$256,000	M		L	X	X	M			
	5	Church Trinity Lutheran	Undefined	59.03973	-158.45752	Undefined	M		L	X	X	M			
	4	Church Dillingham Bible Fellowship	8 Stinson Road	59.0395	-158.464	Undefined	M		L	X	X	L	X	X	X
	2	Church Latter Day Saints	Airport Road	59.039424	-158.5264012	Undefined	M		L	X	X	M			
	20	Alaska Commercial Store (A.C.)	328 Main Street West	59.03946	-158.46629	$819,100	M		L	X	X	L	X	X	X

Table 6-6 Critical Facilities and Infrastructure

Facility Type	Estimated No. of Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Earthquake	Flood	Ground Failure	Severe Weather	Volcanic Ash	Wildland Fire	Urban Conflagration	HAZMAT	Transportation / Utility Disruption
	15	L&M Supplies	429 2nd Avenue West	59.04031	-158.46304	$1,357,160	M		L	X	X	L	X	X	X
	5	Bristol Express	431 D Street	59.04049	-158.46387	$158,758	M		L	X	X	L	X	X	X
	20	N&N - Omni Enterprises	10 Main Street	59.03887	-158.46371	$1,310,592	M		L	X	X	L	X	X	X
	10	NAPA Auto Parts	100 Harbor Road	59.03927	-158.4756	$521,695	M	100	L	X	X	L	X	X	X
	3	Neqleq Variety	417 D Street West	59.04056	-158.46384	$225,936	M		L	X	X	L	X	X	X
	60	Peter Pan Seafoods	1 Denny Way	59.03969	-158.46922	$5,468,268	M	100	L	X	X	M	X		X
	10	Squaw Creek Boat Movers	3005 Kanakanak Road	59.031455	-158.5353609	$125,000	M		L	X	X	L			
	15	Wells Fargo	512 Seward Street	59.04059	-158.46382	$591,262	M		L	X	X	M	X	X	X
	30	BBNA Building	1500 Kanakanak Road	59.04352	-158.4976	$2,650,000	M		L	X	X	M			
	10	Bristol Eagle Restaurant	Undefined	Undefined	Undefined	$72,303	M			X	X	X			
	5	Alaska Net Supply	Undefined	59.04079	-158.47398	$64,352	M	100	L	X	X	M	X		X
	20	Senior Center	Senior Citizen Street	59.04378	-158.463	$3,971,833	M		L	X	X	M	X		X
	0	Youth Center	439 Central Avenue	59.04071	-158.45974	$172,080	M		L	X	X	M	X	X	X
	5	Harbor Bath House	Undefined	Undefined	Undefined	$500,000	M			X	X	X			
	2	Animal Shelter	240 Harbor Road	59.0407	-158.47589	$300,000	M	100	L	X	X	L	X	X	X
	0	Cemetery, Evergreen Memorial	Airport Road	Undefined	Undefined	$40,000	M			X	X	X			
	0	Cemetery, First Avenue	120 1st Avenue	59.03895	-158.461	$40,000	M		L	X	X	M	X	X	X
	0	Cemetery, Kanakanak	Kanakanak Road	Undefined	Undefined	$40,000	M			X	X	X			
	0	Cemetery Olsonville	Lake Road	Undefined	Undefined	$40,000	M			X	X	X			

Table 6-6 Critical Facilities and Infrastructure

Facility Type	Estimated No. of Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Earthquake	Flood	Ground Failure	Severe Weather	Volcanic Ash	Wildland Fire	Urban Conflagration	HAZMAT	Transportation/ Utility Disruption
	0	Cemetery, Russian Orthodox Church	Undefined	Undefined	Undefined	$40,000	M			X	X	X			
	0	Cemetery, Second Avenue West	Second Avenue West	Undefined	Undefined	$40,000	M			X	X	X			
	0	Cemetery, Wood River	Undefined	Undefined	Undefined	$40,000	M			X	X	X			
	0	Dillingham Coastal Trail	Undefined	Undefined	Undefined	$4,652,500	M			X	X	X			
Roads	0	1st Avenue	Total Road Miles: 42.7	N/A	N/A	Cost of $5,854,800 per mile: $250,000,000									
		1st Avenue East					M			X	X	X			
		1st Avenue West					M	500		X	X	X			
		2nd Avenue					M			X	X	X			
		2nd Avenue East					M	100		X	X	X			
		West 2nd Avenue					M			X	X	X			
		North 3rd Street					M			X	X	X			
		B Street					M			X	X	X			
		C Street					M			X	X	X			
		D Street West					M	100		X	X	X			
		D Street East					M			X	X	X			
		E Street West					M			X	X	X			
		Agulawok Drive					M			X	X	X			
		Airport Road/					M	100		X	X	X			
		Airport Spur Road					M			X	X	X			
		Alaska Street					M			X	X	X			

Table 6-6 Critical Facilities and Infrastructure

Facility Type	Estimated No. of Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Earthquake	Flood	Ground Failure	Severe Weather	Volcanic Ash	Wildland Fire	Urban Conflagration	HAZMAT	Transportation / Utility Disruption
		Arctic Ave					M			X	X	X			
		Aleknagik Lake Road					M			X	X	X			
		Alder Circle					M			X	X	X			
		Alder Street					M			X	X	X			
		Aspen Road					M			X	X	X			
		Bayside Drive					M			X	X	X			
		Bea Ave					M			X	X	X			
		Birch Lane					M	100		X	X	X			
		Black Spruce Drive					M			X	X	X			
		Blueberry Street					M			X	X	X			
		Brannon Road					M			X	X	X			
		Canoe Court					M			X	X	X			
		Central Avenue					M			X	X	X			
		Cedar Circle					M			X	X	X			
		Chuthmok Road					M		L	X	X	X			
		Crowberry Lane					M			X	X	X			
		Denny Way					M	100		X	X	X			
		Diamond Willow Drive					M			X	X	X			
		Dragnet Dr					M	100		X	X	X			
		Ekuk Circle					M			X	X	X			
		Emperor Road					M			X	X	X			
		Fairview Drive					M			X	X	X			

Table 6-6 Critical Facilities and Infrastructure

Facility Type	Estimated No. of Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Earthquake	Flood	Ground Failure	Severe Weather	Volcanic Ash	Wildland Fire	Urban Conflagration	HAZMAT	Transportation/ Utility Disruption
		Fortune Lane					M			X	X	X			
		Gauthier Way					M			X	X	X			
		Harbor Road					M	100		X	X	X			
		Main Street					M			X	X	X			
		Nina Way					M			X	X	X			
		John Pearson Lane					M			X	X	X			
		Kanakanak Road					M			X	X	X			
		Kanakanak House Road					M	500		X	X	X			
		Kenny Wren Road					M	500		X	X	X			
		Kingfisher Lane					M			X	X	X			
		Kleepuk Hill Road					M	100		X	X	X			
		Lkokwok Circle					M			X	X	X			
		Lake Road					M			X	X	X			
		Larson Road					M			X	X	X			
		Lupine Drive					M	100		X	X	X			
		Main Street West					M	100		X	X	X			
		Main Street East					M			X	X	X			
		Martin Street					M			X	X	X			
		Maqi Circle					M			X	X	X			
		McGill Road					M			X	X	X			
		Medical Clinic Road					M			X	X	X			
		Mossberry Circle					M			X	X	X			

Table 6-6 Critical Facilities and Infrastructure

Facility Type	Estimated No. of Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Earthquake	Flood	Ground Failure	Severe Weather	Volcanic Ash	Wildland Fire	Urban Conflagration	HAZMAT	Transportation / Utility Disruption
		Nerka Drive					M			X	X	X			
		Nerka Loop					M			X	X	X			
		Nerka Martin Lane					M			X	X	X			
		New Windmill Road					M			X	X	X			
		Nina Way					M			X	X	X			
		North Pacific Court					M	100		X	X	X			
		Olaf Hansen Road					M			X	X	X			
		Old Hansen Road					M			X	X	X			
		Oxstokok Circle					M			X	X	X			
		Pleier Road					M			X	X	X			
		Raspberry Circle					M			X	X	X			
		Salmonberry Circle					M			X	X	X			
		Sandhill Lane					M			X	X	X			
		Seward Street					M			X	X	X			
		Shannon Lake Road					M			X	X	X			
		Spruce Street					M			X	X	X			
		Squaw Creek Road					M			X	X	X			
		Sunny Drive					M			X	X	X			
		Sutherland Road					M			X	X	X			
		Teal Lane					M			X	X	X			
		Lil Larry Road					M			X	X	X			
		Unicorn Lane					M			X	X	X			

Table 6-6 Critical Facilities and Infrastructure

Facility Type	Estimated No. of Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Earthquake	Flood	Ground Failure	Severe Weather	Volcanic Ash	Wildland Fire	Urban Conflagration	HAZMAT	Transportation/ Utility Disruption
		Warehouse Mountain Road					M			X	X	X			
		Waskey Road					M			X	X	X			
		Widgeon Lane					M			X	X	X			
		Wood River Road					M	100		X	X	X			
		Yako Drive					M			X	X	X			
Bridge	0	Scandinavian Creek Bridge	Undefined	Undefined	Undefined	Undefined	M			X	X	X			
	0	Squaw Creek Bridge	Undefined	Undefined	Undefined	Undefined	M			X	X	X			
Transportation	0	Dock Office	Undefined	59.03829	-158.46347	$75,398	M	100	L	X	X	L	X	X	X
	0	DLG Airport	803 Airport Road	59.04544	-158.50394	$21,848,868	M		L	X	X	L			
	7	DOT Maintenance Shop	Airport Road	59.04345	-158.51338	$3,184,165	M		L	X	X	L		X	
	12	DLG Public Works Shop	810 2nd Avenue West	59.03973	-158.46306	$912,500	M		L	X	X	L	X	X	X
	3	Flight Service Station	Undefined	Undefined	Undefined	Undefined	M			X	X	X			
	2	Harbor Master's Office	3005 Kanakanak Rd	59.03944	-158.46298	$295,263	M		L	X	X	M	X		X
	3	Port of DLG office (Pollock Warehouse)	Undefined	Undefined	Undefined	$214,965	M			X	X	X			
	0	Small Boat Harbor	Undefined	59.04036	-158.47816	Undefined	M	100	L	X	X	L	X		X
	0	T dock	Undefined	Undefined	Undefined	$9,299,183	M			X	X	X			
	0	All Tide dock	Undefined	Undefined	Undefined	$14,875,000	M			X	X	X			

Table 6-6 Critical Facilities and Infrastructure

Facility Type	Estimated No. of Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Earthquake	Flood	Ground Failure	Severe Weather	Volcanic Ash	Wildland Fire	Urban Conflagration	HAZMAT	Transportation / Utility Disruption
	0	Wood River Boat Launch	Undefined	59.06946	-158.43992	$383,160	M	100	L	X	X	L		X	
	0	PAF Boatyard	Undefined	59.04439	-158.49543	$718,429	M		L	X	X	M			
	0	Kanakanak Beach	Undefined	Undefined	Undefined	Undefined	M	100	L	X	X	L	X		X
Utilities	2	Nushagak Electric Plant	557 Kenny Wren Road	59.04303	-158.46865	$7,609,452	M		L	X	X	M	X		X
	2	Water Treatment Facility	Undefined	59.04171	-158.45971	$565,093	M		L	X	X	M	X		X
	0	Water Tank	Undefined	59.04161	-158.45975	$565,093	M		L	X	X	M	X		X
	0	Water Tank	Undefined	59.04208	-158.46008	$440,199	M		L	X	X	M	X		X
	4	Bristol Alliance Fuels	109 N Pacific Court	59.03901	-158.4809	$5,750,479	M	100	L	X	X	L	X	X	X
	4	Delta Western Tank Farm	309 Main Street	59.03893	-158.46586	$2,374,127	M		L	X	X	L	X	X	X
	2	Wastewater Treatment Plant	Undefined	Undefined	Undefined	$2,000,000	M			X	X	X			
	0	Snag Point Bulk Head	Undefined	Undefined	Undefined	Undefined	M		L	X	X	M	X		X
	0	Sewer Building & adjacent Sewer Lagoon	826 Lil Larry Road	59.04419	-158.45279	Undefined	M		L	X	X	M	X		X
	0	Sewage Lift Station - 1 Airport	Undefined	59.04508	-158.51181	$85,000	M		L	X	X	L		X	X
	0	Sewage Lift Station - 2 Tubbs Apartments	Undefined	59.0422	-158.49794	$85,000	M		L	X	X	M			
	0	Sewage Lift Station - 3 Tennysons	Undefined	59.04219	-158.49288	$85,000	M		L	X	X	M			
	0	Sewage Lift Station - 4 Smalls	Undefined	59.04372	-158.48841	$85,000	M		L	X	X	M		X	

Table 6-6 Critical Facilities and Infrastructure

Facility Type	Estimated No. of Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Earthquake	Flood	Ground Failure	Severe Weather	Volcanic Ash	Wildland Fire	Urban Conflagration	HAZMAT	Transportation/ Utility Disruption
	0	Sewage Lift Station - 5 Harbor	Undefined	59.04067	-158.47677	$85,000	M	100	L	X	X	L	X	X	X
	0	Sewage Lift Station - 6 Dock	Undefined	59.03786	-158.46511	$85,000	M	100	L	X	X	M	X	X	X
	0	Sewage Lift Station - 7 HUD	Undefined	59.04859	-158.45851	$85,000	M		L	X	X	M	X		X
	5	Landfill	Undefined	59.09821	-158.54638	$17,020,750	M		L	X	X	M			
	30	Nushagak Telephone & Electric Buildings	557 Kenny Wren Road	59.0424	-158.46875	$4,879,262	M		L	X	X	L	X		X
	0	Nushagak Telephone Infrastructure	Undefined	Undefined	Undefined	$4,623,050	M			X	X	X			
	0	VORDME	4519 Antenna Road	58.99419	-158.55202	$1,250,000	M		L	X	X	M			
	0	SACOM	Undefined	Undefined	Undefined	$2,500,000	M			X	X	X			
	7	KDLG Studio	670 Seward Street	59.04312	-158.46387	$400,000	M		L	X	X	L	X		X
	0	KDLG Tower and Transmitter	Undefined	Undefined	Undefined	$600,000	M			X	X	X			
573		**Estimated Occupants**			**Total Potential Damages:**	**$667,177,914**									

Table Key

L Low
M Moderate
H High
X Threat is present

6

6.4 REPETITIVE LOSS PROPERTIES

This section describes DMA 2000 and its implementing regulations requirements to estimate structure number and types at risk to repetitive flooding.

DMA 2000 Requirements
Addressing Risk and Vulnerability to NFIP Insured Structures
§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. *All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods.* The plan should describe vulnerability in terms of: §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 areas; §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions. §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.
1. REGULATION CHECKLIST
ELEMENT B. NFIP Insured Structures
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods?
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate?
Source: FEMA, October 2014

6.4.1 NFIP Participation

The City of Dillingham has been active NFIP participant since August, 07, 1975 and has not experienced any repetitive flood claims since NFIP program inception.

The Dillingham will continue to track comprehensive property loss information as it occurs to fulfill NFIP requirements.

Table 6-7 Repetitive Loss Properties

Type (RL/SRL)	Community Name (Consecutive Numbering ID)	Occupancy (#)	No. of Losses	Flood Insurance (Yes/No)	Structure Value ($)[1]	Total Claims ($)[2]
None						

[1]Insured structural value as of *date*.
[2]Content and building claims.

(DLG 2015)

Table 6-8 lists the City's NFIP participation information and validates there programmatic compliance.

Table 6-8 NFIP Participation Data
(City of Dillingham, #020041)

Category	Data	Category	Data
Date joined NFIP	08/07/1975	Number of policies in force	7
CRS class / discount	N/A	Insurance in force	$1,213,600
CAV date	06/01/2010	Number of paid losses	0
CAC date	09/30/1993	Total losses paid	0
Date of current FIRM	09/30/1982	Substantial damage claims since 1975	0
CAC = Community Assistance Contact CAV = Community Assistance Visit CRS = Community Rating System		FIRM = Flood Insurance Rate Map NFIP = National Flood Insurance Program	

The City of Dillingham does not currently have any repetitive flood loss properties and therefore cannot provide an inventory that meets NFIP criteria.

Table 6-9 delineates the jurisdictions available Flood Insurance Rate Maps (FIRMS).

6

Table 6-9 Dillingham's Flood Insurance Rate Maps (FIRMs)

FIRM[1] Number	Flood Source	Mapped Reach
0200410010B	Wood River and upper Portion of Scandinavian Creek	Reach extends from Northeast quadrant of 0200410010B to southeast quadrant
0200410016B	Squaw Creek to confluence to Nushagak River	Reach extends from south west quadrant of 0200140010B to central southeast quadrant of 0200410016B
0200410017B	Nushagak River & Scandinavian Creek Confluence	Reach extends from northeast to west central panel quadrants
0200410018B	Squaw Creek to Nushagak River south	Reach extends from north central to south central panel quadrants

6.5 VULNERABILITY ANALYSIS 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 probability consideration or damage level.

The legacy 2008 HMP's vulnerability assessment methodology used a two pronged effort. First, The Project Team used the State's Critical Facility Inventory and locally obtained GPS coordinate data to identify critical facility locations in relation to potential hazard's threat exposure and vulnerability. Second this data was used to develop a vulnerability assessment for those hazards where GIS based hazard mapping information was available.

Replacement structure and contents values were determined by the community for their physical assets as indicated in Table 6-5. The community's aggregate exposure was calculated by assuming the worst-case scenario (that is, the asset would be completely destroyed and would have to be replaced) for each physical asset located within a hazard area. A similar analysis was used to

evaluate the proportion of the population at risk. However, the analysis simply represents the number of people at risk; no estimate of the number of potential injuries or deaths was prepared.

6.6 DATA LIMITATIONS

The vulnerability estimates provided herein use the best data currently available, and the methodologies applied result in a risk approximation. 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 HMP 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 HMP.

6.7 VULNERABILITY EXPOSURE ANALYSIS

The City of Dillingham has a stand-alone GIS database. The results of this HMP's GIS based exposure analysis/loss estimations for Dillingham are summarized in Tables 6-10 and 6-10, and Section 6.7.1 provides an exposure analysis narrative summary for each identified hazard obtain from a combination of GIS analysis and from Planning Team subject-matter-experts.

Table 6-10 Potential Hazard Exposure Analysis – Critical Facilities

Hazard Type	Hazard Classification	Assessment Methodology	Government		Emergency Response		Educational		Medical		Community	
			* #Bldgs/ # Occ	Value ($)	* #Bldgs/ # Occ	Value ($)	* # Bldgs/ # Occ	Value ($)	* # Bldgs/ # Occ	Value ($)	* # Bldgs/ # Occ	Value ($)
Natural Hazards												
Earthquake	Moderate	0-8% (g)	7/140	17,539,950	6/56	19,426,520	7/718	54,280,508	10/233	198,071,778	32/286	19,464,739
	Strong	9-20% (g)	--	--	--	--	--	--	--	--	--	--
	Very Strong	20-40% (g)	--	--	--	--	--	--	--	--	--	--
Flood	Moderate	500-year flood zone	--	--	--	--	--	--	--	--		
	High	100-year flood zone	--	--	--	--	--	--	--	--	4/77	6,354,315
Ground Failure	Low	0-14 degrees (°)	6/130	17,539,950	5/56	19,118,245	6/713	54,137,280	5/155	198,071,778	24/271	18,652,436
	Moderate	>14 but </=-32°	--	--	--	--	--	--	--	--	--	--
	High	>32, but </= 56°	--	--	--	--	--	--	--	--	--	--
Severe Weather	* Descriptive	* Descriptive	7/140	17,539,950	6/56	19,426,520	6/56	19,426,520	7/718	198,071,778	32/286	19,464,739
Wildland Fire	Low	Low fuel rank	2/50	4,287,500	5/56	9,121,960	2/319	28,125,000	2/25	2,475,000	9/87	4,818,241
	Moderate	Moderate fuel rank	4/80	13,252,450	3/47	9,996,285	4/394	26,012,280	3/130	195,596,778	15/82	13,834,195
	High	High fuel rank	--	--	--	--	--	--	--	--	--	--
Manmade or Technological Hazards												
Urban Conflagration	Moderate	Moderate development density	5/115	12,539,950	3/47	13,818,245	5/663	49,807,280	3/35	5,789,675	15/121	15,001,039
HAZMAT	¼ mile buffered route	¼ mile buffered route	4/90	13,609,950	3/29	13,818,245	1/20	2,732,280	1/25	2,475,000	13/101	5,496,583
Transportation or Utility Disruption	¼ mile buffered route	¼ mile buffered route	5/115	12,539,950	3/47	13,818,245	5/663	49,807,280	3/35	5,789,675	15/121	15,001,039

Table 6-11 Potential Hazard Exposure Analysis – Critical Infrastructure

Hazard Type	Hazard Area	Methodology	Highway		Bridges		Transportation Facilities		Utilities	
			Miles	Value ($)	No.	Value ($)	# Bldgs/ # Occ	Value ($)	# Bldgs/ # Occ	Value ($)
Natural Hazards										
Earthquake	Moderate	0-8% (g)	42.7	250,500,000	2	Undefined	12/28	52,006,931	22/54	51,734,988
	Strong	9-20% (g)	--	--	--	--	--	--	--	--
	Very Strong	20-40% (g)	--	--	--	--	--	--	--	--
Flood	Moderate	500-year flood zone	Undefined (3 roads)	Undefined	--	--	--	--	--	--
	High	100-year flood zone	Undefined (12 roads)	Undefined	--	--	3/1	658,558	3/4	5,920,479
Ground Failure	Low	0-14 degrees	1 road	Undefined	--	--	8/21	27,617,783	18/49	42,011,938
	Moderate	>14 but </=-32 degrees	--	--	--	--	--	--	--	--
	High	>32, but </= 56 degrees	--	--	--	--	--	--	--	--
Severe Weather	* Descriptive	* Descriptive	42.7	250,000,000	2	Undefined	12/28	52,006,931	22/54	51,734,988
Wildland Fire	Low	Low fuel rank	--	--	--	--	6/19	26,604,091	6/45	13,573,868
	Moderate	Moderate fuel rank	42.7	250,000,000	--	--	2/2	1,013,692	12/9	28,438,070
	High	High fuel rank	--	--	--	--	--	--	--	--
Manmade or Technological Hazards										
Urban Conflagration	Moderate	Moderate development density	--	--	--	--	4/15	1,483,161	12/49	23,401,188
HAZMAT	¼ mile buffered route	¼ mile buffered route	--	--	--	--	4/20	4,555,223	6/8	8,464,606
Transportation or Utility Disruption	¼ mile buffered route	¼ mile buffered route	--	--	--	--	4/20	1,483,161	12/49	23,401,188

6.7.1 Exposure Analysis – Narrative Summaries

Natural Hazards

Earthquake

The City and surrounding area can expect to experience "Negligible", earthquake ground movement that may result in infrastructure damage. Intense shaking may be seen or felt based on past events. Although all structures are exposed to earthquakes, buildings within the City constructed with wood have slightly less vulnerability to the effects of earthquakes than those with masonry.

Based on earthquake probability (PGA) maps produced by the USGS, it is "Unlikely" the Dillingham area would experience significant earthquake impacts as a result of its distant proximity to known earthquake faults.

The recurrence probability is categorized as "Unlikely" (see Section 5.3.1.1.3) because the Community is located within a low probability earthquake hazard zone. Impacts to the community such as "significant" ground movement may result in infrastructure damage and personal injury.

The entire existing, transient, and future population, residential structures and critical facilities are exposed to "Moderate" earthquake impacts.

- 1,938 people in 646 residential parcels (approximate value $1,938,000)
- 140 people in seven government facilities (approximate value $17,539,950)
- 56 people in six emergency response facilities (approximate value $19,426,529)
- 718 people in seven educational facilities (approximate value $54,280,808)
- 233 people in 10 medical facility (approximate value $198,071,778)
- 286 people in 32 community facilities (approximate value $19,464,739)
- 42.7 road system miles (approximate value $250,500,000)
- Two bridges (approximate with an undefined value)
- 28 people in 12 transportation facilities (approximate value $52,006,931)
- 54 people in 22 utility facilities (approximate value $51,734,988)

Impacts to future populations, residential structures, critical facilities, and infrastructure are anticipated at the same historical impact level.

Flood

Typical flood impacts associated include structures and contents water damage, roadbed, embankment, and coastal erosion, boat strandings, areas of standing water in roadways. Flood events may also damage or displace fuel tanks, power lines, or other infrastructure. Buildings on slab foundations, not located on raised foundations, and/or not constructed with materials designed to withstand flooding events (e.g., cross vents to allow water pass-through an open area under the main floor of a building) are more vulnerable to flood impacts (see Section 5.3.1.2.3).

Several Dillingham residential parcels and critical facilities are exposed to flood impacts.

The following are located within the 1 percent chance of occurrence (100-year) floodplain:

- Approximately six people on two residential parcels (approximate value $600,000)
- 77 people in four community facilities (approximate value $6,354,315)

- Undefined road system miles for 2nd Avenue East, D Street West, Airport Road, Birch Lane, Denny Way, Dimond Willow Drive, Ekuk Circle, Harbor Road, Kleepuk Hill Road, Lupine Drive, Main Street West, North Pacific Court, and Wood River Road (approximate value undefined)
- One person in three transportation facilities (approximate value $658,558)
- Four people in three utility facilities (approximate value $5,920,479)

The following are located within the 0.02 percent chance of occurrence (500-year) floodplain:

- 123 people on 41 residential parcels (approximate value $12,300,000)
- Undefined road system miles for 1st Avenue West, Kanakanak House Road, and Kenny Wren Road (approximate value undefined)

The City anticipates that impacts to future populations, residential structures, critical facilities, and infrastructure will be at the same historical impact level.

Ground Failure

Impacts associated with ground failure include surface subsidence, infrastructure, structure, and/or road damage. Buildings that are built on slab foundations and/or not constructed with materials designed to accommodate the ground movement associated with building on permafrost and other land subsidence and impacts are more vulnerable damage.

The potential ground failure impacts from avalanches, landslides, and subsidence can be widespread. Potential debris flows and landslides can impact transportation, utility systems, and water and waste treatment infrastructure along with public, private, and business structures located adjacent to steep slopes, along riverine embankments, or within alluvial fans or natural drainages. Response and recovery efforts will likely vary from minor cleanup to more extensive utility system rebuilding. Utility disruptions are usually local and terrain dependent. Damages may require reestablishing electrical, communication, and gas pipeline connections occurring from specific breakage points. Initial debris clearing from emergency routes and high traffic areas may be required. Water and wastewater utilities may need treatment to quickly improve water quality by reducing excessive water turbidity and reestablishing waste disposal capability.

USGS elevation datasets were used to determine the ground failure hazard areas within Dillingham. Risk was assigned based on slope angle. A slope angle less than 14 degrees was assigned a low risk, a slope angle between 14 and 32 degrees was assigned a medium risk, and a slope angle greater than 32 degrees was assigned a high risk.

Ground Failure hazards periodically cause structure and infrastructure displacement due to ground shifting, sinking, and upheaval. According to mapping completed by the DGGS, Dillingham has limited permafrost (see Section 5.3.1.3.3).

There have been periodic landslides and other ground failure incidents in Dillingham.

Potentially threatened facilities located within the “Low” vulnerability area include:

- 1,731 people in 577 residential parcels (approximate value $173,100,000)
- 130 people in six government facilities (approximate value $17,539,950)
- 56 people in five emergency response facilities (approximate value $19,118,245)
- 713 people in six educational facilities (approximate value $54,137,280)

- 155 people in five medical facility (approximate value $198,071,778)
- 271 people in 24 community facilities (approximate value $18,652,436)
- Undefined road system miles (approximate value undefined)
- 21 people in eight transportation facilities (approximate value $27,617,783)
- 49 people in 18 utility facilities (approximate value $42,011,938)

Potentially threatened facilities located within the "Moderate" vulnerability area include:

- 207 people in 69 residential parcels (approximate value $20,700,000)

Impacts to future populations, residential structures, critical facilities, and infrastructure are anticipated at the same impact level.

Severe Weather

Impacts associated with severe weather events includes roof collapse, trees and power lines falling, damage to light aircraft and sinking small boats, injury and death resulting from snow machine or vehicle accidents, overexertion while shoveling all due to heavy snow. A quick thaw after a heavy snow can also cause substantial flooding. Impacts from extreme cold include hypothermia, halting transportation from fog and ice, congealed fuel, frozen pipes, utility disruptions, frozen pipes, and carbon monoxide poisoning. Additional impacts may occur from secondary weather hazards or complex storms such as extreme high winds combined with freezing rain, high seas, and storm surge. Section 5.3.1.4.3 provides additional detail regarding severe weather impacts. Buildings that are older and/or not constructed with materials designed to withstand heavy snow and wind (e.g., hurricane ties on crossbeams) are more vulnerable to the severe weather damage.

Based on information provided by the Planning Team and the National Weather Service, the entire existing, transient, and future population, residential structures, and critical facilities are exposed to future severe weather impacts.

This includes approximately:

- 1,938 people in 646 residential parcels (approximate value $1,938,000)
- 140 people in seven government facilities (approximate value $17,539,950)
- 56 people in six emergency response facilities (approximate value $19,426,529)
- 718 people in seven educational facilities (approximate value $54,280,808)
- 233 people in 10 medical facility (approximate value $198,071,778)
- 286 people in 32 community facilities (approximate value $19,464,739)
- 42.7 road system miles (approximate value $250,500,000)
- Two bridges (approximate with an undefined value)
- 28 people in 12 transportation facilities (approximate value $52,006,931)
- 54 people in 22 utility facilities (approximate value $51,734,988)

Impacts to future populations, residential structures, critical facilities, and infrastructure are anticipated at the same impact level.

Volcanic Ash

Volcanic ash impacts can threaten community member's health and as well as infrastructure such as overloading community roof resulting in collapse. Any air aspirated machinery would need to be shut-down to prevent total destruction from the abrasive nature of volcanic ash.

Volcanic ash can also contaminate water supplies with excessive turbidity and wastewater treatment plants over powering treatment capabilities. Section 5.3.1.5.3 provides additional detail regarding volcanic ash impacts.

There is a moderate potential for volcanic ash to impact the City. This area includes approximately:

- 1,938 people in 646 residential parcels (approximate value $1,938,000)
- 140 people in seven government facilities (approximate value $17,539,950)
- 56 people in six emergency response facilities (approximate value $19,426,529)
- 718 people in seven educational facilities (approximate value $54,280,808)
- 233 people in 10 medical facility (approximate value $198,071,778)
- 286 people in 32 community facilities (approximate value $19,464,739)
- 42.7 road system miles (approximate value $250,500,000)
- Two bridges (approximate with an undefined value)
- 28 people in 12 transportation facilities (approximate value $52,006,931)
- 54 people in 22 utility facilities (approximate value $51,734,988)

Wildland Fire

Impacts associated with a wildland fire event include the potential for loss of life and property. It can also impact livestock and pets and destroy forest resources and contaminate water supplies. Buildings closer to the outer edge of town, those with a lot of vegetation surrounding the structure, and those constructed with wood are some of the buildings that are more vulnerable to the impacts of wildland fire. Section 5.3.1.6.3 provides additional detail regarding wildland or tundra fire impacts.

According to the 2008 HMP and the Planning Team's subject-matter-experts, there are wildland fire areas within Dillingham's boundaries. However very few fires have occurred within or interfaced with the City area during the legacy HMP's implementation (see Section 5.3.1.6.3). There is a potential for wildland fire to interface with the population center of the City if the summer is unseasonably dry.

Potentially threatened facilities located within the "Low" vulnerability area include:

- 351 people in 117 residential parcels (approximate value $35,100,000)
- 50 people in two government facilities (approximate value $4,287,500)
- 56 people in five emergency response facilities (approximate value $9,121,960)
- 319 people in two educational facilities (approximate value $28,125,000)
- 25 people in two medical facility (approximate value $2,475,000)
- 87 people in nine community facilities (approximate value $4,818,241)

- Two people in two transportation facilities (approximate value $1,013,692)
- Nine people in 12 utility facilities (approximate value $28,438,070)

Potentially threatened facilities located within the "Moderate" vulnerability area include:

- 1,299 people in 433 residential parcels (approximate value $129,900,000)
- 80 people in four government facilities (approximate value $13,252,450)
- 47 people in three emergency response facilities (approximate value $9,996,285)
- 394 people in four educational facilities (approximate value $26,012,280)
- 130 people in three medical facility (approximate value $195,596,778)
- 82 people in 15 community facilities (approximate value $13,834,195)
- 42.7 road system miles (approximate value $250,000,000)
- 19 people in six transportation facilities (approximate value $26,604,091)
- 45 people in six utility facilities (approximate value $13,573,868)

Manmade/Technological Hazards

Urban Conflagration

Impacts associated with an urban conflagration events include the potential for loss of life and property from boat, structures, located within close proximity to each other. Other fire sources include household appliances, improperly stored flammables, industrial accidents, natural fire initiators such as lightning or other primary damaging hazards such as seasonally dry vegetation affected by poor human decisions such as thrown lighted cigarettes, or lit matches.

These fires destroy essential community resources, such as housing, businesses, stores, food, fuel, and other critical use infrastructure. They also can contaminate water supplies and disrupt transportation systems and utility services. Buildings closer to the outer edge of town, those with significant dry vegetation surrounding the structure, and those constructed with wood are some of the buildings that are more susceptible to fire impacts. Isolated events could quickly turn into a destructive out-of-control fire conflagration and spread quickly throughout the City. Section 5.3.2.1.3 provides additional detail regarding urban conflagration fire impacts

According to the 2008 HMP and the Planning Team, there have been numerous boat and structure fires in Dillingham's harbor and downtown areas. There is a moderate potential for an urban conflagration to occur within the population center of the City. This area includes approximately:

- 115 people in five government facilities (approximate value $12,539,950)
- 47 people in three emergency response facilities (approximate value $13,818,245)
- 663 people in five educational facilities (approximate value $49,807,280)
- 35 people in three medical facility (approximate value $5,789,675)
- 121 people in 15 community facilities (approximate value $15,001,039)
- 15 people in four transportation facilities (approximate value $1,483,161)
- 49 people in 12 utility facilities (approximate value $23,401,188)

Hazardous Materials

Impacts associated with hazardous materials events include the potential for loss of life and property. It can also impact livestock and pets and destroy forest resources and contaminate water supplies. Buildings closer to the outer edge of town, those with a lot of vegetation surrounding the structure, and those constructed with wood are some of the buildings that are more vulnerable to the impacts of wildland fire. Section 5.3.2.2.3 provides additional detail regarding wildland/tundra fire impacts

According to the 2008 HMP and the Planning Team, there are wildland fire areas within Dillingham's boundaries. However, very few fires have occurred within or interfaced with the City area. There is a moderate potential for wildland fire to interface with the population center of the City if the summer is unseasonably dry. This area includes approximately:

- 90 people in four government facilities (approximate value $13,609,950)
- 29 people in three emergency response facilities (approximate value $13,818,245)
- 20 people in one educational facilities (approximate value $2,732,280)
- 25 people in one medical facility (approximate value $2,475,000)
- 101 people in 13 community facilities (approximate value $5,496,583)
- 20 people in four transportation facilities (approximate value $4,555,223)
- Eight people in six utility facilities (approximate value $8,464,606)

Transportation and Utility System Disruptions

Impacts associated with an urban conflagration event include the potential for loss of life and property. It can also impact livestock and pets and destroy essential community resources, such as food, fuel, and other critical use infrastructure such as contaminate water supplies and utility services. Buildings closer to the outer edge of town, those with a lot of vegetation surrounding the structure, and those constructed with wood are some of the buildings that are more susceptible to the impacts of wild fire initiated destructive events which could turn into a conflagration and spread quickly throughout the City. Section 5.3.2.3.3 provides additional detail regarding urban conflagration fire impacts

According to the 2008 HMP and the Planning Team, there are wildland fire areas within Dillingham's boundaries. However, very few fires have occurred within or interfaced with the City area (see Section 5.3.7.3). There is a moderate potential for wildland fire to interface with the population center of the City if the summer is unseasonably dry. This area includes approximately:

- 115 people in five government facilities (approximate value $12,539,950)
- 47 people in three emergency response facilities (approximate value $13,818,245)
- 663 people in five educational facilities (approximate value $49,807,208)
- 35 people in three medical facility (approximate value $5,789,675)
- 121 people in 15 community facilities (approximate value $15,001,039)
- 20 people in four transportation facilities (approximate value $1,483,161)
- 49 people in 14 utility facilities (approximate value $23,401,188)

6.8 FUTURE DEVELOPMENT

The City's Capital Improvement Plan (CIP) provides detailed descriptions of the following infrastructure improvements requesting State Legislature Fiscal Year 2014 funding:

No.	Project Description	Funding Requested
1	Wastewater Treatment Plant Upgrades	$10,920,000
2	Landfill Regulatory Compliance Improvements for 2014 Permit	$4,348,436
3	Utilities and Storm Sewer Upgrades for Downtown Streets Project	$3,000,000
4	Nerka Road Rehabilitation	$2,500,000
5	Public Safety Building(s)	$10,450,000
6	Wastewater Collection System Upgrades	$1,500,000
7	E911 System Improvements	$200,000
8	Harbor Revetments and Breakwater/Emergency Bank Stabilization	$7,500,000
9	Downtown Sewer Expansion (Old Airport Sewer Line)	$804,000
10	Seward and D Street Rehabilitation with Downtown Street Project	$675,000
11	Library Ramps, Other Repairs	$100,000
12	Water/Sewer Master Plan Phases 1.3 and 1.4 (New Water Source)	$1,816,314
13	Harbor Bulkheads	$8,184,000
14	Snag Point Bulkhead Protection	$1,200,000
15	Heavy Equipment and Vehicle Replacement Schedule	$42,000

(CIP 2013)

Additionally, the CIP described support for these future State planned projects that will greatly benefit the community:

State Project Description

No.	Transportation Projects within City limits	Funding Requested
1	Downtown Streets Rehabilitation: Project 51780	$10,850,300
2	Kanakanak Road Squaw Creek to Hospital: Project 52458	$5,300,000
3	Kanakanak Road D Street to Squaw Creek: Project 52799	$11,000,000
4	Dillingham Airport Runway Safety Area/Repaving Apron: Project 59304	$26,514,770
	Transportation Projects outside City limits	
1	Wood River Bridge	$ Undefined

(CIP 2013)

Projects Submitted by Other Organizations

No.	Organization	Project Description	Funding Requested
1	Curyung Tribal Council	H. Harvey Samuelsen Community Cultural Center	$7,924,000
2	Curyung Tribal Council	Seafood Processing Plant	$10,444,752

(CIP 2013)

Table 6-13 delineates Dillingham's DCRA identified future, planned, and funded projects and their tentative completion status.

Table 6-13 Planned and Funded Projects

Grant Recipient	Award Year	Project Description/Comments	Project Status	Award Amount	End Date
City of Dillingham	2013	Dillingham library And Museum building Roof repairs	Active	$250,900	6/30/2017
City of Dillingham	2013	Wastewater Treatment Plant Upgrades	Active	$2,280,000	6/30/2017
Dillingham City School District	2013	Nutritional Alaskan Foods for Schools	Active	$30,347	6/30/2014
Southwest Region School District	2013	Nutritional Alaskan Foods for Schools	Active	$38,022	6/30/2014
City of Dillingham	2013	E911 Critical System Upgrades	Active	$200,000	6/30/2018
City of Dillingham	2013	Landfill Regulatory Compliance Improvements	Active	$1,900,000	6/30/2018
Southwest Region School District	2013	Nutritional Alaskan Foods for Schools	Active	$38,556	7/1/2012
Dillingham City School District	2013	Nutritional Alaskan Foods for Schools	Active	$30,491	7/1/2012
City of Dillingham	2012	Snag Point Sewer Line Emergency Relocation	Active	$1,800,000	6/30/2016
UAF-Marine Advisory Program	2010	Fish Waste Compost Project for Improved Nushagak Watershed	Active	$81,189	8/19/2014
Bristol Bay Heritage Land Trust	2010	Native Lands Conservation Protection	Active	$83,002	12/31/2014
UAF-Marine Advisory Program	2009	Composting Toilets for Coastal Water Quality Improvement	Pending	$14,600	5/30/2014
UAF-Bristol Bay Campus	2009	Nushagak Bay Research and Education Project	Active	$29,617	5/31/2014
City of Dillingham	2009	City Shoreline Emergency Bank Stabilization	Active	$1,500,000	6/30/2014

(DCRA 2014)

This page intentionally left blank

Section Seven outlines the Dillingham's HMP mitigation strategy.

7.1 OVERVIEW

The mitigation strategy provides the blueprint for implementing desired activities that will enable the community to continue to save lives and preserve infrastructure by systematically reducing hazard impacts, damages, and community disruption. A vulnerability analysis is divided into six steps:

1. Identifying each jurisdiction's existing authorities for implementing mitigation action initiatives
2. NFIP Participation
3. Developing Mitigation Goals
4. Identifying Mitigation Actions
5. Evaluating Mitigation Actions
6. Implementing the Mitigation Action Plan (MAP)

DMA requirements for developing a comprehensive mitigation strategy include:

DMA 2000 Requirements
Identification and Analysis of Mitigation Actions §201.6(c)(3): [The plan shall include the following:] A *mitigation strategy* that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools. §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. §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. §201.6(c)(3)(iii): [The hazard mitigation strategy shall include an] action plan, describing how the action identified in paragraph (c)(3)(ii) of this section 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. §201.6(c)(3)(iv): [For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan. Requirement §201.6(c)(4): [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 improvements, when appropriate.
1. REGULATION CHECKLIST
ELEMENT C. Mitigation Strategy
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs?
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? *(Addressed in Section 6.4)*
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards?
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?

DMA 2000 Requirements
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction?
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?
Source: FEMA, March 2015.

7.2 CITY OF DILLINGHAM'S CAPABILITY ASSESSMENT

The City's capability assessment reviews the technical and fiscal resources available to the community.

DMA 2000 Requirements
Incorporation into Existing Planning Mechanisms §201.6(c)(3): [The plan shall include the following:] A *mitigation strategy* that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools.
1. REGULATION CHECKLIST
ELEMENT C. Incorporate into Other Planning Mechanisms
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs?
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?
Source: FEMA, March 2015.

7

This section outlines the resources available to the City of Dillingham for mitigation and mitigation related funding and training. Tables 7-1, 7-2, and 7-3 delineate the City's regulatory tools, technical specialists, and financial resource available for project management. Additional funding resources are identified in Appendix A.

Table 7-1 Dillingham's Regulatory Tools

(Available at: http://www.codepublishing.com/AK/Dillingham/)

Regulatory Tools (ordinances, codes, plans)	Existing Yes/No?	Comments
Comprehensive Plan, 2010	Yes	Explains the City's land use initiatives and natural hazard impacts
Land Use Plan, 2010	Yes	Explains the City's land use goals, regulations, and initiatives
Tribal Land Use Plan	Yes	Describes the Village's community development goals and initiatives
Emergency Response Plan	Yes	Provides hazard response activities and priorities; Population education initiatives
Wildland Fire Protection Plan	No	
Building code, 2010	Yes	Delineates public infrastructure initiatives and identifies capital improvement goals
Zoning ordinances, 2010	Yes	Comprehensive Plan

Table 7-1 Dillingham's Regulatory Tools

(Available at: http://www.codepublishing.com/AK/Dillingham/)

Regulatory Tools (ordinances, codes, plans)	Existing Yes/No?	Comments
Subdivision ordinances or regulations, 2010	Yes	Comprehensive Plan
Special purpose ordinances, 2010	Yes	Dillingham Municipal Code: Chapter 15.04-Floodplain Regulations, and other special use area ordinances

Local Resources

The City 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.

Table 7-2 Dillingham's Technical Specialists for Hazard Mitigation

Staff/Personnel Resources	Yes / No	Department/Agency and Position
Planner or engineer with knowledge of land development and land management practices	Yes	The City has staff with this knowledge
Engineer or professional trained in construction practices related to buildings and/or infrastructure	Yes	The City has staff with this knowledge
Planner or engineer with an understanding of natural and/or human-caused hazards	Yes	The City has staff with this knowledge
Floodplain Manager	Yes	City Planner and Floodplain Manager
Surveyors	No	The City can contract for the capability
Staff with education or expertise to assess the jurisdiction's vulnerability to hazards	Yes	The City has staff with this knowledge
Personnel skilled in Geospatial Information System (GIS) and/or Hazards Us-Multi Hazard (Hazus-MH) software	Yes	The City has staff with this knowledge
Scientists familiar with the hazards of the jurisdiction	Yes	City can work with U.S. Fish & Wildlife Service (USFWS) and Fish & Game (ADF&G), and the Alaska Department of Transportation and Public Facilities and other agency specialists as needed
Emergency Manager	Yes	The City Mayor, City Administrator, or Fire Chif as applicable
Finance (Grant writers)	Yes	City Accountants & Planner as applicable
Public Information Officer	Yes	The City Mayor or City Administrator as applicable

Table 7-3 Financial Resources Available for Hazard Mitigation

Financial Resource	Accessible or Eligible to Use for Mitigation Activities
General funds	City can exercise this authority with voter approval
Payment in Lieu of Taxes (PILT)	Provides City operating support funding
Municipal Energy Assistance Program (MEAP)	Provides City operating support funding
Community Development Block Grants (CDBG) Indian Community Development Block Grants (ICDBG)	City can exercise this authority with voter approval
Capital Improvement Project Funding	City can exercise this authority with voter approval
Authority to levy taxes for specific purposes	Can exercise this authority with voter approval
Incur debt through general obligation bonds	Can exercise this authority with voter approval
Incur debt through special tax and revenue bonds	Can exercise this authority with voter approval
Incur debt through private activity bonds	Can exercise this authority with voter approval
Hazard Mitigation Grant Program (HMGP)	FEMA funding which is available to local communities after a Presidentially-declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Pre-Disaster Mitigation (PDM) grant program	FEMA funding which available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects only
Flood Mitigation Assistance (FMA) grant program	FEMA funding which is available on an annual basis. This grant can be used to mitigate repetitively flooded structures and infrastructure to protect repetitive flood structures. ***Dillingham qualifies for this funding source because they are active NFIP participants.***
United State Fire Administration (USFA) Grants	The purpose of these grants is to assist state, regional, national or local organizations to address fire prevention and safety. The primary goal is to reach high-risk target groups including children, seniors and firefighters.
Fire Mitigation Fees	Finance future fire protection facilities and fire capital expenditures required because of new development within Special Districts.

The Planning Team developed the mitigation goals and potential mitigation actions to address identified potential hazard impacts for the City of Dillingham within Section 5.3.

7.3 DEVELOPING MITIGATION GOALS

DMA 2000 stipulated and implementing regulations for developing hazard mitigation goals:

DMA 2000 Requirements
Local Hazard Mitigation Goals §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.
1. REGULATION CHECKLIST
ELEMENT C. Mitigation Goals
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards?
Source: FEMA, March 2015.

The exposure analysis results were used 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.

After reviewing the City's legacy 2008 HMP, the Planning Team redefined by combining or rewriting their goal statements to better represent their multi-hazard, community-wide vision. They are contained within the following 12 Mitigation Goals (Table 7-4) to reduce or avoid long-term vulnerabilities to their identified hazards. Among the changes are three new categories These categories are Multi-Hazard (MH) 1-3:

- MH 1: Provide outreach activities to educate and promote recognizing and mitigating natural and manmade hazards that affect the City of Dillingham.
- MH 2: Cross-reference mitigation goals and actions with other City planning mechanisms and projects.
- MH 3: Develop construction activities that reduce possibility of losses from natural and manmade hazards that affect the City.

Table 7-4 Mitigation Goals

No.	Goal Description
Multi-Hazards (MH)	
MH 1	Provide **outreach** activities to educate and promote recognizing and mitigating natural and manmade hazards that affect the City of Dillingham (City) and the Curyung Tribe (Tribe).
MH 2	**Cross-reference** mitigation goals and actions with other City/Tribal planning mechanisms and projects.
MH 3	Develop **construction activities** that reduce possibility of losses from **all** natural and manmade hazards that affect the City/Village.
Natural Hazards	
EQ 4	Reduce structural vulnerability to earthquake (EQ) damage.
FL 5	Reduce flood and erosion (FL) damage and loss possibility.
GF 6	Reduce ground failure (GF) damage and loss possibility.
SW 7	Reduce structural vulnerability to severe weather (SW) damage.
VO 8	Reduce vulnerability, damage, or loss of structures from volcanic (VO) debris impacts

Table 7-4 Mitigation Goals

No.	Goal Description
WF 9	Reduce structural vulnerability to tundra/wildland fire (WF) damage.
Manmade/Technological Hazards	
UC 10	Reduce structural vulnerability to urban conflagration (UC) damages
HM 11	Reduce structural vulnerability to hazardous materials (HM) impacts
T/U 12	Reduce structural vulnerability to transportation and utility disruption (T/U)

7.4 IDENTIFYING MITIGATION ACTIONS

DMA 2000 requirements and implementing regulations for identifying and analyzing mitigation actions:

DMA 2000 Requirements
Identification and Analysis of Mitigation Actions §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.
1. REGULATION CHECKLIST
ELEMENT C. Mitigation Actions
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?
Source: FEMA, March 2015.

7

After reviewing the 2008 legacy HMP's and the newly combined and edited mitigation goals and Mitigation Action Plan (MAP), the Planning Team reviewed the plan's Mitigation Action Plan's (MAP), along with existing community planning documents to determine their associated mitigation initiatives' current status as: complete, deleted, deferred, ongoing, or combined (to better reflect current community needs).

Table 7-5 summaries this review process as well as defines existing projects' current status. Table 7-8 will list these projects within their newly selected categories.

The Planning Team placed particular emphasis on projects and programs that reduce the hazard impacts to both new and existing buildings and infrastructure placing particular emphasis to facilities located in potential FEMA mapped flood zones to comply with NFIP requirements.

Table 7-5 Mitigation Goals and Potential Actions

(Blue text items are the legacy HMP Identified Mitigation Action Items and their respective status determinations)
(Red text identifies completed or deleted projects)

Goals		Status		Actions
No.	**Description**	**New** *Considered, Selected* **Brought Forward** *Complete, Deferred, Deleted, or Ongoing*	**Explain Project's Status**	**Description**
Multi-Hazards (MH)				
MH 1	*Promote recognition and mitigation of all natural hazards that affect the Borough*	Deferred Ongoing	No available funding – seeking funding	Update public emergency notification procedures and develop an outreach program for potential hazard impacts to identified events
	New	Identify and pursue funding opportunities to implement mitigation actions.		
MH 2	*Promote cross-referencing mitigation goals and actions with other Borough or Jurisdiction's planning mechanisms and projects*	***Not used during legacy HMP development***		
MH 3	*Reduce possibility of losses from all natural and manmade hazards that affect the City and Tribe*	***Not used during legacy HMP development***		
EQ4	*Reduce vulnerability, damage, or loss of structures from earthquake damage*	*Deferred*	*Lack time, staff, and funding resources*	*5B: Implement Uniform International and State Building Codes to ensure that all future development meets all requirements for seismic protection and fire protection*
FL 5	*Reduce vulnerability, damage, or loss of structures from erosion.*	*Ongoing*	*Seeking funding*	***CP-Obj. 1A, 1.:*** *Continue to work with the US Army Corps of Engineers, to map and evaluate the location and degree of erosion issues along the Dillingham waterfront.*
		Ongoing	*Seeking funding*	***CP-Obj. 1A, 1.:*** *Sedimentation: remove sedimentation from the small boat harbor, with a renewed contract every five years.*
		Ongoing	*Undefined*	***CP-Obj. 1A, 3.:*** *City should request that USACE go back to on-land dredge spoils disposal versus pumping the sediment back into the bay.*
		Ongoing	*Seeking funding*	***CP-Obj. 3A, 5.:*** *Stabilize the eroding bank in the vicinity of the recreation area.*
		Deferred	*Seeking funding*	***CP-Obj. 3A, 1.****: Map and evaluate the location and degree of erosion issues along the Dillingham waterfront, with*

Table 7-5 Mitigation Goals and Potential Actions

(Blue text items are the legacy HMP Identified Mitigation Action Items and their respective status determinations)
(Red text identifies completed or deleted projects)

Goals		Status		Actions
No.	**Description**	**New** *Considered, Selected* **Brought Forward** *Complete, Deferred, Deleted, or Ongoing*	**Explain Project's Status**	**Description**
				specific emphasis on the Sewer Lagoon, Small Boat Harbor, Snag Point Bulk Head, and Kanakanak Beach.
		Deferred	*Seeking funding*	***CP-Obj. 3A, 3.**: Develop and implement practical erosion mitigation plans.*
		Ongoing	*Seeking funding*	*1A: Construct breakwater and seawalls in Dillingham harbor* ***CP-Obj. 1A, 1.:** Construct West side revetment and breakwater, proposed by USACE*
		Completed	*Seeking funding*	*1B: Extend seawall in front of the harbor east toward the Peter Pan dock* ***CP-Obj. 1A, 1.:** Construct East side ("city dock" side) revetment armoring the outside of the harbor & providing beach access, proposed by USACE*
		Deferred	*Seeking funding*	*1C: Construction the extension of the North Shore Bulkhead (construct west and east seawalls)*
		Ongoing	*Seeking funding*	*1D: Replace riprap removed by storms at the north end of the Snag Point sheet-pile bulkhead*
		Ongoing	*Seeking funding*	*2A: Public education regarding City of Dillingham participation in NFIP and use and availability of flood insurance*
		Deleted	*No available funding*	*2B: Establish a legislative priority to persuade the Governor to boost ADEC funding to re-implement code enforcement.*
		Ongoing	*Seeking funding*	*2C: Support updates to the FEMA Flood Insurance Rate Maps*
		Ongoing	*Seeking funding*	*2D: Update and enforce floodplain management ordinances*
		Ongoing	*Seeking funding*	*2F: Educate residents about safe well and sewer/septic installation*
		Completed	Completed	Increase culvert sizes to increase their drainage capacity or efficiency.
		Completed	Completed	Harden culvert entrance bottoms with asphalt, concrete, rock, or similar material to reduce erosion of scour.
GF 6	*Reduce vulnerability, damage, or loss of structures from flooding.*	None selected as this is a minor threat to the community		
SW 7	*Reduce vulnerability, damage, or loss*	*Ongoing*	*Seeking funding*	*7B: Conduct community alert tests for NOAA warning tones (contact NOAA, City Police and Fire Departments, and Volunteer Fire Departments to coordinate test)*

Table 7-5 Mitigation Goals and Potential Actions

(Blue text items are the legacy HMP Identified Mitigation Action Items and their respective status determinations)
(Red text identifies completed or deleted projects)

Goals		Status		Actions
No.	**Description**	**New** *Considered, Selected* **Brought Forward** *Complete, Deferred, Deleted, or Ongoing*	**Explain Project's Status**	**Description**
	of structures from ground failure.	*Ongoing*	*Seeking funding*	*7C: Provide two annual weather safety talks*
		Deleted	*No available funding*	*8A: Complete Storm Readiness Program*
		Ongoing	*Seeking funding*	*8B: Complete MOU with KDLG regarding communication in the event of an emergency*
		Completed	*N/A*	*8C: Finalize Community Siren System Project*
VO 8	*Reduce vulnerability, damage, or loss of structures from volcanic ash or debris impacts*	None selected as this is deemed a minor threat to the community		
WF 9	*Reduce vulnerability, damage, or loss of structures from wildland or tundra fires.*	*Deleted*	*No available funding*	*4A: Hold workshop on subdivision design with BBNA Realty to promote awareness of Fire Prevention and Dillingham EMS*
		Deferred	*Combined projects Seeking funding*	*2G: Develop new water source in Neqleq Subdivision*
				4B: Tie new water source in Neqleq Subdivision to the rest of the city water system
		Deleted	*No available funding*	*4C: Identify possible locations of underground water tanks and property ownership*
		Deleted	*No available funding*	*4D: Obtain MOA or agreements with property owners to install underground water tanks*
		Deferred	*Combined projects Seeking funding*	*4E: Purchase underground water supply tanks in specified locations*
				4F: Install underground water supply tanks
		Deleted	No available funding	*4G: Hold FireWise Workshop*
		Deleted	*No available funding*	*4H: Conduct residential audits for wildland and building fire hazards*
		Ongoing	*Seeking funding*	*4I: Public Education "info-mercials" on local radio*
Manmade / Technological Hazards				
UC 10	Reduce structural vulnerability to	*Ongoing*	*Seeking funding*	*9A: Improve water lines to south side of the harbor*

Table 7-5 Mitigation Goals and Potential Actions

(Blue text items are the legacy HMP Identified Mitigation Action Items and their respective status determinations)
(Red text identifies completed or deleted projects)

Goals		Status		Actions
No.	**Description**	**New** *Considered, Selected* **Brought Forward** *Complete, Deferred, Deleted, or Ongoing*	**Explain Project's Status**	**Description**
	urban conflagration (UC) damages	*Ongoing*	*Seeking funding*	*9B: Design an evacuation plan for the core town site*
		Ongoing	*Seeking funding*	*9E: Promote FireWise building design, siting, and materials use for construction*
HM 11	Reduce structural vulnerability to hazardous materials (HM) impacts	None selected as this is deemed a minor threat to the community		
T/U 12	Reduce structural vulnerability to Transportation and utility disruption (T/U)	None selected as this is deemed a minor threat to the community		

7

7.5 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 Requirements: Mitigation Strategy - Implementation of Mitigation Actions
Implementation of Mitigation Actions §201.6(c)(3)(iii): [The hazard mitigation strategy shall include an] action plan, describing how the action identified in paragraph (c)(3)(ii) of this section 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.
1. REGULATION CHECKLIST
ELEMENT C. MITIGATION STRATEGY
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))
Source: FEMA, March 2015.

The Planning Team evaluated and prioritized each of the mitigation actions on May 28, 2015 to determine which actions would be included in the MAP. The MAP represents mitigation projects and programs to be implemented through the cooperation of multiple entities including the City, Curyung Tribe, State, and Federal agencies. To complete this task, the Planning Team first prioritized the natural hazards that were regarded as the most significant within the community

(earthquake, flood, ground failure, severe weather, and wildland fire) and then Human or technologically initiated hazards that could potential impact the Dillingham area such as hazardous materials incidents, transportation and utility disruptions, and finally but not the least damaging – urban conflagration.

The Planning Team reviewed the social, technical, administrative, political, legal, economic, and environmental (STAPLE-E) project evaluation criteria (Table 7-6) and (Appendix E) as well as the simplified Benefit-Cost Analysis Fact Sheet (Appendix G) to consider the opportunities and constraints of implementing each particular mitigation action. For each action considered for implementation, a qualitative statement is provided regarding the benefits and costs and, where available, the technical feasibility. A detailed cost-benefit analysis is anticipated as part of the application process for those projects the City chooses to implement.

Table 7-6 Simplified Project Evaluation Criteria STAPLE-E

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, economic development, safety, and emergency management.	Political support Local champion 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 Federal Emergency Management Agency (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

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 7-7 Dillingham's 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 (Table 7-8 and 7-9) represent the Calculated Priority Risk Index for each hazard facing the community.

Table 7-8 Dillingham Calculated Priority Risk Index - Natural Hazard

Hazard	Probability	Magnitude /Severity	Warning Time	Duration	Priority Risk Index	Hazard
Natural Hazards						
Earthquake	1 Unlikely	1 Negligible	4 < 6 Hours	1 < 6 Hours	1.45	Earthquake
Flooding (Scour)	2 Possible	1 Negligible	1 24+ Hours	2 < One Day	1.55	Flood, Scour, Snow/Rain Melt
Ground Failure	1 - Unlikely	1 - Negligible	1 - 24+ Hours	1 - Less Than 6 Hours	1 - Unlikely	Melt Permafrost, Subsidence
Severe Weather	3 Likely	2 Limited	1 24+ Hours	3 < One Week	2.4	Coastal Surge, Wind
Tsunami	1 Unlikely	2 Limited	4 < 6 Hours	1 < 6 Hours	1.75	Tsunami
Volcano	1 Unlikely	1 Negligible	4 < 6 Hours	3 < One Week	1.65	Volcanic Ash
Wildfires	2 Possible	1 Negligible	4 < 6 Hours	3 < One Week	2.1	Wild Fire

Table 7-9 Dillingham Calculated Priority Risk Index – Manmade-Techno Hazard

Hazard	Probability	Magnitude /Severity	Warning Time	Duration	Priority Risk Index	Hazard
Manmade/Technological						
Urban Conflagration	2 Possible	4 - Catastrophic	4 - < 6 Hours	3 - < 1 Week	3.25 (Highly Likely)	Urban Structure Fire
Hazardous Materials	2 Possible	2 - Limited	4 - < 6 Hours	3 -< 1 Week	2.75 (Likely)	HAZMAT or Chemical Spill
Transportation and Utility Disruption	2 Possible	2 - Limited	4 - < 6 Hours	3 - <n 1 Week	2.75 (Likely)	EQ, SW, Fire, HAZMAT

In August 2015, the hazard mitigation Planning Team prioritized three new and 22 legacy natural hazard and five legacy manmade/technological hazard mitigation actions that were selected to carry forward into the Mitigation Action Plan (MAP) located in Table 7-11.

The hazard mitigation Planning Team considered each hazard's history, extent, and recurrence probability to determine each potential actions priority. A rating system based on high, medium, or low was used.

- High priorities are associated with actions for hazards that impact the community on an annual or near annual basis and generate impacts to critical facilities and/or people.

- Medium priorities are associated with actions for hazards that impact the community less frequently, and do not typically generate impacts to critical facilities and/or people.
- Low priorities are associated with actions for hazards that rarely impact the community and have rarely generated documented impacts to critical facilities and/or people.

Prioritizing the mitigation actions within the MAP matrix (Table 7-8) was completed to provide the City with an implementation approach.

7.6 MITIGATION ACTION PLAN

Table 7-10 delineates the acronyms used in Table 7-11, MAP. See Appendix A for summarized agency funding source descriptions.

Table 7-10 Potential Funding Agency List
(See complete funding resource description in Appendix A)

City of Dillingham (City)

Curyung Tribal Council (Tribe)

US Department of Homeland Security (DHS)
Citizens Corp Program (CCP)
Emergency Operations Center (EOC)
Homeland Security Grant Program (HSGP)
Emergency Management Performance Grant (EMPG)
State Homeland Security Program (SHSP)

Federal Management Agency (FEMA) /
Hazard Mitigation Assistance Grant Programs (HMA)
Emergency Management Program Grant (EMPG)
Debris Management Grant (DM)
Flood Mitigation Assistance Grants (FMA)
National Earthquake Hazards Reduction Program (NEHRP)
National Dam Safety Program (NDS)

US Department of Commerce (DOC) /
Remote Community Alert Systems Program (RCASP)
National Oceanic and Atmospheric Administration (NOAA)

US Department of Agriculture (USDA) /
USDA, Farm Service Agency (FSA)
Emergency Conservation Program (ECF)
Rural Development (RD)

USDA, Natural Resources Conservation Service (NRCS)
Conservation Technical Assistance Program (DCT)
Conservation Innovation Grants (CIG)
Environmental Quality Incentives Program (EQIP)
Emergency Watershed Protection Program (EWP)
Watershed Planning (WSP)

US Geological Survey (USGS)
Alaska Volcano Observatory (AVO)

Assistance to Native Americans (ANA)
*Native American Housing Assistance and Self Determination Act (NA*FSMA),

US Army Corp of Engineers (USACE) /
Planning Assistance Program (PAP)
Capital Projects: Erosion, Flood, Ports & Harbors

Alaska Department of Military and Veterans Affairs (DMVA) /

Division of Homeland Security and Emergency Management (DHSEM)
Mitigation Section (for PDM & HMGP projects and plan development)

Table 7-10 Potential Funding Agency List
(See complete funding resource description in Appendix A)

Preparedness Section (for community planning)
State Emergency Operations Center (SEOC for emergency response)

Alaska Department of Community, Commerce, and Economic Development (DCCED) /

Division of Community and Regional Affairs (DCRA) /
Community Development Block Grant (CDBG)
Alaska Climate Change Impact Mitigation Program (ACCIMP)
Flood Mitigation Assistance Grants (FMA)

Alaska Department of Transportation
State road repair funding

Alaska Energy Authority (AEA)
AEA/Bulk Fuel (ABF)
AEA/Alternative Energy and Energy Efficiency (AEEE)

Alaska Department of Environmental Conservation (DEC) /
Village Safe Water (VSW)
DEC/Alaska Drinking Water Fund (ADWF)
DEC/Alaska Clean Water Fund [ACWF]
DEC/Clean Water State Revolving Fund (CWSRF)

Alaska Division of Forestry (DOF) /
Volunteer Fire Assistance and Rural Fire Assistance Grant (VFAG/RFAG)
Assistance to Firefighters Grant (AFG)
Fire Prevention and Safety (FP&S)
Staffing for Adequate Fire and Emergency Response Grants (SAFER)
Emergency Food and Shelter (EF&S)

Denali Commission (Denali)
Energy Program (EP
Solid Waste Program (SWP)

Lindbergh Foundation Grant Programs (LFGP)

Rasmuson Foundation Grants (LFG)

The MAP, Table 7-11, depicts how each mitigation action will be implemented and administered by the Planning Team by delineating each selected mitigation action, its priorities, the responsible entity, the anticipated implementation timeline, and a brief explanation as to how the overall benefit/costs and technical feasibility were taken into consideration.

Table 7-11 Dillingham's Mitigation Action Plan (MAP)

(Blue Italicized Initiatives were brought forward from existing HMP or other identified plans)

(See Table 7-9 Potential Funding Agency list; Appendix 9 for agency programmatic details)

Goal / Action ID	Description	Priority (High, Medium, Low)	Responsible Department	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (BC) / Technical Feasibility (T/F)
Multi-Hazard (MH) 1.1	Identify and pursue funding opportunities to implement mitigation actions.	High	Dillingham's Mayor's or City Manager's Office	City, (See Appendix A)	Ongoing	B/C: City life requires this as an ongoing activity; it is essential for rural communities as there are limited funds available to accomplish effective mitigation actions. TF: This activity is ongoing demonstrating its feasibility.
MH 1.2	*Public education regarding City of Dillingham participation in NFIP and use and availability of flood insurance*	*Medium*	*City of Dillingham, City Planner*	*FEMA HMA, -FMA, -PDM, or -HMGP funding for additional floodplain management activities*	*Ongoing 1-3 years*	*B/C: NFIP participation while one of FEMA's highest priorities also enables communities with an effective program focus on repetitive flood loss properties and other priority flood locations and projects.* *TF: City is currently a member and residents enjoy lower cost insurance. Continuation is relatively simple.*
MH 1.3	*Educate residents about safe well, and sewer, and septic installations*	*Medium*	*ADEC/ City of Dillingham, City Planner*	*HMA, DEC, USDA, Denali Commission*	*Ongoing 2-4 years*	*B/C: 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.* *T/F: Specialized skills may need to be contracted-out with materials and*

Table 7-11 Dillingham's Mitigation Action Plan (MAP)

(Blue Italicized Initiatives were brought forward from existing HMP or other identified plans)

(See Table 7-9 Potential Funding Agency list; Appendix 9 for agency programmatic details)

Goal / Action ID	Description	Priority (High, Medium, Low)	Responsible Department	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (BC) / Technical Feasibility (T/F)
						equipment barged in depending on the method selected.
MH 1.4	*Public Education "info-mercials" on local radio*	*Medium*	*City of Dillingham: VFD & City Planner*	*PDM or HMGP funding*	*Ongoing Continuous*	*B/C: 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.* *T/F: Specialized skills may need to be contracted-out with materials and equipment barged in depending on the method selected.*
MH 1.5	*Provide two annual weather safety talks*	*Low*	*City of Dillingham, VFD & City Planner*	*City, FEMA HMA, AFG, FP&S, SAFER, ANA, EEFSP, Lindbergh, Rasmuson, Denali Commission*	*Ongoing 2-4 years*	*B/C: Sustained mitigation outreach program has minimal cost and will help build and support area-wide capacity. This type activity enables the public to prepare for, respond to, and recover from disasters.* *TF: This low cost activity can be combined with recurring community meetings where hazard specific information can be presented in small increments. This activity is ongoing demonstrating its feasibility.*
MH 1.6	*Promote FireWise building design, siting, and materials use for construction*	*High*	*City of Dillingham , VFD & City Planner, State Fire Marshall's Office*	*City, AFG, FP&S*	*Ongoing 1-3 Years*	*B/C: Sustained mitigation outreach programs have minimal cost and will help build and support community capacity enabling the public to*

Table 7-11 Dillingham's Mitigation Action Plan (MAP)

(Blue Italicized Initiatives were brought forward from existing HMP or other identified plans)

(See Table 7-9 Potential Funding Agency list; Appendix 9 for agency programmatic details)

Goal / Action ID	Description	Priority (High, Medium, Low)	Responsible Department	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (BC) / Technical Feasibility (T/F)
						appropriately prepare for, respond to, and recover from disasters. *TF: This project is technically feasible using existing City and Tribal staff.*
MH 1.7	Increase culvert sizes to increase their drainage capacity or efficiency.	High	City of Dillingham, City Planner's Office	City, Federal Highway Administration	Completed	B/C This project was completed over a 4 year process through Knik. T/F: This project included re-paving the main road, replacing culverts for larger ones, raising the road by 5 feet in some areas, and hardening the ditches and culvert bottoms with rock.
MH 1.8	Harden culvert entrance bottoms with asphalt, concrete, rock, or similar material to reduce erosion of scour.	High	City of Dillingham, City Planner's Office	City, Federal Highway Administration	Completed	B/C This project was completed over a 4 year process through Knik. T/F: This project included re-paving the main road, replacing culverts for larger ones, raising the road by 5 feet in some areas, and hardening the ditches and culvert bottoms with rock.
MH 2.1	*Support updates to the FEMA Flood Insurance Rate Maps*	*High*	*City of Dillingham, City Planner's Office*	*FMA, PDM, or HMGP funding for additional floodplain management activities*	*Ongoing 1-3 years*	*B/C: 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.* *TF: This is technically feasible using existing city and tribal resources.*
MH 2.2	*Update and enforce floodplain management ordinances*	*High*	*City of Dillingham, City Planner*	*FMA, PDM, or HMGP funding for additional*	*Ongoing 1-3 years*	*B/C: Additional floodplain management activities (i.e.: public outreach material, enhanced floodplain*

Table 7-11 Dillingham's Mitigation Action Plan (MAP)

(Blue Italicized Initiatives were brought forward from existing HMP or other identified plans)

(See Table 7-9 Potential Funding Agency list; Appendix 9 for agency programmatic details)

Goal / Action ID	Description	Priority (High, Medium, Low)	Responsible Department	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (BC) / Technical Feasibility (T/F)
				floodplain management activities		*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.* *TF: This is technically feasible using existing city and tribal resources.*
MH 2.3	*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, HS&EM-DOC-RCASP, -NOAA, DOF-AFG, -FP&S, and -SAFER*	*Ongoing Continuous*	*B/C: 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.* *TF: Low to no cost makes this a very feasible project to successfully educate large populations.*
MH 2.4	*Complete MOU with KDLG regarding communication in the event of an emergency*	*High Priority*	*Dillingham Department of Public Safety – Chief*	*City, DHS&EM, DHS, DOC-RCASP, -NWS, -NOAA, USDA-NRCS*	*Ongoing 0-2 years*	*B/C: 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.* *TF: This is technically feasible using existing city and tribal resources.*
MH 2.5	*Design an evacuation plan for the core town site*	*High Priority*	*Dillingham Fire Department – Coordinator*	*City, Denali Commission, DCRA, DOF*	*Ongoing 1-3 years*	*B/C: This project will ensure the community looks closely at their hazard areas to ensure they can safely*

Table 7-11 Dillingham's Mitigation Action Plan (MAP)

(Blue Italicized Initiatives were brought forward from existing HMP or other identified plans)

(See Table 7-9 Potential Funding Agency list; Appendix 9 for agency programmatic details)

Goal / Action ID	Description	Priority (High, Medium, Low)	Responsible Department	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (BC) / Technical Feasibility (T/F)
						evacuate their residents and visitors to safety during a natural hazard event. *TF: This is technically feasible using existing city and tribal resources.*
MH 3.1	*Develop new water source in Neqleq Subdivision*	*High Priority*	*City of Dillingham, City Manager and City Planner* *City of Dillingham, Public Works Director*	*City, Denali Commission, NRCS, USDA*	*0-5 years*	*B/C: This program will help mitigate urban conflagration and wildland fire hazards around vulnerable populations. Protecting vulnerable populations from a disaster is FEMA and CDC goal.* *TF: This is technically feasible using existing city and tribal resources. Specialized skills may need to be contracted-out with materials and equipment barged in depending on the method selected.*
MH 3.2	*Tie new water source in Neqleq Subdivision to the rest of the City's 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*	*B/C: This program will help mitigate primary or secondary damaging hazard impacts hazards throughout the city.* *TF: This is technically feasible using existing city and tribal resources. Specialized skills may need to be contracted-out with materials and equipment barged in depending on the method selected.*
MH 3.3	*Purchase and install underground water supply tanks in specified locations*	*Medium*	*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*	*3-5 years*	*B/C: This program will help mitigate primary or secondary damaging hazard impacts throughout the city.* *TF: This is technically feasible using existing city and tribal resources. Specialized skills may need to be*

Table 7-11 Dillingham's Mitigation Action Plan (MAP)

(Blue Italicized Initiatives were brought forward from existing HMP or other identified plans)

(See Table 7-9 Potential Funding Agency list; Appendix 9 for agency programmatic details)

Goal / Action ID	Description	Priority (High, Medium, Low)	Responsible Department	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (BC) / Technical Feasibility (T/F)
						contracted-out with materials and equipment barged in depending on the method selected.
Flood (FL) 5.1	*Construct breakwater and seawalls in Dillingham harbor* *Construct West side revetment and breakwater, proposed by USACE*	*High Priority*	*City of Dillingham – City Manager, City Planner, and Harbormaster*	*USACOE, FEMA, DHS&EM*	*0-5 years*	*B/C: This effort will prevent future damage and losses due to severe storm induced erosion loss.* *T/F: Historical work has proven this project is technically feasible. The community needs the USCA to prioritize and fund the project.*
FL 5.2	*Extend seawall in front of the harbor east toward the Peter Pan dock* *Construct East side ("city dock" side) revetment armoring the outside of the harbor & providing beach access, proposed by USACE*	*High Priority*	*City of Dillingham – City Manager, City Planner, and Harbormaster*	*USACOE, FEMA, DHS&EM*	*0-5 years*	*B/C: This effort will prevent future damage and losses due to severe storm induced erosive scour loss.* *T/F: Historical work has proven this project is technically feasible. The community needs the USCA to prioritize and fund the project.*
FL 5.3	*Renew contract every five years to remove sedimentation from the small boat harbor.*	*Medium*	*City Mayor's Office as applicable*	*City, ANA, NRCS, Denali Commission, DCRA, USACE*	*2-4 years*	*B/C: Sedimentation is a continual threat to community harbor navigation. It is essential to have a recurring sedimentation removal program to prevent excessive build-up.* *T/F: Historical work has proven this project is technically feasible. The community needs the USCA to prioritize and fund the project.*
FL 5.4	*Request that USACE go back to on-land dredge spoils*	*Medium*	*City Mayor's Office as applicable*	*City, ANA, NRCS, Denali Commission, DCRA, USACE*	*2-4 years*	*B/C: Sedimentation is a continual threat to community harbor navigation. It is essential to have a recurring*

Table 7-11 Dillingham's Mitigation Action Plan (MAP)

(Blue Italicized Initiatives were brought forward from existing HMP or other identified plans)

(See Table 7-9 Potential Funding Agency list; Appendix 9 for agency programmatic details)

Goal / Action ID	Description	Priority (High, Medium, Low)	Responsible Department	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (BC) / Technical Feasibility (T/F)
	disposal versus pumping the sediment back into the bay.					*sedimentation removal program to prevent excessive build-up.* *T/F: Historical work has proven this project is technically feasible. Removing dredged material from one location and moving to another within the same water body threatens to have adverse impacts at that or other downstream locations. The community needs the USCA to prioritize and fund the project.*
FL 5.5	Stabilize the eroding bank in the vicinity of the recreation area.	*High*	*City Mayor's Office as applicable*	*City, HMA, ANA, NRCS, USACE*	*3-5 years*	*B/C: Improving embankment and slope stability will greatly reduce potential infrastructure and residential losses. Project costs would outweigh replacement costs of lost facilities.* *TF: This is technically feasible using existing city and tribal resources. Specialized skills may need to be contracted-out by funding agencies with materials and equipment barged in depending on the method selected.*
FL 5.6	*Map and evaluate the location and degree of erosion issues along the Dillingham waterfront.*	*High*	*City Mayor's Office or Tribal Council Office as applicable*	*City, HMA, ANA, NRCS, USACE*	*3-5 years*	*B/C: Improving embankment and slope stability will greatly reduce potential infrastructure and residential losses. Project costs would outweigh replacement costs of lost facilities.* *T TF: This is technically feasible using existing city and tribal resources. Specialized skills may need to be contracted-out with materials and*

Table 7-11 Dillingham's Mitigation Action Plan (MAP)

(Blue Italicized Initiatives were brought forward from existing HMP or other identified plans)

(See Table 7-9 Potential Funding Agency list; Appendix 9 for agency programmatic details)

Goal / Action ID	Description	Priority (High, Medium, Low)	Responsible Department	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (BC) / Technical Feasibility (T/F)
						equipment barged in depending on the method selected.
FL 5.7	Develop and implement practical erosion mitigation plans.	*High*	*City Mayor's Office as applicable*	*City, HMA, ANA, NRCS, USACE*	*3-5 years*	*B/C: Improving embankment and slope stability will greatly reduce potential infrastructure and residential losses. Project costs would outweigh replacement costs of lost facilities.* *TF: This is technically feasible using existing city and tribal resources. Specialized skills may need to be contracted-out with materials and equipment barged in depending on the method selected.*
FL 5.8	*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*	*B/C: This effort will prevent future damage and losses due to severe storm induced erosion loss.* *TF: This is technically feasible using existing city and tribal resources. Specialized skills may need to be contracted-out by funding agencies with materials and equipment barged in depending on the method selected.*
FL 5.9	*Replace riprap removed by storms at the north end of the Snag Point sheet-pile bulkhead*	*High Priority*	*City of Dillingham – City Manager, City Planner, and Public Works Director*	*USACOE, FEMA, ADEC, and DHS&EM*	*0-5 years*	*B/C: This effort will prevent future damage and losses due to severe storm induced erosion loss.* *TF: This is technically feasible using existing city and tribal resources. Specialized skills may need to be contracted-out by funding agencies*

Table 7-11 Dillingham's Mitigation Action Plan (MAP)

(Blue Italicized Initiatives were brought forward from existing HMP or other identified plans)

(See Table 7-9 Potential Funding Agency list; Appendix 9 for agency programmatic details)

Goal / Action ID	Description	Priority (High, Medium, Low)	Responsible Department	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (BC) / Technical Feasibility (T/F)
						with materials and equipment barged in depending on the method selected.
Manmade / Technological Hazards						
Urban Conflagration (UC) 10.1	*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 or HMGP funding*	*0-2 years, then ongoing*	*B/C: The recurrence probability for future damage from urban conflagration or wildland fires could be high if this mitigation action is not implemented.* *TF: This is technically feasible using existing city and tribal resources once funding becomes available.*
UC 10.2	*Identify possible locations of underground water tanks and property ownership*	*High Priority*	*City of Dillingham. VFD*	*City of Dillingham, AFG, FP&S, SAFER, State Fire Marshall's Office, ANA*	*0-5 years*	*B/C: This low cost program will help mitigate wildland fire hazards around vulnerable populations. Protecting vulnerable populations from a disaster is FEMA and CDC goal.* *TF: This is technically feasible using existing city and tribal resources.*
UC 10.3	*Purchase and install underground water supply tanks*	*High Priority*	*City of Dillingham, City Manager, City Planner, and* *Volunteer Fire Department Staff*	*City, FEMA, HMA, AFG, FP&S, SAFER DOF: VFAG, RAGP, FireWise*	*0-5 years*	*B/C: This low-cost program will help mitigate wildland fire hazards around vulnerable populations.* *T/F: This project is feasible using existing staff skills, equipment, and materials. Acquiring contractor expertise may be required for large facilities.*

Table 7-11 Dillingham's Mitigation Action Plan (MAP)

(Blue Italicized Initiatives were brought forward from existing HMP or other identified plans)

(See Table 7-9 Potential Funding Agency list; Appendix 9 for agency programmatic details)

Goal / Action ID	Description	Priority (High, Medium, Low)	Responsible Department	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (BC) / Technical Feasibility (T/F)
UC 10.4	*Obtain MOA or agreements with property owners to install underground water tanks*	*High Priority*	*City of Dillingham, Public Works (PW) Manager and VFD*	*City of Dillingham, AFG, FP&S, SAFER, State Fire Marshall's Office, ANA*	*0-5 years*	*B/C: This low-cost program will help mitigate wildland fire hazards around vulnerable populations.* *TF: This is technically feasible using existing city and tribal resources once funding becomes available.*
UC 10.5	*Conduct residential audits for wildland and building fire hazards*	*High Priority*	*City of Dillingham VFD, City Planner*	*City of Dillingham, AFG, FP&S, SAFER, State Fire Marshall's Office, ANA*	*0-2 years, then ongoing*	*B/C: This low-cost program will help mitigate wildland fire hazards around vulnerable populations.* *TF: This is technically feasible using existing city and tribal resources once funding becomes available.*

7.7 IMPLEMENTING MITIGATION STRATEGY INTO EXISTING PLANNING MECHANISMS

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

DMA 2000 Requirements
Incorporation into Existing Planning Mechanisms §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 C. Incorporate into Other Planning Mechanisms
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?
Source: FEMA, March 2015.

After the adoption of the HMP, each Planning Team Member will ensure that the HMP, 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.

- Review the community specific regulatory tools to determine where to integrate the mitigation philosophy and implementable initiatives. These regulatory tools are identified in Section 7.1 capability assessment.
- Work with pertinent community departments to increase awareness for implementing HMP philosophies and identified initiatives. Provide assistance with integrating the mitigation strategy (including the Mitigation Action Plan) into relevant planning mechanisms (i.e. Comprehensive Plan, Capital Improvement Project List, Transportation Improvement Plan, etc.).
- Implementing this philosophy and activities may require updating or amending specific planning mechanisms.

This page intentionally left blank

Section Eight provides a comprehensive reference list used to develop the HMP.

ACIA 2014. University of Alaska Fairbanks (UAF), Arctic Climate Impact Assessment (ACIA). Available: http://www.amap.no/documents/doc/arctic-arctic-climate-impact-assessment/796. (November 2014)

AICC 2015. Alaska Interagency Coordination Center (AICC), *Wildfire History Data,* 2015. Available: http://fire.ak.blm.gov/aicc.php. (December 2014)

AVO 2008. Alaska Volcano Observatory (AVO) 2008. *Map showing Monitoring Status of Alaska Volcanoes*. Available: http://www.avo.alaska.edu/images/image.php?id=14033. (February 2015)

AVO 2009a. AVO. *The eruption of Redoubt Volcano, Alaska, December 14, 1989-August 31, 1990*. Available: http://www.dggs.dnr.state.ak.us/pubs/pubs?reqtype=citation&ID=13450. (February 2015)

AVO 2009b. AVO. *Service Review, Mount Redoubt Volcanic Eruptions, March – April 2009*. Available: http://www.nws.noaa.gov/om/assessments/pdfs/redoubt.pdf. (December 2009)

AVO 2015a. AVO. *About Alaska's Volcanoes*. Available: http://www.avo.alaska.edu/volcanoes/about.php. (February 2015)

AVO 2012b. Alaska Volcano Observatory, *Makushin Volcano Description and Information.* Available: http://www.avo.alaska.edu/volcanoes/volcinfo.php?volcname=Makushin. (February 2015)

AVO 2012c. *Alaska's volcanic activity*. Available: http://www.avo.alaska.edu/. (February 2015)

BKP 1988. Baker, V.R.; Kochel, R.C.; Patton, P.C. *Flood Geomorphology*, Published by Wiley-Interscience, April 1988. Available: http://books.google.com/books?id=snLfvo2w-ngC&pg=PA176&lpg=PA176&dq=geomorphology+debris+deposition+during+floods&source=bl&ots=cixFlUnKLb&sig=3gLzWfoyciL3vcYfCOIUcky-ErM&hl=en&ei=E-JxSs-8CYzatAOL2tTMDA&sa=X&oi=book_result&ct=result&resnum=5. (December 2014)

Brown et al 2001. Brown, J., O.J. Ferrians Jr., J.A. Heginbottom, and E.S. Melnikov, 2001, revised February 2001. *Circum-Arctic Map of permafrost and ground-ice conditions.* Boulder, CO: National Snow and Ice Data Center/World Data Center for Glaciology, Digital Media. http://nsidc.org/data/ggd318.html. (January 2015)

Census (United States Census Bureau) 2014. *American Fact Finder.* 2010 Census Data and 2014 Census Estimates for the City of Dillingham, Alaska. http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml. (November 2014)

CEHHWG 2014. The Climate, Ecosystems & Human Health Work Group. 2014. Available: http://www.climatechange.alaska.gov/chh.htm. And links: http://www.climatechange.alaska.gov/doc-links.htm#com. (January 2015)

CP 2010 *City of Dillingham Comprehensive Plan Update and Waterfront Plan.* October 2010. Available: http://www.commerce.state.ak.us/dca/commdb/CF_Plans.cfm. (February 2015)

DCRA 2014. DCCED/DCRA, DCRA Research & Analysis (DEC Sponsored) staff provided historically pertinent Capital Projects archived Database Information that is no longer available online. 2014. (November 2014)

DCRA 2014a. DCCED/DCRA, Community Plans and Infrastructure Libraries 2014. Available http://commerce.state.ak.us/dnn/dcra/PlanningLandManagement/CommunityPlansAndInfrastructure.aspx. (November 2014)

DCRA 2015. *Photo Credit: Department of Commerce, Community and Economic Development (DCCED); Division of Community and Regional Affairs' (DCRA) Community Photo Library*. 2015. Available: http://commerce.state.ak.us/dnn/dcra/photolibrary.aspx. (February 2015)

DEC 2015. Department of Environmental Conservation (DEC), *Alaska's Contaminated Sites Database.* Available: http://www.arcgis.com/home/item.html?id=315240bfbaf84aa0b8272ad1cef3cad3. (March 2015)

DGGS 1994a. (Division of Geological and Geophysical Survey [DGGS]). *Neotectonic Map of Alaska.* 1994. Available: http://www.dggs.alaska.gov/pubs/id/22331. (January 2015)

DGGS 1994b. DGGS. *Overview of Environmental and Hydrogeologic Conditions at Dillingham, Alaska Open-File Report 94-482.* Available: http://pubs.dggsalaskagov.us/webpubs/usgs/of/text/of94-0482.pdf. (February 2015)

DGGS 2015. DGGS Publications. 2015. Available: http://www.dggs.alaska.gov/pubs/id/22331. (February 2015)

DHS&EM (Division of Homeland Security and Emergency Management) 2013. *Alaska State Hazard Mitigation Plan, 2013.* Available: http://ready.alaska.gov/plans/documents/2013%20State%20Mitigation%20Plan%20Draft.pdf (November 2015)

DHS&EM 2012. *Critical Facilities Inventory,* 2013. (January 2015)

DHS&EM 2014. *Disaster Cost Index 2014*. (December 2014)

DOF (Alaska Division of Forestry). 2015. *Role of Fire in the Alaskan Environment*. Available: http://forestry.alaska.gov/fire/fireplans.htm. (December 2014)

DNR 2009. Department of Natural Resources (DNR), *Coastal Processes and Erosion Response Seminar. October 6-9, 2009.* Available: http://dnr.alaska.gov/coastal/acmp/Enews/coastal_processes/index.html and http://dnr.alaska.gov/coastal/acmp/Enews/coastal_processes/Revetments.pdf. (January 2015)

EPA 2014. Environmental Protection Agency (EPA), *Toxic Release Inventory Updated November 24, 2014.* Available: http://iaspub.epa.gov/triexplorer/tri_factsheet.factsheet?pDataSet=TRIQ1&pyear=2013&pstate=AK&pcity=dilinghma (March 2015)

FEMA 2002. Federal Emergency Management Agency (FEMA), *Mitigation Planning How-To Guides, 2002.* U.S. Department of Homeland Security, FEMA 386-1. Available: http://www.fema.gov/hazard-mitigation-planning-resources#1. (December 2014)

FEMA 20110. FEMA, *Mitigation Planning Fact Sheet.* Available: http://www.fema.gov/library/viewRecord.do?id=2066. (December 2014)

FEMA 2011. FEMA, *Hazard Mitigation Plan Review Guide, October 1, 2011.* Available: https://www.fema.gov/media-library/assets/documents/23194. (November 2014)

FEMA 2013. FEMA, *Local Mitigation Planning Handbook, March 20, 2013*. Available: http://www.fema.gov/library/viewRecord.do?id=7209 . (December 2014)

FEMA 2014a. FEMA, *Flooding and Flood Risks*. Available: http://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/ffr_overview.jsp. (December 2014)

FEMA 2014b. FEMA, *Flood Frequently Asked Questions* Available: http://www.floodsmart.gov/floodsmart/pages/faqs/faqs_flood.jsp. (December 2014)

FEMA 2014e. FEMA, *Flood Facts.* Available: http://www.floodsmart.gov/floodsmart/pages/flood_facts.jsp. (December 2014)

FEMA 2014d. FEMA, *Community Status Book Report.* Available http://www.fema.gov/cis/AK.html. (December 2014)

FEMA 2015a. *Code of Federal Regulations (CFR), Title 44 – Emergency Management and Assistance*. Available: http://www.ecfr.gov/cgi-bin/text-idx?SID=3e6e6ed90d4fe2483bb7b781f2e31362&node=pt44.1.201&rgn=div5. (March 2015)

FEMA 2015b. FEMA, *Hazard Mitigation Assistance Guidance and Addendum, February 27, 2015*. Available: https://www.fema.gov/media-library/assets/documents/103279. (February 2015)

FEMA 2015c. FEMA Flood Map Service Center Portal. Available: *http://msc.fema.gov/portal/search. (March 2015)*

Haeussler, P. USGS (United States Geologic Survey). 2009. E-mail correspondence concerning Shake Maps. (January 2015)

Jorgenson 2008 et al. Jorgenson, T., Yoshikawa, K., Kanevskiy, M., Shur, Y., Romanovsky, V., Marchenko, S., Grosse, G., Brown, J., and Jones, B (2008). *Permafrost characteristics of Alaska – A new permafrost map of Alaska.* In: Kane, D.L. and Hinkel, K.M. (eds.), Institute of Northern Engineering, University of Alaska Fairbanks, *Extended Abstracts of the Ninth International Conference on Permafrost*, June 29-July 3, Fairbanks, Alaska, 2008, pp. 121-122. Available: http://permafrost.gi.alaska.edu/sites/default/files/AlaskaPermafrostMap_Front_Dec2008_Jorgenson_etal_2008.pdf. (November 2014)

MMI 2014. *Modified Mercalli Intensity Scale.* Michigan Technical University. Available: http://www.geo.mtu.edu/UPSeis/Mercalli.html. (December 2014)

NCDC 2014. National Climate Data Center (NCDC) *Severe Weather Data* 2014. Available: http://www.ncdc.noaa.gov/data-access/severe-weather. (November 2014)

NOAA 2001. *Winter Storms: The Deceptive Killers: A Preparedness Guide.* National Weather Service. Available: http://www.nws.noaa.gov/om/winterstorm/winterstorms.pdf. (November 2014)

NOAA 2015. *National Weather Service Definitions*. Available: http://www.weather.gov/glossary/index.php?letter=F. (November 2014)

NWS (National Weather Service (NWS), Climate Search Results 2014. Available: http://www.arh.noaa.gov/clim/climDataSearch.php?stnid=CTEA2 (November 2014)

NRC 2015. National Response Center. Hazardous Materials Data Query, 2015. Available:

NRCS 2015b. NRCS, Technical Services, *Permafrost Map*. Available: http://www.ak.nrcs.usda.gov/technical/permafrost.html. (January 2015)

SWMP 2006. Dillingham Solid Waste Management Plan (SWMP), BEESC Project No. 26089, June 2006. Available: http://www.dillinghamak.us/index.asp?Type=B_BASIC&SEC={1736595C-A6B7-42DB-9836-760681FCFE62}. (March 2015)

UAF/SNAP 2015. University of Alaska Fairbanks (UAF), Scenarios Network for Alaska and Arctic Planning (SNAP), 2014. *Historic, current, and predicted weather data*. Available: http://www.snap.uaf.edu/charts.php. (November 2014).

USACE 2006. US Army Corp of Engineers (USACE), *Alaska Village Erosion Technical Assistance (AVETA) Report Summary– Dillingham, Alaska – 2006.* Available: http://66.223.166.160/usace_disclaimer.html. (January 2015)

USACE (U.S. Army Corps of Engineers). 2011. *Civil Works Branch, Alaska Floodplain Management Flood Hazard Data,* Dillingham*, Alaska.* Available: http://66.223.166.160/usace_disclaimer.html. (November 2014 2015)

USGS 1994. United States Geologic Survey, (USGS). *Overview of Environmental and Hydrogeologic Conditions at Dillingham, Alaska Open-File Report 94-482. 1994.* Available: http://pubs.er.usgs.gov/publication/ofr94482. (February 2015)

USGS 1998. USGS, *Can Another Great Volcanic Eruption Happen in Alaska? USGS Fact Sheet 075-98*. Available: http://pubs.usgs.gov/fs/fs075-98/. (February 2015)

USGS. 2002. *Preliminary Volcano-Hazard Assessments.* Available: http://www.avo.alaska.edu/downloads/classresults.php?pregen=haz. (February 2015)

USGS 2015a. USGS *NEIC Historic Earthquake Search Results*. Available: http://earthquake.usgs.gov/earthquakes/search/. (January 2015)

USGS 2015b. National Earthquake Information Center, Earthquake Probability Mapping; based on 2009 parameters: Available: https://geohazards.usgs.gov/eqprob/2009/index.php. (January 2015)

USGS 2015c. USGS, Land Subsidence. Available: http://water.usgs.gov/ogw/subsidence.html. (February 2015)

USGS 2015d. USGS. Measuring Land Subsidence from Space. Available: http://pubs.usgs.gov/fs/fs-051-00. (February 2015)

USGS 2015e. USGS North Pacific and Russian Far East Air Routes pass over volcanoes. U.S. Geological Survey Fact Sheet 030-97. Online Version 1.0. Available: http://pubs.usgs.gov/fs/fs030-97/. (March 2015)

WRCC 2015f. Western Regional Climate Center, 2015. Available: http://www.wrcc.dri.edu/narratives/ALASKA.htm. (November 2014)

Appendix A
Funding Resources

This page intentionally left blank.

Funding Resources

Federal Funding Resources

The Federal government requires local governments to have a HMP in place to be eligible for mitigation funding opportunities through FEMA such as the UHMA Programs and the HMGP. 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 here:
  - 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/plan/mitplanning/resources.shtm#1).
  - 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.
  - A Guide to Recovery Programs FEMA 229(4), September 2005. The programs described in this guide may all be of assistance during disaster incident recovery. Some are available only after a Presidential declaration of disaster, but others are available without a declaration. Please see the individual program descriptions for details. (http://www.fema.gov/txt/rebuild/ltrc/recoveryprograms229.txt)
  - 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.
  - The FEMA Hazard Mitigation Assistance (HMA Unified Guidance, February 27, 2015. The guidance introduces the five HMA grant programs, funding opportunities, award information, eligibility, application and submission information, application review process, administering the grant, contracts, additional program guidance,

additional project guidance, and contains information and resource appendices(FEMA 2015).

- FEMA also administers emergency management grants (http://www.fema.gov/help/site.shtm) and various firefighter grant programs (http://www.firegrantsupport.com/) such as
  - Emergency Management Performance Grant (EMPG). This is a pass through grant. The amount is determined by the State. The grant is intended to support critical assistance to sustain and enhance State and local emergency management capabilities at the State and local levels for all-hazard mitigation, preparedness, response, and recovery including coordination of inter-governmental (Federal, State, regional, local, and tribal) resources, joint operations, and mutual aid compacts state-to-state and nationwide. Sub-recipients must be compliant with National Incident Management System (NIMS) implementation as a condition for receiving funds. Requires 50% match.
  - National Earthquake Hazards Reduction Program (NEHRP). The National Earthquake Hazards Reduction Program (NEHRP) seeks to mitigate earthquake losses in the United States through both basic and directed research and implementation activities in the fields of earthquake science and engineering.

    The NEHRP is the Federal Government's coordinated approach to addressing earthquake risks. Congress established the program in 1977 (Public Law 95-124) as a long-term, nationwide program to reduce the risks to life and property in the United States resulting from earthquakes. The NEHRP is managed as a collaborative effort among FEMA, the National Institute of Standards and Technology, the National Science Foundation, the United States Geological Survey, and the Department of Interior.

    The four goals of the NEHRP are to:

    - Develop effective practices and policies for earthquake loss-reduction and accelerate their implementation.
    - Improve techniques to reduce seismic vulnerability of facilities and systems.
    - Improve seismic hazards identification and risk-assessment methods and their use.
    - Improve the understanding of earthquakes and their effects.

    Information may be found at:
    http://www.fema.gov/plan/prevent/earthquake/nehrp.shtm, and
    http://www.ehow.com/info_7968511_disaster-research-grant-funding.html
  - Assistance to Fire Fighters Grant (AFG), Fire Prevention and Safety (FP&S), Staffing for Adequate Fire and Emergency Response Grants (SAFER), and Assistance to Firefighters Station Construction Grant programs. Information can be found at: (http://forestry.alaska.gov/fire/vfarfa.htm).
- Department of Homeland Security (DHS) provides the following grants:
  - Homeland Security Grant Program (HSGP), State Homeland Security Program (SHSP) are 80% pass through grants. SHSP supports implementing the State Homeland Security Strategies to address identified planning, organization,

equipment, training, and exercise needs for acts of terrorism and other catastrophic events. In addition, SHSP supports implementing the National Preparedness Guidelines, the NIMS, and the National Response Framework (NRF). Must ensure at least 25% of funds are dedicated towards law enforcement terrorism prevention-oriented activities.

- Citizen Corps Program (CCP). The Citizen Corps mission is to bring community and government leaders together to coordinate involving community members in emergency preparedness, planning, mitigation, response, and recovery activities.
- Emergency Operations Center (EOC) This program is intended to improve emergency management and preparedness capabilities by supporting flexible, sustainable, secure, strategically located, and fully interoperable Emergency Operations Centers (EOCs) with a focus on addressing identified deficiencies and needs. Fully capable emergency operations facilities at the State and local levels are an essential element of a comprehensive national emergency management system and are necessary to ensure continuity of operations and continuity of government in major disasters or emergencies caused by any hazard. Requires 25% match.

- U.S. Department of Commerce's grant programs include:
  - Remote Community Alert Systems (RCASP) grant for outdoor alerting technologies in remote communities effectively underserved by commercial mobile service for the purpose of enabling residents of those communities to receive emergency messages. This program is a contributing element of the Warning, Alert, and Response Network (WARN) Act.
  - National Oceanic and Atmospheric Administration (NOAA), provides funds to the State of Alaska due to Alaska's high threat for tsunami. The allocation supports the promotion of local, regional, and state level tsunami mitigation and preparedness; installation of warning communications systems; installation of warning communications systems; installation of tsunami signage; promotion of the Tsunami Ready Program in Alaska; development of inundation models; and delivery of inundation maps and decision-support tools to communities in Alaska.
- Department of Agriculture (USDA). Provides diverse funding opportunities; providing a wide benefit range. Their grants and loans website provides a brief programmatic overview with links to specific programs and services. (http://www.rd.usda.gov/programs-services)
  - Farm Service Agency: Emergency Conservation Program, Non-Insured Assistance, Emergency Forest Restoration Program, Emergency Watershed Protection, Rural Housing Service, Rural Utilities Service, and Rural Business and Cooperative Service. (http://www.fsa.usda.gov/FSA/stateoffapp?mystate=ak&area=home&subject=landing&topic=landing)
  - Natural Resources Conservation Service (NRCS) has several funding sources to fulfill mitigation needs. (http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/cig/)
  - The Emergency Watershed Protection Program (EWP). This funding source is designed is to undertake emergency measures, including the purchase of flood plain

easements, for runoff retardation and soil erosion prevention to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood or any other natural occurrence is causing or has caused a sudden impairment of the watershed. (http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/alphabetical/)

- Conservation Technical Assistance Program (CTA) is voluntary program available to any group or individual interested in conserving their natural resources and sustaining agricultural production. The program assists land users with addressing opportunities, concerns, and problems related to using their natural resources enabling them to make sound natural resource management decisions on private, tribal, and other non-federal lands. (http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/)
- Conservation Innovation Grants (CIG) is a voluntary program intended to stimulate developing and adopting innovative conservation approaches and technologies while leveraging Federal investment in environmental enhancement and protection, in conjunction with agricultural production. Under CIG, Environmental Quality Incentives Program funds are used to award competitive grants to non-Federal governmental or nongovernmental organizations, Tribes, or individuals.

  CIG enables NRCS to work with other public and private entities to accelerate technology transfer and adoption of promising technologies and approaches to address some of the Nation's most pressing natural resource concerns. CIG will benefit agricultural producers by providing more options for environmental enhancement and compliance with Federal, State, and local regulations. (http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/cig/)
- The Environmental Quality Incentives Program (EQIP) is a voluntary program that provides financial and technical assistance to agricultural producers through contracts up to a maximum term of ten years in length. These contracts provide financial assistance to help plan and implement conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air and related resources on agricultural land and non-industrial private forestland. In addition, a purpose of EQIP is to help producers meet Federal, State, Tribal and local environmental regulations. (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/eqip/?cid=stelprdb1242633)
- Watershed Surveys and Planning. NRCS watershed activities in Alaska are voluntary efforts requested through conservation districts and units of government and/or tribes. The purpose of the program is to assist Federal, State, and local agencies and tribal governments to protect watersheds from damage caused by erosion, floodwater, and sediment and to conserve and develop water and land resources. Resource concerns addressed by the program include water quality, opportunities for water conservation, wetland and water storage capacity, agricultural drought problems, rural development, municipal and industrial water needs, upstream flood damages, and water needs for fish, wildlife, and forest-based industries.

(http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wsp/)

- Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy, Weatherization Assistance Program (http://www1.eere.energy.gov/wip/wap.html). 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.
  - The Tribal Energy Program offers financial and technical assistance to Indian tribes to help them create sustainable renewable energy installations on their lands. This program promotes tribal energy self-sufficiency and fosters employment and economic development on America's tribal lands. (http://www1.eere.energy.gov/wip/tribal.html)
- US Environmental Protection Agency (EPA). Under EPA's Clean Water State Revolving Fund (CWSRF) program, each state maintains a revolving loan fund to provide independent and permanent sources of low-cost financing for a wide range of water quality infrastructure projects, including: municipal wastewater treatment projects; non-point source projects; watershed protection or restoration projects; and estuary management projects. (http://yosemite.epa.gov/R10/ecocomm.nsf/6da048b9966d22518825662d00729a35/7b68c420b668ada5882569ab00720988!OpenDocument)
  - Public Works and Development Facilities Program. This program provides assistance to help distressed communities attract new industry, encourage business expansion, diversify local economies, and generate long-term, private sector jobs. Among the types of projects funded are water and sewer facilities, primarily serving industry and commerce; access roads to industrial parks or sites; port improvements; business incubator facilities; technology infrastructure; sustainable development activities; export programs; brownfields redevelopment; aquaculture facilities; and other infrastructure projects. Specific activities may include demolition, renovation, and construction of public facilities; provision of water or sewer infrastructure; or the development of stormwater control mechanisms (e.g., a retention pond) as part of an industrial park or other eligible project. (http://cfpub.epa.gov/fedfund/program.cfm?prog_num=51)
- Department of Health and Human Services, Administration of Children & Families, Administration for Native Americans (ANA). The ANA awards funds through grants to American Indians, Native Americans, Native Alaskans, Native Hawaiians, and Pacific Islanders. These grants are awarded to individual organizations that successfully apply for discretionary funds. ANA publishes in the Federal Register an announcement of funds available, the primary areas of focus, review criteria, and the method of application. (http://www.acf.hhs.gov/programs/ana/programs/program_information.html)
  - Indian Housing Block Grant / Native American Housing Assistance and Self Determination Act (IHBG/NAHASDA) administration, operating & construction funds. The act is separated into seven sections:
    - Title I: Block Grants and Grant Requirements
    - Title II: Affordable Housing Activities

- Title III: Allocation of Grant Amount
- Title IV: Compliance, Audits, and Reports
- Title V: Termination of Assistance for Indian Tribes Under Incorporated Programs
- Title VI: Federal Guarantees for Financing for Tribal Housing Activities
- Title VII: Other Housing Assistance for Native Americans

To receive grants through this program both a one and a five year plan are required. Together they must include a mission statement, list of goals and objectives, an activities plan, a statement of needs, financial resources, and of affordable housing resources, and a certification of compliance. Once funds have been awarded grantees must meet a standard of wages, comply with the National Environmental Policy Act of 1969, keep rents at or below 30% of the residents' monthly adjusted income, set eligibility requirements for admission, and secure a management that efficiently maintains and operates the units. (http://en.wikipedia.org/wiki/Native_American_Housing_Assistance_and_Self-Determination_Act_of_1996)

- Department of Housing and Urban Development (HUD) provides a variety of disaster resources. They also partner with Federal and state agencies to help implement disaster recovery assistance. Under the *National Response Framework* the FEMA and the Small Business Administration (SBA) offer initial recovery assistance. (http://www.hud.gov/info/disasterresources_dev.cfm)
  - HUD, 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. (http://www.hud.gov/offices/cpd/communitydevelopment/programs/108/index.cfm)
  - HUD, Office of Homes and Communities, Section 184 Indian Home Loan Guarantee Programs (IHLGP). The Section 184 Indian Home Loan Guarantee Program is a home mortgage specifically designed for American Indian and Alaska Native families, Alaska Villages, Tribes, or Tribally Designated Housing Entities. Section 184 loans can be used, both on and off native lands, for new construction, rehabilitation, purchase of an existing home, or refinance.
  - Because of the unique status of Indian lands being held in Trust, Native American homeownership has historically been an underserved market. Working with an expanding network of private sector and tribal partners, the Section 184 Program endeavors to increase access to capital for Native Americans and provide private funding opportunities for tribal housing agencies with the Section 184 Program. (http://www.hud.gov/offices/pih/ih/homeownership/184/)
  - HUD/CDBG 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 (http://www.hud.gov/offices/cpd/communitydevelopment/programs/)

- Department of Labor (DOL), 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. (http://www.workforcesecurity.doleta.gov/unemploy/disaster.asp)
    - The Workforce Investment Act contains provisions aimed at supporting employment and training activities for Indian, Alaska Native, and Native Hawaiian individuals. The Department of Labor's Indian and Native American Programs (INAP) funds grant programs that provide training opportunities at the local level for this target population. (http://www.dol.gov/dol/topic/training/indianprograms.htm)
- U.S. Department of Transportation (DOT), Hazardous Materials Emergency Preparedness Grant. DOT increases State, Territorial, Tribal and local effectiveness in safely and efficiently handling hazardous materials accidents and incidents, enhances implementation of the Emergency Planning and Community Right-to-Know Act of 1986, and encourages a comprehensive approach to emergency training and planning by incorporating the unique challenges of responses to transportation situations, through planning and training. Requires a 20% local match.
- Federal Financial Institutions. Member banks of Federal Deposit Insurance Corporation, Financial Reporting Standards or Federal Home Loan Bank Board may be permitted to waive early withdrawal penalties for Certificates of Deposit and Individual Retirement Accounts.
- Internal Revenue Service (IRS), Disaster Tax Relief. Provides extensions to current year's tax return, allows deductions for disaster losses, and allows amendment of previous year's tax returns (http://www.irs.gov/newsroom/article/0,,id=108362,00.html).
- U.S. Small Business Administration (SBA) Disaster Assistance provides information concerning disaster assistance, preparedness, planning, cleanup, and recovery planning. (http://www.sba.gov/category/navigation-structure/starting-managing-business/managing-business/running-business/emergency-preparedness-and-disaster-)
    - May provide low-interest disaster loans to individuals and businesses that have suffered a loss due to a disaster. (http://www.sba.gov/category/navigation-structure/loans-grants/small-business-loans/disaster-loans). Requests for SBA loan assistance should be submitted to DHS&EM.
- United States Army Corps of Engineers (USACE) Alaska District's Civil Works Branch studies potential water resource projects in Alaska. These studies analyze and solve water resource issues of concern to the local communities. These issues may involve navigational improvements, flood control or ecosystem restoration. The agency also tracks flood hazard data for over 300 Alaskan communities on floodplains or the sea coast. These data help local communities assess the risk of floods to their communities and prepare for potential future floods (http://www.poa.usace.army.mil/en/cw/index.htm). The USACE is a member and co-chair of the Alaska Climate Change Sub-Cabinet.
- Grants.gov. was established as a governmental resource named the E-Grants Initiative, part of the President's 2002 Fiscal Year Management Agenda to improve government services to the public. The concept has its origins in the Federal Financial Assistance Management Improvement Act of 1999, also known as Public Law 106-107. The Grants

Policy Committee (GPC), a committee of the U.S. Chief Financial Officers (CFO) Council consisting of grants policy experts from across the federal government assumed responsibility for implementing P.L. 106-107, working to enhance federal financial assistance even after P.L. 106-107 expired in November 2007. The Council on Financial Assistance Reform (COFAR), created in October 2011, continues to assist the Federal financial assistance community with delivery, management, coordination, and accountability of Federal grants and cooperative agreements.

Today, www.Grants.gov is a central storehouse for information on over 1,000 grant programs and provides access to approximately $500 billion in annual awards.

State Funding Resources

- Department of Military and Veterans Affairs (DMVA): Provides damage appraisals and settlements for VA-insured homes, and assists with filing of survivor benefits. (http://veterans.alaska.gov/links.htm)
  - DHS&EM within DMVA is responsible for improving hazard mitigation technical assistance for local governments for the State of Alaska. Providing hazard mitigation training, current hazard information and communication facilitation with other agencies will enhance local hazard mitigation efforts. DHS&EM administers FEMA mitigation grants to mitigate future disaster damages such as those that may affect infrastructure including elevating, relocating, or acquiring hazard-prone properties. (http://ready.alaska.gov/plans/mitigation.htm)

    DHS&EM also provides mitigation funding resources for mitigation planning on their Web site at http://www.ak-prepared.com/plans/mitigation/localhazmitplan.htm.
- Division of Senior Services (DSS): Provides special outreach services for seniors, including food, shelter and clothing. (http://www.hss.state.ak.us/dsds/seniorInfoResources.htm)
- Division of Insurance (DOI): Provides assistance in obtaining copies of policies and provides information regarding filing claims. (http://www.dced.state.ak.us/insurance/)
- DCRA within the DCCED administers the HUD/CDBG, FMA Program, and the Climate Change Sub-Cabinet's Interagency Working Group's program funds and administers various flood and erosion mitigation projects, including the elevation, relocation, or acquisition of flood-prone homes and businesses throughout the State. This division also administers programs for State's" distressed" and "targeted" communities. (http://www.commerce.state.ak.us/dca/)
  - DCRA Planning and Land Management staff provide Alaska Climate Change Impact Mitigation Program (ACCIMP) funding to Alaskan communities that meet one or more of the following criteria related to flooding, erosion, melting permafrost, or other climate change-related phenomena: Life/safety risk during storm/flood events; loss of critical infrastructure; public health threats; and loss of 10% of residential dwellings.

    The Hazard Impact Assessment is the first step in the ACCIMP process. The HIA identifies and defines the climate change-related hazards in the community, establishes current and predicted impacts, and provides recommendations to the community on alternatives to mitigate the impact. The community may then pursue

these recommendations through an ACCIMP Community Planning Grant. (http://commerce.alaska.gov/dca/planning/accimp/hazard_impact.html)

- Department of Environmental Conservation (DEC). DEC's primary roles and responsibilities concerning hazards mitigation are ensuring safe food and safe water, and pollution prevention and pollution response. DEC 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. (http://dec.alaska.gov/)
  - The Division of Water's Village Safe Water Program works with rural communities to develop sustainable sanitation facilities. Communities apply each year to VSW for grants for sanitation projects. Federal and state funding for this program is administered and managed by the State of Alaska's Village Safe Water (VSW) program. VSW provides technical and financial support to Alaska's smallest communities to design and construct water and wastewater systems. In some cases, funding is awarded by VSW through the Alaska Native Tribal Health Consortium, who in turn assist communities in design and construct of sanitation projects.
  - Municipal Grants and Loans Program. The Department of Environmental Conservation / Division of Water administer the Alaska Clean Water Fund (ACWF) and the Alaska Drinking Water Fund (ADWF). The division is fiscally responsible to the Environmental Protection Agency (EPA) to administer the loan funds as the EPA provides capitalization grants to the division for each of the loan funds. In addition, it is prudent upon the division to administer the funds in a manner that ensures their continued viability.
  - Under EPA's Clean Water State Revolving Fund (CWSRF) program, each state maintains a revolving loan fund to provide independent and permanent sources of low-cost financing for a wide range of water quality infrastructure projects, including: municipal wastewater treatment projects; non-point source projects; watershed protection or restoration projects; and estuary management, [and stormwater management] projects. (http://yosemite.epa.gov/R10/ecocomm.nsf/6da048b9966d22518825662d00729a35/7b68c420b668ada5882569ab00720988!OpenDocument)

    Alaska's Revolving Loan Fund Program, prescribed by Title VI of the Clean Water Act as amended by the Water Quality Act of 1987, Public Law 100-4. DEC will use the ACWF account to administer the loan fund. This Agreement will continue from year-to-year and will be incorporated by reference into the annual capitalization grant agreement between EPA and the DEC. DEC will use a fiscal year of July 1 to June 30 for reporting purposes. (http://www.epa.gov/region10/pdf/water/srf/cwsrf_alaska_operating_agreement.pdf)

- Department of Transportation and Public Facilities (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.

- DOT/PF and DHS&EM coordinate buy-out 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 the safe, efficient, economical, and effective State highway, harbor, and airport operation. DOT/PF uses it's Planning, Design and Engineering, Maintenance and Operations, and Intelligent Transportation Systems resources to identify hazards, plan and initiate mitigation activities to meet the transportation needs of Alaskans, and make Alaska a better place to live and work. DOT/PF budgets for temporary bridge replacements and materials necessary to make the multi-modal transportation system operational following natural disaster events.

- DNR administers various projects designed to reduce stream bank erosion, reduce localized flooding, improve drainage, and improve discharge water quality through the stormwater grant program funds. Within DNR,
  - The Division of Geological and Geophysical Survey (DGGS) is responsible Alaska's mineral, land, and water resources use, development, and earthquake mitigation collaboration.

    Their geologists and support staff are leaders in researching Alaska's geology and implementing technological tools to most efficiently collect, interpret, publish, archive, and disseminate information to the public. Information is available at: (http://www.dggs.dnr.state.ak.us/index.php?menu_link=publications&link=publications_search#)
  - The DNR's Division of Forestry (DOF) 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. (http://forestry.alaska.gov/pdfs/08FireSuppressionMediaGuide.pdf)
  - DOF also manages various wildland fire programs, activities, and grant programs such as the FireWise Program (http://forestry.alaska.gov/fire/firewise.htm), Community Forestry Program (CFP) (http://forestry.alaska.gov/community/), Assistance to Fire Fighters Grant (AFG), Fire Prevention and Safety (FP&S), Staffing for Adequate Fire and Emergency Response Grants (SAFER), and Volunteer Fire Assistance and Rural Fire Assistance Grant (VFA-RFA) programs (http://forestry.alaska.gov/fire/vfarfa.htm). Information can be found at http://forestry.alaska.gov/fire/current.htm.

Other Funding Resources

The following provide focused access to valuable planning resources for communities interested in sustainable development activities.

- FEMA, http://www.fema.gov - includes links to information, resources, and grants that communities can use in planning and implementation of sustainable measures.
- Rural Alaska Community Action Program Inc. (RurAL CAP) In the nearly 50 years since it began, it is difficult to imagine any aspect of rural Alaskan lives which has not been touched in some way by the people and programs of RurAL CAP. From Head Start, parent education, adult basic education, and elder-youth programs, to Native land claims

and subsistence rights, energy and weatherization programs, and alcohol and substance abuse prevention, RurAL CAP has left a lasting mark on the history and development of Alaska and its rural Peoples. (http://ruralcap.com/?page_id=334)

From its earliest days to the present, RurAL CAP's success can be attributed to the direct involvement of rural Alaskans in its programs and in the decision making processes which affect their lives, and to the belief in and respect for those Peoples by the board and staff of RurAL CAP.

- Weatherization Assistance Program assists low to moderate income households in weatherization needs. The program is available to homeowners as well as renters and includes; single family homes, cabins, mobile homes, condominiums and multifamily dwellings.

  Services *may* include improvements such as; air sealing, caulking and insulation, doors and windows, exterior paint, heating system test and tune, ventilation and moisture control. Major home repairs are not classified under weatherization and thus are not eligible under the program. (http://www.weatherizeme.org/Applications/RUR/Wx%20app%20Rural%2004-13.pdf)
- Energy Programs. VISTA Energy Program (VEP) Members work on projects like energy efficiency education, planning and capacity building for renewable energy options, and home energy efficiency education. VEP helps rural Alaskan communities reduce their energy bills.

  VEP Members build partnerships, developed funding proposals, and worked with their sponsoring council to raise money and in-kind resources for energy projects in their communities.
- Environment. RurAL CAP has several interwoven projects under the Environmental Program. All of these projects were created to respond to the needs rural Alaskans reported in community assessments conducted by AmeriCorps members. All of these interconnected projects address local environmental issues with local solutions, connect rural Alaskans to each other to share resources, and are connected to the RAVEN AmeriCorps program.

  RurAL CAP's environmental programs surround issues of solid waste, backhaul efforts, the RAVEN AmeriCorps program, subsistence and indoor air quality. The programs include the Denali Solid Waste Grants, EPA Community Environmental Demonstration Projects, Solid Waste Management Technical Assistance, RAVEN AmeriCorps Members, Subsistence in Alaska, and Alaska Village Indoor Air Quality.
- Solid Waste Management. RurAL CAP continues to host an expert solid waste liaison, Ted Jacobson, through funding provided by the Environmental Protection Agency (EPA) and Senior Services America, Inc. The liaison provides solid waste management technical assistance to rural communities through training, site visits, hands-on demonstrations, and remote contact. Resources are provided for dump management activities, collaborating with funders for funding and technical assistance on solid waste management, recycling, and backhaul.

- American Planning Association (APA), 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 (IBHS), http://ibhs.org - an initiative of the insurance industry to reduce deaths, injuries, property damage, economic losses, and human suffering caused by natural disasters.
- American Red Cross (ARC). 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. (http://dialoguemakers.org/Resourses4states+Nonprofits.htm)
- Denali Commission. Introduced by Congress in 1998, the Denali Commission is an independent federal agency designed to provide critical utilities, infrastructure, and economic support throughout Alaska. With the creation of the Denali Commission, Congress acknowledged the need for increased inter-agency cooperation and focus on Alaska's remote communities. Since its first meeting in April 1999, the Commission is credited with providing numerous cost-shared infrastructure projects across the State that exemplifies effective and efficient partnership between federal and state agencies, and the private sector. (http://www.denali.gov/index.php?option=com_content&view=section&id=1&Itemid=3)
    - The Energy Program primarily funds design and construction of replacement bulk fuel storage facilities, upgrades to community power generation and distribution systems, alternative-renewable energy projects, and some energy cost reduction projects. The Commission works with the Alaska Energy Authority (AEA), Alaska Village Electric Cooperative (AVEC), Alaska Power and Telephone and other partners to meet rural communities' fuel storage and power generation needs.
    - The goal of the solid waste program at the Denali Commission is to provide funding to address deficiencies in solid waste disposal sites which threaten to contaminate rural drinking water supplies.
- Lindbergh Foundation Grants. Each year, The Charles A. and Anne Morrow Lindbergh Foundation provides grants of up to $10,580 (a symbolic amount representing the cost of the Spirit of St. Louis) to men and women whose individual initiative and work in a wide spectrum of disciplines furthers the Lindberghs' vision of a balance between the advance of technology and the preservation of the natural/human environment. (http://www.lindberghfoundation.org/docs/index.php/our-grants)
- Rasmuson Foundation Grants. The Rasmuson foundation invests both in individuals and well-managed 501(c)(3) organizations dedicated to improving the quality of life for Alaskans.

  Rasmuson Foundation awards grants both to organizations serving Alaskans through a base of operations in Alaska, and to individuals for projects, fellowships and sabbaticals.

To be considered for a grant award, grant seekers must meet specific criteria and complete and submit the required application according to the specific guidelines of each program. (http://www.rasmuson.org/index.php?switch=viewpage&pageid=5)

- Tier 1 Awards: Grants of up to $25,000 for capital projects, technology updates, capacity building, program expansion, and creative works.
- Tier 2 Awards: Grants over $25,000 for projects of demonstrable strategic importance or innovative nature.
- Pre-Development Program: Guidance and technical resources for planning new, sustainable capital projects.

The Foundation seeks to support not-for-profit organizations that are focused and effective in the pursuit of their goals, with special consideration for those organizations that demonstrate strong leadership, clarity of purpose and cautious use of resources.

The Foundation trustees believe successful organizations can sustain their basic operations through other means of support and prefer to assist organizations with specific needs, focusing on requests which allow the organizations to become more efficient and effective. The trustees look favorably on organizations which demonstrate broad community support, superior fiscal management and matching project support. (http://www.rasmuson.org/index.php)

Appendix B
FEMA Hazard Mitigation Plan (HMP) Review Tool

This page intentionally left blank.

Appendix C
HMP Adoption Resolutions

CITY OF DILLINGHAM, ALASKA

RESOLUTION NO. 2016-44

A RESOLUTION OF THE DILLINGHAM CITY COUNCIL FORMALLY ADOPTING THE 2016 HAZARD MITIGATION PLAN

WHEREAS, the City of Dillingham is vulnerable to damages from natural hazard events which pose a threat to public health and safety and could result in property loss and economic hardship; and

WHEREAS, the Disaster Mitigation Act of 2000 (P.L. 106-390) (DMA 2000) and associated Federal regulations published under 44 CFR Part 201.6 requires the City Council to adopt a Hazard Mitigation Plan ("HMP") and update the HMP every five years, subject to the approval of the Federal Emergency Management Agency to be eligible for federal hazard mitigation projects and activities funds; and

WHEREAS, the City of Dillingham developed and adopted a Hazard Mitigation Plan in 2008 through the work of City of Dillingham's Planning Team, interested parties within the planning area and through public comment as required by DMA 2000; and

WHEREAS the HMP recommends hazard mitigation actions that will protect people and property affected by natural hazards that face the City, that will reduce future public, private, community, and personal costs of disaster response and recovery, and that will reinforce City of Dillingham's leadership in emergency preparedness efforts; and

WHEREAS, the City began a review process in 2014 which identified revisions that should be made to bring the HMP current in regards to natural hazards and updated infrastructure within the community. During this review it was apparent that erosion issues should be identified more clearly, which will update the sections of the City of Dillingham Critical Facilities and Infrastructure, Tables 6-4 and 6-6 to include the Sewer Lagoon, Snag Point Bulk Head, Harbor and Kanakanak Beach; and

WHEREAS, a goal within the Plan's Mitigation Goals & Potentials Actions section, Table 7-5, was revised to include erosion at the Sewer Lagoon, Snag Point Bulk Head, Harbor and Kanakanak Beach;

NOW, THEREFORE, BE IT RESOLVED by the City Council that:

1. The 2016 Hazard Mitigation Plan is hereby adopted as an official plan of the City of Dillingham, which will include erosion at the Sewer Lagoon, Snag Point Bulk Head, Harbor and Kanakanak Beach.

2. Section 3 of the HMP outlines the Planning Process and identifies City's officials who are part of the Hazard Mitigation Planning Team and hereby directed to implement the

recommended actions assigned to them in Section 7, the Mitigation Action Plan. Members of the team are listed in the attached table and will report quarterly on their activities, accomplishments, and progress to the City Council.

3. The City's Hazard Mitigation Planning Team will provide annual progress reports on the status of the implemented Mitigation Action Plan's projects to the City's Planning Director. The Planning Director shall submit this report to the City Council annually by the HMP's adoption anniversary date.

4. The Planning Team will complete periodic updates of the HMP throughout the first year to refine the plan closer to Dillingham's needs which are indicated in the Plan Maintenance Section (Section 3), but no less frequently than every five years.

BE IT FURTHER RESOLVED that the Dillingham City Council adopts the 2016 Hazard Mitigation Plan, dated August 2016, as this jurisdiction's Hazard Mitigation Plan, and resolves to execute the actions in the HMP.

PASSED and ADOPTED by the Dillingham City Council on August 18, 2016.

Alice Ruby, Mayor

ATTEST: [SEAL]

Janice Williams, City Clerk

City of Dillingham Information Memorandum Agenda of: August 4, 2016

Attachment to:

Ordinance No. _____ **/ Resolution No.** 2016-44

Subject:

A RESOLUTION OF THE DILLINGHAM CITY COUNCIL FORMALLY ADOPTING THE 2016 HAZARD MITIGATION PLAN

City Manager: Recommend Approval

Signature: Rose Loera

Fiscal Note: ☑ Yes ☑ No **Funds Available:** ☐ Yes ☐ No

Other Attachments:

- List of City officials comprising the Planning Team

Summary Statement:

A resolution was introduced at the February 4, 2016, Regular Council Meeting, preceded by a workshop to review the HMP. Council postponed the resolution to the April 7, 2016 Council Meeting and bring forward a plan to include more public input by the various agencies.

Since the resolution was introduced:
- BBNA had asked Curyung Tribe to work on the HMP with others in the community. Curyung Tribal wanted to hold a MOU meeting with the City and appointed several tribal chiefs to participate in the discussions.
- The Planning Commission met and passed a resolution to postpone making a recommendation to the City for 60 days when the plan could be reviewed and revised by a committee of community members to include planning commissioners, City of Dillingham, BBNA, etc.
- Council asked to postpone adoption at their April 7 meeting and approved Council members, Misty Savo, Paul Liedberg, and Holly Johnson, to help City staff revise the plan, recognizing it might be futile to try and get a wider group of other organizations involved given the timeline.

A copy of the 2016 HMP with updates will be made available at the August 4, 2016 Council meeting.

Attachment to:
Ordinance No. _____ **/ Resolution No.** 2016-44

Summary Statement continued:

Route to	Department Head	Date
	Finance Director	
X	Planning Director	
X	City Clerk	

This page intentionally left blank.

Appendix D
Public Outreach Activities

CITY OF DILLINGHAM ALASKA

Planning Commission Workshop

Hazard Mitigation Plan – May 9, 2016

NAME	ORGANIZATION	EMAIL	PHONE
Gusty Akelkolk	BBNA	gakelkolk@BBNA.com	(907)842-6143
Julianne Baltar	BBNA	jbaltar@bbna.com	(907) 842-6219
Brandon Jones	DVFD · COD	firedept@Dillinghamak.us	842 2288
Dorothy B. Larson	Curyung Tribal	dorothy@curyungtribe.com	8422384
Shane Titus	Curyung Tribal	shane@curyungtribe.com	442-2344
Courteray Carty	COD · Admin		
Dan Pasquariello	DPD	chiefofpolice@dillinghamak.us	842-5354
Melody Nibeck	Planning Commission	melody.nibeck@alaska.gov	x5135
Michael G. Holko	BBAHC	mholko@bbahc.org	
Greg Marxmiller	Planning Commission	Gregory.Marxmiller@yahoo.com	843-0720
Jean Barrett	City of Dillingham	harbor@dillinghamak.us	

Dillingham Draft Hazard Mitigation Plan Review
Planning Commission Workshop
May 9, 2016 Dillingham Firehall
10:30 to 12:05

Present:

1. Julie Baltar, Planning Commission and BBNA
2. Gusty Akelkok, BBNA
3. Dorothy Larson, Curyung Tribe
4. Shane Judge, Curyung Tribe
5. Braden Tinker, Fire Department City of Dillingham,
6. Courtenay Carty, City of Dillingham
7. Dan Pasquariello, Police Department, City of Dillingham
8. Melody Nibeck, Planning Commission
9. Michael Halko, BBAHC
10. Gregg Marxmiller, Planning Commission
11. Jean Barrett, Port/Harbor City of Dillingham

Tribal Council May 17th. Julie to provide a synopsis of the City's plan and a draft letter.

The draft is moving forward to the City Council on June 2.

Discussion on how it should be reviewed, pick a specific are to review through each year.

Recommendation to remove the reference to the Tribe in the current plan such as on page 3-14 the second paragraph, and then the tribe with BBNA will use this document as a template and will be developing a Curyung tribal HMP that may be adopted by the City at a later date, or even incorporated into the City plan as a amendment.

Planning Commission has indicated an interest to be involved and could play a role in yearly updates as well as on the HMP planning team.

A number of typos in the

Recommendation to assure that if it states that a meeting or notice was put out, that it have backup documentation be put into the document as an appendix.

Update projects for those that have been completed.

7-8 EQ4 recommend changing this to refer to planning commission to have ongoing updates.

Add sewage lagoon –

Kanakanak Hospital – critical facility that serves the community is impacted by erosion. Could be a broader issues identified in the tribal plan.

There are graves impacted, erosion, large subsistence area, access to the beaches. It is federal land.

Outflow lines from City sewage lagoon are being uncovered…serious erosion with each east wind event. Erosion is currently only about 50' from critical infrastructure

Harbor is only safe haven in this part of country for boats. If we loose harbor we are very vulnerable to any winds.

Because of demographics, that allows us to apply for additional funding from Indian Health Service. Contact as hospital is Greg Calvert, Environmental Health. Apparently some political issues going on with the State government that may be having a negative impact on current proposed projects. (Melody has information)

There is a need for continued cooperation.

Need to prioritize what needs to happen by June 2, by next update, or during yearly update. Need to update values of critical facilities. Boat harbor has no valued assigned to it at this point in time.

The hospital has the information on the value of their properties.

Didn't notice erosion along whole shoreline. As far as graves, are there potential hazards from diseases?

Identify seawalls as critical infrastructure.

One strong point for the plan, is to move forward to have it passed, and the use of global language, building consensus on what it needed.

There is some evidence that tsunamis can occur in Bristol Bay.

Don't have a second way to get out of Dillingham.

Consider in future efforts review of Tribal long-range plans.

Our ability to respond to a hazard in the summer can be limited by manpower.

City has template, let's improve it from there,

Who will be the lead on this in the future?

With the capital improvements list. The HMP helps to inform and visa versa.

Request to include the comment and risk that there is only one road in and out of town.

Is road to Kanakanak beach in there? Big impact on subsistence.

The tribe's transportation plan needs to be coordinated with the HMP as the City has adopted it.

Cross reference capital projects list

Observation: In the event of an emergency, whether there is manpower or not, the community comes together to help out.

Identify and expand the HMP team.

Tribe needs to be at the table.

Hospital has a Hazard Vulnerability Analysis (HVA) versus a HMP. They also address what resources they have available to address, i.e. and earthquake. We have extra food. Active shooter, we seek assistance from the local law enforcement. How do we protect our assets, people and facilities? Our HVA considers:

- Environmental
- Human
- Technology
- Other

Julie will work with Tribe to generate resolution/letter

This page intentionally left blank

Appendix E

STAPLE/E Process

This page intentionally left blank

STAPLE/E

Social: Community development staff, local non-profit organizations, or local planning groups can help answer these questions.

- Is the proposed action socially acceptable to the community?
- Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- Will the action cause social disruption?

Technical: The City public works and building department can help answer these questions.

- Will the proposed action work?
- Will it create more problems than it solves?
- Does it solve a problem or only a symptom?
- Is it the most useful action in light of other goals?

Administrative: Elected officials from local government can help answer these questions.

- Is the action implementable?
- Is there someone to coordinate and lead the effort?
- Is there sufficient funding, staff, and technical support available?
- Are there ongoing administrative requirements that need to be met?

Political: Consult Board of Commissioners, local City Mayor's, and planning officials, to help answer these questions.

- Is the action politically acceptable?
- Is there public support both to implement and to maintain the project?

Legal: Include legal counsel, land use planners, and risk managers in this discussion.

- Who is authorized to implement the proposed action?
- Is there a clear legal basis or precedent for this activity?
- Are there legal side effects? Could the activity be construed as a taking?
- Is the proposed action allowed by the comprehensive plan, or must the comprehensive plan be amended to allow the proposed action?
- Will the City be liable for action or lack of action?
- Will the activity be challenged?

Economic: City economic development staff, civil engineers, building department, and the assessor's office can help answer these questions.

- What are the costs and benefits of this action?
- Do the benefits exceed the costs?
- Are initial, maintenance, and administrative costs taken into account?
- Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private)?
- How will this action affect the fiscal capability of the City?
- What burden will this action place on the tax base or economy?
- What are the budget and revenue effects of this activity?
- Does the action contribute to other goals, such as capital improvements or economic development?
- What benefits will the action provide? (This can include dollar amount of damages prevented, number of homes protected, credit under the CRS, potential for funding under the HMGP or the FMA program, etc.)

Environmental: Environmental groups, land use planners, and natural resource managers can help answer these questions.

- How will the action impact the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

This page intentionally left blank

Appendix F
Benefit–Cost Analysis Fact Sheet

This page intentionally left blank

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 G

Plan Maintenance Documents

This page intentionally left blank

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 Planning Team undertaken any public outreach activities regarding the HMP or implementation of mitigation actions?			
HAZARD PROFILES	Has a natural and/or manmade/ technologically caused disaster occurred during this reporting period?			
	Are there natural and/or manmade/ technologically 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 critical facilities or infrastructure need to be added to the asset lists?			
	Have there been development patterns changes 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 City of Village as applicable?			
	Are the goals still applicable?			
	Should new mitigation actions be added to the Mitigation Action Plan (MAP)?			
	Do existing mitigation actions listed in the Mitigation Strategies' MAP need to be reprioritized			
	Are the mitigation actions listed in the MAP 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(s):** _____

List Supporting Agencies and Contacts:

Total Project Cost: _____

Anticipated Cost Overrun/Underrun: _____

Project Approval Date: _____ **Project Start date:** _____

Anticipated completion date: _____

Description of Project (describe each phase, if applicable, and the time frame for completing each phase:

Milestones	Complete	Projected Completion Date

MITIGATION ACTION PROGRESS REPORT

Plan Goal(s) Addressed:

Goal:

Success Indicators:

Project Status

- ☐ **Project on schedule**
- ☐ **Project completed**
- ☐ **Project delayed***

*** explain:**

- ☐ **Project canceled**

Project Cost Status

- ☐ **Cost unchanged**
- ☐ **Cost overrun****

**** explain:**

Cost underrun***

***** explain:**

Summary of progress on project for this report:

A. What was accomplished during this reporting period?

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

C. How was each problem resolved?

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

Other Comments: