Village of Tuntutuliak, Alaska
Hazard Mitigation Plan

July 2015

Village of Tuntutuliak
Draft HMP
July 2015 Draft Review

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Table of Contents

Tables

Figures

Appendices

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Acronyms/Abbreviations

°F	Degrees Fahrenheit
ACCIMP	Alaska Climate Change Impact Mitigation Program
ACWF	Alaska Clean Water Fund
ADWF	Alaska Drinking Water Fund
AECOM	AECOM Corporation
AEIC	Alaska Earthquake Information Center
AEA	Alaska Energy Authority
AFG	Assistance to Firefighters Grant
AICC	Alaska Interagency Coordination Center
ANA	Administration For Native Americans
ANTHC	Alaska Native Tribal Health Consortium-Community
APA	American Planning Association
APR	Annual Performance Report
ARC	American Red Cross
AVCP	Association of Village Council Presidents
AVEC	Alaska Village Electric Cooperative
B/C	Benefit-Costs
BCA	Benefit-Cost Analysis
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BRV	Building Replacement Value
CCP	Citizen Corps Program
CDBG	Community Development Block Grant
CEDAP	Community Economic Development Assistance Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFDA	Catalog of Federal Domestic Assistance
CFR	Code of Federal Regulations
CFP	Community Forestry Program
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
DF&G	Department of Fish and Game
DHS	Department Of Homeland Security
DHS&EM	Division of Homeland Security and Emergency Management
DHSS	Division of Health and Social Services
DGGS	Division of Geological and Geophysical Survey
DMA 2000	Disaster Mitigation Act of 2000
DMVA	Department of Military and Veterans Affairs
DNR	Department of Natural Resources
DOC	U.S. Department of Commerce

Acronyms/Abbreviations

DOE	U.S. Department of Energy
DOF	Division of Forestry
DOI	Division of Insurance
DOL	U.S. Department of Labor
DOT/PF	Department of Transportation and Public Facilities
DSPR	Division of Spill Prevention and Response
DUA	Disaster Unemployment Assistance
EAS	Emergency Alert System
ECP	Emergency Conservation Program
EFSP	Emergency Food and Shelter Program
EMPG	Emergency Management Performance Grant
ENSO	El Niño/La Niña Southern Oscillation
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act of 1986
EQ	Earthquake
EWP	Emergency Watershed Protection Program
FEMA	Federal Emergency Management Agency
FFE	First Floor Elevations
FL	Flood
FMA	Flood Mitigation Assistance
FP&S	Fire Prevention and Safety
ft	Feet
g	Gravity
GAP	General Assistance Program
GF	Ground Failure
GI	Geophysical Institute
GIS	Geospatial Information System
HIA	Hazard Impact Assessment
HMA	Hazard Mitigation Assistance
HMEP	Hazardous Materials Emergency Preparedness
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HSGP	Homeland Security Grant Program
HUD	Housing And Urban Development
IBHS	Institute for Business and Home Safety
ICDBG	Indian Community Development Block Grants
ICS	Incident Command System
IGAP	Indian General Assistance Program
IHLGP	Indian Home Loan Guarantee Programs
IHBG	Indian Housing Block Grant
IHP	Indian Housing Plan
IRS	Internal Revenue Service

Acronyms/Abbreviations

INAP	Indian and Native American Programs
Kts	Knots
Lindbergh	Lindbergh Foundation
M	Magnitude
MAP	Mitigation Action Plan
MGL	Municipal Grants and Loans
MH	Multi-Hazard
MMI	Modified Mercalli Intensity
mph	Miles per Hour
NAHASDA	Native American Housing Assistance and Self Determination Act of 1996
NEHRP	National Earthquake Hazards Reduction Program
NFIP	National Flood Insurance Program
NIMS	National Incident Management System
NIST	National Institute of Standards and Technology
NOAA	National Oceanic And Atmospheric Administration
NRCS	Natural Resources Conservation Service
NRF	National Response Framework
NWS	National Weather Service
P	Primary
PDM	Pre-Disaster Mitigation
PGA	Peak Ground Acceleration
POP	Period of Performance
PPD-8	Presidential Policy Directive Eight
Rasmuson	Rasmuson Foundation
RCASP	Remote Community Alert Systems
RD	Rural Development
RFC	Repetitive Flood Claims
RL	Repetitive Loss
RurALCAP	Rural Alaska Community Action Program Incorporated
S	Secondary
SAFER	Staffing for Adequate Fire and Emergency Response
SBA	U.S. Small Business Administration
SHMAC	Alaska State Hazard Mitigation Advisory Council
SHMO	State Hazard Mitigation Officer
SHMP	Alaska State Hazard Mitigation Plan
SHSP	State Homeland Security Program
Sq.	Square
SRL	Severe Repetitive Loss
Stafford Act	Robert T. Stafford Disaster Relief and Emergency Assistance Act
STAPLEE	Social, Technical, Administrative, Political, Legal, Economic, and Environmental
SW	Severe Weather
TDHE	Tribally Designated Housing Entity

Acronyms/Abbreviations

TF	Technical Feasibility
Tribe	Qemirkalek Coast Corporation Tribal Council
UAF	University of Alaska Fairbanks
UHMA	Unified Hazard Mitigation Assistance
US or U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USHA	United States Housing Act of 1937
VFA-RFA	Volunteer Fire Assistance and Rural Fire Assistance Grant
Village	Native Village of Tuntutuliak
VSW	Village Safe Water
WARN	Warning, Alert, and Response Network
WF	Wildfire
WSO	Weather Service Officer

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

1

1.1 HAZARD MITIGATION PLANNING

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 2002), 44 Code of Federal Regulations (CFR) Part 201 with subsequent updates. The planning requirements for local entities are described in detail in Section 3 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 March 11, 2015 and applicable guidance documents. (FEMA 2015a).

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 24-14, Flood Resistant Design and Construction) wherever possible.*

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

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 2015b)

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, 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 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 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 Village of Tuntutuliak does not currently participate in the NFIP, and is therefore ineligible for National Flood Insurance Act Grant Programs until they become a NFIP participant.

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 2015b).

As the State Hazard Mitigation plan states:

"The Flood Mitigation Assistance Program (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 the long-term risk of flood damage to insured structures. FMA provides an annual amount of $10,000 for planning and $100,000 for projects. Distributions of remaining funds are based upon the number of NFIP policies, repetitive loss structures, and other factors contributing to a disaster resistant community. 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 grant programs (SRL). 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

Section one defines a hazard mitigation plan, 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

Section two provides a general history and background of the Native Village of Tuntutuliak (Village), including historical trends for population and the demographic and economic conditions that have shaped the area.

Section 3 Planning Process

Section three describes the HMP planning process, identifies the Planning Team members, records the meetings held as part of the planning process, and notes the key stakeholders within the Village and the surrounding 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 Village of Tuntutuliak plans to implement for continued public participation; and the 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 F – Maintenance Documents), and updating the HMP as well as implementation initiatives.

Section 4 Jurisdictional Adoption

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

Section 5 Hazard Analysis

Section five 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 future event recurrence probability for each hazard. In addition, historical impact and hazard location figures are included when available.

Section 6 Vulnerability Assessment

Section six identifies the Village of Tuntutuliak's potentially vulnerable assets—people, residential and nonresidential buildings, critical facilities, and critical infrastructure. The resulting information identifies the full range of hazards that the Village could face and potential social impacts, damages, and economic losses. Land use and development trends are also discussed.

Section 7 Mitigation Strategy

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

The Planning Team developed a list of mitigation goals and potential actions to address the risks facing the Village of Tuntutuliak. 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

Section eight 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.

Appendix D: Provides public outreach information, including newsletters.

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

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

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Section Two provides the Native Village of Tuntutuliak's location, geography, history, and demographic information.

2.1 LOCATION, GEOGRAPHY, AND HISTORY

Tuntutuliaq "Many Caribou"
*(*Calista 2014).

Tuntutuliak is located on the Qinaq River (sometimes spelled Kinak River), about 3 miles from its confluence with the Kuskokwim River. It is about 40 miles from the Bering Sea coast. Tuntutuliak is approximately 40 miles southwest of Bethel and 440 miles west of Anchorage (DCRA 2014) (see Figure 2-1). Seaplanes are able to access the village seasonally, and barges make deliveries to the Village about six times a year. Residents travel by boat and snowmachine, and there are winter trails to Kipnuk and Kongiganak (Calista 2014).

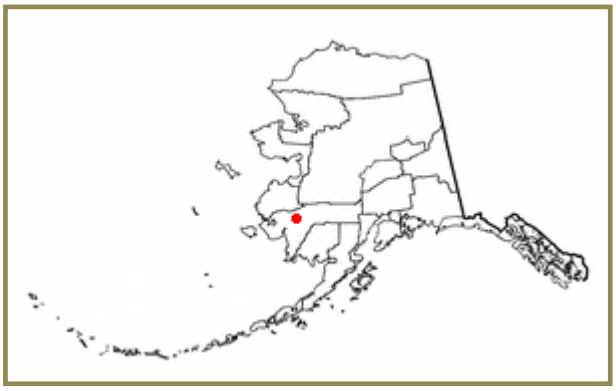

Figure 2-1 Tuntutuliak's Location Map

The Village census-designated place covers approximately 119.4 square miles of land and water. The Village's temperatures range from an average winter low of -2 degrees Fahrenheit (°F) to an average summer high of 62 °F. The area receives on average 16 inches of precipitation annually, with approximately 50 inches of snow. (DCRA 2014, WRCC 2015).

Figure 2-2 Tuntutuliak Photograph (Moistner 2003)

2.2 DEMOGRAPHICS

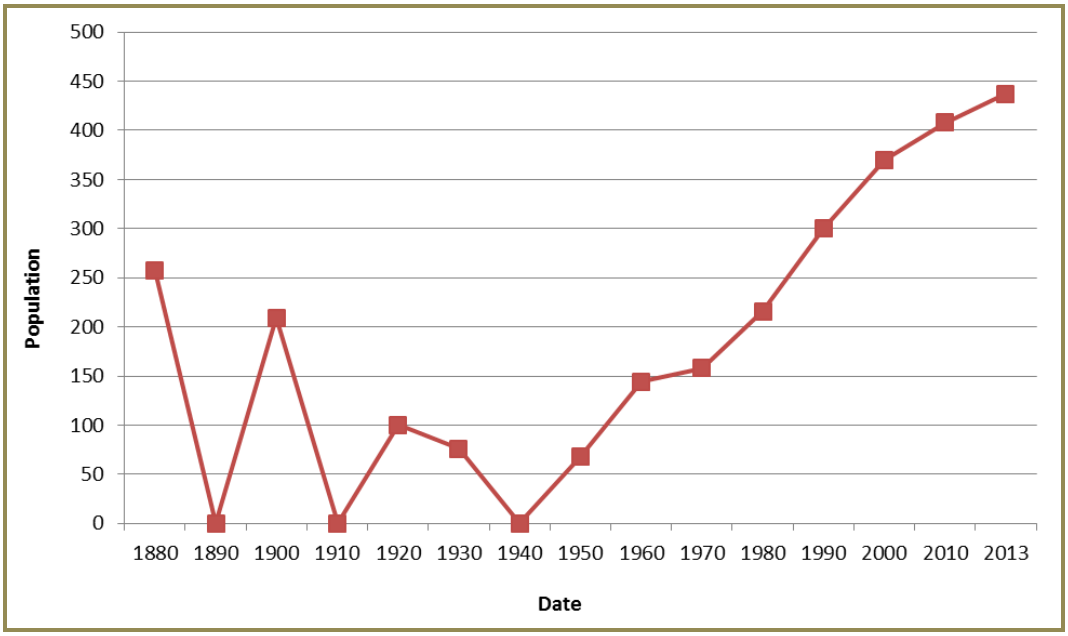

Figure 2-3 Tuntutuliak's Historic Population

Tuntutuliak was originally called Qinaq and located four miles to the east. Moravian missionaries visited in 1908, and a school was built in 1909. However, the school was closed in 1917 and the building was moved to the community of Eek. Some Qinaq residents moved to Eek with the school. In 1923, the first Moravian chapel was built. John Johnson opened and operated a trading post and store in the late 1920s. In 1945, Qinaq was relocated to higher ground to avoid seasonal flooding and was renamed Tuntutuliak. Tuntutuliak has had steady population increases since a school was built in 1957 and a post office was built in 1960 (DCRA 2014, Calista 2014).

The 2010 census recorded 408 residents. The median age was 22, indicating a relatively young population. The population of Tuntutuliak is expected to remain steady because over half of the population is under 30 years of age. The village population is predominantly of Yup'ik heritage. Children are taught in the Yup'ik language until the third grade, and then classes are instructed in English. The male and female composition is approximately 53 and 47 percent respectively. The 2010 census documented 96 households with the average household having approximately 5 individuals (DCRA 2014). The 2013 DCCED certified population is 437. Figure 2-3 illustrates the village's historic population (DCRA 2014).

2.3 ECONOMY

The Village's economy is primarily based on subsistence. Salmon and seal are important subsistence foods.

Local government jobs are the principle industry in Tuntutuliak, however, other general employment opportunities do exist within the community such as trade, transportation, utilities, and financial activities. Seasonal industry includes commercial fishing (Calista 2014).

According to the 2009-2013 American Community Survey 5-Year Estimates, the median household income in Tuntutuliak was $36,250 with a per capita income of $9,681. Approximately 36% were reported to be living below the poverty level. The potential work force (those aged 16 years or older) in the Village was estimated to be 242, of which 158 were actively employed. In 2013 the number of unemployment insurance claimants was 71. Practical unemployment or underemployment is likely to be significantly higher as the employment data includes seasonal or part-time jobs.

Figure 2-4, 2-5, and 2-6 depict aerial photographs of the Village.

Figure 2-4 Area Use Map Tuntutuliak (DCRA 2004)

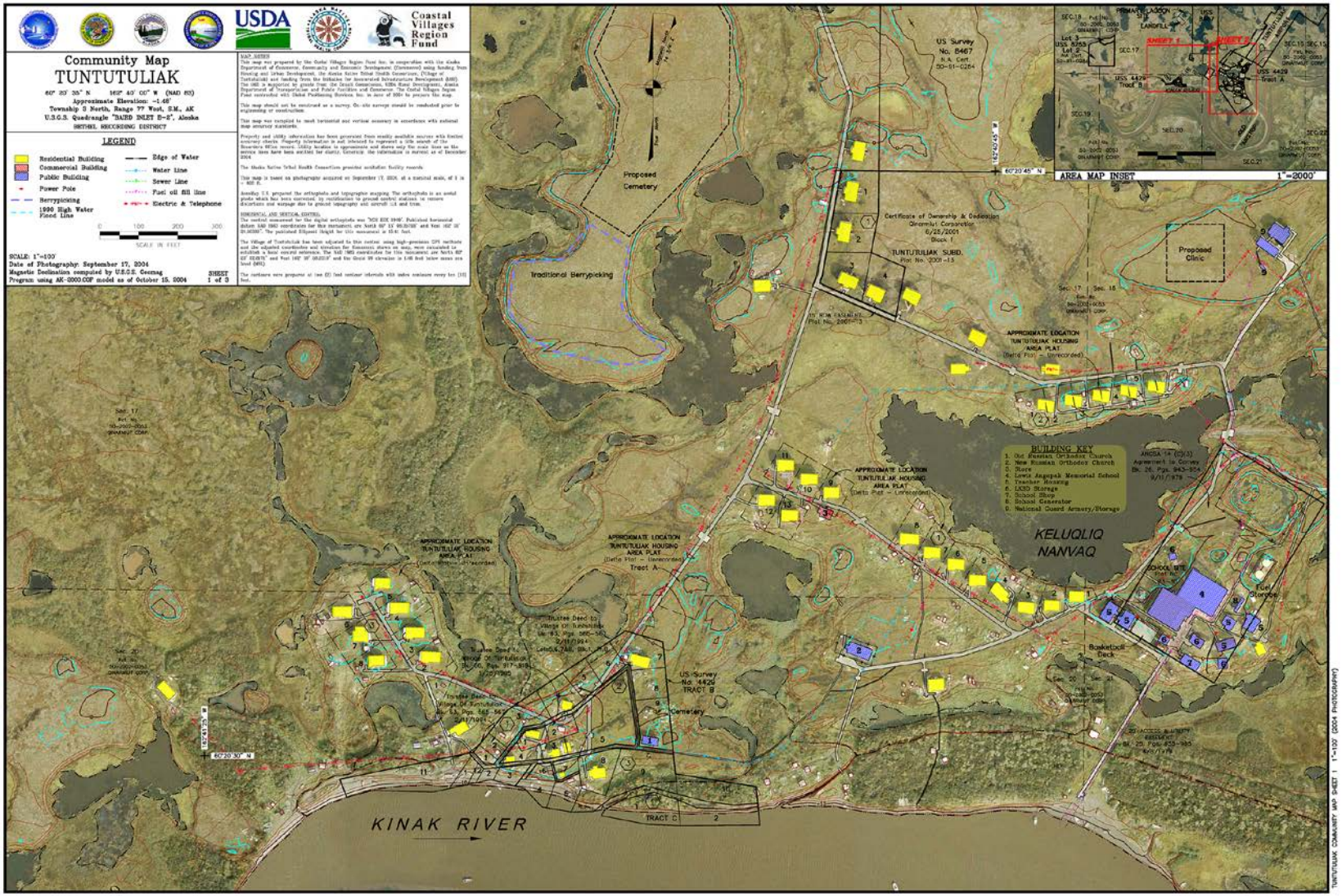

Figure 2-5 Community Map-Sheet 1 Tuntutuliak (DCRA 2004)

2

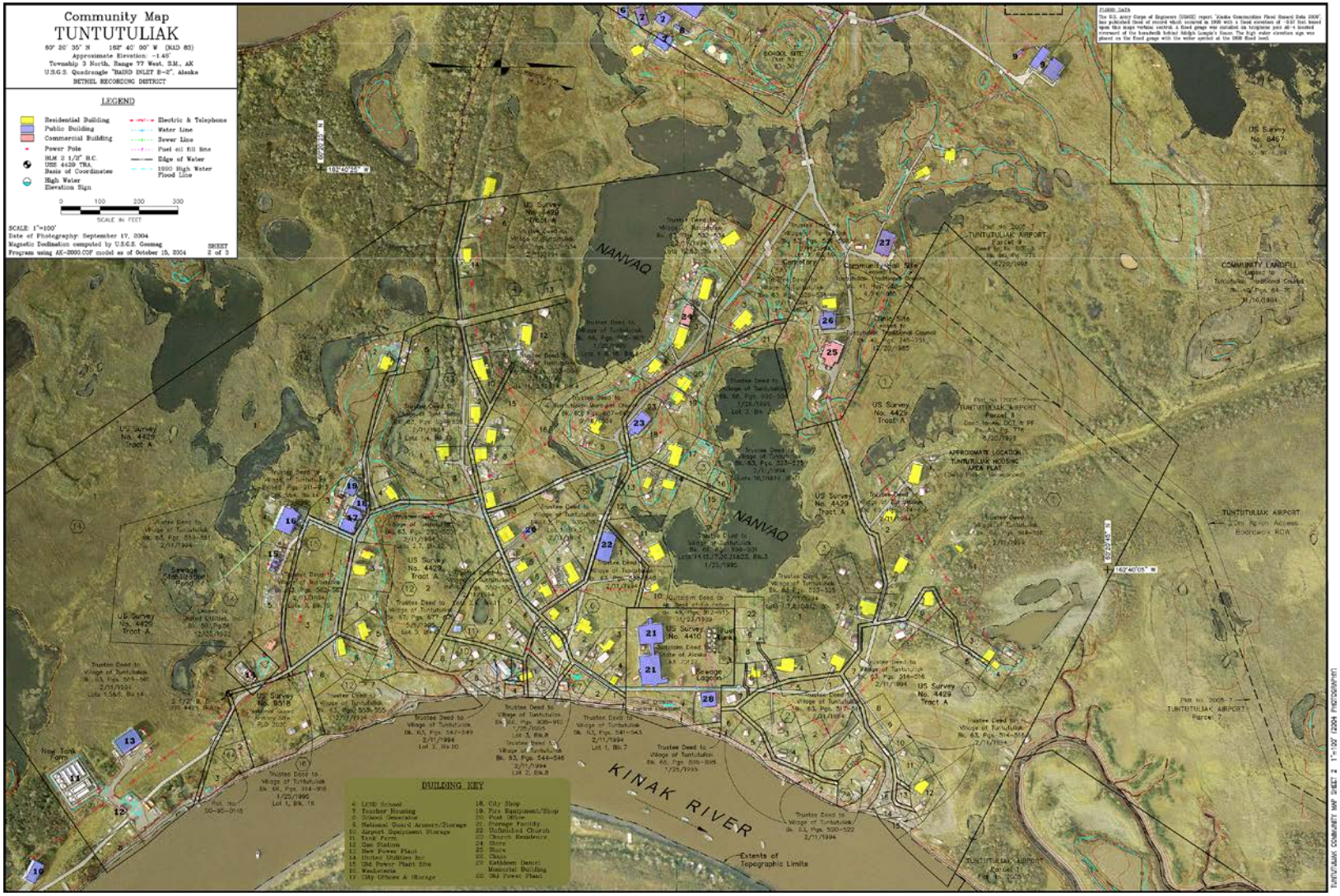

Figure 2-6 Community Use Map-Sheet 2 Tuntutuliak (DCRA 2004)

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 D.

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))
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 hazard mitigation planning consultant (AECOM) to facilitate and guide Planning Team development and HMP development.

The planning process began on January 5, 2015 with a teleconference with the Planning Team identified by Tribal Administrator Deanna White. Planning team members at the initial teleconference included Carl Andrew with Tuntutuliak Community Services Association Electric

(TSCSA Electric) and Robert Enoch with Coastal Villages Region Fund (CVRF). The teleconference was conducted to explain how the community of Tuntutuliak was selected by the Division of Homeland Security and Emergency Management 2014 Pre-Disaster Mitigation Grant award. AECOM staff described the HMP development requirement to enable the Village to qualify for Hazard Mitigation Grant Program grants and the overall HMP development process.

AECOM explained how the HMP differed from current emergency plans, the importance of having a Planning Team, and other aspects of the hazard mitigation planning process. A discussion followed of the community's roles, which include acting as an advocate for the planning process, assisting with information gathering, and supporting public participation opportunities. The Planning Team identified applicable Village resources and capabilities during the meeting.

AECOM asked the teleconference participants to help identify hazards that affect the Village. The Planning Team discussed existing hazards that affect Tuntutuliak, such as erosion, high winds, and permafrost impacts, which are increasing in intensity due to climate changes.

A couple Planning Team members were added during the planning process. Deanna White resigned as Tribal Administrator, and Jonathan Pavila joined the Planning Team in his capacity as the new Tribal Administrator for Tuntutuliak. Henry Lupie with Qinarmiut Corporation, the Alaska Native Village Corporation in Tuntutuliak, also became a member of the Planning Team.

In summary, the following five-step process took place from December 2014 through July 2015:

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 Tuntutuliak and with the assistance of 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

The local Planning Team members are Deanna White and Jonathan Pavila (Native Village of Tuntutuliak), Carl Andrew (TCSA Electric), Robert Enoch (CVRF), and Henry Lupie (Qinarmiut Corporation).

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

Table 3-1 Hazard Mitigation Planning Team

Name	Title	Key Input
Jonathan Pavila	Tribal Administrator (end of planning process) Native Village of Tuntutuliak	Planning Team Lead, Tribal data input, and HMP review.
Deanna White	Tribal Administrator (start of panning process), Native Village of Tuntutuliak	Initial Planning Team Lead, Tribal data input, and HMP review. Transferred out of Tribal Administrator position in March 2015.
Carl Andrew	Manager, Tuntutuliak Community Services Association Electric (TSCSA Electric)	Planning Team Member, Tribal data input, and HMP review.
Robert Enoch	Community Service Representative, Coastal Village Region Fund (CVRF)	Planning Team Member, Tribal data input, and HMP review.
Henry Lupie	General Manager, Qinarmiut Corporation	Planning Team Member, Tribal data input, and HMP review.
Elizabeth Appleby	Hazard Mitigation Planner, AECOM Alaska	Temporary Team Member, Responsible for 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)
- Alaska State Hazard Mitigation Advisory Council (SHMAC)
- 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)

Table 3-2 lists the community's public involvement initiatives focused to encourage participation and insight for the HMP effort.

Table 3-2 Public Involvement Mechanisms

Mechanism	Description
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/Tribal All Hazard Mitigation Plan Development website at: http://ready.alaska.gov/plans/localhazmitplans.htm
Newsletter #1 Distribution (January 2015)	In January, 2015, the Planning Team distributed a newsletter introducing the upcoming planning activity. The newsletter encouraged the whole community to provide hazard and critical facility information.
Newsletter #2 Distribution (July 2015)	In July 2015, the Planning Team 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 tribal office.

Initial contact was made with Tribal Administrator Deanna White on December 18, 2014. Deanna was enthusiastic and supportive about Tuntutuliak's inclusion within DHS&EM's Pre-Disaster Mitigation grant and the prospects of completing the hazard mitigation plan. Ms. White recruited staff from TCSA Electric and CVRF to the Planning Team. The Planning Team began meeting January 5, 2015, and continued meeting throughout the planning process.

The first newsletter was placed on the DHS&EM website and sent to the Planning Team for distribution. The Planning Team identified five natural hazards: earthquake, erosion/flood, ground failure, severe weather, and wildland fire which periodically impact the Village.

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 Planning Team evaluated these facilities and their associated risks to facilitate creating a viable or realistic risk analysis and subsequent

vulnerability assessment for Tuntutuliak. Meetings were held in April and May to discuss critical facilities and hazard risks.

A Planning Team meeting was held on May 26, 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 July 2015. The second newsletter described the planning process to date, presented the prioritized mitigation actions, and announced the availability of the draft HMP for public review and comment.

The Planning Team held a meeting on , 2015 to review the draft HMP for accuracy – ensuring it meets the Village's needs. The meeting was productive with (will add details after the meeting).

Changes were specifically targeted to...]

3.4 EXISTING DATA INCORPORATION

During the planning process, the Planning Team reviewed and incorporated information from existing plans, studies, reports, and technical reports into the HMP. The following were available from Tuntutuliak and were reviewed and used as references for the jurisdiction information and hazard profiles in the risk assessment of the HMP for the Village (Table 3-3). A complete list of references list is provided in Section 8.

Table 3-3 Documents Reviewed

Existing plans, studies, reports, ordinances, etc.	Contents Summary (How will this information improve mitigation planning?)
US Army Corps of Engineers, Baseline Community Erosion Assessment, 2009	Defined the area's erosion impacts
Coastal Impact Assistance Program (CIAP) Waste Erosion Assessment and Review (WEAR) Site Visit Trip Report – Tuntutuliak, 2012	Defined the area's erosion impacts and environmental contaminant concerns
Lower Kuskokwim School District Safety, Emergency, and Crisis Response Plan	Identified potential emergency situations for the school
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

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

3.5.1 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, each Planning Team Member 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 undertake 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

3.5.2 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 Village 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 Tribal Office/Community Hall. 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 Tribal Office.

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 Tribal-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.

3.5.3 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. §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 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 Tuntutuliak'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

3.5.3.1 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 Village 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 7-8) will be responsible for implementing the Mitigation Action Plan and determining whether their respective actions were effectively implemented. The hazard mitigation Planning Team Leader (or designee), will serve as the

primary point of contact and will coordinate local efforts to monitor, evaluate, revise, and tabulate HMP actions' status.

3.5.3.2 Reviewing the HMP

The Village 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 F) to the Planning Team. The report will include the current status of the mitigation project, including any project changes, a list of identified implementation problems (with an appropriate strategies to overcome them), and a statement of whether or not the project has helped achieve the appropriate goals identified in the plan.

3.5.3.3 Evaluating the HMP

The Annual Review Questionnaire (Appendix F) 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 Village 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

3.5.3.4 Updating the HMP

In addition to the annual review, the Planning Team will update the HMP every five years. The following section explains how the HMP will be reviewed, evaluated, and implementation successes described.

The Village of Tuntutuliak will annually review the HMP as described in Section 3.5.3.3 and update the HMP every five years (or when significant changes are made) by having the identified Planning Team review all Annual Review Questionnaires (Appendix F) to determine the success of implementing the HMP's Mitigation Action Plan.

The Annual Review Questionnaire will enable the Team to identify possible changes 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 fourth 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 current status of the 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 Village of Tuntutuliak still desires to implement
    - Prepare a "new" MAP matrix for the Village of Tuntutuliak
- Prepare a new Draft Updated HMP
- Submit the updated draft HMP to DHS&EM and FEMA for review and approval

3.5.3.5 Formal State and FEMA HMP Review

Completed Hazard Mitigation Plans do not qualify the Village for mitigation grant program eligibility until they have been reviewed and approved by the State and FEMA and received final State of Alaska promulgation.

The Village of Tuntutuliak (or its contractor) will submit the draft HMP to the State Hazard Mitigation Officer (SHMO) for initial State review and preliminary approval. Once any corrections are made, the State will send the draft HMP to FEMA Region X for formal review and tentative pre-approval.

The SHMO will coordinate the local HMP's review process and comment analysis and ensure any required corrections are made prior to resubmittal for FEMA final approval.

Once the plan has fulfilled all FEMA criteria, the State will promulgate the HMP and return to FEMA for final approval. FEMA's final approval ensures the Village is eligible for applying for appropriate mitigation grant programs.

The State-promulgated, FEMA-approved HMP will then be returned to the Village.

FEMA's final approval assures the Village is eligible for applying for appropriate mitigation grant program funding.

AECOM will send a final copy of the FEMA-approved HMP to the Tribal Office.

Section Four is included to fulfill the Village of Tuntutuliak'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 Village of Tuntutuliak is represented in this HMP and meets the requirements of Section 409 of the Stafford Act and Section 322 of DMA 2000, and 44 CFR §201.6(c)(5).

The Village of Tuntutuliak's participation is in lieu of completing a 44 CFR §201.7 tribal specific hazard mitigation plan due to limited available funding needed to meet Tribal HMP project funding match requirements.

Tribal participation is in lieu of completing a Tribal Specific Hazard Mitigation Plan to fulfill government to government application development and project funding match requirements.

A scanned copy of DHS&EM's formal promulgation *will be* included in Appendix C. *(upon FEMA final approval)*

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Section Five identifies and profiles the hazards that could affect the Village of Tuntutuliak.

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. Human and Technological, and Terrorism related hazards are beyond the scope of this plan. 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 are considered; the hazards that are unlikely to occur or for which the risk of damage is accepted as being very low, are eliminated from consideration.

Hazard profiling is accomplished by describing hazards in terms of their nature, history, magnitude, frequency, location, extent, and 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.
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.

For the first step of the hazard analysis, in January 2015, the Planning Team reviewed seven possible hazards that could affect the Kuskokwim REAA. They then evaluated and screened the comprehensive list of potential hazards based on a range of factors, including prior knowledge or perception of their threat and the relative risk presented by each hazard, the ability to mitigate the hazard, and the known or expected availability of information on the hazard (Table 5-1). The Planning Team determined that five hazards pose a great threat to the Village: earthquake, erosion/flood, ground failure, severe weather, and wildland/tundra fire. Some of these hazards

are influenced by increasing changing climate conditions such as late ice formation, early thaw conditions, or increased rain, lack of rain, or inconsistent rain.

Table 5-1 Identification and Screening of Hazards

Hazard Type	Should It Be Profiled?	Explanation
Natural Hazards		
Earthquake	Yes	Periodic, unpredictable occurrences. The Kuskokwim Delta area experienced no damage from the 11/2003 Denali EQ, but experienced minor shaking from the earthquake and its aftershocks, from the 1964 Good Friday Earthquake. The Village has experienced 62 earthquakes below M5 with epicenters located from 7 to 200 miles from the area since 1973.
Flood (Riverine and/or coastal related floods and resultant erosion)	Yes	Snowmelt run-off and rainfall flooding occurs during spring thaw and the fall rainy season. Events occur from soil saturation. Several minor flood events cause damage. The Village experiences storm surge, coastal ice run-up, and coastal wind erosion along the shoreline, and riverine erosion along the Tuntutuliak River, streams, and creek embankments from high water flow, riverine high water ice flows, wind, surface runoff, and boat traffic wakes.
Ground Failure (Permafrost, Subsidence)	Yes	Ground Failure occurs throughout Alaska from avalanches, landslides, melting permafrost, and ground subsidence. However, subsidence and permafrost are the primary hazards causing houses to shift due to ground sinking and upheaval, and high ground water melting the permafrost.
Severe Weather (Cold, Drought, Rain, Snow, Wind, etc.)	Yes	Severe weather impacts the community with climate change/global warming generating increasingly severe weather events such as heavy winds, winter storms, heavy or freezing rain, and with subsequent secondary hazards such as riverine or coastal storm surge floods. Severe weather events cause fuel price increases and frozen pipes. Heavy snow loads potentially damage house roofs. High winds remove or damage roofs and cause power disruptions.
Tsunami (Seiche)	No	This hazard does not exist for this location.
Volcano	No	This hazard does not exist for this location.
Wildland (Tundra) Fire	Yes	The community and the surrounding tundra area become very dry in summer months with weather (such as drought and lightening) and human caused incidents igniting dry vegetation in the adjacent area (burning trash outside their landfill's burn box, campfires, etc.).

5.3 HAZARD PROFILE

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 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 (to include magnitude and severity)
- Impact (Section 5 provides general impacts associated with each hazard. Section 6 provides detailed impacts to Tuntutuliak's residents and critical facilities)
- Recurrence Probability

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

Estimating magnitude and severity and recurrence probability are determined based on historic events using the criteria identified in the introductory narrative description (Section 5.2) as well as the following tables (Table 5-2 and Table 5-3 respectively) that defines each hazard's rating criteria.

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

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

5.3.1 Earthquake

5.3.1.1 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.

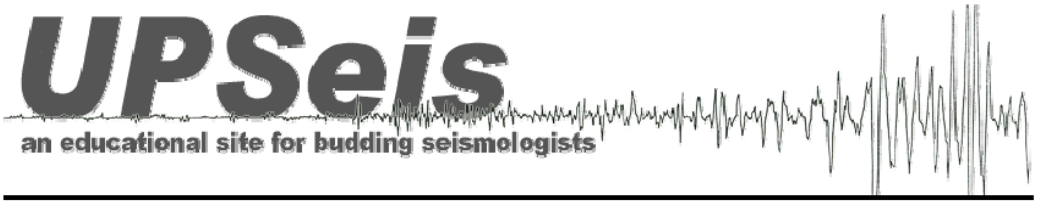
In addition to ground motion, several secondary natural hazards can occur from earthquakes such as:

- **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 Figure 5-1, 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 2014).

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 (see Table 5-4).



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 2014)

5.3.1.2 History

Accurate seismology for Alaska is relatively young with historic data beginning in 1973 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) and the State of Alaska, University of Alaska Fairbanks (UAF) Geophysical Institute's (GI) archives. Research included searching the USGS earthquake database for events spanning from 1973 to present. No earthquakes were recorded that exceeded M4.7. There were 62 historical earthquakes within 200 miles of the Village, with 43 earthquakes exceeding 3.0M.

Based upon available recorded data, the Planning Team determined that the Village of Tuntutuliak has a minor concern for earthquake damages. Tuntutuliak has not experienced

damaging impacts from their historical earthquake events, and only needs to be concerned with earthquakes with a magnitude > M5.0. This is substantiated in Table 5-4 which lists 43 historical earthquakes within 200 miles of the Village with a magnitude of M3.0 or higher; the largest one (M4.7) occurring on February 23, 2013. (USGS 2015a).

Table 5-4 Historical Earthquakes for Tuntutuliak

Year	Month	Day	Time (UTC)	Latitude	Longitude	Depth	Magnitude	Distance (Miles)
2015	3	26	21:05:47	60.524	-159.037	11.3	3.4	124.7
2015	1	20	09:57:00	59.795	-158.222	0.2	3.3	158.3
2014	10	22	09:45:31	60.417	-158.119	11.3	3.5	155.8
2014	6	26	02:33:52	61.209	-158.192	23.0	3.0	162.8
2014	3	6	13:51:40	61.595	-159.689	29.5	3.9	132.4
2013	3	11	21:58:09	60.368	-162.184	14.0	3.4	16.5
2013	2	23	02:35:34	60.357	-162.454	0.3	4.7	7.3
2012	12	22	12:57:26	61.045	-158.614	11.7	3.9	145.8
2011	8	11	10:09:08	58.813	-157.866	8.3	3.1	198.9
2010	6	1	17:31:31	61.037	-160.863	17.3	3.5	77.8
2009	4	22	17:42:39	61.516	-160.267	1.9	3.4	114.5
2008	7	16	10:08:06	61.432	-158.372	15.0	3.0	163.2
2005	8	19	23:49:07	61.155	-158.240	0.6	3.1	160.1
2005	6	28	08:58:44	61.287	-158.368	34.4	3.0	159.3
2005	6	11	06:57:52	61.305	-158.363	18.6	3.5	159.9
2005	6	9	00:08:54	61.125	-158.201	5.7	3.9	160.6
2005	6	9	00:07:58	61.275	-158.490	3.7	3.9	155.2
2005	6	9	01:28:32	61.141	-158.481	27.3	3.0	152.1
2005	6	8	23:41:43	61.274	-158.426	28.0	4.6	157.1
2005	5	27	07:35:30	61.158	-157.940	18.9	4.5	169.7
2005	5	27	07:34:04	61.270	-158.508	12.4	4.5	154.5
2005	3	21	12:50:12	62.748	-165.082	0.6	3.0	184.7
2004	5	31	12:24:29	58.861	-158.646	3.5	3.1	174.3
2004	4	4	03:35:11	61.441	-159.669	11.5	3.8	126.4
2002	2	5	17:39:18	61.910	-157.673	6.2	3.0	199.2
2002	1	19	13:53:50	61.859	-157.671	27.0	3.6	197.4
2000	11	21	21:48:06	59.192	-157.423	30.0	3.5	199.5
1997	3	20	15:04:15	60.901	-159.357	0.0	3.8	118.9
1997	3	2	19:18:47	58.728	-158.833	1.5	3.3	175.0
1995	4	13	08:44:02	58.796	-158.159	37.4	3.1	191.0
1995	2	10	08:14:16	61.840	-157.551	20.5	3.4	200.2
1995	1	28	06:45:34	60.875	-158.340	6.2	3.1	151.7
1994	2	11	16:02:08	59.713	-158.684	0.0	3.3	144.6
1994	2	10	21:35:42	59.856	-159.327	6.2	4.4	120.1

Table 5-4 Historical Earthquakes for Tuntutuliak

Year	Month	Day	Time (UTC)	Latitude	Longitude	Depth	Magnitude	Distance (Miles)
1994	2	9	07:55:50	59.771	-159.614	12.4	4.0	112.7
1994	2	9	23:31:32	59.646	-159.057	0.0	3.5	134.0
1992	9	26	06:47:53	60.245	-157.775	9.4	3.1	168.1
1992	5	16	02:55:59	58.987	-160.279	0.0	4.2	125.6
1992	2	9	19:42:30	61.215	-157.933	21.6	3.1	171.1
1991	1	26	19:17:32	61.881	-159.321	20.5	4.1	154.5
1984	7	25	12:36:45	61.504	-157.329	20.5	4.1	196.9
1983	8	4	23:38:34	61.404	-157.875	20.5	4.0	177.5
1983	1	30	22:08:52	61.105	-159.217	20.5	4.6	128.2

(USGS 2015a)

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. Tuntutuliak experienced minimal ground motion from this historic event. Planning Team members further stated that Tuntutuliak did not experience any ground shaking from the November 3, 2002 M7.9 Denali EQ.

5.3.1.3 Location, Extent, Impact, and Recurrence Probability

Location

The entire geographic area of Alaska is prone to earthquake effects. As such, the Village of Tuntutuliak has experienced 62 earthquakes since 1973 with an average of approximately 1.5 earthquakes per year.

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

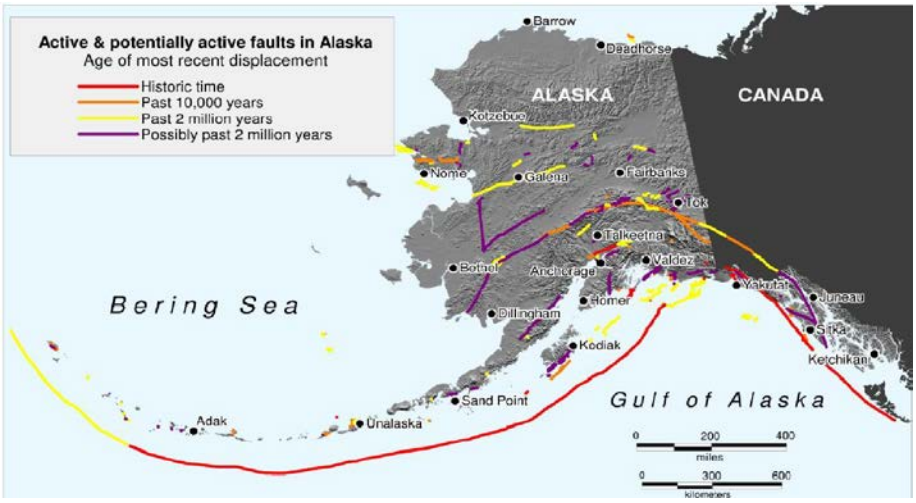


Figure 5-2 Active and Potentially Active Faults in Alaska

Extent

There are no recorded earthquakes within 200 miles that exceeded M5.0, and the average distance of the 43 recorded earthquakes that were above M3.0 was 149.7 miles (with a range from 7.3 to 199.5 miles) from the Village (USGS 2015a).

Based on historic earthquake events and the criteria identified in Table 5-2, the magnitude and severity of earthquake impacts in the Village are considered "Negligible" with injuries treatable with first aid; critical facilities could expect to be shut-down for more 24 hours or less; and less than 10 percent of property severely damaged with limited damage to transportation, infrastructure, or the economy.

The Village is located approximately 130 miles from the Denali Fault, Togika-Tikchik and approximately 60 miles from smaller, unnamed faults as depicted in Figure 5-3.

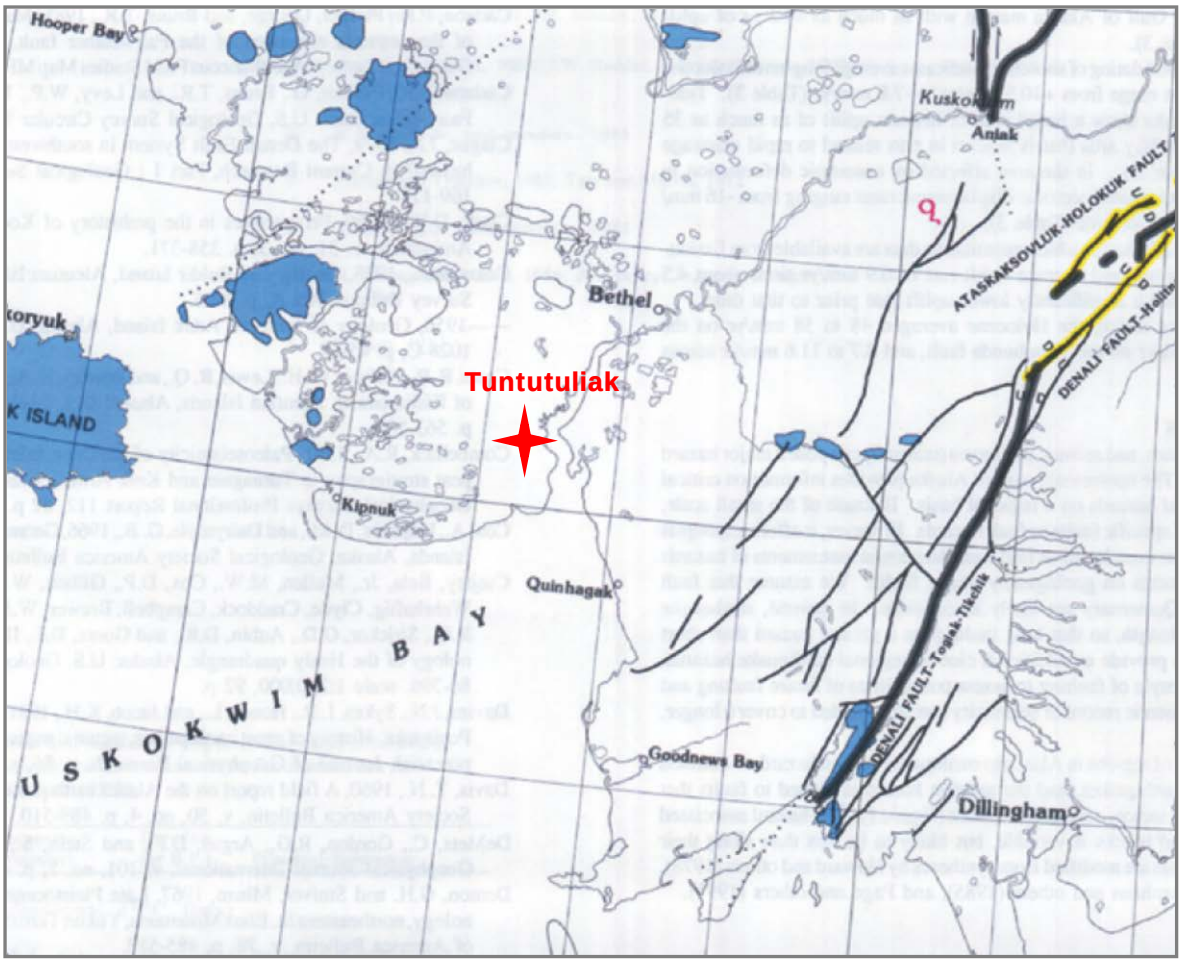


Figure 5-3 Earthquake Fault Proximity to Tuntutuliak. (Plafker et al. 1993)

Impact

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. Impacts to

future populations, residences, critical facilities, and infrastructure are anticipated to remain the same.

Recurrence Probability

This 2009 Shake Map incorporates current seismicity in its development and is the most current map available for this area. As Peter Haeussler, USGS Alaska Region, states, it 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).*

While it is not possible to predict when an earthquake will occur, the Shake Map in Figure 5-4 generated using the United States Geological Survey (USGS) Earthquake Mapping Model predicts the probability of a M5.0 or greater earthquake occurring within 50 years and 50 kilometers (31 miles) of the Village (USGS 2015b).

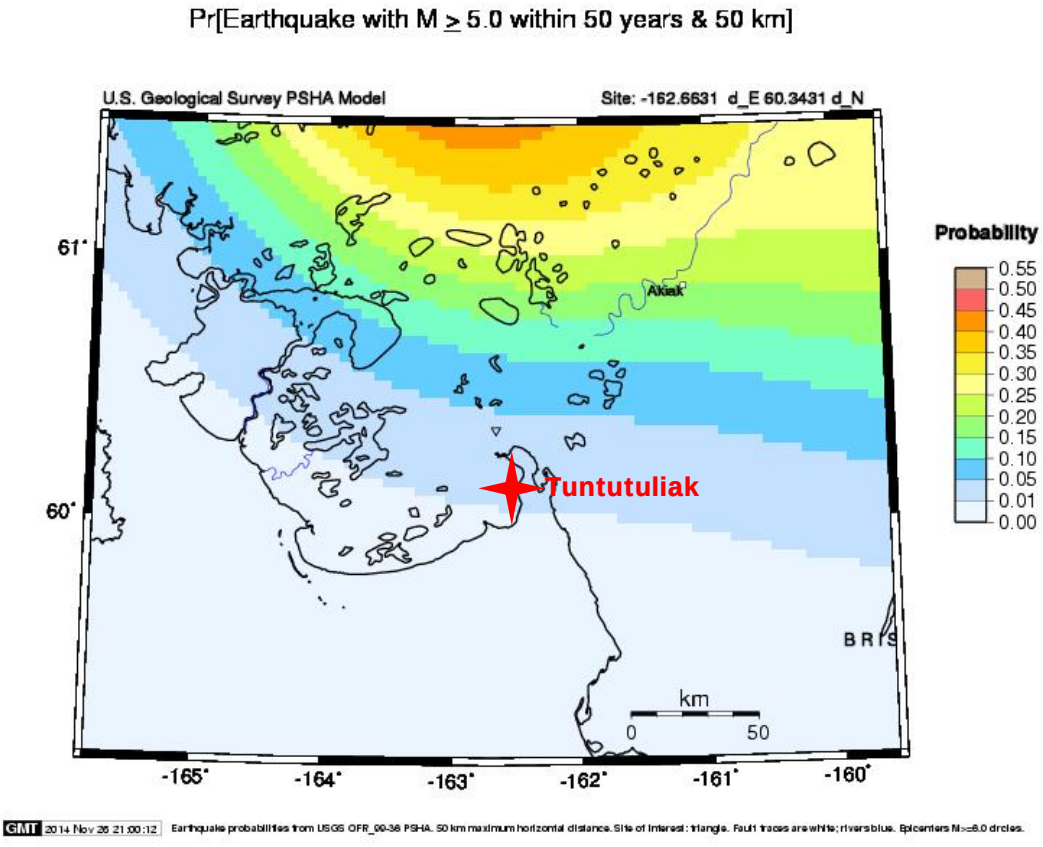


Figure 5-4 Tuntutuliak's Earthquake Probability (USGS 2015b)

The Shake Map indicates a M5.0 or greater earthquake occurring within 50 years and 50 miles of the Village is "Possible." Within the next 10 years, the chance of an earthquake of M5.0 or greater occurring in Tuntutuliak is "Unlikely" (1/10=10 percent) due to an event history that is less than or equal to 10 percent likely per year.

5.3.2 Flood

5.3.2.1 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.

Four primary types of flooding occur in the Village: snowmelt, ice jam, storm surge, and ice override floods. Riverine and coastal erosion also are a concern for the community.

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 cause 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 Surges, or coastal floods, occur when the sea is driven inland above the high-tide level onto land that is normally dry. Often, heavy surf conditions driven by high winds accompany a storm surge adding to the destructive-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.

The meteorological parameters conducive to coastal flooding are low atmospheric pressure, strong winds (blowing directly onshore or along the shore with the shoreline to the right of the direction of the flow), and winds maintained from roughly the same direction over a long distance across the open ocean (fetch).

Communities that are situated on low-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, Beaufort Sea and the Kuskokwim Bay 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 erosion, storm surge flooding and ice override events.

Ice Override (also known as a *venuq* in Yup'ik) is a phenomenon that occurs when motion of the sheet ice is initiated by wind stress acting on the surface of ice that is not confined. Onshore wind, coupled with conditions such as a smooth gradual sloping beach and high tides can cause ice sheets to slide up or "override" the beach and move inland as much as several hundreds of feet. Ice override typically occurs in fall and early winter (though events have been reported at other times) and is usually associated with coastal storms and storm surge but may also happen in calm weather.

Override advances are slow enough to allow people to move out of its path, and therefore poses little immediate safety hazard. Intact sheets of ice up to several feet thick moving into buildings or across roads and airports can however cause structural damage and impede travel. Shoreline protection in the form of bulkheads or other structures to break-up the ice can limit the movement of ice.

Riverine or Coastal Scour (used interchangeably with erosion) rarely causes death or injury. However, erosion 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 erosion are problems for communities where disappearing land threatens development and infrastructure, and is a major erosion threat to the Village as it threatens the embankment, shoreline, infrastructure, structures, and utilities of residents.

Coastal Erosion

Coastal erosion, 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 erosion.

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

The forces of erosion are embodied in waves, currents, and winds. Surface and ground water flow, and freeze-thaw cycles may also play a role. Not all of these forces may be present at any particular location. Coastal erosion can occur from rapid, short-term daily, seasonal, or annual natural events such as waves, storm surge, wind, coastal storms, and flooding, or from human

activities including boat wakes and dredging. The most dramatic erosion often occurs during storms, particularly because the highest energy waves are generated under storm conditions.

Coastal erosion may also be due to multi-year impacts and long-term climatic change such as sea-level rise, lack of sediment supply, subsidence, or long-term human factors such as aquifer depletion or the construction of shore protection structures and dams. Attempts to control erosion using shoreline protective measures such as groins, jetties, seawalls, or revetments can lead to increased erosion.

Riverine Erosion

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

Attempts to control erosion using shoreline protective measures such as groins, jetties, levees, or revetments can lead to increased erosion.

Land surface erosion results from flowing water across road surfaces due to poor or improper drainage during rain and snowmelt run-off which typically result from fall and winter sea storms.

Event Occurrence Intervals

Many floods are predictable based on and seasonal 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 flooding. It also breaks the winter ice cover, which causes localized ice-jam floods or coastal ice override damages.

5.3.2.2 History

The Village experiences severe floods and erosion from ice jams, venuq, storm surge, and winter/spring flooding. (NWS) identified for the Kuskokwim Delta's Weather Zone. Each flood event may not have specifically impacted the Tuntutuliak area. These flood events are listed due to their close proximity to Tuntutuliak or by location within the identified zone, and are meant to show a representative sample of historic flood events.

In their 2009 Baseline Erosion Assessment, the Army Corp of Engineers reported episodic erosion during break-up and the fall storm season in Tuntutuliak (USACE 2009). During breakup, ice jam failure upriver and melting snow and ice increase water flows in the Qinaq and Kuskokwim Rivers, leading to ice scour and erosion near the Village. During the fall storm season, high wind and storm surges back into the Quinaq River from the Kuskokwim River, particularly during high tide. Table 5-5 lists historic flood events in the Tuntutuliak area.

Table 5-5 Historic Flood Events and Impacts

Location	Date	Event Type	Magnitude
Kuskokwim Delta (Zone)	11/6/2013	Coastal Flood	An intense and large storm in the Bering Sea produced a long fetch of strong wind across the Bering Sea aligned with the Kuskokwim Delta coast November 6th through the 9th. This produced a surge of up to 5 feet along the Kuskokwim Delta Coast.
Kuskokwim Delta Co.	5/13/2012	Ice Jam Flood	Ice Jam Flood: Ice Jam flooding occurred along the Kuskokwim River near Kwethluk during the spring breakup
Kuskokwim Delta (Zone)	11/8/2011	Coastal Flood	Blizzard, Snow, Wind, Coast Flood: Episode Narrative: A strong Bering Sea storm produce strong wind and snow along the Kuskokwim Delta coast and the northern coast of Bristol Bay November 19th producing blizzard conditions. This storm produced high wind along with blizzard conditions and a storm surge that resulted in minor coastal flooding. The peak wind reached 83 mph at Shemya...The strong wind and long fetch resulted in a coast storm surge that produced minor coastal flooding in the Kuskokwim Delta region. Report from the public at Kipnuk of water reaching homes.
Kuskokwim Delta (Zone)	9/6/2006	Storm Surge Flood	Storm Surge Flood: The Remnants of super typhoon Loke moved into the Bering Sea... Strong west wind across the Bering Sea that produced seas in excess of 30 feet; this surge coincided with very high astronomical tides along the Bristol Bay coast and the coast of the Kuskokwim Delta. The combination of the storm surge and the very high tides produced minor coastal flooding along the Bristol Bay coast and the Kuskokwim Delta coast.
Kuskokwim Delta (Zone)	10/17/2005	Storm Surge Flood	Storm Surge Flood: West wind gusting to 90 mph across the Pribilof Islands late Sunday night into the early morning hours Monday. The combination of the strong wind and long fetch produced a surge that coincided with high tides. Flooding occurred in the Bristol Bay area north to Kipnuk along the Kuskokwim Delta.
Kuskokwim Delta (Zone)	9/22/2005	Storm Surge Flood	Storm Surge Flood: Strong southwest wind across the southern Bering Sea into the Bering Sea coast of Alaska. The resulting surge combined with high tides resulted in coastal flooding from Nunivak Island north into Norton Sound and the Bering Strait late in the afternoon September 22nd. Rough surf and tidal overflow persisted through Friday September 23rd due to the storm remaining in the northern Bering sea as it slowly weakened. At Quinhagak, all low lying areas flooded.
Kuskokwim Delta (Zone)	11/19/2004	Coastal Flood	Coastal Flood: Weather front moved across the Alaska Peninsula... Strong southeasterly winds resulted in... a west to southwest fetch across the Bering Sea, combined with high astronomical tide, resulted in coastal flooding across the west coast of the state.
Kuskokwim Delta (Zone)	9/9/2004	Storm Surge Flood	Storm Surge Flood: A strong storm in the Bering Sea created a long fetch with high wind. This produced a coastal storm surge resulting in minor coastal flooding along the Kuskokwim Delta.

Table 5-5 Historic Flood Events and Impacts

Location	Date	Event Type	Magnitude
Kuskokwim Delta (Zone)	12/9/2003	Storm Surge/Tide	Storm Surge, Tide: 104 mph Strong wind across the Alaska Peninsula on the morning of the 8th. A ship outside of Cold Bay reported measured wind gusts of 104 mph. The strong long southwest fetch across the Bering Sea resulted in a coastal storm surge along the Yukon and Kuskokwim Delta and northern Bristol Bay.
Kuskokwim Delta (Zone)	8/29/2000	Flood, High Wind	Flood, Wind: mph (53Kts) ($5K Damages) One of the first major Bering Sea storms of the year moved into the southern Bering Sea Sunday, … for those residing along coastal areas of Bristol Bay and the Kuskokwim Delta, residents had ample lead time (nearly 48 hours) to prepare for the impending situation. Gusts above 60 mph were recorded along the south and southwest side of the storm. Moderately large areas of open water in the south Bering, combined with the strong onshore winds, presented the possibility of coastal flooding across low lying areas of the southwest coast. In fact, high water levels were observed around Bethel, along with a few boats swamped. There were also reports of beach erosion and high water at several coastal villages, along with at least one report of damaged boardwalks. Fortunately, the onset of the strong southwest winds did not directly correspond to the high tide. In fact, most areas were just coming off of low tide when the strong winds hit. The prolonged blow, however, did manage to keep water high into the following high tide period, when damage developed.

(USACE 2012, NWS 2011, DHS&EM 2013)

5.3.2.3 Location, Extent, Impact, and Future Events Probability

Location

The Planning Team indicated that Tuntutuliak has some flooding impacts, most of which occur from ice jams, venuq, and overall poor drainage in the area. USACE stated that, "Tuntutuliak has a definite erosion problem", and reported concerns with 59 outbuildings (fish camps and related structures), 11 residences, 4 commercial buildings, 2 outbuildings and a gas station, and 11 public buildings mostly associated with the school and airport. In the 1990s, a 1,350-foot riprap revetment was installed along the riverbank to protect Tuntutuliak from erosion. This revetment is estimated to provide protection for another decade, but will slowly lose its protection features by about 2030 if not bolstered. Tuntutuliak is losing about 0.48 acres of land per year from erosion (USACE 2009).

Alaska Department of Environmental Conservation (ADEC) noted in 2012 that the landfill and sewage lagoon both were flooded by the Qinaq River from a storm event (ADEC 2012). ADEC noted residents' reports of the ineffective rip rap structure currently in place, and that the bulk tank farm was only 150 feet away from the actively eroding Qinaq River. Figures 5-5- and 5-6 show the eroding rip rap along the Qinaq River. Old BIA structures, some with toxic materials, were also reported as erosion risks by ADEC.

Figure 5-5 Photo of Eroding Rip-Rap Along the Qinaq River (ADEC 2012)

Figure 5-6 Close-Up photo of Eroding Rip-Rap Along the Qinaq River (ADEC 2012)

The Planning Team corroborated the USACE report by discussing their observations of erosion along the Qinaq (Kinaq) River, including along the rip-rap revetment. The revetment is in the lower Village area, and there is currently no erosion control in the upper Village. The Planning Team noted flooding of the boardwalk, particularly in fall. At times, the sewage lagoon leaks and ponds near the Village, usually during breakup. Several houses are close to the river, particularly residences near the high school. The western end of the airport runway is also being eroded.

Figure 5-7 depicts the Village's USACE-generated aerial photograph and their identified flood or high water flow induced erosion impact locations.

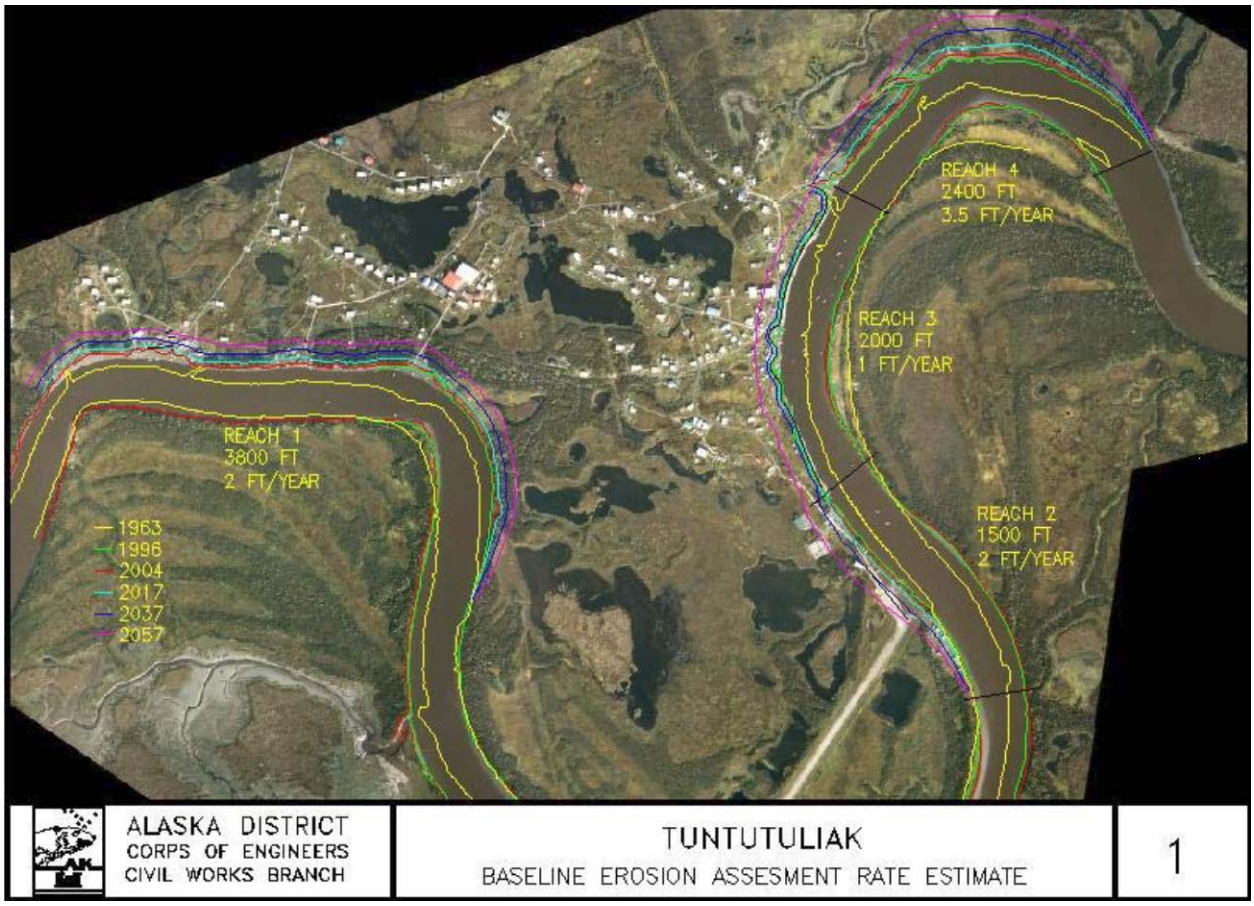


Figure 5-7 Tuntutuliak's Baseline Erosion Assessment Rate Estimate (USACE 2009)

Extent

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

The following factors contribute to 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
- Village location related to identified-historical flood elevation

The Village does experience severe riverine flooding and they experience severe high water flow flood erosion 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 Village are considered "Critical" where critical facilities would shut-down for at least two weeks with more than 25 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

Based on previous occurrences, USACE Floodplain Manager's report, and criteria in Table 5-3, it is "Likely" that a major flood event will occur with a 1 in 3 year (1/3=33 percent) chance. History of events is greater than 20 percent but less than or equal to 33 percent likely per year. There is no data identifying a 500-year (0.2 percent chance of occurring in a given year) flood threat in Tuntutuliak.

5.3.3 Ground Failure

5.3.3.1 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 six landslide types, distinguished by material type and movement mechanism including:

- **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, and then flows through confined channels, liquefying and gaining speed. Debris flows can travel at

speeds of more than 35 miles per hour (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.

In Alaska, earthquakes, seasonally frozen ground, and permafrost are often agents of ground failure. 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. (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 Tuntutuliak.

5.3.3.2 History

There are few written records defining ground failure impacts. However, residents of Tuntutuliak have been monitoring ground subsidence and recognize the impacts.

5.3.3.3 Location, Extent, Impact, and Recurrence Probability

Location

There are various ground failure locations throughout Tuntutuliak. Land subsidence, such as melting permafrost and floodwater soil saturation, are the most common ground failure impacts.

The Planning Team described ground failure impacts such as some homes and facilities sinking into the tundra. Newer buildings are elevated on pilings, but structures built later or by individual homeowners are not on pilings and are directly on the tundra.

According to permafrost and ice conditions map developed for the National Snow and Ice Data Center/World Data Center for Glaciology in 1998 (revised 2001) located in the 2013 State Hazard Mitigation Plan (SHMP), shows that Tuntutuliak has continuous permafrost (DHS&EM 2013). However, in 2008, Jorgensen et al. mapped the area around Tuntutuliak as having sporadic to discontinuous permafrost, as shown in Figure 5-8. This could be a reflection of more accurate data or the slowly changing landscape near the community.

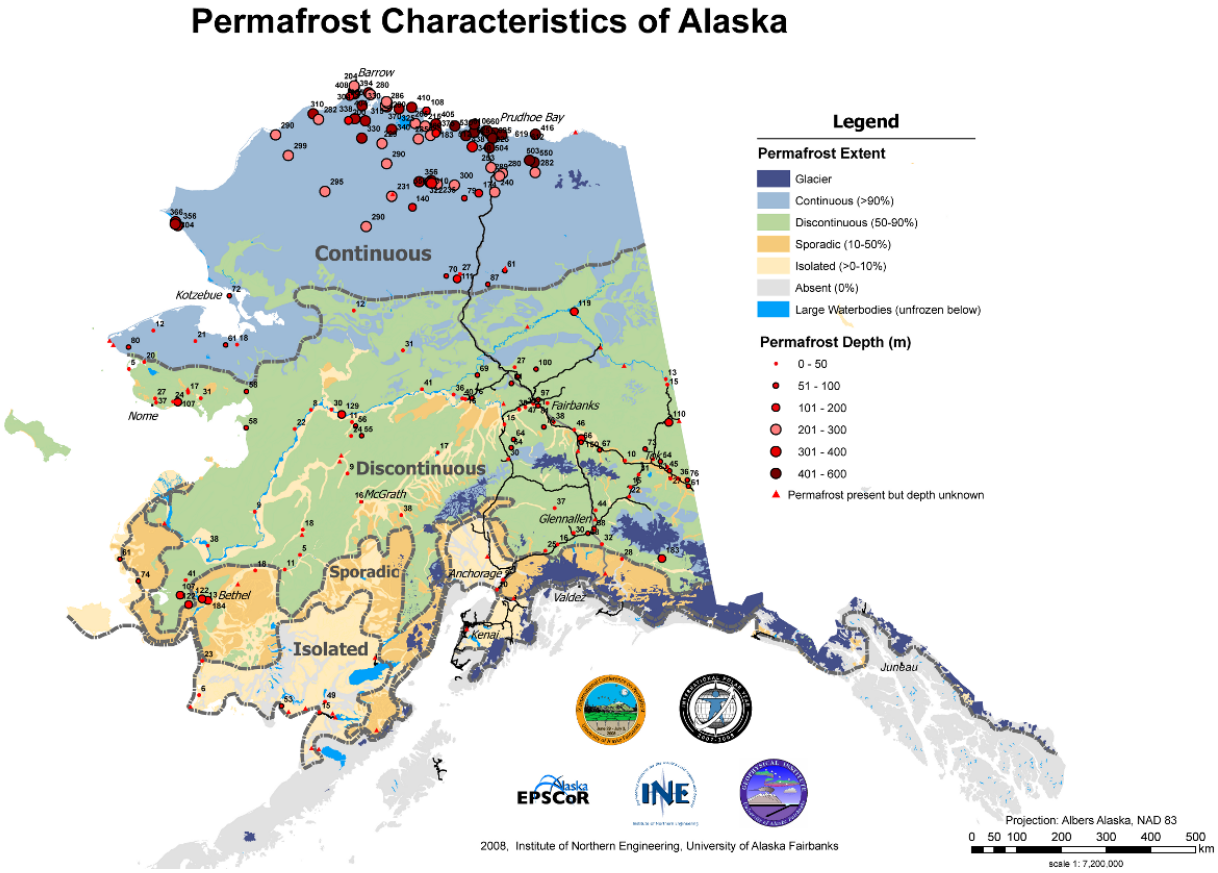


Figure 5-8 Permafrost and Ground Ice Map of Alaska (Jorgenson et al. 2008)

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 affected.

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 ground failure impacts in the Village 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 or more of property 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 damages 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.

Subsidence has been recorded in the Village throughout the community, and many buildings are sinking into the tundra. The Planning Team discussed problems with sewage infrastructure in Tuntutuliak partly caused by ground failure, and noted ground heaving.

Recurrence Probability

Even though there are few written records defining ground failure impacts for the Village, the Planning Team has solid evidence of their recurring ground failure damages throughout the community – to structures, roads, and cultural sites. The probability for ground failure follows the criteria in Table 5-3, the future damage probability resulting from ground failure is "Likely" in the next three years; an event has up to 1 in 3 years (1/3=33 percent) chance of occurring as the history of events is greater than 20 percent but less than 33 percent likely per year.

5.3.4 Severe Weather

5.3.4.1 Nature

Severe weather occurs throughout Alaska with extremes experienced by the Village of Tuntutuliak that includes heavy and drifting snow, freezing rain/ice storm, extreme cold, and high winds. The Village 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, the state has an increased awareness and understanding of 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. More gases create a thicker the blanket that warms the earth. Trees and other plants cannot absorb carbon dioxide through photosynthesis if foliage growth is inhibited. 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 Alaskans about the connection between their health and changing environmental patterns.

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 definition 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 less than -40°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. (DHS&EM 2013).

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 hurricane characteristics. In Alaska, high winds (winds in excess of 60 mph) occur rather frequently over the coastal areas along the Gulf of Alaska, the Kuskokwim Bay and the Bering Sea. High winds are a threat to Tuntutuliak.

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.

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 the 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.

Figure 5-9 displays Alaska's annual rainfall map based on Parameter-elevation Regressions on Independent Slopes Model that combines climate data from the National Oceanic and Atmospheric Administration (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.

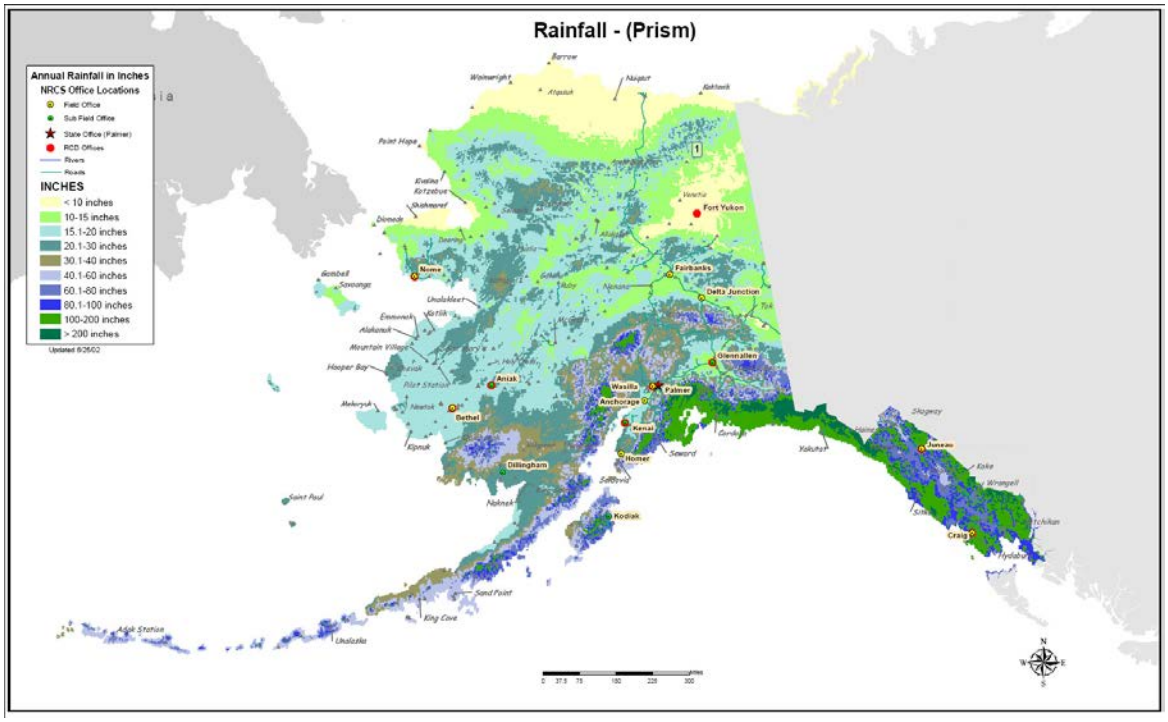


Figure 5-9 Statewide Rainfall Map (NRCS 2015)

5.3.4.2 History

The Village of Tuntutuliak is continually impacted by severe weather events. Hurricane force wind, ice storms, and cold typically have disastrous results.

Climate Change. The University of Alaska Fairbanks (UAF) Arctic Climate Impact Assessment (ACIA) 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 2015)

Tables 5-6 and 5-7 delineate the Weather Service Office's (WSO) weather data for the Bethel area. Actual weather in Tuntutuliak may have varied, but these tables provide a representation of typical weather events and temperatures which may have impacted Tuntutuliak.

Table 5-6 Precipitation and Snowfall Trends: Station:500754; BETHEL WSO AIRPORT

From Year=1949 To Year=2012														
Precipitation												Total Snowfall		
Month	Mean (in.)	High (in.)	Year	Low (In.)	Year	1 Day Max. (dd-mm-yyyy)		>= 0.01 in.	>= 0.10 in.	>= 0.50 in.	>= 1.00 in.	Mean (in.)	High (in.)	Year
January	0.77	6.48	1952	0.04	2004	1.76	01-03-1952	9	2	0	0	7.9	57.4	1952
February	0.71	3.41	1951	0	1984	1.03	02-27-1996	8	2	0	0	7.3	35.8	1951
March	0.75	3.44	1991	0	1986	0.85	03-15-1951	9	2	0	0	8.5	36.1	1951
April	0.72	3.89	1979	0.02	1985	0.92	04-18-1983	10	2	0	0	5.4	28.7	2006
May	0.95	3.63	2002	0.02	1954	1.35	05-02-2012	11	3	0	0	1.8	7.7	1998
June	1.55	4.30	1999	0.25	1974	1.36	06-11-1981	13	5	0	0	0.1	2.2	1963
July	2.26	4.19	2001	0.49	1957	1.43	07-27-1952	16	7	1	0	0	0	1950
August	3.35	12.37	1951	0.99	1976	2.30	08-12-1951	18	9	2	0	0	0	1950
September	2.50	7.05	2007	0.42	1968	1.97	09-28-1971	16	7	1	0	0.3	5.5	2004
October	1.47	4.45	2006	0.11	1965	1.37	10-04-74	12	5	0	0	4.1	12.8	1978
November	1.29	4.23	2003	0.04	1969	1.45	11-08-2000	12	4	0	0	10.0	34.7	1994
December	1.06	6.17	1951	0.05	1956	1.18	12-23-1970	11	3	0	0	10.3	47	1951
Annual	*17.36*	*40.42*	*1951*	*7.29*	*1976*	*2.30*	*08-12-1951*	*145*	*52*	*6*	*1*	*55.7*	*149.5*	*1951*
Winter	*2.54*	*14.90*	*1952*	*0.45*	*1974*	*1.76*	*01-03-1952*	*28*	*7*	*1*	*0*	*25.5*	*123.6*	*1952*
Spring	*2.41*	*6.36*	*1951*	*0.74*	*1966*	*1.35*	*05-02-2002*	*30*	*8*	*0*	*0*	*15.7*	*53.2*	*2006*
Summer	*7.16*	*16.91*	*1951*	*2.71*	*1976*	*2.30*	*08-12-1951*	*47*	*21*	*3*	*0*	*0.1*	*2.2*	*1963*
Fall	*5.26*	*10.43*	*2007*	*1.69*	*1969*	*1.97*	*09-28-1971*	*41*	*16*	*2*	*0*	*14.4*	*36.2*	*1994*

Table updated on Oct. 31, 2012

For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons

Winter = Dec., Jan., and Feb.
Spring = Mar., Apr., and May
.

Summer = Jun., Jul., and Aug
Fall = Sep., Oct., and Nov.

Source: WRCC 2012

Table 5-7 Temperature Trends: Station:500754; BETHEL WSO AIRPORT

From Year=1949 To Year=2012															
	Monthly Averages			Daily Extremes				Monthly Extremes				Max. Temp		Min. Temp	
Month	Max. (ºF)	Min. (ºF)	Mean (ºF)	High (ºF)	Year	Low (ºF)	Year	Highest Mean (ºF)	Year	Lowest Mean (ºF)	Year	>= 90 (ºF) #Days	<= 32 (ºF) #Days	<= 32 (ºF) #Days	>= 0 (ºF) #Days
January	12.0	-0.8	5.6	48	1963	-48	1989	25.7	1985	-17.3	2012	0.0	25.4	30.4	16.3
February	15.4	1.4	8.5	46	1970	-39	1954	26.1	1989	-13.2	1984	0.0	21.7	27.7	13.3
March	20.9	4.9	12.9	48	1954	-42	1956	29.4	1981	-3.1	1966	0.0	22.5	30.6	12.9
April	33.1	17.2	25.1	63	2004	-31	1956	35.7	2007	8.3	1985	0.0	12.1	27.9	4.4
May	49.6	32.6	41.1	80	1993	4	1965	48.1	1981	31.0	1964	0.0	1.3	15.3	0.0
June	59.9	43.1	51.5	86	1959	28	1960	57.8	1957	45.1	1978	0.0	0.0	0.6	0.0
July	62.6	48.0	55.3	86	1951	31	1959	61.1	2004	50.5	1959	0.0	0.0	0.0	0.0
August	59.7	46.6	53.1	87	2003	28	1984	59.4	2004	49.0	1969	0.0	0.0	0.1	0.0
September	52.1	38.6	45.3	72	1979	18	1957	50.2	1995	37.6	1992	0.0	0.1	5.5	0.0
October	35.8	24.4	30.1	65	1954	-6	2001	38.5	2006	20.9	2008	0.0	10.4	25.3	0.4
November	23.4	11.3	17.4	51	2002	-26	2008	27.4	1970	2.8	1963	0.0	20.8	28.5	6.7
December	14.1	1.2	7.6	49	2007	-41	1957	25.3	1985	-10.7	1999	0.0	25.0	30.5	15.4
Annual	36.6	22.4	29.5	87	2003	-48	1989	34.3	2002	24.7	1956	0.0	139.4	222.5	69.5
Winter	13.8	0.6	7.2	49	2007	-48	1989	21.8	2001	-2.7	1965	0.0	72.1	88.6	45.0
Spring	34.5	18.2	26.4	80	1993	-42	1956	36.6	1981	16.5	1972	0.0	36.0	73.8	17.3
Summer	60.7	45.9	53.3	87	2003	28	1960	58.8	2004	50.1	1965	0.0	0.0	0.7	0.0
Fall	37.1	24.8	30.9	72	1979	-26	2008	36.4	2002	25.1	2008	0.0	31.2	59.3	7.2

Table updated on Oct. 31, 2012

For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons

Winter = Dec., Jan., and Feb.
Spring = Mar., Apr., and May

Summer =Jun., Jul., and Aug.
Fall = Sep., Oct., and Nov.

Source: WRCC 2012

The DHS&EM Disaster Cost Index delineates historical weather events affecting the Village. The index lists the following event:

> ***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.*
>
> ***107. Tuntutuliak, March 2, 1990*** *Inclement weather and equipment failures prevented normal barge deliveries of winter fuel to the village of Tuntutuliak, causing a shortage as the winter progressed. The governor's declaration of disaster supported air delivery of supplies sufficient to last the winter. (DHS&EM 2013b).*

The Kuskokwim Delta area is continually impacted by severe weather. Figures 5-10 and 5-11 depict the Village's historic and future predicted precipitation and temperatures. Note the projected increasing precipitation due to climate changes. Increased rain and snow could dramatically increase flooding and erosion.

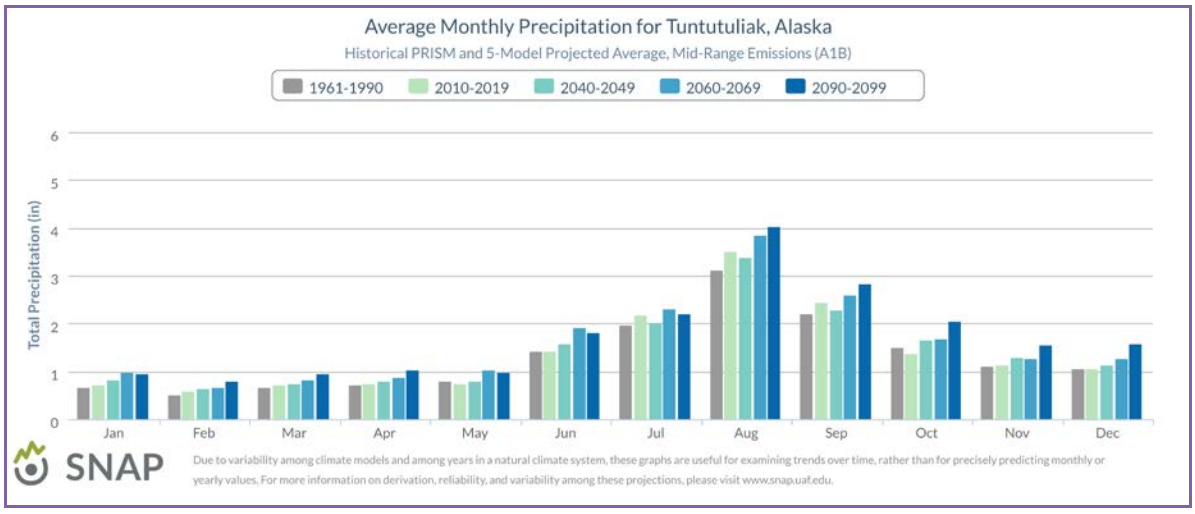


Figure 5-10 Tuntutuliak Historic and Predicted Precipitation (UAF/SNAP 2015)

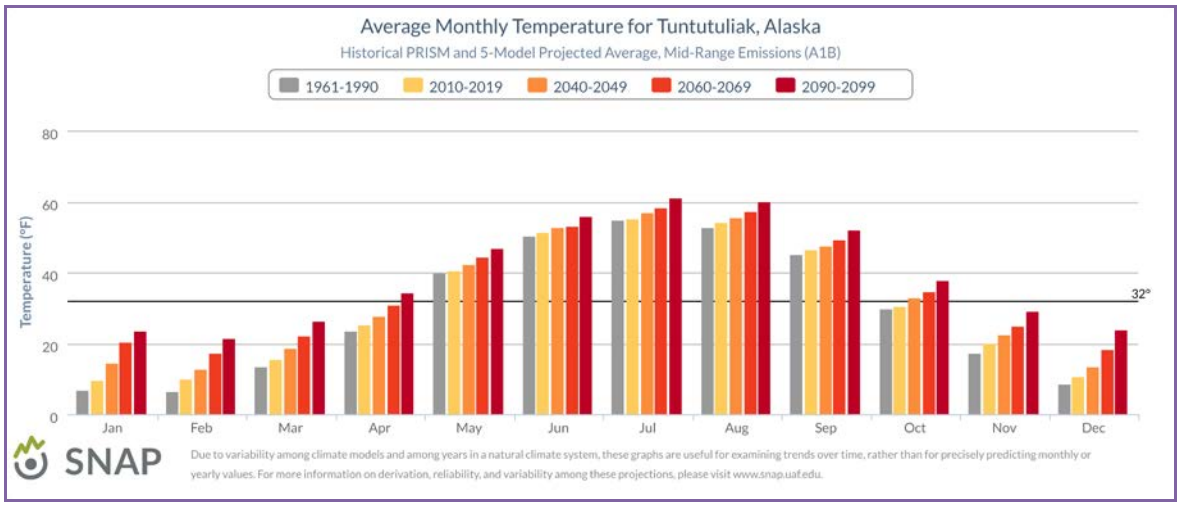


Figure 5-11 Tuntutuliak Historic and Predicted Temperatures (UAF/SNAP 2015)

5

Table 5-8 lists a representative sample of major storm events the National Weather Service (NWS) identified for the Kuskokwim Delta's Weather Zone. Each weather event may not have specifically impacted the Tuntutuliak area. These storm events are listed due to their close proximity to Tuntutuliak or by location within the Kuskokwim Delta zone.

Table 5-8 Wildfire Locations Since 1939 within 50 Miles of Tuntutuliak

Location	Date	Event Type	Magnitude
KUSKOKWIM DELTA (ZONE)	12/26/2012	Blizzard	Blizzard, Snow, Wind: A strong storm moved to the Bering Sea coast producing strong wind and snow with blowing snow. This resulted in blizzard conditions in the Kuskokwim Delta.
KUSKOKWIM DELTA (ZONE)	1/4/2010	Blizzard	Blizzard, Snow, Wind: A strong storm produced snow and strong wind that resulted in a blizzard along the coast of the Kuskokwim Delta. Light freezing rain also occurred further inland of the coast in the Bethel area.
KUSKOKWIM DELTA (ZONE)	12/20/2009	High Wind	Blizzard, Snow, Wind: 78 mph Episode Narrative: An intense Bering Sea Storm produced localized high wind along the Kuskokwim Delta and Bristol Bay coast of Alaska. The peak wind was 78 mph in this region. Platinum measured a peak gust of 68 KT. Based upon this observation it is estimated gust were at least this high in Kuskokwim Bay.
KUSKOKWIM DELTA (ZONE)	2/25/2009	Blizzard	Blizzard, Snow, Wind, Coastal Storm Surge: 100+ mph ($200K Damages) An intense hurricane force storm moved across the Aleutians into the eastern Bering Sea ... This storm produced hurricane force wind, blizzard conditions along the Bering Sea coast from Bristol Bay north across the Kuskokwim Delta. Wind gusts were reported in excess of 100 mph in the Pribilof Islands and in Bristol Bay. Extensive damage occurred to many homes and buildings.
KUSKOKWIM DELTA (ZONE)	1/30/2007	High Wind	Blizzard, Snow, Wind: 127 mph ($100K Damages) High Wind swept through southwest and south central Alaska and along the central Aleutians and Alaska Peninsula... Wide spread

Table 5-8 Wildfire Locations Since 1939 within 50 Miles of Tuntutuliak

Location	Date	Event Type	Magnitude
			power outages plagued the Kuskokwim Delta with this storm along with roofs being blown off two houses, two houses shifted on their foundation and minor tidal overflow along Kuskokwim Bay. Unconfirmed wind gusts were reported to 127 mph at Sand Point on the Alaska Peninsula with this storm.
KUSKOKWIM DELTA (ZONE)	11/16/2005	Blizzard	Blizzard, Snow, Wind: 44 mph Snow and blowing snow into the Kuskokwim Delta region. Strong cold advection and a tight pressure gradient produced winds that gusted up to 44 mph while reducing visibilities to 1/4 mile for nearly nine hours.
KUSKOKWIM DELTA (ZONE)	10/18/2002	Ice Storm	Blizzard, Snow, Wind, Ice: Overrunning of the arctic front...stalled south of Bethel...produced spotty areas of freezing rain in parts of Southwest Alaska. Bethel reported a thin coating of glaze ice and extremely slick roads around the area.
KUSKOKWIM DELTA (ZONE)	2/13/2002	Blizzard	Blizzard, Snow, Wind: Visibilities around Bethel were frequently at or below 1/4 mile in moderate snow and blowing snow. Visibilities were also at blizzard levels around Nunapitchuk. Blizzard conditions were reported around Bethel for 9 hours.
KUSKOKWIM DELTA (ZONE)	10/13/2000	Ice Storm	Ice Storm: ($5K Damages) Freezing rain...reported around Bethel by the observer at the Weather Service Office. Indications were that freezing rain was also falling in other parts of the Kuskokwim Delta. The event lasted a little over 7 hours. Temperatures rose above freezing into the upper 30s in the afternoon. A coating of ice was reported on structures such as buildings and also on cars. Several vehicles sustained minor damage.
KUSKOKWIM DELTA (ZONE)	1/2/2000	Extreme Cold/Wind Chill	Extreme Cold, Wind Chill: -70 F Wind chills reached -70°F along the coastal areas of the Kuskokwim Delta several times during the period.
KUSKOKWIM DELTA (ZONE)	12/25/1999	Winter Storm	Blizzard, Snow, Extreme Cold, Wind Chill: -70°F Blizzard conditions were reported across much of the southwest Alaskan coast, Bristol Bay, the eastern Aleutians and Pribilofs Sunday. Wind gusts reached close to 50 mph in places, with local wind chills to -70°F calculated in the southwest interior. By Sunday morning, freezing rain was locally reported across the Bristol Bay and Kuskokwim Valley zones. Two snowmachiners died in the Kuskokwim Delta on their way to Bethel, where warnings for wind chills to -75°F were in effect. Rain and freezing rain were preceded by locally heavy snows across much of the southern third of the Alaska mainland from Saturday afternoon through midday Sunday.
KUSKOKWIM DELTA (ZONE)	1/21/1999	High Wind	Heavy Snow, Driving Rain and Wind (80 mph): Brief blizzard conditions were reported locally along the southwest Alaskan coast. Blizzard conditions, followed by areas of freezing rain, plagued the southwest coast as the storm hit. Coastal flooding and movement of pack ice toward shore also caused local problems along the

Table 5-8 Wildfire Locations Since 1939 within 50 Miles of Tuntutuliak

Location	Date	Event Type	Magnitude
			southwest coast of the State. Up to 4 feet of coastal storm surge water was reported over the ice near Bethel along the Kuskokwim River. The forecast of impending hazardous weather prompted the cancellation of the Kuskokwim 500 dog race normally held at this time of year.

(NWS 2013, WRCC 2013)

5.3.4.3 Location, Extent, Impact, and Recurrence Probability

Location

The entire Kuskokwim Delta, which includes the Village of Tuntutuliak, experiences periodic severe weather impacts. The most common to the area are high winds and severe winter storms. Table 5-8 depicts weather events that have impacted the area since 1998 and are provided as a representative sample.

Extent

The entire Village is equally vulnerable to the severe weather effects. The Village experiences severe storm conditions with moderate snow depths; wind speeds exceeding 75 mph; and extreme low temperatures that reach -30ºF.

Based on past severe weather events and the criteria identified in Table 5-2, the extent of severe weather in the Village 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 the impact of a severe weather event within a community. Hurricane force winds, rain, snow, and winter storms can be expected to impact the entire Village of Tuntutuliak.

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 communities.

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 likely a severe storm event will occur in the next year with an event having up to 1 in 1 years (1/1=100%) chance of occurring as the history of events is greater than 33% likely per year.

5.3.5 Wildland Fire

5.3.5.1 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 tundra fires, urban fires, interface or intermix 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 that 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. 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 wildlife 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.

5.3.5.2 History

The Alaska Interagency Coordination Center (AICC) identified 42 tundra/wildland fires in close proximity (within approximately 50 miles) to the Village. Table 5-9 lists 18 fires that exceeded 20 acres, with the largest one burning 20,000 acres in 1940. Only five fires occurred within a 25 mile radius of the Village (Figure 5-12).

Table 5-9 Wildfire Locations Exceeding 20 Acres Since 1939 Within 50 Miles of Tuntutuliak

Fire Name	Fire Year	Estimated Acres	Latitude	Longitude	Cause
Gweek River	2014	25	60.95417	-161.564	Lightning
Kuskokuak Slough	2012	43	60.79922	-161.318	Lightning
Dall Lake	2008	170	60.39917	-163.173	Lightning
Nunap	2006	60	60.93333	-162.450	Lightning
Johnson River	2005	58	61.00000	-162.617	Human
Kipnuk	2003	80	60.11666	-163.583	Lightning
Bethel 2	2003	75	60.75000	-161.917	Human
Nunavakpak	1997	125	60.96667	-162.733	Lightning
Kipnuk	1997	27	59.81667	-163.767	Lightning
Bet E 11	1984	1,500	60.76667	-161.500	Human
Kwinhagak	1960	1,000	59.93333	-162.050	Unknown
Bethel 1/2S	1957	2,491	60.75000	-161.750	Debris Burning
Bethel 30-E	1957	1,000	60.83333	-161.917	Lightning
Bethel #2	1943	200	60.96667	-161.800	Lightning
Nunipitchuk	1941	1,500	60.93333	-162.217	Lightning
Nunipitchuk #2	1941	1,500	60.91667	-162.200	Lightning
Lomavik	1940	16,000	60.66667	-161.917	Unknown
Napaiskak	1940	20,000	60.58333	-162.117	Unknown

(AICC 2015)

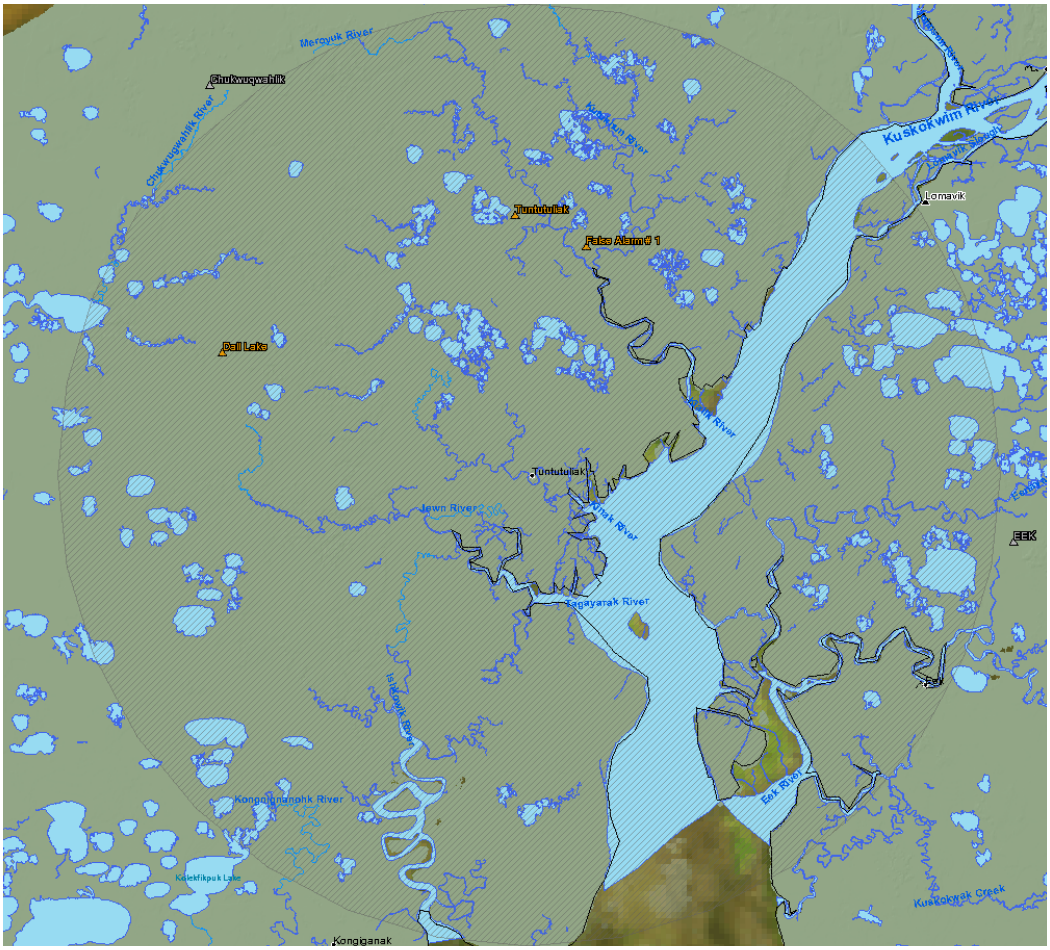


Figure 5-12 Tuntutuliak's Historical Wildfire Locations (AICC 2015)

5.3.5.3 Location, Extent, Impact, and Recurrence Probability

Location

Under certain conditions wildland fires may occur near the Village when weather, fuel availability, topography, and ignition sources combine. Since fuels data is not readily available, for the purposes of this plan, all areas outside Village limits are considered to be vulnerable to tundra/wildland fire impacts. Since 1938, only five wildland fire events have occurred within approximately 25 miles of the Village (Figure 5-10).

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.

5

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.

The 1940 Napaiskak fire burned approximately 20,000 acres. Due to poor records, the location is approximate. The cause of the fire was unknown. It is difficult to determine the average number of acres burned as the fires were vastly different for each of the 18 wildland fire events identified in Table 5-9 (AICC 2014). An average based on such diverse data would easily be overstated.

Based on the limited number of past wildland fire events and the criteria identified in Table 5-2, the magnitude and severity of impacts in the Village of Tuntutuliak are considered "Limited" with minor injuries, there is potential for critical facilities to be shut down for more than one week, more than 10 percent 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 that interfaces with the population center of the Village could grow into an emergency or disaster if not properly controlled. 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.

Fire is recognized as a critical feature of the natural history of many ecosystems. It is essential to maintain the biodiversity and long-term ecological health of the land. The role of wildland fire as an essential ecological process and natural change agent has been incorporated into the fire management planning process and the full range of fire management activities is exercised in Alaska, to help achieve ecosystem sustainability, including its interrelated ecological, economic, and social consequences on firefighters, public safety and welfare; natural and cultural resources threatened; and the other values to be protected dictate the appropriate management response to the fire. In Alaska, and within 50 miles of the Village of Tuntutuliak, the natural fire regime is characterized by a return interval of approximately 150 years due to their tundra vegetation, gently rolling topography.

Future Event Probability

An important issue related to the wildland or tundra fire probability is the interface fire of 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.

Based on the history of wildland fires in the Tuntutuliak area and applying the criteria identified in Table 5-3, it is "Unlikely" a wildland fire event will occur within in the next ten years. The event has up to 1 in 10 years chance of occurring and the history of events is less than or equal to 10 percent likely each year. Climate change and flammable vegetation species are prolific throughout Alaska's forests and tundra locations. Fire frequency may increase in the future as a result.

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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.
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 Repetitive Loss (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 Village of Tuntutuliak'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
Earthquake	100	100	100	100
Flood	100	100	100	100
Ground Failure	100	100	100	100
Severe Weather	100	100	100	100
Wildland Fire	100	100	100	100

6.2 LAND USE AND DEVELOPMENT TRENDS

6.2.1 Land Use

Land use in the Village is predominately residential with limited area for commercial services and community (or institutional) facilities. The surrounding areas are used for subsistence. Suitable developable vacant land is in short supply within the boundaries of the Village because of the wet nature of the landscape, and the sloping of the areas that are not wet. Open space and various hydrological bodies lay within the community and surrounding areas. The Planning Team noted the community is growing towards the west where there is higher ground. Tuntutuliak is connected by a system of boardwalks, which serve as roads. Primary travel is via ATV or snowmachine.

6.3 CURRENT ASSET EXPOSURE ANALYSIS

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 Village were obtained from the 2010 U.S. Census and the Department of Labor's estimate (DOL). The U.S. Census reports the Village's total population for 2010 as 408 and 2014 DOL data reported a population of 437 (Table 6-2).

Table 6-2 Estimated Population and Building Inventory

Population		Residential Buildings	
2010 Census	DCCED 2014 Data	Total Building Count	Total Value of Buildings[1]
408	437	110	US Census $10,725,000 Village: $19,250,000

Sources: Sources: Census 2010, DOL 2014 population data. American Community Survey 2013 housing data. US Census listed housing value at $97,500.
The Project Team determined that the average structural replacement value of the average single-family residential buildings is $175,000. The Project Team confirmed the 2010 Census household estimate of 110 structures.

Estimated replacement values for those structures, as shown in Table 6-2, were obtained from the U.S. Census Bureau, 2009-2013 5-Year American Community Survey.

The Planning Team stated that residential replacement values are generally understated because replacement costs exceed Census structure estimates due to material purchasing, barge or airplane delivery, and construction in rural Alaska. The Planning Team estimates an average 30ft by 40 ft (1,200 sq ft) residential structure costs $175,000. A total of 110 single-family residential buildings were considered in this analysis.

6.3.1.2 Existing Infrastructure

The Village of Tuntutuliak has benefited from numerous funding opportunities to assist them with upgrading their infrastructure. Table 6-3 list the Village's identified "completed" infrastructure improvement projects. They provide a depiction of the community's ongoing development trends and focus toward improving aging infrastructure.

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

Recipient	Award Year	Project Description/Comments	Project Status	Award Amount
Tuntutuliak Traditional Council	1984	Community Hall Completion	Closed	$0
Tuntutuliak Traditional Council	1985	Community Hall Completion	Closed	$0

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

Recipient	Award Year	Project Description/Comments	Project Status	Award Amount
Tuntutuliak Traditional Council	1988	Community Hall Completion	Closed	$0
Tuntutuliak Traditional Council	1994	Jailhouse	Closed	$25,000
Tuntutuliak Traditional Council	1995	Bulk Fuel Tank/Farm Dike	Closed	$25,000
Tuntutuliak Traditional Council	1996	Purchase of a Snowmachine and Four Wheeler and Accessories	Closed	$21,940
Tuntutuliak Traditional Council	1997	Erosion Control	Closed	$0
Tuntutuliak Traditional Council	1998	Erosion Control	Closed	$0
Tuntutuliak Traditional Council	1999	Community Building Restoration	Closed	$16,000
Tuntutuliak Traditional Council	1999	Jailhouse Construction Completion	Closed	$6,750
Tuntutuliak Traditional Council	2005	Community Projects & Improvements	Closed	$0
Tuntutuliak Traditional Council	2004	Temporary Fiscal Relief Grant	Closed	$3,500
Tuntutuliak Traditional Council	2003	State Revenue Sharing	Closed	$3,631
Tuntutuliak Traditional Council	2002	Community Hall Foundation Replacement	Closed	$35,026
Tuntutuliak Traditional Council	2002	Jail House Completion	Closed	$0
Tuntutuliak Traditional Council	2002	Post Office Construction	Closed	$0
Tuntutuliak Village Council	2010	Purchase Fuel and Electrical Power	Closed	$12,532
Tuntutuliak Traditional Council	2003	CP&I/ Community Facilities & Equipment	Closed	$24,759
Tuntutuliak Village Council	2013	Public Safety Equipment	Closed	$10,000
Tuntutuliak Village Council	2012	Public Safety Vehicle	Closed	$9,800

(DHS&EM 2014a)

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 Village 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 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 Village's critical facilities and infrastructure are listed in Table 6-4.

Table 6-4 Tuntutuliak's Critical Facilities and Infrastructure

Facilities	Number of Occupants	Facilities	Latitude	Longitude	Estimated Value	Building Type	Earthquake	Flood/Erosion	Ground Failure	Severe Weather	Wildland Fire
Government	10	Tribal Council/Community Hall/Headstart program	60.34407	-162.67030	$2,000,000	W2	X	X	X	X	X
	10	Tribal Offices	60.34407	-162.67030	$1,000,000	W2	X	X	X	X	X
	3	U.S. Post Office	60.34407	-162.67030	$125,000	W1	X	X	X	X	X
	3	National Guard Armory	60.34579	-162.67308	$250,000	W1	X	X	X	X	X
	0	Old National Guard Armory	N/A	N/A	$150,000	W1	X	X	X	X	X
Emergency Response	5	Village Public Safety Office (VPSO)	60.34360	-162.66693	$300,000	W1	X	X	X	X	X
	0	Fire Station (Equipment and Shop)	60.34132	-162.66578	$50,000	S1L	X	X	X	X	X
Education	150	Lewis Angapak Memorial School	60.34338	-162.67390	$60,000,000	W2	X	X	X	X	X
		Teachers quarters (currently used as overflow classroom space)	60.34314	-162.66427	$150,000	W1	X	X	X	X	X
Medical	10	Tuntutuliak Health Clinic (Kathleen Daniel Memorial Clinic)	60.34450	-162.669	$1,000,000	W1	X	X	X	X	X
Community	10	Teachers quarters (duplex)	60.34310	-162.67343	$300,000	W1	X	X	X	X	X
		Teachers quarters (duplex)	60.34310	-162.67343	$300,000	W1	X	X	X	X	X
		Teachers quarters (rented out for visitors)	N/A	N/A	$150,000	W1	X	X	X	X	X
	0	Old teachers quarters (rent to visitors sometimes)	N/A	N/A	$75,000	W1	X	X	X	X	X
	0	Old teachers quarters BIA building	N/A	N/A	$75,000	W1	X	X	X	X	X
	4	Play Deck	60.34337	-162.66465	$10,000	W1	X	X	X	X	X
	12	TCSA Electric Company offices	60.34107	-162.66650	$250,000	W2	X	X	X	X	X
	5	Old electric company offices (currently rented out to a family)	N/A	N/A	$50,000	W1	X	X	X	X	X

Table 6-4 Tuntutuliak's Critical Facilities and Infrastructure

Facilities	Number of Occupants	Facilities	Latitude	Longitude	Estimated Value	Building Type	Earthquake	Flood/Erosion	Ground Failure	Severe Weather	Wildland Fire
	20	Russian Orthodox Church	60.34293	-162.67875	$125,000	W1	X	X	X	X	X
	20	Moravian Church	60.34302	-162.66782	$100,000	W1	X	X	X	X	X
	0	Old Russian Orthodox Church	N/A	N/A	$50,000	W1	X	X	X	X	X
	0	Russian Orthodox cemetery	60.34244	-162.68156	$10,000	N/A	X	X	X	X	X
	0	Moravian Church cemetery	60.34410	-162.66995	$10,000	N/A	X	X	X	X	X
	0	New cemetery	N/A	N/A	$15,000	N/A	X	X	X	X	X
	6	Qinarmiut (village corporation) offices	N/A	N/A	$175,000	W1	X	X	X	X	X
	3	Qinarmiut gas station	N/A	N/A	$100,000	W1	X	X	X	X	X
	7	Qinarmiut store	60.34438	-162.66879	$300,000	W1	X	X	X	X	X
	7	Paul Andrew trading post	60.34338	-162.66937	$300,000	W1	X	X	X	X	X
	4	Peter Pavila store	N/A	N/A	$150,000	W1	X	X	X	X	X
	3	Pavila Evans store	N/A	N/A	$125,000	W1	X	X	X	X	X
	0	Qinarmiut Conex container storage #1	N/A	N/A	$3,000	N/A	X	X	X	X	X
		Qinarmiut Conex container storage #2	N/A	N/A	$3,000	N/A	X	X	X	X	X
		Qinarmiut Conex container storage #3	N/A	N/A	$3,000	N/A	X	X	X	X	X
		Qinarmiut Conex container storage #4	N/A	N/A	$3,000	N/A	X	X	X	X	X
		Qinarmiut Conex container storage #5	N/A	N/A	$3,000	N/A	X	X	X	X	X
	5	Coastal Village Regional Fund (CVRF) offices and shop	N/A	N/A	$175,000	W1	X	X	X	X	X
	0	Emergency Shelter between Kongiganak and Tuntutuliak	N/A	N/A	$30,000	W1	X	X	X	X	X
Roads	0	6 Miles of Boardwalk Roads	N/A	N/A	$12,000,000	N/A	X	X	X	X	X
Bridges	0	Boardwalk Bridge #1	N/A	N/A	$25,000	N/A	X	X	X	X	X
		Boardwalk Bridge #2	N/A	N/A	$25,000	N/A	X	X	X	X	X
		Boardwalk Bridge #3	N/A	N/A	$25,000	N/A	X	X	X	X	X
		Boardwalk Bridge #4	N/A	N/A	$25,000	N/A	X	X	X	X	X

Table 6-4 Tuntutuliak's Critical Facilities and Infrastructure

Facilities	Number of Occupants	Facilities	Latitude	Longitude	Estimated Value	Building Type	Earthquake	Flood/Erosion	Ground Failure	Severe Weather	Wildland Fire
		Boardwalk Bridge #5	N/A	N/A	$25,000	N/A	X	X	X	X	X
		Boardwalk Bridge #6	N/A	N/A	$25,000	N/A	X	X	X	X	X
Transportation	0	Tuntutuliak Airport (gravel surface runway is 3,025 feet long and 23 feet wide)	60.33535	-162.66702	$15,000,000	AFO	X	X	X	X	X
	0	Airport Storage Building #1	60.33886	-162.66136	$200,000	W1	X	X	X	X	X
	0	Airport Storage Building #2	N/A	N/A	$200,000	W1	X	X	X	X	X
	0	Barge Landing	N/A	N/A	$100,000	N/A	X	X	X	X	X
Utilities	2	TCSA Power Plant building	60.34253	-162.68847	$1,300,000	EPPS	X	X	X	X	X
	0	School generator	N/A	N/A	$150,000	N/A	X	X	X	X	X
	5	School shop	N/A	N/A	$75,000	W1	X	X	X	X	X
	0	School tank farm	60.34354	-162.67303	$1,000,000	OTF	X	X	X	X	X
	0	Airport tank farm (not in use)	N/A	N/A	$1,000,000	OTF	X	X	X	X	X
	0	Consolidated tank farm	N/A	N/A	$2,500,000	OTF	X	X	X	X	X
	8	Washeteria/Water treatment plant	60.34059	-162.66631	$3,500,000	S1L	X	X	X	X	X
	0	Washeteria Sewage Lagoon	60.3402	-162.67309	$500,000	N/A	X	X	X	X	X
	0	Community Sewage Lagoon	60.34367	-162.66459	$400,000	N/A	X	X	X	X	X
	0	Natural pond for waste discharge	N/A	N/A	$300,000	N/A	X	X	X	X	X
	0	Reservoir/Water Supply	60.34167	-162.66670	$300,000	N/A	X	X	X	X	X
	2	Water maintenance building	N/A	N/A	$100,000	S1L	X	X	X	X	X
	0	Wind turbines (4 operating, 1 not in use)	N/A	N/A	$3,700,000	EOOS	X	X	X	X	X
	0	Tuntutuliak Class III Landfill	60.34257	-162.69902	$700,000	N/A	X	X	X	X	X
Total Occ	315			**Total Damages**	$111,090,000						

(Tuntutuliak 2015, DHS&EM 2014b)

6.4 REPETITIVE LOSS PROPERTIES

DMA 2000 and its implementing regulations for estimating the number and type of structures 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, March 2015.

6.4.1 NFIP Participation

The Village of Tuntutuliak does not participate in the NFIP, neither do they have a repetitive flood property inventory that meets NFIP criteria as the loss thresholds are substantially below FEMA values.

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 consideration of probability or level of damage.

The methodology used a two pronged effort. First, the Project Team used the State's Critical Facility Inventory and locally obtained location and value data to identify critical facility locations in relation to potential hazard's threat exposure and vulnerability. This data were used to develop a vulnerability assessment for their identified hazards.

Replacement structure and contents values were determined by the community for their physical assets. 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

There is limited Geospatial Information System (GIS) data available for the Village of Tuntutuliak The following discussion contains information obtained from the Project Team and is summarized in Tables 6-5 and 6-6.

Table 6-5 Potential Hazard Exposure Analysis – Critical Facilities

		Government and Emergency Response		Educational		Medical		Community	
Hazard Type	Methodology	# Bldgs / # Occ	Value ($)	# Bldgs / # Occ	Value ($)	# Bldgs / # Occ	Value ($)	# Bldgs / # Occ	Value ($)
Earthquake	Descriptive	7/31	$3,875,000	2/150	$60,150,000	1/10	$1,000,000	21/107	$2,890,000
Flood/Erosion	Descriptive	7/31	$3,875,000	2/150	$60,150,000	1/10	$1,000,000	21/107	$2,890,000
Ground Failure	Descriptive	7/31	$3,875,000	2/150	$60,150,000	1/10	$1,000,000	21/107	$2,890,000
Severe Weather	Descriptive	7/31	$3,875,000	2/150	$60,150,000	1/10	$1,000,000	21/107	$2,890,000
Wildland Fire	Descriptive	7/31	$3,875,000	2/150	$60,150,000	1/10	$1,000,000	21/107	$2,890,000

Table 6-6 Potential Hazard Exposure Analysis – Critical Infrastructure

		Roads (Boardwalks)		Bridges		Transportation Facilities		Utilities	
Hazard Type	Methodology	Miles	Value ($)	No.	Value ($)	# Bldgs / # Occ	Value ($)	# Bldgs / # Occ	Value ($)
Earthquake	Descriptive	6	$12,000,000	6	$150,000	4/0	$15,500,000	14/17	$15,525,000
Flood/Erosion	Descriptive	6	$12,000,000	6	$150,000	4/0	$15,500,000	14/17	$15,525,000
Ground Failure	Descriptive	6	$12,000,000	6	$150,000	4/0	$15,500,000	14/17	$15,525,000
Severe Weather	Descriptive	6	$12,000,000	6	$150,000	4/0	$15,500,000	14/17	$15,525,000
Wildland Fire	Descriptive	6	$12,000,000	6	$150,000	4/0	$15,500,000	14/17	$15,525,000

6.7.1 Exposure Analysis – Hazard Narrative Summaries

Earthquake

The Village and surrounding area can expect to experience limited earthquake ground movement that may result in infrastructure damage. Some small shaking may be seen or felt based on past events. Although all structures are exposed to earthquakes, buildings within the Village 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, the entire Village area is not at risk of experiencing moderate or significant earthquake impacts as a result of its far proximity to known earthquake faults.

The probability is unlikely (see Section 5.3.1.3) that impacts to the community from ground movement may result in infrastructure damage and personal injury.

The entire existing, transient, and future Tuntutuliak population, residential structures, and critical facilities are exposed to the effects of "negligible" earthquake events. This includes approximately:

- 408 people in 110 residences (approximate value $19,250,000)
- 31 people in 7 government and emergency response facilities (approximate value $3,875,000)
- 150 people in 2 educational facilities (approximate value $60,150,000)
- 10 people in 1 medical facility (approximate value $1,000,000)
- 107 people in 21 community facilities (approximate value $2,890,00)
- 6 road system miles (approximate value $12,000,000)
- 6 bridges (approximate value $150,000)
- 0 people in 4 transportation facilities (approximate value $15,500,000)
- 17 people in 14 utility facilities (approximate value $15,525,000)

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, and 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 5.3.2.3).

No detailed 100 year flood analysis has been prepared for the Village, but the USACE provided an erosion assessment for Tuntutuliak. This includes approximately:

- 408 people in 110 residences (approximate value $19,250,000)
- 31 people in 7 government and emergency response facilities (approximate value $3,875,000)
- 150 people in 2 educational facilities (approximate value $60,150,000)
- 10 people in 1 medical facility (approximate value $1,000,000)
- 107 people in 21 community facilities (approximate value $2,890,00)
- 6 road system miles (approximate value $12,000,000)
- 6 bridges (approximate value $150,000)
- 0 people in 4 transportation facilities (approximate value $15,500,000)
- 17 people in 14 utility facilities (approximate value $15,525,000)

The Village anticipates that impacts to future populations, residential structures, critical facilities, and infrastructure will continue.

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 to 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.

Ground Failure hazards periodically cause structure and infrastructure displacement due to ground shifting, sinking, and upheaval. According to mapping completed by Jorgensen et al. and the DHS&EM, Tuntutuliak has sporadic or continuous permafrost (see Section 5.3.3.3).

There have been ground failure incidents in Tuntutuliak from subsidence. Threatened facilities include:

- 408 people in 110 residences (approximate value $19,250,000)
- 31 people in 7 government and emergency response facilities (approximate value $3,875,000)

- 150 people in 2 educational facilities (approximate value $60,150,000)
- 10 people in 1 medical facility (approximate value $1,000,000)
- 107 people in 21 community facilities (approximate value $2,890,00)
- 6 road system miles (approximate value $12,000,000)
- 6 bridges (approximate value $150,000)
- 0 people in 4 transportation facilities (approximate value $15,500,000)
- 17 people in 14 utility facilities (approximate value $15,525,000)

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, 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 5.3.4.3 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 Village of Tuntutuliak and the National Weather Service, the entire existing, transient, and future Tuntutuliak population, residential structures, and critical facilities are exposed to future severe weather impacts. This includes approximately:

- 408 people in 110 residences (approximate value $19,250,000)
- 31 people in 7 government and emergency response facilities (approximate value $3,875,000)
- 150 people in 2 educational facilities (approximate value $60,150,000)
- 10 people in 1 medical facility (approximate value $1,000,000)
- 107 people in 21 community facilities (approximate value $2,890,00)
- 6 road system miles (approximate value $12,000,000)
- 6 bridges (approximate value $150,000)
- 0 people in 4 transportation facilities (approximate value $15,500,000)
- 17 people in 14 utility facilities (approximate value $15,525,000)

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

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 5.3.6.3 provides additional detail regarding wildland/tundra fire impacts.

According to the Alaska Fire Service, there are no wildland fire areas within Tuntutuliak's boundaries. However, nine wildland fires have occurred within a 50-mile radius of the Village (see Section 5.3.5.3). There is a slight potential for wildland fire to interface with the population center of the Village. This area includes approximately:

- 408 people in 110 residences (approximate value $19,250,000)
- 31 people in 7 government and emergency response facilities (approximate value $3,875,000)
- 150 people in 2 educational facilities (approximate value $60,150,000)
- 10 people in 1 medical facility (approximate value $1,000,000)
- 107 people in 21 community facilities (approximate value $2,890,00)
- 6 road system miles (approximate value $12,000,000)
- 6 bridges (approximate value $150,000)
- 0 people in 4 transportation facilities (approximate value $15,500,000)
- 17 people in 14 utility facilities (approximate value $15,525,000)

6.8 FUTURE DEVELOPMENT

Table 6-7 delineates a future, planned, and funded project for Tuntutuliak and its tentative completion status, as of the beginning of 2015.

Table 6-7 Planned and Funded Projects

Grant Recipient	Award Year	Project Description/Comments	Project Status	Award Amount	End Date
Tuntutuliak Traditional Council	2012	Alaska Energy Authority – Tuntutuliak Power System Upgrade	Active	$1,832,600	6/30/2019
Tuntutuliak Traditional Council	2015	Alaska Energy Authority – Tuntutuliak Power System Upgrade (additional funds)	Active	$750,000	6/30/2019
Lower Kuskokwim School District	2014	Lewis Angapak K-12 School Renovation/Addition	Active	$55,462,324	Not Specified

(DHS&EM 2014c)

Section Seven outlines the six-step process for preparing a mitigation strategy including:

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 2000 and its implementing regulations for comprehensive mitigation strategy development:

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. 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?
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?
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 VILLAGE OF TUNTUTULIAK'S CAPABILITY ASSESSMENT

The Village's capability assessment reviews the technical and fiscal resources available to the community. DMA 2000 and its implementing regulations for technical and fiscal resources available to the community for HMP project implantation and management:

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.

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

Table 7-1 Tuntutuliak's Regulatory Tools

Regulatory Tools (ordinances, codes, plans)	Existing Yes/No?	Comments (Year of most recent update; problems administering it, etc.)
Comprehensive Plan	No	A comprehensive planning effort is in progress
Land Use Plan	No	Land use planning will be included in the Comprehensive Plan
Tribal Land Use Plan	No	
Emergency Response Plan	No	
Wildland Fire Protection Plan	No	
Building code	No	
Zoning ordinances	No	
Subdivision ordinances or regulations	No	
Special purpose ordinances	No	

Local Resources

The Village 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 Tuntutuliak'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	No	The Village consult with outside staff to determine land management practices
Engineer or professional trained in construction practices related to buildings and/or infrastructure	No	The Village consults with engineers
Planner or engineer with an understanding of natural and/or human-caused hazards	No	The Village consults with regional experts
Floodplain Manager	No	The Village consults with the State flood manager
Surveyors	No	The Village consults with surveyors
Staff with education or expertise to assess the jurisdiction's vulnerability to hazards	No	The Village consults with outside staff to determine hazard vulnerability
Personnel skilled in Geospatial Information System (GIS) and/or Hazards Us-Multi Hazard (Hazus-MH) software	No	The Village consults with GIS specialists
Scientists familiar with the hazards of the jurisdiction	No	The Village consults with scientists
Emergency Manager	No	There is not an Emergency Manager in the Village
Finance (Grant writers)	Yes	The Village Administrator
Public Information Officer	Yes	The Village President

Table 7-3 Financial Resources Available for Hazard Mitigation

Financial Resource	Accessible or Eligible to Use for Mitigation Activities
General funds	Can exercise this authority with tribal council approval
Payment in Lieu of Taxes (PILT)	Not available
Municipal Energy Assistance Program (MEAP)	Not available
Indian Community Development Block Grants (CDBG)	Can exercise this authority with voter option
Capital Improvement Project Funding	Can exercise this authority with voter option
Authority to levy taxes for specific purposes	Not available
Incur debt through general obligation bonds	Not available
Incur debt through special tax and revenue bonds	Not available
Incur debt through private activity bonds	Not available
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. *Tuntutuliak does not qualify for this funding source because they do not participate in the NFIP.*

Table 7-3 Financial Resources Available for Hazard Mitigation

Financial Resource	Accessible or Eligible to Use for Mitigation Activities
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 Village of Tuntutuliak 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.

7

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. Goal statements are typically long-range, policy-oriented statements representing community-wide visions. As such, nine goals were developed to reduce or avoid long-term vulnerabilities to the identified hazards (Table 7-4).

Table 7-4 Mitigation Goals

No.	Goal Description
Multi-Hazards (MH)	
MH 1	Provide **outreach** activities to educate and promote recognizing and mitigating all natural and manmade hazards that affect the Native Village of Tuntutuliak (Village).
MH 2	**Cross-reference** mitigation goals and actions with other Village planning mechanisms and projects.
MH 3	Develop **construction** activities that reduce possibility of losses from all natural and manmade hazards that affect the 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.
WF 8	Reduce structural vulnerability to Tundra/Wildland Fire (WF) damage.

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.

After developing mitigation goals, the Planning Team reviewed a comprehensive list of potential mitigation actions that were identified during this HMP development process.

The Planning Team assessed the potential mitigation actions to carry forward into the mitigation strategy. Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Mitigation actions are usually grouped into three broad categories: property protection, public education and awareness, and structural projects.

On May 26, 2015, the Planning Team selected 26 natural hazard mitigation actions for potential Mitigation Action Plan (MAP) implementation during the five-year life cycle of this HMP. The Planning Team placed particular emphasis on projects and programs that reduce the effects of hazards on both new and existing buildings and infrastructure as well as facilities located in potential flood zones to comply with NFIP requirements should the Village join the NFIP.

The table breaks out the project criteria as considered, selected, ongoing, and completed. The Planning Team considered projects from a comprehensive list for each hazard type. They identified numerous "ongoing" mitigation actions currently in-process. The Planning Team then selected "newly identified" actions identified through this plan development activity that would most benefit the community. These projects are listed in Table 7-5 below.

Table 7-5 Potential Mitigation Actions

(Ongoing and newly selected items will be carried forward into the MAP implementation)

Supports Goal No.	Hazard	Criteria *Considered Selected Ongoing Completed*	Action Description
Multi-Hazards (MH)			
MH 1	Provide **outreach** activities to educate and promote recognizing and mitigating **all** natural and manmade hazards that affect the Native Village of Tuntutuliak (Village).	Ongoing	Continue the Hazard Mitigation Planning Team's forward progress to implement, monitor, review, and evaluate hazard and mitigation actions.
		Selected	Identify and pursue funding opportunities to implement mitigation actions.
		Selected	Disseminate FEMA pamphlets to educate and encourage homeowners concerning structural and non-structural retrofit benefits.
		Considered	Investigate benefits of, and potentially join the National Flood Insurance Program to reduce monetary losses to individuals and the community.
		Considered	Develop an outreach program to educate public concerning NFIP participation benefits, floodplain development, land use regulation, and NFIP flood insurance availability to facilitate continued compliance with NFIP.
		Considered	Identify evacuation routes away from high hazard areas and develop outreach program to educate the public concerning warnings and evacuation procedures.
MH 2	**Cross-reference** mitigation goals and actions with other Tribal planning mechanisms and projects.	Ongoing	Develop and incorporate mitigation provisions and recommendations into all community plans and community development processes to maintain protect critical infrastructure, residences, and population from natural hazard impacts.
		Selected	Integrate the Mitigation Plan's hazard vulnerability assessment findings for enhanced emergency planning.
		Considered	Prohibit new construction in identified mitigatable hazard impact areas (ground failure, flood, erosion, etc.)
		Considered	Identify and list repetitively flooded structures and infrastructure, analyze the threat to these facilities, and raise mitigation action priorities to protect the threatened population.
MH 3	Develop **construction activities** that reduce possibility of losses from **all** natural and manmade	Completed	Encourage utility companies to evaluate and harden vulnerable infrastructure elements (power lines, utility poles, fuel headers, etc.) for sustainability.
		Selected	Acquire (buy-out), demolish, elevate, or relocate structures from hazard prone areas (erosion, flood, ground failure, etc.), including residential structures near the Qinaq River.

Table 7-5 Potential Mitigation Actions

(Ongoing and newly selected items will be carried forward into the MAP implementation)

Supports Goal No.	Hazard	Criteria *Considered Selected Ongoing Completed*	Action Description
	hazards that affect the Village.		
Natural Hazards			
EQ 4	Reduce vulnerability of structures to earthquake damage.	Considered	Install non-structural seismic restraints for large furniture such as bookcases, filing cabinets, heavy televisions, and appliances to prevent toppling damage and resultant injuries to small children, elderly, and pets.
		Considered	Inspect, prioritize, and retrofit any critical facility or public infrastructure that does not meet current State Adopted Building Codes.
FL 5	Reduce the possibility of damage and losses from flooding and erosion.	Selected	Determine and implement the most cost beneficial and feasible mitigation actions for locations with repetitive flooding or potential for boardwalk obstruction.
		Selected	Elevate residential, public, or critical facilities at least two feet above the base flood elevation, on gravel pads or pilings.
		Selected	Provide wastewater treatment systems flood protection to prevent erosion damage and sewage lagoons out-wash. Prevent flooding and ground failure of existing sewage pits.
		Selected	Develop mitigation initiatives such as: Rip-rap (large rocks), sheet pilings, gabion baskets, articulated matting, concrete, asphalt, vegetation, or other armoring or protective materials to provide river bank protection along the Qinaq River.
		Selected	Improve and/or elevate boardwalks in order to protect against flooding and ground failure.
		Selected	Repair and replace existing revetment in lower Tuntutuliak that has eroded along the Qinaq River. Extend revetment to protect upper Tuntutuliak along the Qinaq River.
GF 6	Reduce possibility of damage and losses from ground failure.	Ongoing	Complete a ground failure (avalanche, landslide, permafrost etc.) location inventory; identify (and map) threatened critical facilities, residential buildings, infrastructure, and other essential buildings.
		Selected	Promote permafrost sensitive construction practices in permafrost areas.
SW 7	Reduce vulnerability of structures to severe weather damage.	Selected	Reinforce buildings and homes against high winds to prevent damage.
		Considered	Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms (snow load, ice, and wind).
WF 8	Reduce structural vulnerability to tundra/wildland Fire (WF) damage.	Selected	Identify, develop, implement, and enforce mitigation actions such as fuel breaks and reduction zones for potential wildland fire hazard areas.
		Selected	Update fire-fighting equipment and ensure operability of existing equipment.

7.5 EVALUATING AND PRIORITIZING MITIGATION ACTIONS

DMA 2000 stipulated and implementing regulations for evaluating and implementing mitigation actions:

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 April 2, 2015 to determine which actions would be included in the Mitigation Action Plan. The Mitigation Action Plan represents mitigation projects and programs to be implemented through the cooperation of multiple entities in the Village. To complete this task, the Planning Team first prioritized the hazards that were regarded as the most significant within the community (earthquake, erosion, flood, ground failure, severe weather, and wildfire).

The Planning Team reviewed the simplified social, technical, administrative, political, legal, economic, and environmental (STAPLEE) evaluation criteria (Table 7-6) and the Benefit-Cost Analysis Fact Sheet (Appendix E) 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 Village chooses to implement.

Table 7-6 Evaluation Criteria for Mitigation Actions

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

Table 7-6 Evaluation Criteria for Mitigation Actions

Evaluation Category	Discussion "It is important to consider…"	Considerations
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

On May 26, 2015, the hazard mitigation Planning Team prioritized natural hazard mitigation actions that were selected to carry forward into the Mitigation Action Plan (MAP).

The hazard mitigation Planning Team considered each hazard's history, extent, and 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 Village with an implementation approach.

7.6 MITIGATION ACTION PLAN

Table 7-7 delineates the acronyms used in the Mitigation Action Plan (Table 7-8). See Appendix A for summarized agency funding source descriptions.

Table 7-7 Potential Funding Source Acronym List

Village of Tuntutuliak (Village)
Qinarmiut Corporation 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)
Economic Development Administration (EDP)
Public Works and Development Facilities Program (PWDFP)
US Environmental Protection Agency (EPA)/
Indian Environmental General Assistance Program (IGAP)

US Department of Agriculture (USDA) /
USDA, Farm Service Agency
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)
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) /
V*illage 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 Village's Mitigation Action Plan, Table 7-8, depicts how each mitigation action will be implemented and administered by the Planning Team. The MAP delineates each selected mitigation action, its priorities, the responsible entity, the anticipated implementation timeline, and provides a brief explanation as to how the overall benefit/costs and technical feasibility were taken into consideration.

Table 7-8 Village of Tuntutuliak's Mitigation Action Plan (MAP)

(See acronym and abbreviations list for complete titles)

Action ID	Description	Priority (High, Medium, Low)	Responsible Office or Agency	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (B/C) Technical Feasibility (TF)
MH 1.1	Continue the Hazard Mitigation Planning Team's forward progress to implement, monitor, review, and evaluate hazard and mitigation actions.	Medium	Native Village of Tuntutuliak (Tribal Office)	Tribe	1-3 years	B/C: The existing team has gained experienced throughout this process which can provide invaluable insight for ensuring a sustained effort toward mitigating natural hazard damages. TF: This is feasible to accomplish as no cost is associated with the action and only relies on member availability and willingness to serve their community.
MH 1.2	Identify and pursue funding opportunities to implement mitigation actions.	High	Tribal Office	Tribe	Ongoing	B/C: This ongoing activity is essential for the Village as there are limited funds available to accomplish effective mitigation actions. TF: This activity is ongoing demonstrating its feasibility.
MH 1.3	Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all identified natural hazards.	Medium	Tribal Office	Tribe, FEMA HMA, HMGP, DOF	1-3 years	B/C: FEMA provides free publications for community education purposes. TF: Low to no cost makes this a very feasible project to successfully educate large populations.
MH 2.1	Develop and incorporate mitigation provisions and recommendations into all community plans and community development processes to maintain protect critical infrastructure, residences, and population from natural hazard impacts.	High	Tribal Office	Tribe, Denali, DCRA	Ongoing	B/C: Coordinated planning ensures effective damage abatement and ensures proper attention is assigned to reduce losses and damage to structures and Village residents. TF: This is technically feasible because it requires application of knowledge of the hazard mitigation plan and other planning efforts. Feasibility is reliant on technical skills already possessed by employees holding positions that would implement this action.

Table 7-8 Village of Tuntutuliak's Mitigation Action Plan (MAP)

(See acronym and abbreviations list for complete titles)

Action ID	Description	Priority (High, Medium, Low)	Responsible Office or Agency	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (B/C) Technical Feasibility (TF)
MH 2.2	Integrate the Mitigation Plan's hazard vulnerability assessment findings for enhanced emergency planning.	Low	Tribal Office	Tribe	1-3 years	B/C: Coordinated planning will improve local responses in natural hazard emergencies. TF: This action is feasible with current staff and limited fund expenditures.
MH 3.1	Acquire (buy-out), demolish, elevate, or relocate structures from hazard prone area (erosion, flood, ground failure, etc.), including residential structures near the Qinaq River.	High	Tribal Office	Tribe, HMA, NRCS, ANA, USACE, USDA, Lindbergh	1-5 years	B/C: This project would remove threatened structures from hazard areas, eliminating future damage while keeping land clear for perpetuity. TF: This project is feasible using existing staff skills, equipment, and materials. Acquiring contractor expertise may be required for large facilities.
FL 5.1	Determine and implement the most cost beneficial and feasible mitigation actions for locations with repetitive flooding or potential for boardwalk obstruction.	Low	Tribal Office	HMA, ANA, DOT/PF, Denali Commission, NRCS, USACE, USDA/EWP, USDA/ECP, DCRA/ ACCIMP	3-5 years	B/C: This project would prevent future inundation of flood-prone boardwalk segments. TF: This project is feasible using existing staff skills, equipment, and materials.
FL 5.2	Elevate residential, public, or critical facilities at least two feet above the base flood elevation, on gravel pads or pilings.	High	Tribal Office	Tribe, HMA, ANA, EFSP, DOT/PF	2-4 years	B/C: Elevation projects can be very cost effective methods for communities as materials and shipping costs are very high. Project viability is depending on the cost and extent of the modifications. A comprehensive BCA needs to be conducted to validate this activity. TF: The Village will need phase funding to obtain engineering and design expertise to determine project viability.

Table 7-8 Village of Tuntutuliak's Mitigation Action Plan (MAP)

(See acronym and abbreviations list for complete titles)

Action ID	Description	Priority (High, Medium, Low)	Responsible Office or Agency	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (B/C) Technical Feasibility (TF)
FL 5.3	Protect wastewater treatment systems flood protection to prevent erosion damage, sewage lagoons out-wash, and ground failure or flooding of sewage pits.	High	Tribal Office	Tribe, HMA, ANA, DOT/PF, Denali, NRCS, USACE, USDA/EWP, USDA/ECP, DCRA/ ACCIMP	3-5 years	B/C: Hardening infrastructure to reduce flood related damages potentially reduces future damages and replacement costs. TF: The Village has the technical capability to manage and conduct this project.
FL 5.4	Develop mitigation initiatives such as: Rip-rap (large rocks), sheet pilings, gabion baskets, articulated matting, concrete, asphalt, vegetation, or other armoring or protective materials to provide river bank protection along the Qinaq River.	High	Tribal Office	Tribe, HMA, ANA, NRCS, USACE	Ongoing	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: The community has the skill to implement this action. Specialized skills may need to be contracted out with materials and equipment barged in depending on the method selected.
FL 5.5	Improve and/or elevate boardwalks in order to protect against flooding and ground failure.	High	Tribal Office	Tribe, HMA, ANA, EFSP, DOT/PF	Ongoing	B/C: Elevation projects can be very cost effective methods for communities as materials and shipping costs are very high. Project viability is depending on the cost and extent of the modifications. A comprehensive BCA needs to be conducted to validate this activity. TF: The Village will need phase funding to obtain engineering and design expertise to determine project viability.
FL 5.6	Repair and replace existing revetment in lower Tuntutuliak that has eroded along the Qinaq River.	High	Tribal Office	Tribe, HMA, ANA, DOT/PF, Denali, NRCS, USACE,	1-3 years	B/C: The existing revetment is in need of repair, and much of the community has no revetment protection. Revetment work is needed to protect

Table 7-8 Village of Tuntutuliak's Mitigation Action Plan (MAP)

(See acronym and abbreviations list for complete titles)

Action ID	Description	Priority (High, Medium, Low)	Responsible Office or Agency	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (B/C) Technical Feasibility (TF)
	Extend revetment to protect upper Tuntutuliak along the Qinaq River.			USDA/EWP, USDA/ECP, DCRA/ ACCIMP		the Village from flooding and erosion. TF: This project would likely be feasible using existing staff skills, equipment, and materials with outside funding and contracted design work.
GL 6.1	Complete a ground failure (avalanche, landslide, permafrost etc.) location inventory; identify (and map) threatened critical facilities, residential buildings, infrastructure, and other essential buildings.	Medium	Tribal Office	Tribe, HMA, ANA, EFSP, CVRF	2-4 years	B/C: This outreach project would identify in detail ground failure priority areas, which would help guide funding actions. TF: Technically feasible with tribal staff and possibly with help from a consultant for GIS work. This activity would likely be a minor cost if tribal labor is used to the greatest extent possible.
GF 6.2	Promote permafrost sensitive construction practices in permafrost areas.	High	Tribal Office	Tribe, HMA, ANA	Ongoing	B/C: This outreach project would decrease damage to facilities if they were sited and used the most appropriate construction practices. TF: Technically feasible as the community currently has identified permafrost locations but they have not created a map defining the area and they dig test holes to determine permafrost depth prior to construction.
SW 7.1	Reinforce buildings and homes against high winds to prevent damage.	High	Tribal Office	Tribe, DCCED/CDBG, Denali	Ongoing	B/C: Scheduling maintenance and implementing mitigation activities will potentially reduce severe winter storm damages caused by heavy snow loads, wind, and freezing rain. TF: This type activity is technically feasible within the community typically using existing labor, equipment, and materials. Specialized methods are not new to rural communities as they are used to importing required contractors.

Table 7-8 Village of Tuntutuliak's Mitigation Action Plan (MAP)

(See acronym and abbreviations list for complete titles)

Action ID	Description	Priority (High, Medium, Low)	Responsible Office or Agency	Potential Funding Source(s)	Timeframe (1-3 Years 2-4 Years 3-5 Years)	Benefit-Costs (B/C) Technical Feasibility (TF)
WF 9.1	Identify, develop, implement, and enforce mitigation actions such as fuel breaks and reduction zones for potential wildland fire hazard areas.	High	Tribal Office	Tribe, AFG, FP&S, SAFER, DOF FireWise Program	1-3 years	B/C: This sustainable mitigation activity will greatly reduce the wildland/urban interface, have minimal cost, and will help build and support community capacity to respond to wildland fire disasters. TF: This project is technically feasible using existing Tribal Council staff.
WF 9.2	Update fire-fighting equipment and ensure operability of existing equipment.	High	Tribal Office	Tribe, AFG, FP&S, SAFER, DOF FireWise Program	1-3 years	B/C: This project will ensure the community looks closely at their wildland fire hazard to ensure they can safely address actions and needs during a wildland fire event. TF: This project is technically feasible using existing Tribal Council staff.

7.7 IMPLEMENTING MITIGATION STRATEGY INTO EXISTING PLANNING MECHANISMS

DMA 2000 and its implementing regulations for implementing the HMP into existing planning mechanisms:

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.
1. REGULATION CHECKLIST
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.

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

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Appendix A
Funding Resources

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Appendix A: 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 Unified Hazard Mitigation Assistance (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/hazard-mitigation-planning-resources#1)
    - Local Mitigation Planning Handbook, March 2013. This handbook explains the basic concepts of hazard mitigation and provides guidance to local governments on developing or updating hazard mitigation plans to meet the requirements of Title 44 Code of Federal Regulations (CFR) §201.6 for FEMA approval and eligibility to apply for FEMA Hazard Mitigation Assistance grant programs. (http://www.fema.gov/library/viewRecord.do?id=7209)
    - 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. (https://www.fema.gov/media-library/assets/documents/3412)
    - The 2015 Hazard Mitigation Assistance (HMA) Guidance and Addendum, February 27 and March 3, 2015 respectively. Part I of the HMA Guidance introduces the three

HMA programs, identifies roles and responsibilities, and outlines the organization of the document. This guidance applies to Hazard Mitigation Grant Program (HMGP) disasters declared on or after the date of publication unless indicated otherwise. This guidance is also applicable to the Pre-Disaster Mitigation (PDM) and Flood Mitigation Assistance (FMA) Programs; the application cycles are announced via http://www.grants.gov/. The guidance in this document is subject to change based on new laws or regulations enacted after publication.

- FEMA, http://www.fema.gov - includes links to information, resources, and grants that communities can use in planning and implementing community resilience and sustainability measures.
- 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. (https://www.fema.gov/fiscal-year-2015-emergency-management-performance-grant-program)
  - National Earthquake Hazards Reduction Program (NEHRP). 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. (https://www.fema.gov/national-earthquake-hazards-reduction-program)

    The NEHRP agencies pursue the goals of the program through collaboration with each other and numerous partners. In addition to other federal agencies, program partners include state and local governments, universities, research centers, professional societies, trade associations and businesses, as well as associated councils, commissions and consortia.

    NEHRP's work encompasses research, development and implementation activities. Program research helps to advance our understanding of why and how earthquakes occur and impact the natural and built environments. The program develops strategies, tools, techniques and other measures that can reduce the adverse effects of earthquakes and facilitates and promotes implementation of these measures, thereby strengthening earthquake resilience among at-risk communities.

    Detailed information about the program is available at NEHRP.gov, which is maintained by the National Institute of Standards and Technology (NIST), the lead agency for NEHRP. For additional agency-specific information, visit FEMA Earthquake, the USGS Earthquake Hazards Program, the NIST NEHRP Office and the National Science Foundation.

- 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/vfa.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. (https://www.dhs.gov/homeland-security-grant-program-hsgp)
  - 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. (http://www.dhs.gov/citizen-corps)
  - Emergency Operations Center (EOC) Guidance. 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. (https://www.fema.gov/media-library/assets/documents/20622)
  - Emergency Alert System (EAS). Resilient public alert and warning tools are essential to save lives and protect property during times of national, state, regional, and local emergencies. The EAS is used by alerting authorities to send warnings via broadcast, cable, satellite, and wireline communications pathways. Emergency Alert System participants, which consist of broadcast, cable, satellite, and wireline providers, are the stewards of this important public service in close partnership with alerting officials at all levels of government. The EAS is also used when all other means of alerting the public are unavailable, providing an added layer of resiliency to the suite of available emergency communication tools. The EAS is in a constant state of improvement to ensure seamless integration of CAP-based and emerging technologies. (https://www.fema.gov/emergency-alert-system)

- U.S. Department of Commerce's grant programs include:
  - 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. (http://www.tsunami.noaa.gov/warning_system_works.html)

- 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. (http://www.federalgrants.com/Remote-Community-Alert-Systems-Program-11966.html). This program is a contributing element of the Warning, Alert, and Response Network (WARN) Act.

- 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/landscape/ewpp/)
    - 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. 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. (http://www1.eere.energy.gov/wip/wap.html)
    - 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://energy.gov/eere/wipo/tribal-energy-program)
- 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://dec.alaska.gov/water/MuniGrantsLoans/index.htm)
    - 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. (https://ofmpub.epa.gov/apex/watershedfunding/f?p=109:2:0::NO::P2_X_PROG_NUM,P2_X_YEAR:51,2015)
    - Indian Environmental General Assistance Program (IGAP). In 1992, Congress passed the Indian Environmental General Assistance Program Act (42 U.S.C. 4368b) which authorizes EPA to provide General Assistance Program (GAP) grants to federally-recognized tribes and tribal consortia for planning, developing, and establishing environmental protection programs in Indian country, as well as for developing and implementing solid and hazardous waste programs on tribal lands. (http://www.epa.gov/tribal/gap/)
- 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 application information. (http://www.acf.hhs.gov/grants/open/foa/)

- 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/)
  - 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:

    The Indian Housing Block Grant Program (IHBG) is a formula grant that provides a range of affordable housing activities on Indian reservations and Indian areas. The block grant approach to housing for Native Americans was enabled by the Native American Housing Assistance and Self Determination Act of 1996 (NAHASDA).

    Eligible IHBG recipients are Federally recognized Indian tribes or their tribally designated housing entity (TDHE), and a limited number of state recognized tribes who were funded under the Indian Housing Program authorized by the United States Housing Act of 1937 (USHA). With the enactment of NAHASDA, Indian tribes are no longer eligible for assistance under the USHA.

    An eligible recipient must submit to HUD an Indian Housing Plan (IHP) each year to receive funding. At the end of each year, recipients must submit to HUD an Annual Performance Report (APR) reporting on their progress in meeting the goals and objectives included in their IHPs.

    Eligible activities include housing development, assistance to housing developed under the Indian Housing Program, housing services to eligible families and individuals, crime prevention and safety, and model activities that provide creative

approaches to solving affordable housing problems. (http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/ih/grants/ihbg)

- 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/)
- HUD/Indian Community Development Block Grants (ICDBG) provide grant assistance and technical assistance to aid communities or Indian tribes 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://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/ih/grants/icdbg)

- Department of Labor (DOL), Employment and Training Administration, Disaster Unemployment Assistance (DUA). 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 (USDOT), Hazardous Materials Emergency Preparedness (HMEP) Grant. The Hazardous Materials Transportation Safety and Security Reauthorization Act of 2005 authorizes the USDOT to provide assistance to public sector employees through training and planning grants to States, Territories, and Native American tribes for emergency response. The purpose of this grant program is to increase State, Territorial, Tribal, and local effectiveness in safely and efficiently handling hazardous materials accidents and incidents, enhance implementation of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), and encourage a comprehensive approach to emergency training and planning by incorporating the unique challenges of responses to transportation situations. (http://www.phmsa.dot.gov/hazmat/grants)
- 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/Businesses/Small-Businesses-%26-Self-Employed/Disaster-Assistance-and-Emergency-Relief-for-Individuals-and-Businesses-1)

- U.S. Small Business Administration (SBA) Disaster Assistance Loans and Grants program provides information concerning disaster assistance, preparedness, planning, cleanup, and recovery planning. (https://www.sba.gov/category/navigation-structure/loans-grants)
    - May provide low-interest disaster loans to individuals and businesses that have suffered a loss due to a disaster. (https://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. The USACE is a member and co-chair of the Alaska Climate Change Sub-Cabinet.
    - Civil Works and Planning (http://www.poa.usace.army.mil/Missions/CivilWorksandPlanning.aspx)
    - Environmental Resources Section (http://www.poa.usace.army.mil/About/Offices/Engineering/EnvironmentalResources.aspx)
    - USACE Alaska District Grants (http://search.usa.gov/search?affiliate=alaska_district&query=grants)
- The Grants.gov program management office was established, in 2002, as a part of the President's Management Agenda. Managed by the Department of Health and Human Services, Grants.gov is an E-Government initiative operating under the governance of the Office of Management and Budget.

  Under the President's Management Agenda, the office was chartered to deliver a system that provides a centralized location for grant seekers to find and apply for federal funding opportunities. Today, the Grants.gov system houses information on over 1,000 grant programs and vets grant applications for 26 federal grant-making agencies.

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://ready.alaska.gov/grants.

- Division of Health and Social Services (DHSS): On this site you will find information intended to assist all who are interested in DHSS grants and services they support. (http://dhss.alaska.gov/fms/grants/Pages/grants.aspx and http://dhss.alaska.gov/fms/Documents/FY15GrantBook.pdf)
- Division of Health and Social Services (DHSS): Provides special outreach services for seniors, including food, shelter and clothing. (http://dhss.alaska.gov/dsds/Pages/hcb/hcb.aspx)
- Division of Insurance (DOI): Provides assistance in obtaining copies of policies and provides information regarding filing claims. (http://commerce.state.ak.us/dnn/ins/Consumers/AlaskaConsumerGuide.aspx)
- 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. (http://commerce.state.ak.us/dnn/dcra/PlanningLandManagement/ACCIMP.aspx)

      The Hazard Impact Assessment (HIA) 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. (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 (VSW) 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 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 (ANTHC), who in turn assist communities in design and construct of sanitation projects.

- Municipal Grants and Loans (MGL) 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.
  (http://dec.alaska.gov/water/MuniGrantsLoans/loanoverview.html)
- 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. (http://dggs.alaska.gov/pubs/advanced-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.
    - The Alaska Interagency Coordination Center (AICC) is the Geographic Area Coordination Center for Alaska. AICC serves as the focal point for initial attack resource coordination, logistics support, and predictive services for all state and federal agencies involved in wildland fire management and suppression in Alaska.

      Fire management planning, preparedness, suppression operations, prescribed burning, and related activities are coordinated on an interagency basis. DOF has cooperative agreements with the Departments of Agriculture and Interior, and numerous local government and volunteer fire departments to respond to wildland fires, reduce duplication of efforts, and share resources.

      In 1984 the State of Alaska adopted the National Interagency Incident Management System Incident Command System concept for managing fire suppression. The Incident Command System (ICS) guiding principles are followed in all wildland fire management operations. All State of Alaska Departments adopted ICS in 1996 through the Governor's administrative order.

Other Funding Resources

The following provide focused access to valuable planning resources for communities interested in sustainable development activities.

- 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)
    - 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. (http://ruralcap.com/?page_id=794)
    - 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. (http://ruralcap.com/?page_id=198)
- 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), an initiative of the insurance industry to reduce deaths, injuries, property damage, economic losses, and human suffering caused by natural disasters. (http://www.disastersafety.org/)
- 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. (http://www.redcross.org/find-help)
- Catalog of Federal Domestic Assistance (CFDA) 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/grants)

- 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.thelindberghfoundation.org/awards)

- 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 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)

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Appendix B

FEMA Hazard Mitigation Plan Review Tool

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Appendix C
HMP Promulgation

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Appendix D
Public Outreach Activities

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From: Simmons, Scott
To: "mewest@alaska.edu"; "hdenny@anthc.org"; "tneal@usgs.gov"; "swhite@avcp.org"; "steve.heppner.bia.ak@gmail.com"; "kato_howard@ak.blm.gov"; "jneimeyer@denali.gov"; "leslie.pearson@alaska.gov"; "ryan.anderson@alaska.gov"; "Alice.Edwards@alaska.gov"; "taunnie.boothby@alaska.gov"; "scott.nelsen@alaska.gov"; "alan.wien@alaska.gov"; "terri.lomax@alaska.gov"; "Soderlund.Dianne@epamail.epa.gov"; "john.lingaas@noaa.gov"; "joel.curtis@noaa.gov"; "sam.albanese@noaa.gov"; "meg.mueller@ak.usda.gov"; "merlaine.kruse@ak.usda.gov"; "greg.magee@alaska.gov"; "Anna_Plager@dnr.state.ak.us"; "kerry_walsh@dnr.state.ak.us"; "John_Dunker@dnr.state.ak.us"; "Steve_Clautice@dnr.state.ak.us"; "patricia_burns@dnr.state.ak.us"; "Steve_McGroarty@dnr.state.ak.us"; "Mac_McLean@dnr.state.ak.us"; "Margie_Goatley@dnr.state.ak.us"; "Bruce.R.Sexauer@poa02.usace.army.mil"; "colleen.bickford@hud.gov"; "ak_le@fws.gov"
Cc: Eileen Bechtol (erbechtol@gmail.com); DHSEM Scott Nelsen; Evans, Jessica; Appleby, Elizabeth; URS Evan Wasserman
Subject: Hazard Mitigation Plan Development Project Initial Notice
Date: Thursday, November 20, 2014 11:18:00 AM
Attachments: image002.png

Dear Potential HMP Development Participants,
URS Corporation has received a 2014 contract from the State Division of Homeland Security and Emergency Management (DHS&EM) to develop 21 Local/Tribal All-Hazard Mitigation Plans for the following communities:

New HMP Development

- Atmautlauk (Unorganized)
- Chitina (Unorganized)
- Copper Center (Unorganized)
- Grayling (Unorganized)
- Kongiganak (Unorganized)
- Kwigillingok (Unorganized)
- City of Merkoryuk (2nd Class City)
- City of Nightmute (2nd Class City)
- Tuntutuliak (Unorganized)
- Tununak (Unorganized)
- City of Wales (2nd Class city)

HMP Update Required

- Newtok (Unorganized)
- City of Aniak (2nd Class City)
- City of Dillingham (1st Class City)
- City of Golovin (2nd Class City)
- Lake and Peninsula Borough, MJHMP
- City of Hooper Bay (2nd Class City)
- City of Kivalina (2nd Class City)
- City of Saint Paul (2nd Class City)
- City of Unalakleet (2nd Class City)
- City and Borough of Yakutat

The Lake and Peninsula Borough (L&PB) Multi-Jurisdictional HMP (MJHMP) consists of six organized cities and 12 unorganized communities:

The Lake and Peninsula Borough, MJHMP

Organized Cities

- City of Chignik (2nd Class City)
- City of Egegik (2nd Class City)
- City of Newhalen (2nd Class City)
- City of Nondalton (2nd Class City)
- City of Pilot Point (2nd Class City)
- City of Port Heiden (2nd Class City)

Unorganized Communities

- Chignik Lagoon
- Chignik Lake
- Igiugig
- Iliamna
- Ivanof Bay
- Kokhanok

We invite you to participate in this important community planning effort during the development process. Community newsletters will be located on the DHS&EM Local/Tribal All Hazard Mitigation Plan Development website at:
http://ready.alaska.gov/plans/localhazmitplans as the communities finalize them.

Please feel free to contact me and to forward this email to the most appropriate person within your agency involved with hazard assessments, hazard mitigation plan development or community specific hazard information or planning suggestions. (Please cc me so I may update the contact list)

I encourage you to acknowledge receiving this invitation at your earliest convenience to allow me to include your participation (with appropriate acknowledgments) within the Draft and Final HMPs prior to State and FEMA review and subsequent approvals.

Kind Regards
-Scott-

R. Scott Simmons, CFM, CPM
AECOM + URS
700 G Street, Suite 500 | Anchorage, AK 99501
Ph: 907.261.9706 | 800.909.6787 | Personal Mobile: 841.1832 | Fax: 907.562.1297
eMail Address: scott.simmons@urs.com

Appleby, Elizabeth

From: Appleby, Elizabeth
Sent: Wednesday, November 26, 2014 10:16 AM
To: 'Tuntutuliak@aitc.org'
Cc: Simmons, Scott
Subject: Tuntutuliak Hazard Mitigation Plan
Attachments: TuntutuliakHazardMitigationPlan_Newletter#1.pdf

Hello President Frank,

I am writing to introduce myself, Elizabeth Appleby, as well as our project manager, Scott Simmons, with AECOM-URS. We were contracted by the Division of Homeland Security and Emergency Management (DHS&EM) to develop a Hazard Mitigation Plan for eleven communities. The Village of Tuntutuliak is one of the selected communities. We have previously worked with neighboring communities of Quinhagak, Kipnuk, Chefornak, Napaskiak, Toksook Bay, and Eek to write their plans.

Your Hazard Mitigation Plan will identify hazards which routinely impact your community, locate facilities that could be impacted, and list potential projects to reduce impacts before they occur. It is important to note that the Village of Tuntutuliak does not have to pay anything for this project.

Our task is to write the plan while guiding you through the process using a planning team from your community. AECOM-URS will write the plan. The community Planning Team will work with AECOM-URS to identify hazards, and provide information on historic damage and facilities. As a team we can come up with projects to reduce risk, and develop mitigation goals. We will provide a list of potential funding sources for projects.

Our first goal is to encourage you to select a planning team leader and a few team members. Team members should have knowledge of natural hazards that continually cause damages and what facilities are critical for protection from these hazards. We suggest you look for team members from the Village elders, the health clinic, school, volunteer fire fighters, law enforcement, and other potential members. We suggest no more than four or five members on this team.

I am attaching a draft newsletter to encourage public involvement. When it is final, you can distribute it to the community. It will ask the community to identify known hazards, and confirm critical infrastructure. When the Planning Team is selected, I will update the draft and return it to you for distribution to your community.

I would like to schedule an introductory meeting with your Planning Team to introduce the project and the process. You will be able to call into a teleconference using a speaker phone to simplify the discussions. We would like to schedule this teleconference by the end of next week if feasible. Please let me know which day and time is convenient for you. We will then provide you the toll-free number which you can pass to each essential participant.

I will look for you reply about:

- Who will be on your Planning Team
- When you would like to schedule an introductory meeting

I look forward to working with you and your Team on this exciting project!

Thank you,

Elizabeth Appleby
Environmental Planner

AECOM - URS Corporation
700 G Street, Suite 500
Anchorage, AK 99501
Direct: (907) 375-9019
Office: (907) 261-6721

VILLAGE OF TUNTUTULIAK HAZARD MITIGATION PLAN

Newsletter #1 **January 2015**

This newsletter describes the Village of Tuntutuliak Hazard Mitigation Planning project development processes to interested agencies, stakeholders, and the public. This newsletter also serves to solicit comments. It can be viewed online at the State of Alaska Division of Homeland Security and Emergency Management Website at *http://www.ready.alaska.gov/plans/localhazmitplans.htm* .

The State of Alaska, Department of Military and Veterans Affairs, Division of Homeland Security and Emergency Management (DHS&EM) was awarded a Pre-Disaster Mitigation Program grant from the Federal Emergency Management Agency (FEMA) to prepare Hazard Mitigation Plans (HMP) for fifteen Alaskan Communities. The Village of Tuntutuliak was selected for participation in this effort.

URS was contracted to assist the community with preparing a FEMA approvable hazard mitigation plan and subsequent hazard mitigation grant program application during 2012 and 2013.

The Tuntutuliak Hazard Mitigation Plan will identify all natural hazards, such as earthquake, erosion, flood, severe weather, and wildland fire hazards, etc. The plan will also identify the people and facilities potentially at risk and ways to mitigate damage from future hazard impacts. The public participation and planning process is documented as part of these projects.

What is Hazard Mitigation?

Across the United States, natural and human-caused disasters have increasingly caused injury, death, property damage, and business and government service interruptions. The toll on individuals, families, and businesses can be very high. The time, money, and emotional effort required to respond to and recover from these disasters takes public resources and attention away from other important programs and problems.

The people and property in the State of Alaska are at risk from a variety of natural hazards that can potentially cause human injury, property damage, or environmental harm.

Hazard mitigation projects eliminate the risk or reduce the hazard impact severity to people and property. Projects may include short- or long-term activities to reduce exposure to or the effects of known hazards. Hazard mitigation activities include relocating or elevating buildings, replacing insufficiently sized culverts, using alternative construction techniques, or developing, implementing, or enforcing building codes, and education.

Why Do We Need A Hazard Mitigation Plan?

Communities must have a State, FEMA approved, and community adopted mitigation plan to receive a project grant from FEMA's pre- and post- disaster grants identified in their Hazard Mitigation Assistance and other agency's mitigation grant programs. The Village of Tuntutuliak plans to apply for mitigation funds after our plan is complete.

A FEMA approved and community adopted HMP enables the Local government to apply for the Hazard Mitigation Grant Program (HMGP), a disaster related assistance program. Applicants typically compete on a statewide basis.

The Pre-Disaster Mitigation (PDM) and the National Insurance Program's Flood Mitigation Assistance (FMA), grant programs are nationally competitive funding programs. These grants use the same application process and eligibility requirements.

The Planning Process

There are very specific federal requirements that must be met when preparing a hazard mitigation plan. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000 criteria. Information about the criteria and other applicable laws and regulations may be found at: http://www.fema.gov/mitigation-planning-laws-regulations-guidance.

The DMA2000 requires the plan to include and document the following topics:

- Plan development process
- Identify hazards specific to the community
- Identify the population's and structures' risks
- Define the jurisdiction's mitigation goals
- List the community's mitigation strategy, selected actions, and implemented projects
- Provide a copy of the community's HMP Adoption Resolution

FEMA has prepared a Local Planning Review Guide) and (available at: http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=4859). It explains how the HMP meets each of the DMA2000 requirements.

FEMA has prepared and "Mitigation Planning Guidance) and "How to" Guides (available at: http://www.fema.gov/hazard-mitigation-planning-resources. The Village of Tuntutuliak's Hazard Mitigation Plan will follow those guidelines.

We are currently in the very beginning stages of preparing the plan. We will be conducting a public meeting to introduce the project and planning team, and to gather comments from our community residents. Specifically we will complete the hazard identification task, and collect data to conduct the risk assessment.

DHS&EM has previously identified natural hazards that occur in the Lower Kuskokwim Regional Educational Attendance Area (REAA) that may also occur specifically in Tuntutuliak.

We Need Your Help

Please use the following table to identify any hazards you have observed in your area that DHS&EM is not aware of AND any additional natural hazards that may not be on the list.

Tuntutuliak Hazard Worksheet		
Hazard	Lower Kuskokwim REAA*	Village of Tuntutuliak
Earthquake	Yes (Moderate)	Yes
Erosion	Yes (Low)	Yes
Flood	Yes (High)	Yes
Ground Failure (Avalanche, Landslide, Permafrost)	No	Yes
Severe Weather	Yes (High)	Yes
Tsunami & Seiche	No	No
Volcano	No	No
Tundra/Wlldland Fire	Yes	Yes

*Hazard Matrix from the 2010 State of Alaska Hazard Mitigation Plan for the Lower Kuskokwim REAA. (Parentheses show threat level and number of historical events)

DHS&EM identified critical facilities within the Village of Tuntutuliak as part of the Alaska Critical Facilities Inventory, but the list of critical facilities needs to be updated and the estimated value and location (latitude/longitude) determined.

In addition, the number and value of structures, and the number of people living in each structure will need to be documented. Once this information is collected we will determine which critical facilities, residences, and populations are vulnerable to specific hazards in Tuntutuliak. Please add additional facilities if needed.

The Planning Team

The planning team is being led by Scott Simmons (AECOM-URS), with assistance from Elizabeth Appleby (AECOM-URS) and Tuntutuliak's Planning Team. AECOM-URS has been contracted by DHS&EM to provide assistance and guidance to the Planning Team throughout the planning process.

Public Participation

Public involvement will continue throughout the project. The goal is to receive comments, identify key issues or concerns, and improve ideas for mitigation. When the Draft C Hazard Mitigation Plan is complete, the results will be presented to the community before DHS&EM and FEMA approval and community adoption

Tuntutuliak Critical Facilities*	
Facility Type	Facility Name
Airport	02/20
Cemetery	1
Cemetery	2
Church	Moravian Church
Church	Russian Orthodox Church
Community Hall	NA
Community Storage Shed	Airport Storage
Fire Station	Water and Sewer Office
Fuel Storage Tanks (>500gal)	Fuel Storage
Fuel Storage Tanks (>500gal)	Fuel Storage 2
Fuel Storage Tanks (>500gal)	Washeteria fuel storage
Hospital/Clinic/ER	Kathleen Daniel Memorial Hospital
Landfill/Incinerator	Tuntutuliak Class III Muni Landfill, Active
Landfill/Incinerator	Tuntutuliak Landfill, Old
National Guard	National Guard Armory
Offices	Community Hall/ Traditional Council Offices
Offices	TCSA Office (Electric)
Park	Play Deck
Police Station	VPSO Office
Post Office	Community Hall/Traditional Council Office
Power Generation Facility	Village Generator Plant 1
Power Generation Facility	Village Generator Plant 2
Reservoir/Water Supply	LKSD Tuntutuliak Angapac SC
Reservoir/Water Supply	Tuntutuliak Washeteria
School	LEWIS ANGAPAK MEMORIAL SCHOOL
School	Pre-school
Sewage Lagoon	2
Sewage Lagoon	NA
Store	Millers Store
Store	Paul Andrew Store
Store	Store
Store	Village Corporation Store
Teachers Quarters	Old Elementary School
Teachers Quarters	Teachers Quarters
Telephone	United Utilities/ Alascom
Washeteria	NA
Wind Turbines	5 wind turbines, 4 operating and 1 damaged

* Alaska Critical Facilities Inventory

Please email updated hazard and critical facility information directly to AECOM or provide it to your community planning and project team leader.

We encourage you to take an active part in Tuntutuliak's Hazard Mitigation Plan development effort. The purpose of this newsletter is to keep you informed and to allow you every opportunity to voice your opinion regarding these important projects. Please contact your community HMP Team Leader or Elizabeth Appleby, URS directly if you have any questions, comments, or requests for more information:

Village of Tuntutuliak
Planning Team Leader
Deanna White, Tribal Administrator
P.O. Box 8086
Tuntutuliak, AK 99680
Phone: (907) 256-2128
Email: dwhite@tuntutuliaktc.org

AECOM
Elizabeth Appleby,
Environmental Planner
700 G Street, Suite 500
Anchorage, Alaska 99501
375.9019 or 800.909.6787
elizabeth.appleby@aecom.com

Division of Homeland Security & Emergency Management
Scott Nelsen, State Support
PO Box 5750
Anchorage, AK 99505-5750
428.7010 or 800.478.2337
scott.nelsen@alaska.gov

Appleby, Elizabeth

From: Appleby, Elizabeth
Sent: Thursday, April 02, 2015 3:41 PM
To: 'tcsaelec@gmail.com'
Subject: Tuntutuliak Hazard Mitigation Plan update
Attachments: Tuntutuliak Kick-Off Mtg Notes_010515.pdf; Facilities List.docx

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Carl,

Thank you for speaking with me today. I did give Robert Enoch a call as well—he is out of the office today, but I will try to reach him tomorrow or next week.

I attached 2 documents:
-Notes from our January kick-off meeting---let me know if I recorded something incorrectly, or if you want to add hazard observations.
-Facilities list---Please add the estimated number of occupants, cost, and type. We can do this over the phone if you have trouble—this part is always the most difficult for me. It is just your best guess, so it is okay if it is not exactly correct.

Let me know if you have questions—my direct phone number is 375-9019. Thank you so much for your time on this project!

Elizabeth Appleby
Environmental Planner
D 1-907-375-9019
elizabeth.appleby@aecom.com

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AECOM

Memorandum

Subject: Tuntutuliak Kick-Off – Team Meeting Teleconference -- Division of Homeland Security and Emergency Management (DHS&EM) Hazard Mitigation Plan (HMP)

Community: Tuntutuliak, Alaska

Date/Time: January 5th, 2015--11am-noon

From: Elizabeth Appleby

Attendees:
Community Members:

- Carl Andrew, TCSA Electrical Services
- Robert Enoch, CVRF Community Representative
- Note: Deanna White, Tribal Administrator, was unable to attend, but is part of follow-up coordination and future meeting planning.

AECOM:

- Elizabeth Appleby, Environmental Planner
- Jessica Evans, Environmental Planner

Subjects covered included:

- AECOM was hired to develop a hazard mitigation plan (HMP) for Tuntutuliak by the Alaska State Division of Homeland Security and Emergency Management. It is AECOM's responsibility to write the plan and take on the bulk of the work to guarantee FEMA compliance, but we need several critical items that only the community can provide:
    - The attendees identified and screened hazards that impact the community and provided brief histories. Attendees also noted the community is developing mitigation project ideas.
    - A mitigation plan ensures community eligibility for FEMA and potentially other federal agency funding, for which they are not currently eligible. The HMP prepares the community to potentially obtain funding to implement projects.
    - AECOM will provide newsletters for public distribution that will outline how to provide input to the planning process and will let the public know where a copy of the plan is available for review, etc.
- Community members confirmed inclusion of earthquake, severe weather, and ground failure as hazard to be profiled in the HMP. These are not the only concerns, however, and attention should be paid to other hazards.
- During the hazard screening, erosion concerns were noted by community members:
    - There is erosion along the Kinaq River.
    - In the 1970s and 1980s, a rip-rap sea wall was put in place. The wall was constructed in the lower village area, but no erosion control is currently in the upper village.
    - The rip-rap is being eroded. There is less and less rip-rap every year. Rip-rap rocks freeze with ice on the riverbank, and are washed away during spring breakup.
    - Several houses are close to the river, particularly ones past the woody vegetation line near the high school.
    - Erosion is in issue at the new airport. The western end of the runway is close to the Kinaq riverbank. The rip-rap in place is composed of smaller stones, and these are being eroded.
- Flooding patterns were noted:
    - Tuntutuliak floods in the fall. This is different than communities upriver on the Kuskokwim and along the Yukon River that tend to experience flooding in the spring

  - Parts of the boardwalk in Tuntutuliak are flooded, particularly during fall. The boardwalk near newer houses by a pond typically floods. Some boardwalks are damaged by the flooding.

- Ground failure noted as a hazard experienced by Tuntutuliak, and should be included in the HMP:
  - Many buildings are sinking into the tundra
  - Newer buildings are elevated on pilings, but structures built later or by individual homeowners are not on pilings.
  - Notes of ground heaving with permafrost freezing and melting.

- Problems with the landfill, sewage lagoon, and popper bunkers discussed:
  - Sewage lagoon leaks at times and ponds near the village. This is particularly a problem during spring breakup.
  - There are several old popper bunkers that are no longer in use. Some of these are starting to collapse, and at times sludge is carried away. The ones that are not in use should be covered up or closed out. Popper bunkers still in use are starting to overflow.
  - A sewer system was put in place, but many residents have moved to popper (honey bucket) use due to lack of sewage system maintenance.
  - The dump site and sewage lagoon are beyond their lifespan, and are reaching usable limits.
  - The platform access to the sewage lagoon fell of its foundation.

- Briefly started to discuss critical facilities:
  - There are five wind turbines in Tuntutuliak. Four are operating, and one was damaged and is not in use.
  - Diana White had mentioned in a phone call an old BIA school building in town that is not in use due to asbestos, but is still standing. The community would like to get rid of the building.

- Potential capital improvement projects that were discussed:
  - New covers for honey bucket popper bunkers.
  - Replacement/repair of rip-rap.
  - Elevation of home that are not currently on pilings.
  - Repair access to the sewage lagoon.

- Carl talked about a list of projects currently being made for Tuntutuliak's Comprehensive Plan. Elizabeth would like to include mitigation projects in the HMP, and said she could send potential funding resource list before the plan is completed.

- AECOM and Tuntutuliak will follow up with more communication to continue drafting the HMP.

Material—Is the building made of wood? Is it made of steel? I blocked out some that do not have a building type (like the airport runway and the cemetery).

Estimated Occupants---Your best guess of how many people are in the facility at one time. It is okay if some have zero occupants (such as the fuel storage tanks).

Estimated Value—Your best guess of the cost of rebuilding the facility. One way to do this could be to think about a house where you know the building costs. For example, if the hospital is twice as large than it would cost twice as much to build.

Thank you!

Facility Type	Facility Name	Type? (material)	Estimated # of Occupants	Estimated Value
Airport		Not available	_____ people	$
Cemetery		Not available	_____ people	$
Cemetery		Not available	_____ people	$
Church	Moravian Church		_____ people	$
Church	Russian Orthodox Church		_____ people	$
Community Hall	NA		_____ people	$
Community Storage Shed	Airport Storage		_____ people	$
Fire Station	Water and Sewer Office		_____ people	$
Fuel Storage Tanks (>500gal)	Fuel Storage	Not available	_____ people	$
Fuel Storage Tanks (>500gal)	Fuel Storage 2	Not available	_____ people	$
Fuel Storage Tanks (>500gal)	Washeteria fuel storage	Not available	_____ people	$
Hospital/Clinic/ER	Kathleen Daniel Memorial Hospital		_____ people	$
Landfill/Incinerator	Tuntutuliak Class III Muni Landfill, Active	Not available	_____ people	$
Landfill/Incinerator	Tuntutuliak Landfill, Old	Not available	_____ people	$
National Guard	National Guard Armory		_____ people	$
Offices	Community Hall/ Traditional Council Offices		_____ people	$
Offices	TCSA Office (Electric)		_____ people	$

Material—Is the building made of wood? Is it made of steel? I blocked out some that do not have a building type (like the airport runway and the cemetery).

Estimated Occupants---Your best guess of how many people are in the facility at one time. It is okay if some have zero occupants (such as the fuel storage tanks).

Estimated Value—Your best guess of the cost of rebuilding the facility. One way to do this could be to think about a house where you know the building costs. For example, if the hospital is twice as large than it would cost twice as much to build.

Thank you!

Park	Play Deck	Not available	_____ people	$
Police Station	VPSO Office		_____ people	$
Post Office	Community Hall/Traditional Council Office		_____ people	$
Power Generation Facility	Village Generator Plant 1	Not available	_____ people	$
Power Generation Facility	Village Generator Plant 2	Not available	_____ people	$
Reservoir/Water Supply	LKSD Tuntutuliak Angapac SC	Not available	_____ people	$
Reservoir/Water Supply	Tuntutuliak Washeteria	Not available	_____ people	$
School	LEWIS ANGAPAK MEMORIAL SCHOOL		_____ people	$
School	Pre-school		_____ people	$
Sewage Lagoon		Not available	_____ people	$
Sewage Lagoon		Not available	_____ people	$
Store	Millers Store		_____ people	$
Store	Paul Andrew Store		_____ people	$
Store	Store		_____ people	$
Store	Village Corporation Store		_____ people	$
Teachers Quarters	Old Elementary School		_____ people	$
Teachers Quarters	Teachers Quarters		_____ people	$

Material—Is the building made of wood? Is it made of steel? I blocked out some that do not have a building type (like the airport runway and the cemetery).

Estimated Occupants---Your best guess of how many people are in the facility at one time. It is okay if some have zero occupants (such as the fuel storage tanks).

Estimated Value—Your best guess of the cost of rebuilding the facility. One way to do this could be to think about a house where you know the building costs. For example, if the hospital is twice as large than it would cost twice as much to build.

Thank you!

Telephone	United Utilities/ Alascom		_____ people	$
Washeteria	NA		_____ people	$
Wind Turbines	5 wind turbines, 4 operating and 1 damaged	Not available	_____ people	$

Appleby, Elizabeth

From: Appleby, Elizabeth
Sent: Wednesday, May 27, 2015 2:52 PM
To: 'Jonathan Pavila'
Subject: Tuntutuliak HMP

Hi Jonathan,

Thanks for going over the mitigation actions with me this week. I had mentioned a newsletter on the phone—I checked with my supervisor, and the newsletter goes to you when I send the entire plan for review.

Feel free to call me with questions; thanks again!

Elizabeth Appleby
Environmental Planner
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VILLAGE OF TUNTUTULIAK HAZARD MITIGATION PLAN (HMP)

July 2015 **Newsletter 2**

This newsletter discusses the preparation of the Village of Tuntutuliak Hazard Mitigation Plan. It has been prepared to inform interested agencies, stakeholders, and the public about the project and to solicit comments. This newsletter can also be viewed on the State of Alaska Division of Homeland Security and Emergency Management Website at:
http://www.ready.alaska.gov/plans/localhazmitplans.htm.

HMP Development

The Village of Tuntutuliak was one of 21 communities selected by the State of Alaska, Division of Homeland Security and Emergency Management (DHS&EM) for a Hazard Mitigation Planning (HMP) development project. The plan identifies natural hazards that affect the community including earthquake, erosion, flood, ground failure, severe weather, and tundra/wildland fire. The HMP also identifies the people and facilities potentially at risk and potential actions to mitigate community hazards. The public participation and planning process is documented as part of the project.

What is Hazard Mitigation?

Across the United States, natural disasters have increasingly caused injury, death, property damage, and business and government service interruptions. The toll on individuals, families, and businesses can be very high. The time, money, and emotional effort required to respond to and recover from these disasters take public resources and attention away from other important programs and problems.

People and property throughout Alaska are at risk from a variety of hazards that have the potential for causing human injury, property damage, or environmental harm.

The purpose of hazard mitigation is to implement projects that reduce the risk severity of hazards on people and property. Mitigation programs may include short-term and long-term activities to reduce hazard impacts or exposure to hazards. Mitigation could include education, construction or planning projects. Hazard mitigation activity examples include relocating buildings, developing or strengthening building codes, and educating residents and building owners.

Why Do We Need A Hazard Mitigation Plan?

A community is only eligible to receive grant money for mitigation programs by preparing and adopting a hazard mitigation plan. Communities must have an approved mitigation plan to receive grant funding from the Federal Emergency Management Agency (FEMA) for eligible mitigation projects.

The Planning Process

There are very specific federal requirements that must be met when preparing a HMP. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000 criteria. Information about the criteria may be found on the Internet at: http://www.fema.gov/mitigation-planning-laws-regulations-guidance.

The DMA2000 requires the plan to document the following topics:

- Planning process
- Community Involvement and HMP review
- Hazard identification
- Risk assessment
- Mitigation Goals
- Mitigation programs, actions, and projects
- A resolution from the community adopting the plan

FEMA has prepared a Local Planning Review Guide) and (available at: http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=4859). It explains how the HMP meets each of the DMA2000 requirements. FEMA has prepared and "Mitigation Planning Guidance" and "How to Guides" (available at: http://www.fema.gov/hazard-mitigation-planning-resources). The City's Hazard Mitigation Plan will follow those guidelines.

The planning process kicked-off on January 5, 2015 by establishing a local planning committee and holding a meeting. The planning committee examined the full spectrum of hazards listed in the State Hazard Mitigation Plan and identified five hazards the HMP would address.

After the first meeting, Village staff and AECOM began identifying critical facilities, compiling the hazard profiles, assessing capabilities, and conducting the risk assessment for the identified hazards. Critical facilities are facilities that are critical to the recovery of a community in the event of a disaster. After collection of this information, AECOM helped to determine which critical facilities and estimated populations are vulnerable to the identified hazards in Tuntutuliak.

A mitigation strategy was the next component of the plan to be developed. Understanding the community's local capabilities and using information gathered from the public

and the local planning committee and the expertise of the consultants and agency staff, a mitigation strategy was developed. The mitigation strategy is based on an evaluation of the hazards, and the assets at risk from those hazards. Mitigation goals and a list of potential actions/projects were developed as the foundation of the mitigation strategy.

Mitigation goals are defined as general guidelines that explain what a community wants to achieve in terms of hazard and loss prevention. Goals are positively stated future situations that are typically long-range, policy-oriented statements representing community-wide visions. Mitigation actions and projects are undertaken in order to achieve your stated objectives. On May 26, 2015, the local planning committee identified projects and/or actions for each hazard that focus on six categories: prevention, property protection, public education and awareness, natural resource protection, emergency services, and structural projects. A representative sample of the mitigation actions identified as a priority by the planning team are listed below, and explained in more detail in the plan.

The selected projects and/or actions will potentially be implemented over the next five years as funding becomes available. A maintenance plan was also been developed for the hazard mitigation plan. It outlines how the community will monitor progress on achieving the projects and actions that will help meet the stated goals and objectives, as well as an outline for continued public involvement.

The draft plan is available in the Tribal office for public review and comment. Comments should be made via email, fax, or phone to Elizabeth Appleby (listed below) and be received no later than August 4, 2015. The plan will be provided to DHS&EM and FEMA for their preliminary approval and returned to Tuntutuliak's Tribal Council for formal adoption.

The Planning Committee

The plan was developed with the assistance from the community's planning committee consisting of a cross section from the community. Planning Team members who helped with developing the plan include Tribal Administrator Jonathan Pavila, Deanna White, Carl Andrew, Robert Enoch, Henry Lupie, and AECOM.

Sample of the Village of Tuntutuliak's Mitigation Actions. Review the draft HMP for a complete list.		
Continue the Hazard Mitigation Planning Team's forward progress to implement, monitor, review, and evaluate hazard and mitigation actions.	Determine and implement the most cost beneficial and feasible mitigation actions for locations with repetitive flooding or potential for boardwalk obstruction.	Elevate residential, public, or critical facilities at least two feet above the base flood elevation, on gravel pads or pilings.
Identify and pursue funding opportunities to implement mitigation actions.	Integrate the Mitigation Plan's hazard vulnerability assessment findings for enhanced emergency planning.	Protect wastewater treatment systems flood protection to prevent erosion damage, sewage lagoons out-wash, and ground failure or flooding of sewage pits.
Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all identified natural hazards.	Develop and incorporate mitigation provisions and recommendations into all community plans and community development processes to maintain protect critical infrastructure, residences, and population from natural hazard impacts.	Acquire (buy-out), demolish, elevate, or relocate structures from hazard prone area (erosion, flood, ground failure, etc.), including residential structures near the Qinaq River.
Develop mitigation initiatives such as: Rip-rap (large rocks), sheet pilings, gabion baskets, articulated matting, concrete, asphalt, vegetation, or other armoring or protective materials to provide river bank protection along the Qinaq River.	Improve and/or elevate boardwalks in order to protect against flooding and ground failure.	Repair and replace existing revetment in lower Tuntutuliak that has eroded along the Qinaq River. Extend revetment to protect upper Tuntutuliak along the Qinaq River.
Promote permafrost sensitive construction practices in permafrost areas.	Reinforce buildings and homes against high winds to prevent damage.	Update fire-fighting equipment and ensure operability of existing equipment.

We encourage you to learn more about the Village of Tuntutuliak's Hazard Mitigation Plan. The purpose of this newsletter is to keep you informed and to allow you every opportunity to voice your opinion regarding this important project. If you have any questions, comments, or requests for more information, please contact:

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Appendix E
Benefit–Cost Analysis Fact Sheet

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Appendix E: 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 F
Plan Maintenance Documents

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 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

- ☐ **On Schedule**
- ☐ **Completed**
- ☐ **Delayed***

*** Explain:**

- ☐ **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: