

**The City of McGrath, Alaska**

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**Flood & All-Hazards Mitigation Plan**



**December 21, 2007**

**Prepared by:  
City of McGrath  
Rural Alaska Mitigation Planning**

## **ACKNOWLEDGEMENTS**

### McGrath City Council – November 2007

Verdene Anselment  
Elsie Bobby  
Karen Ladegard, Vice-Mayor  
Douglas Lyman  
Benton Magnuson  
Dustin Parker, Mayor  
Richard Strick, Sr.

And

### McGrath City Council – December 2008

Karen Ladegard, Vice-Mayor  
Douglas Lyman  
Dustin Parker, Mayor  
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Jill Missal, Rural Alaska Mitigation Planning initially uploaded the Plan to [www.mitigationplan.com](http://www.mitigationplan.com). It was later downloaded and formatted in Microsoft Word by city staff. Additional information, revisions, and illustrations have been added to the Word version.

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## Acronyms – Commonly Used

ACMP	Alaska Coastal Management Program
AEIS	Alaska Economic Information System
ANCSA	Alaska Native Claims Settlement Act
BFE	Base Flood Elevation (100 year flood)
CFR	Code of Federal Regulations
CMP	Coastal Management Plan
CRSA	Coastal Resource Service Area
DCCED	(Alaska) Department of Commerce, Community and Economic Development
DEC	(Alaska) Department of Environmental Conservation
DGGS	(Alaska) Division of Geological and Geophysical Surveys
DHS&EM	Alaska Division of Homeland Security and Emergency Management
DNR	(Alaska) Department of Natural Resources
FEMA	Federal Emergency Management Agency
HMP	Hazard Mitigation Plan
HMPG	Hazard Mitigation Planning Grant
KNA	Kuskokwim Native Association
NFIP	National Flood Insurance Program
NOAA	National Oceanographic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
OHMP	Office Habitat Management and Permitting
OPMP	Office of Project Management and Permitting
PDMG	Pre Disaster Mitigation Grant
RAPIDS	Rural Alaska Identification and Delivery System
STIP	Statewide Transportation Improvement Program
USCOE	United States Army Corps of Engineers
USF&WS	U.S. Fish and Wildlife Service
VSW	Village Safe Water

## **Section 1 Public Planning Process**

### **1.1 Narrative Description**

The McGrath Flood and All-Hazards Mitigation Plan includes information to assist city agencies and residents with planning to avoid potential future disaster losses. The plan provides information on hazards that affect the community and descriptions of past disasters, and lists activities that may help the community prevent disaster losses. The plan was developed to help the City of McGrath make decisions regarding natural hazards that affect the community.

The plan was designed and written beginning in the fall of 2006, utilizing the State of Alaska's mitigationplan.com planning tool. The City of McGrath contracted a hazard mitigation consultant, Rural Alaska Mitigation Planning, to assist with the planning process including vulnerability assessment, public meeting facilitation, capability assessment, and preparation of prioritization criteria, mitigation prioritization, and cost/benefit analysis. The City of McGrath City Administrator, Natalie Baumgartner, oversaw the consultant's activities. The plan was developed utilizing existing City of McGrath plans and studies, outside information and research, and site visits conducted by the consultant.

Public involvement was conducted throughout the development of the plan. A public meeting was held in conjunction with a City Council meeting on Tuesday, December 19, 2006. Public involvement was invited by PSAs on KSKO Radio, notices on the [www.mcgrathalaska.net](http://www.mcgrathalaska.net) Message Board, 3 "Legal Notice" bulletin boards (Post Office, store and Washeteria) and the city's City News, that goes to each household by mail. During the first community meeting, participants, including residents, council members and National Weather Service staff, identified hazards that threaten the community and chose three hazards about which they were most concerned: wildfire, flooding, and erosion. These three hazards were judged to present a risk of extremely damaging losses to the city as well as a high probability of occurrence. A fourth hazard, Severe Weather, was discussed and later added.

The City of McGrath will be responsible for adopting the Flood and All-Hazards Mitigation Plan and all future updates and changes. This governing body has the authority to promote sound public policy regarding hazards. The Flood and All-Hazards Mitigation Plan will be assimilated into other City of McGrath plans and documents as they come up for review. The City will evaluate the Flood and All-Hazards Mitigation Plan on an annual basis to determine the effectiveness of programs and to reflect changes in land development, status, or other situations that make changes to the plan necessary. The City will review the mitigation action items to determine their relevance to changing situations in the community as well as in state or federal policy, and to ensure that mitigation continues to address current and expected conditions. The City will review the hazard analysis information to determine if this information should be updated or modified, given any new available data or changes in status.

The plan will continue to be developed as resources become available. Additional information will be added each year during plan review as the information becomes available or as the situation changes. Vulnerability assessment information, including more specific cost/benefit and monetary damages information will be clarified as additional studies are performed. Currently, only very rough estimates for potential damages are available, and more study is necessary to refine this information. The City of McGrath will be responsible for updating and maintaining the plan by adding additional information.

The public has the opportunity to provide further comments on the draft plan through a variety of forums, including public meetings, e-mail, and the Internet. Copies of the plan will be available for public perusal at the city offices in the Captain Snow Center.

## **1.2 Planning Team Information**

### **Project Staff**

The City of McGrath contracted a hazard mitigation consultant, Rural Alaska Mitigation Planning, to assist with the planning process including vulnerability assessment, public meeting facilitation, capability assessment, preparation of prioritization criteria, mitigation prioritization, and cost/benefit analysis. The plan was designed and written beginning in the fall of 2006, initially utilizing the State of Alaska's [www.mitigationplan.com](http://www.mitigationplan.com) planning tool. The McGrath city administrator, Natalie Baumgartner, oversaw the consultant's activities and formatted the MitigationPlan.com download of the plan resulting in this version in Word. The plan was developed utilizing existing City of McGrath plans and studies, outside information and research, and a site visit conducted by the consultant.

Taunnie Boothby of the State Department of commerce, Community Economic Development, Division of Community Advocacy, Floodplain Management, provided technical assistance and reviewed drafts of the plan. Ervin Petty of the division of Homeland Security & Emergency Management (DHS&EM) provided technical assistance and reviewed the drafts of the plan.

## **1.3 Public Involvement in Planning Process**

Public involvement was conducted throughout the development of the plan.

Fall 2006-Initial work began by Rural Alaska Mitigation Planning and the city. Research began, files shared and resources identified and located.

December 19, 2006-McGrath City Council meeting and public presentation. During the first community meeting, participants, including residents, council members and National Weather Service staff, identified hazards that threaten the community and chose three hazards about which they were most concerned: wildfire, flooding, and erosion. These three hazards were judged to present a risk of extremely damaging losses to the city as well as a high probability of occurrence. A fourth hazard, Severe Weather, was discussed and would be added later.

December 2006-Invitations to the City Council meeting with Jill Missal of Rural Alaska Mitigation Planning were extended via KSKO Radio, 3 Bulletin Boards, online Message Board and in the City News that is mailed to each household on a monthly basis. Citizens came to the meeting and participated in lively discussion about the risks posed by the identified hazards and what we, as a community, can do to mitigate loss. Telephone calls were received from individuals who wanted to talk about some of the issues.

December 19, 2006 City Council meeting -National Weather Service personnel gave a presentation on McGrath's "Storm Ready" certification process nearing completion, (<http://www.stormready.noaa.gov/com-maps/ak-com.htm>). Jill Missal's participated in this discussion was greatly appreciated collaboration between the two plans in the area of "emergency communications" was initiated.

July 24, 2007-City Council Meeting announcement, invitation to participate to entire community and all stakeholders which included the notice for the second public meeting for the Mitigation Plan were placed on the local online Message Board and 3 official bulletin board sites used for official notices; AC Co. Store, Post Office and Washeteria. The City Council regular meeting posted Agenda of July 24th included Resolution 08-01 Adoption of McGrath Flood and All-Hazard Mitigation Plan, which will be reviewed again and adopted following approval at the state and federal levels. Several residents were present at the meeting in addition to the city council members. Residents did not have any further comments or questions.

Outreach: Public Involvement consisted of the following: KSKO Radio PSAs and reading the articles from the Council Meetings and City News on the air, NOAA StormReady Plan collaboration, input from the community during the December 19th meeting and via telephone, online Message Board postings.

- April 2007: Preparation of the 2007 Emergency Response Plan for potential flood and wildfire. Public Meetings, email for coordinating and updating information, KSKO Radio PSAs, City News articles, Mail-outs to all residents.
- August 27, 2007, Open House with State of AK DCCED, Taunnie Boothby, State NFIP and Floodplain Management Program and Ruth St. Amour DCCED. Public Notice on KSKO, flyers mailed out, online Message Board notification and Bulletin Board posting of flyers. They made a PowerPoint presentation, answered questions on the development of the Mitigation Plan and the NFIP.
- August 28, 2007 City Council and Public Works Committee Work Session on the NFIP. The public was notified and invited to participate as was done for the Open House.

August 28, 2007 - City Council Meeting. Agenda item: Guests Taunnie Boothby and Ruth St. Amour, DCCED; Army Corps of Engineers, George Kalli and two others – archeologist and environmental person, NRCS Emergency Erosion Control project engineer, Brett Nelson; State of AK Dept. of Homeland Security & Emergency Services, Brian Fisher and George Coyle. Each group gave an overview of McGrath's current erosion status and how that affects potential and past flooding.

#### **1.4 Other Interested Party Involvement**

**State of Alaska Department of Homeland Security and Emergency Management (DHS&EM)** - Ongoing involvement regarding all four risks and currently on an emergency response to a multi-risk project through USDA's NRCS efforts to assist the community to rebuild the 1,100' levee that is nearly breached. This area is along an area that is eroding at an alarming rate, but was accelerated dramatically during a severe weather event in 2005. Due to the affected property owner's land rights legal requirements that are very difficult to work through, the city will be contributing about \$25,000 of non-reimbursable legal fees to allow the \$2.14 million dollar project to proceed.

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

Improving hazard mitigation technical assistance for local governments is another high priority list item for the State of Alaska. Providing hazard mitigation training, current hazard information, and the facilitation of communication with other agencies would encourage local hazard mitigation efforts. ADES provides resources for mitigation planning on their Web site at <http://www.ak-prepared.com>.



**State of Alaska Department of Community and Economic Development** - Working with numerous DCCED personnel on the mitigation efforts, this Plan and other issues caused by the identified risks. The water treatment plant and distribution system is at risk due to erosion (water mains only a few feet from eroding bank), prolonged severe weather (-40°F to -50°F+ degree weather) causing water and sewer system failures and emergencies, etc. Their input/suggestions have been incorporated into the Plan.

**U. S. Army Corps of Engineers** - (Mr. George Kalli) The team currently working on the Feasibility Study for Erosion Control (Erosion & Flood risks) were involved through an ongoing working relationship of site visits, email and telephone calls regarding the erosion and flooding history and documentation. This work is being accomplished through a 100% federally funded Congressional Appropriation.

**Tetra Tech** (Ms. Christy Miller) – contracted by U.S. Army Corps of Engineers to collect data and complete the *Alaska Community Erosion Survey - McGrath*. Data research and sharing.

**USDA Natural Resource Conservation Services** - Palmer and Bethel offices – Information and input was shared regarding a current Emergency Watershed Protection project that involves rebuilding a levee and a Voluntary Acquisition project. Public input meetings were held on both of these projects.

**NOAA - National Weather Service, McGrath, Alaska** - Coordination of communications and emergency preparedness through the process leading to McGrath becoming a Storm Ready community. Public input was sought through two public meetings and other media.

**State of Alaska Department of Natural Resources** - Preparation of the 2007 Emergency Response Plan for potential flood and wildfire. Public Meetings, email for coordinating and updating information, KSKO Radio PSAs, City News articles, Mail-outs to all residents.

**U.S. Fish & Wildlife Service - Innoko Wildlife Refuge** - Preparation of the 2007 Emergency Response Plan for potential flood and wildfire. Public Meetings, email for coordinating and updating information, KSKO Radio PSAs, City News articles, Mail-outs to all residents.

## **1.5 Review of Technical and Fiscal Resources**

This section describes the review of technical and fiscal resources:

There are no road connections to McGrath, but ATVs and passenger vehicles use local roads. Winter trails are marked to Nikolai (50 mi.) and Takotna (20 mi.) Residents rely on air service and barges to deliver cargo. Air facilities include a State-owned 5,435' long by 150' wide asphalt runway with a 1,720' long by 100' wide crosswind landing strip, and a seaplane base on the Kuskokwim River. The airport is currently undergoing major improvements. There is no dock; however, an unimproved boat launch ramp is available.

In recent years, technical capacity has been greatly increased and utilized through the ability to easily communicate with experts and access data via high-speed broadband Internet, which is available by all agencies, the school system and is utilized in most every home.

The City of McGrath operates and receives revenue from a piped water system that serves nearly all 178 households. A few homes have individual wells or haul water. The majority of residents use individual septic tanks; a limited City sewage system serves approximately 34 homes, also a service of the City. Funds have been approved for a 3-year phased construction to replace the water mains, develop a new water source, a new water treatment plant and replacement of many components of the limited sewer system and

sewage lagoon. A private firm, McGrath Trash & Refuse, collects refuse for disposal at the City landfill. Residents pay a monthly fee for Landfill access and streetlights.

Industrial lots, office space for the SCF McGrath Health Center, Behavioral Health and administrative offices, Alaska State Troopers, McGrath District Court, University of Alaska Fairbanks – McGrath Center are leased and bring additional revenue to the city.

## **1.6 Review of Existing Plans**

This section describes the review and incorporation if appropriate of existing plans, policies, and ordinances:

Numerous mitigation plans and programs on the federal, state and local levels were reviewed to learn of the valuable resources that are available. Through use of the Internet, McGrath has the capability to identify relevant information whenever the need should arise. The list is lengthy and comprehensive and is not entered into this document.

The following existing plans and documents for McGrath, Alaska were utilized in development of the Flood and All-Hazards Mitigation Plan:

- McGrath Community Strategic Plan, 2003
- McGrath Comprehensive Plan, 1981
- Numerous flood maps
- Contingency Emergency Evacuation Plan
- McGrath Emergency Response Team plan
- McGrath – StormReady Community  
(See <http://www.stormready.noaa.gov/com-maps/ak-com.htm>)
- City of McGrath Ordinances – McGrath Municipal Code
- City of McGrath Flood Plan Outline
- State of Alaska Disaster Declarations 1991, 2004
- McGrath Congressional Appropriations Request
- Mutual Spill Response Assistance Agreement (Yukon Fuel/MTNT/City of McGrath)

## **Section 2 Jurisdiction Participation Information**

### **2.1 Adoption by Local Governing Body**

#### **2.1.1 Primary Point of Contact**

**Natalie Baumgartner**  
**Administrator**  
P.O. Box 30  
McGrath, AK 99627  
(907) 524-3825 (Office)  
(907) 524-3536 (Fax)

#### **2.1.2 Promulgation Authority Information**

This Hazard Mitigation Plan was reviewed and approved by the following Promulgation Authorities:

(Pending Approval - Governor Sarah Palin, State of Alaska)

**RESOLUTION PENDING APPROVALS**

**McGrath City Council**

PO Box 30

McGrath, AK 99627

This will be added, once the review and approval is completed by The State of Alaska - DCCED, Homeland Security & Emergency Services and adopted by the City of McGrath

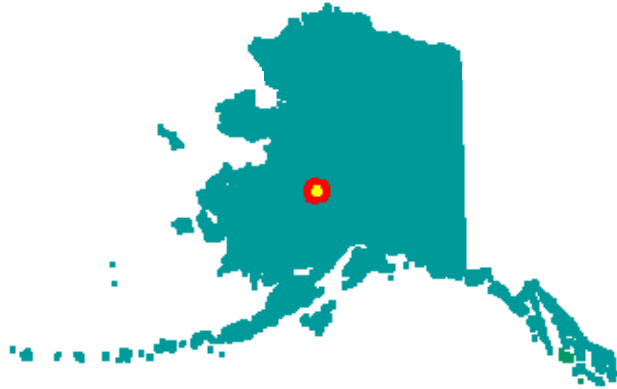
## Section 3 Jurisdiction Information

### Plan Development

The McGrath Flood and All-Hazards Mitigation Plan includes information to assist city agencies and residents with planning to avoid potential future disaster losses. The plan provides information on hazards that affect the community and descriptions of past disasters, and lists activities that may help the community prevent disaster losses. The plan was developed to help the City of McGrath make decisions regarding natural hazards that affect McGrath.

### Plan Scope

McGrath, population 347, is located 221 miles northwest of Anchorage and 269 miles southwest of Fairbanks in Interior Alaska. It is adjacent to the Kuskokwim River directly south of its confluence with the Takotna River. It is located at approximately 62.956390° North Latitude and -155.595830° West Longitude. (Sec. 18, T033N, R033W, Seward Meridian.) McGrath is located in the Mt. McKinley Recording District. The area encompasses 48.9 sq. miles of land and 5.7 sq. miles of water.



McGrath is located on the south bank of the Kuskokwim River, inside an "oxbow" or sharp bend in the river. The town site is primarily flat, but there are mountainous areas within fifty miles of the community in every direction. Wetlands and marshy areas can be found to the west and east of the community. The Kuskokwim River continues its winding course to the south and to the northeast of the community.

McGrath was incorporated as a second-class city in 1975. McGrath has a mayor-council form of government and is located within the "unorganized" borough. The seven council members elect a mayor from among their number. The mayor and city council manage city business, and the McGrath Native Village Council is the official tribal government managing programs and services for the community's Alaska Native population. The city's municipal employees include a city administrator, city clerk-treasurer, public works foreman and water treatment plant operator. The public safety department consists of a VPSO funded by the state through Tanana Chiefs Conference, McGrath Volunteer Fire Department and volunteer Kuskokwim Valley Rescue Squad (ambulance).

The regional native corporation is Doyon, Limited. The regional native non-profit is Tanana Chiefs Conference and the village corporation with headquarters located in McGrath is M.T.N. T. Limited.

**Topography:**

McGrath is located 221 miles northwest of Anchorage and 269 miles southwest of Fairbanks in Interior Alaska. It is adjacent to the Kuskokwim River directly south of its confluence with the Takotna River. It lies at approximately 62.956390° North Latitude and -155.595830° West Longitude. (Sec. 18, T033N, R033W, Seward Meridian.) McGrath is located in the Mt. McKinley Recording District. The area encompasses 48.9 sq. miles of land and 5.7 sq. miles of water.

McGrath is located on the south bank of the Kuskokwim River, inside an "oxbow" or sharp bend in the river. The town site is primarily flat, but there are mountainous areas within fifty miles of the community in every direction. Wetlands and marshy areas can be found to the west and east of the community. The Kuskokwim River continues its winding course to the south and to the northeast of the community.



**Climate:**

The McGrath area has a cold, continental climate. Average summer temperatures range from 62 to 80, winters temperatures can range from -64 to 0. Precipitation is light, averaging 10 inches per year, including an average snowfall of 86inches. The Kuskokwim River is generally ice-free from June through October.

**Demographics:**

McGrath was a seasonal Upper Kuskokwim Athabascan village which was used as a meeting and trading place for Big River, Nikolai, Telida and Lake Minchumina residents. In 1904, Abraham Appel established a trading post at the old Townsite, which lies across the river from the current town site. In 1906, gold was discovered in the Innoko District, and at Ganes Creek in 1907. Since McGrath is the northernmost point on the Kuskokwim River accessible by large riverboats, it became a regional supply center. By 1907, a town was established, and was named for Peter McGrath, a local U.S. Marshal. In 1909, the Alaska Commercial Company opened a store.

The Iditarod Trail also contributed to McGrath's role as a supply center. From 1911 to 1920, hundreds of people walked and mushed over the Trail on their way to the Ophir gold districts. Mining sharply declined after 1925.

After a major flood in 1933, some residents decided to move to the south bank of the River. Changes in the course of the River eventually left the old site on a slough, useless as a river stop. In 1937, the Alaska Commercial Company opened a store at the new location. In 1940, an airstrip was cleared, the FAA built a communications complex, and a school was opened. McGrath became an important refueling stop during World War II, as part of the Lend-Lease Program between the U.S. and Russia. In 1964, a new high school was built, attracting boarding students from nearby villages. The City was incorporated in 1975.

Resources include:

[http://www.commerce.state.ak.us/dca/commdb/CF\\_BLOCK.cfm?Comm\\_Boro\\_Name=McGrath&Data\\_type=Overview](http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.cfm?Comm_Boro_Name=McGrath&Data_type=Overview)

## **Section 4 Risk Assessment**

The goal of mitigation is to reduce the future impacts of a hazard including property damage, disruption to local and regional economies, and the amount of public and private funds spent to assist with recovery; however, mitigation should be based on risk assessment.

A risk assessment is measuring the potential loss from a hazard event by assessing the vulnerability of buildings, infrastructure and people. It identifies the characteristics and potential consequences of hazards, how much of the community could be affected by a hazard, and the impact on community assets. A risk assessment consists of three components: hazard identification, vulnerability analysis and risk analysis. Technically, these are three different items, but the terms are sometimes used interchangeably.

### **4.1 Overall Hazard Ranking**

Each hazard is assigned a likelihood rating based on the criteria and methods described below. This table gives the likelihood of event Probability "Rating" definitions. Based on history, using the definitions given, the likelihood of future events is "Quantified" which

results in the classification within one of the four "Ranges" of likelihood.

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

Next, the magnitude of the hazard's effect is considered according to the severity associated with past events of the hazard. This table gives four classifications of Magnitude / Severity.

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

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

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

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

**Table 1      Calculated Priority Risk Index**

Hazard	Probability	Magnitude /Severity	Warning Time	Duration	Priority Risk Index
Earthquake	2 Possible	1 Negligible	4 < 6 Hours	- Not Specified -	1.8
Erosion	4 Highly Likely	3 Critical	1 24+ Hours	4 > One Week	3.25
Flooding	4 Highly Likely	3 Critical	3 6-12 Hours	- Not Specified -	3.15
Severe Winter Storm	4 Highly Likely	2 Limited	1 24+ Hours	4 > One Week	2.95
Volcano	2 Possible	2 Limited	1 24+ Hours	- Not Specified -	1.65
Wildfires	3 Likely	4 Catastrophic	4 < 6 Hours	- Not Specified -	3.15

Hazard Event	Estimated Total Loss	Average Cost Per Event	Likelihood Rating
Earthquake	<b><u>\$86,549,722</u></b>	\$0	Possible
Erosion	\$0	\$0	Highly Likely
Flooding	\$0	\$0	Highly Likely
Severe Winter Storm	\$0	\$0	Highly Likely
Volcano	\$0	\$0	Possible
Wildfires	\$0	\$0	Likely



## **4.2 Hazard Profile**

### **1. Earthquake**

#### **A. Hazard Definition for Earthquake**

An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet; however, some earthquakes occur in the middle of plates.

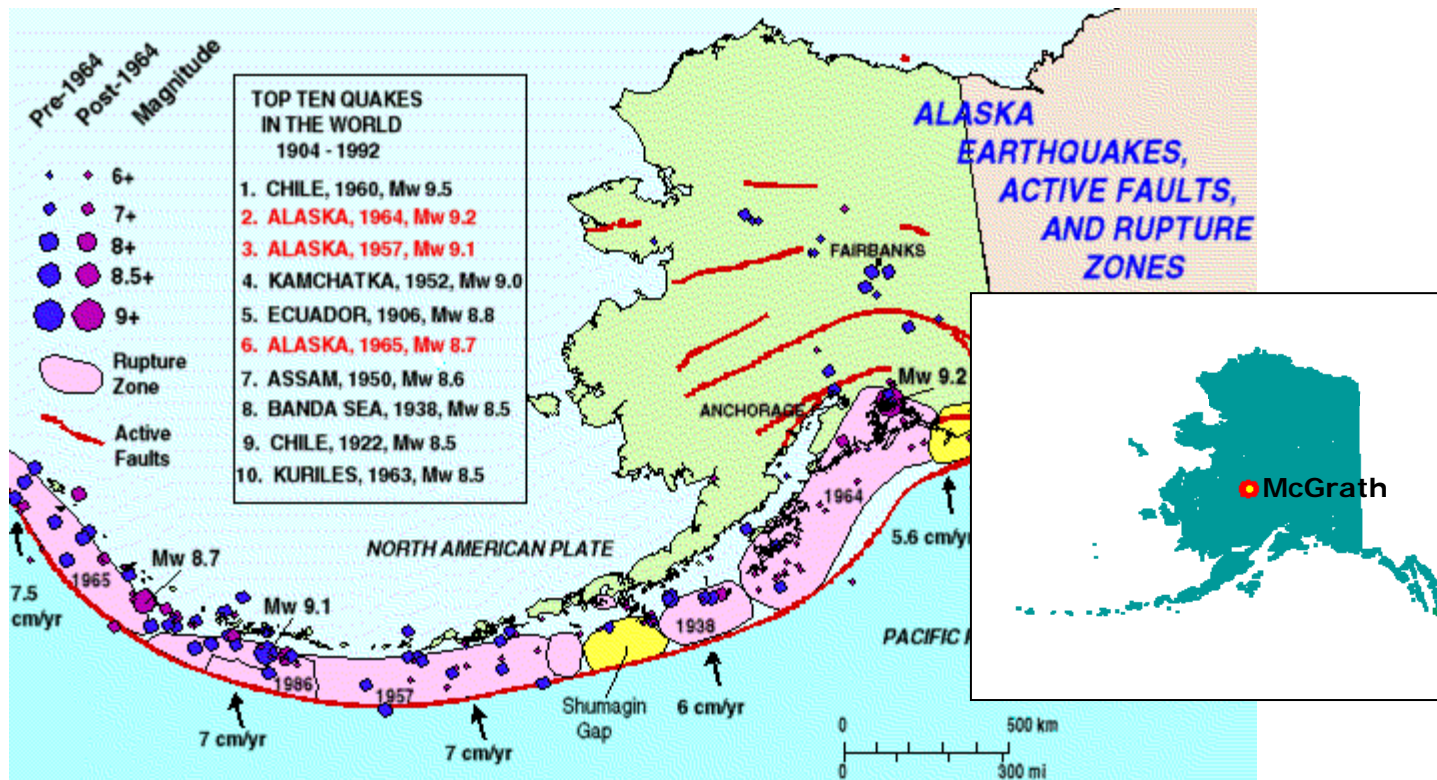
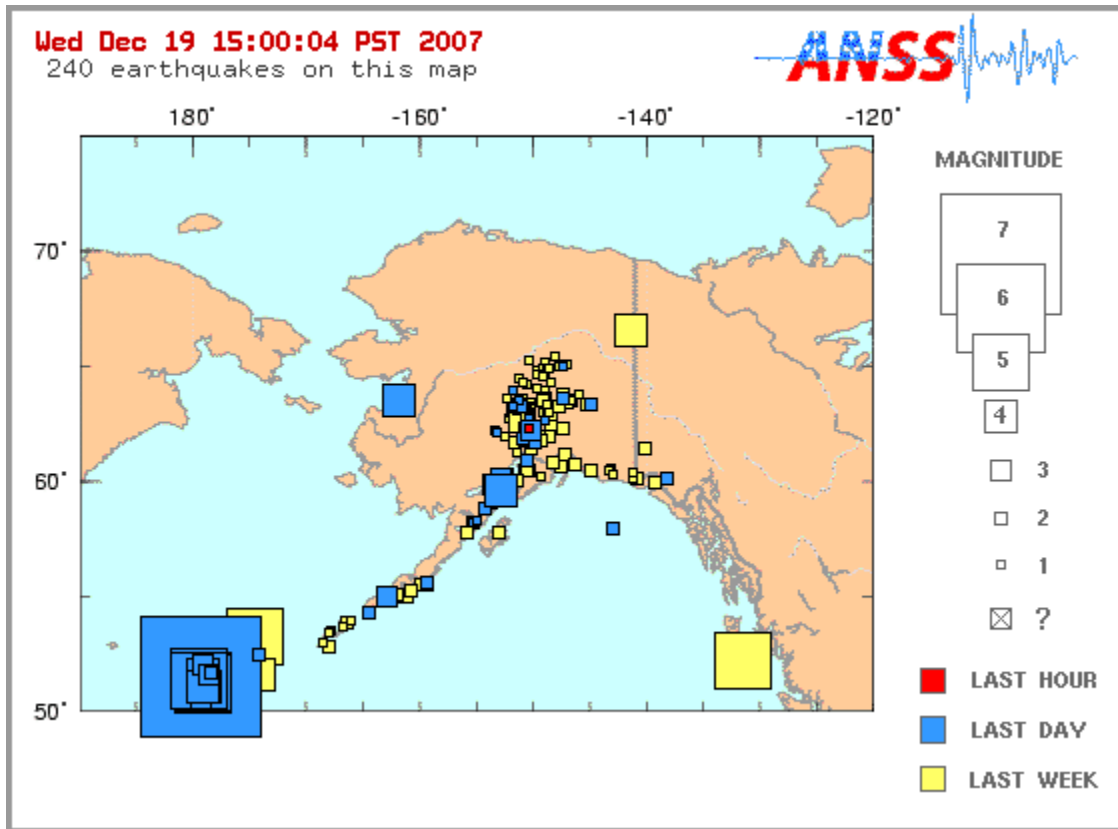
Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tsunamis). Buildings with foundations resting on unconsolidated landfill and other unstable soil, and trailers and homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths and injuries and extensive property damage.

Earthquakes strike suddenly, without warning. Earthquakes can occur at any time of the year and at any time of the day or night.

#### **B. Previous Occurrences for Earthquake**

On Good Friday, March 27, 1964, North America's strongest recorded earthquake, with a moment magnitude of 9.2, rocked central Alaska. On a global level, three of the ten strongest earthquakes ever recorded occurred in Alaska. Three of the ten strongest earthquakes ever recorded occurred in Alaska. Other, smaller earthquakes occur every day throughout the state. Each year, Alaska has approximately 5,000 earthquakes, including over 1,000 that measure above 3.4 on the Richter scale. McGrath itself has no reported earthquake damages.

### C. Geographic Location for Earthquake



Source: Alaska Information Earthquake Center, UAF

<http://www.giseis.alaska.edu/Seis/>

The entire geographic area of Alaska is prone to the effects of an earthquake and McGrath is no exception. Of particular concern to the residents of McGrath is the possibility of a large earthquake striking one of the regional hubs of the state, i.e. Anchorage, and cutting off communications, transportation, supplies and utilities for extended periods of time.

#### **D. Hazard Extent for Earthquake**

McGrath's relative distance from major fault lines, coastlines, and mountainous regions keep the relative risk of earthquake damage somewhat lower than that of communities with more exposure to secondary hazards. Earthquakes, while a hazard throughout Alaska, do not present catastrophic potential within the city.

#### **E. Hazard Summary for Earthquake**

Following provides information on the probability of future events. In addition, the data provides an overall summary of the Jurisdiction's vulnerability and impact of each hazard.

Earthquakes are a concern for every community in Alaska. While the time between damaging quakes may be extremely long, the damage caused by an earthquake can be catastrophic and can leave rural communities isolated without outside assistance for extended periods of time. It is important for all communities to conduct earthquake mitigation measures to reduce future earthquake damages. In communities such as McGrath where isolation is a concern, mitigation measures should primarily include supplies and preparation for extended periods of reduction of services.

#### **F. Calculated Priority Risk Index for Earthquake**

The CPRI factors the elements of risk: Probability (P), Magnitude/Severity (M), Warning Time (WT) and Duration to create an index which allows for the prioritization of mitigation activities based on the level of risk.

Probability:	2	Possible
Magnitude/Severity:	1	Negligible
Warning Time:	4	< 6 Hours
Duration:	-	Not Specified -

$$\begin{array}{rcccccc} \text{Probability} & + & \text{Magnitude} & + & \text{Warning} & + & \text{Duration} & = & \text{CPRI} \\ & & / \text{Severity} & & \text{Time} & & & & \\ \mathbf{2 \times .45} & + & \mathbf{1 \times .30} & + & \mathbf{4 \times .15} & + & \mathbf{0 \times .10} & = & \mathbf{1.8} \end{array}$$

#### **G. Vulnerability Analysis for Earthquake**

This section serves to identify each hazard confronting the community and its vulnerabilities to that hazard.

##### **a. Population**

Approximately **100** percent of the community's population is vulnerable.

#### **b. Critical Facilities**

- (1) Approximately 100 percent of the community's critical facilities is vulnerable.
- (2) The specific critical facilities vulnerable are:

#### **c. Non-Critical Facilities**

- (1) Approximately 100 percent of the community's non-critical facilities is vulnerable.
- (2) The specific non-critical facilities vulnerable are:

### **H. Hazard Economic Loss Estimation for Earthquake**

This section describes the potential economic losses due to each hazard confronting the community.

#### **a. Economic Loss**

The economic loss resulting from this hazard is approximately \$86,549,722.

#### **b. Structure Loss**

The loss from damage to structures from this hazard is approximately \$86,549,722.

#### **c. Following is the methodology for estimating losses**

Vulnerable structures were estimated by community officials.

### **I. Hazard Human Loss Estimation for Earthquake**

This section describes the potential human loss due to each hazard confronting the community.

#### **a. Fatalities**

The estimated number of fatalities resulting from this hazard is approximately 0.

#### **b. Injuries**

The estimated number of injuries resulting from this hazard is approximately 0.

#### **c. Displacees**

The estimated number of displacees resulting from this hazard is approximately 347.

#### **d. Total Affected**

The estimated total number of people affected by this hazard is approximately 347.

#### **e. Percentage of Population**

The estimated total percentage of the community's population at risk associated with this hazard is approximately 100%.

### **J. Vulnerability to Future Assets/Infrastructure for Earthquake**

All future assets and infrastructure will be at risk of earthquake damage.

## 2. Erosion

### A. Hazard Definition for Erosion

Erosion is a process that involves the gradual wearing away, transportation, and movement of land. However, not all erosion is gradual. It can occur quite quickly as the result of a flash flood, coastal storm, or other event. Most of the geomorphic change that occurs in a river system is in response to a peak flow event. It is a natural process but its effects can be exacerbated by human activity.

Erosion is a problem in developed areas where the disappearing land threatens development and infrastructure. There are three main types of erosion that affect human activity in Alaska:

- \* Coastal erosion
- \* Riverine erosion
- \* Wind erosion

McGrath is not located near a coast, so coastal erosion is not an issue in the community. Riverine erosion is the primary cause of erosion damages to the community.

#### Riverine Erosion

Riverine erosion results from the force of flowing water in and adjacent to river channels. This erosion affects the bed and banks of the channel and can alter or preclude any channel navigation or riverbank development. In less stable braided channel reaches, erosion and deposition of material are a constant issue. In more stable meandering channels, episodes of erosion may only occur occasionally. Rivers constantly alter their course, changing shape and depth, trying to find a balance between the sediment transport capacity of the water and the sediment supply. This process, called riverine erosion, is usually seen as the wearing away of riverbanks and riverbeds over a long period of time.

Riverine erosion is often initiated by failure of a riverbank causing high sediment loads or heavy rainfall. This generates high volume and velocity run-off, which will concentrate in the lower drainages within the river's catchment area. When the stress applied by these river flows exceeds the resistance of the riverbank material, erosion will occur. As the sediment load increases, fast-flowing rivers will erode their banks downstream. Eventually, the river becomes overloaded or velocity is reduced, leading to the deposition of sediment further downstream or in dams and reservoirs. The deposition may eventually lead to the river developing a new channel.

While all rivers change in the long-term, short-term rates of change vary significantly. In less stable braided channel reaches, erosion and deposition of material are a constant issue. In more stable meandering channels, episodes of erosion may only occur occasionally. The erosion rate depends on the sediment supply and amount of run-off reaching the river. Many things including earthquakes, floods, climatic changes, loss of bank vegetation, urbanization, and the construction of civil works in the waterway affect these variables.

Riverine erosion has many consequences including the loss of land and any development on that land. It can cause increased sedimentation of harbors and river deltas. It can hinder channel navigation - affect marine transportation source. Other problems include reduction in water quality due to high sediment loads, loss of native aquatic habitats, damage to public utilities (roads, bridges and dams) and maintenance costs associated with trying to prevent or control erosion sites.

## Wind Erosion

Wind erosion occurs when wind is responsible for the removal, movement, and re-deposition of land. It can cause a loss of topsoil, which can hinder agricultural production. The blowing dust can also reduce visibility and have a negative effect on air quality.

Wind moves soil particles 0.1-0.5 mm in size in a hopping or bouncing fashion (known as saltation) and those greater than 0.5 mm by rolling (known as soil creep). The finest particles (less than 0.1 mm) are carried in suspension. Wind erosion can increase during periods of drought.

Wind erosion can also cause a loss of topsoil, which can hinder agricultural production. The dust can reduce visibility causing automobile accidents, hinder machinery, and have a negative effect on air and water quality creating animal and human health concerns. Wind erosion also causes damage to public utilities and infrastructure.

### **B. Previous Occurrences for Erosion**

The city of McGrath has been critically damaged by ongoing erosion of the riverbank along the city's populated footprint. Over 24 lots and three roads have succumbed to erosion of the banks of the Kuskokwim River. The average rate of riverbank erosion is approximately 5 feet per year. Accelerated erosion has occurred in 1990 and 2003, years in which approximately 15 to 20 feet of riverbank was lost to erosion. More dramatic changes and accelerated erosion beginning in 2003, when a downstream oxbow was cut off by natural river dynamics, changing the rate of river flow and subsequently increasing the rate of erosion along the banks of lengthy spans of the oxbow on which McGrath is located.

### **C. Geographic Location for Erosion**

Following information identifies the geographic area(s) affected by each specified hazard.

McGrath's location makes erosion very problematic. The city is located on the banks of the Kuskokwim River on the inside banks of an oxbow, a sharp bend in the river caused by the natural dynamics of the river as it changes course over the years. McGrath is located directly on an eroding riverbank and within a floodplain, exacerbating the effects of the natural riverine system.

### **D. Hazard Extent for Erosion**

Following information describes the magnitude and severity of each specified hazard.

Erosion rarely causes death or injury. However, erosion causes the destruction of property, development and infrastructure. Over a long-term period of years and/or decades, erosion can devastate a community and leave it unprotected from storm surges and other coastal storms. Severe bank erosion currently threatens numerous critical public facilities, including the McGrath runway and Airport, the Post Office, the City's multi-use facility (Health Center Clinic, Washeteria, Alaska State Troopers, District Court, City offices, Water Treatment Plant), water supply infrastructure, and fuel storage tanks, as well as many residences. The erosion rate has increased from an estimated 5 feet per year to as much as 20 feet per year. McGrath's erosion problem is critical, and without immediate action, the community will likely lose more roads, structures, the airstrip, and other critical facilities.

## E. Hazard Summary for Erosion

Following provides information on the probability of future events. In addition, the data provides an overall summary of the Jurisdiction's vulnerability and impact of each hazard.

McGrath's erosion problem is critical, and without immediate action, the community will likely lose more roads, structures, the airstrip, and other critical facilities. Erosion mitigation is a top priority for the community.

## F. Calculated Priority Risk Index for Erosion

The CPRI factors the elements of risk: Probability (P), Magnitude/Severity (M), Warning Time (WT) and Duration to create an index which allows for the prioritization of mitigation activities based on the level of risk.

Probability: 4 Highly Likely  
Magnitude/Severity: 3 Critical  
Warning Time: 1 24+ Hours  
Duration: 4 > One Week

$$\begin{array}{rcccccc} & + & \text{Magnitude} & + & \text{Warning} & + & \text{Duration} & = & \text{CPRI} \\ \text{Probability} & & / \text{Severity} & & \text{Time} & & & & \\ \mathbf{4} \times \mathbf{.45} & + & \mathbf{3} \times \mathbf{.30} & + & \mathbf{1} \times \mathbf{.15} & + & \mathbf{4} \times \mathbf{.10} & = & \mathbf{3.25} \end{array}$$

## G. Vulnerability Analysis for Erosion

This section serves to identify each hazard confronting the community and its vulnerabilities to that hazard.

### a. Population

Approximately **100** percent of the community's population is vulnerable.

### b. Critical Facilities

(1) Approximately **0** percent of the community's critical facilities is vulnerable.

(2) The specific critical facilities vulnerable are:

The airport, water supply system, Cap'n Snow building, and two roads are at immediate risk of erosion damages.

### c. Non-Critical Facilities

(1) Approximately **0** percent of the community's non-critical facilities is vulnerable.

(2) The specific non-critical facilities vulnerable are:

Structures nearest to the banks of the Kuskokwim River are in moderate danger of erosion damages.

## H. Hazard Economic Loss Estimation for Erosion

This section describes the potential economic losses due to each hazard confronting the community.

### a. Economic Loss

The economic loss resulting from this hazard is approximately **\$86,549,722**.

#### **b. Structure Loss**

The loss from damage to structures from this hazard is approximately \$86,549,722.

#### **c. Following is the methodology for estimating losses**

Estimated potential losses for "next occurrence" cannot be calculated with any degree of accuracy because erosion is an ongoing process.

### **I. Hazard Human Loss Estimation for Erosion**

This section describes the potential human loss due to each hazard confronting the community.

#### **a. Fatalities**

The estimated number of fatalities resulting from this hazard is approximately 0.

#### **b. Injuries**

The estimated number of injuries resulting from this hazard is approximately 0.

#### **c. Displacees**

The estimated number of displacees resulting from this hazard is approximately 347.

#### **d. Total Affected**

The estimated total number of people affected by this hazard is approximately 347.

#### **e. Percentage of Population**

The estimated total percentage of the community's population at risk associated with this hazard is approximately 100%.

### **J. Vulnerability to Future Assets/Infrastructure for Erosion**

And future assets or infrastructure will be eventually vulnerable to erosion damages unless erosion near the community is halted completely.

## **3. Flooding**

### **A. Hazard Definition for Flooding**

Flooding occurs when rain, snow, or glacial melt causes a waterway to exceed its capacity. While there are many different types of flooding, Borough communities primarily are vulnerable to rainfall-runoff, storm surge, snowmelt, and ice jam floods. Rainfall-runoff flooding, the most common, usually occurs in the late summer and early fall. Snowmelt flooding occurs in the spring.

Rainfall-runoff flooding is the most common type of flood, occurring when waterways can't accommodate the increased volume of water resulting from heavier-than-normal rainfalls. The rainfall intensity, duration, distribution and geomorphic characteristics of the watershed all play a role in determining the magnitude of the flood.

Similarly, snowmelt floods occur in the spring or early summer, when runoff from melting snow-packs overwhelms waterways. The depth of the snow-pack and the spring weather patterns influence the magnitude of flooding. Snowmelt floods can also be caused by glacial melt.



Storm surges occur when high winds combine with high tides to drive waves inland, overtopping communities and causing damage. Storm surges can produce short-term increases in water levels to an elevation considerably above mean levels. The Lake and Peninsula coastline is vulnerable to storm surges due to its exposure to a long southwest fetch.

Groundwater flooding occurs when water accumulates and saturates the soil. The water table rises and floods low-lying areas, including homes, septic tanks, and other facilities.

Ice jam floods happen when large blocks of ice resulting in a jamming effect constrict rivers. Flooding from these events can occur when water collects upstream from a jam, creating a lake-like effect and flooding a large area; or when an ice jam suddenly releases, allowing water to rapidly drain into the waterway and rapidly raising the water level.

Other problems related to flooding are deposition (the accumulation of soil, silt, and other particles on a river bottom or delta) and stream bank erosion. Deposition leads to the destruction of fish habitat and presents a challenge for navigational purposes. Deposition also reduces channel capacity, resulting in increased flooding or bank erosion. Stream bank erosion involves the removal of material from the stream bank. When bank erosion is excessive, it becomes a concern because it results in loss of streamside vegetation, loss of fish habitat, and loss of land and property.

Many floods are fairly predictable based on rainfall patterns. For coastal areas of Alaska, most of the annual precipitation is received from September through February with October being the wettest. In Interior Alaska, the wettest period is June through November with August the wettest month. This rainfall leads to flooding in late summer and fall. Spring snowmelt increases runoff, which can cause flooding. It also breaks the winter ice cover, which causes localized ice-jam floods.

## **B. Previous Occurrences for Flooding**

Flooding is a regular occurrence in McGrath. Significant floods have occurred in 1921, 1924, 1927, 1933, 1937, 1972, 1974, 1976, 1981, 1982, 1987, 1990, 1991, 1996, 2005, and 2005 (Source: U.S. Army Corps of Engineers). Flooding was also photographically recorded in 2003.

Significant flooding occurred in 1957. The U.S. Army Corps of Engineers reports that had the 1957 flood been one foot higher, it would have inundated the entire community.

In 1991, approximately 65 businesses and homes were flooded due to an ice jam flood, experiencing extensive damage and loss. A Declaration of Disaster for the May 6-7, 1991 flood was sent to the Governor of Alaska and stated a dollar value loss of \$1,921.00.

Beginning May 3, 2005, ice jam flooding eroded several local roads, including Takotna and Tonzona Avenues and Cranberry Ridge Road, and unusually high water levels threatened city infrastructure and private homes. The city infrastructure at risk included: the City Office building which houses the water plant, health clinic, fire station, Washeteria, and State Trooper Office; the utility corridor containing power and water lines; two marine fuel headers and associated tank farms; and Federal and State offices and housing. Several private homes were cut off from emergency services due to impassable roads (Source: National Weather Service and City of McGrath).

The City of McGrath signed a local disaster declaration and requested State assistance on

May 13, 2005. The high water levels at McGrath receded slowly from May 14 to 18, 2005.

Flood depths during previous occurrences have ranged from an estimated 10-15 feet near the riverbanks to several inches throughout the community.

### C. Geographic Location for Flooding

Following information identifies the geographic area(s) affected by each specified hazard.

McGrath is located directly on the bank of the Kuskokwim River, inside an "oxbow" which is being steadily eroded away. The city is located on the Kuskokwim River floodplain. Takotna Avenue, a main transportation route, serves as a levee against rising river water. In recent years, the road has eroded and is currently closed because it is unsafe for travel. Tonzona Avenue also used to be a main transportation route, although now a block-long section has eroded and the edge of the riverbank is now marked with drums of sand and marked with reflective tape. Just beyond that, one additional block of Tonzona Avenue has succumbed to the river and an alternate route must be taken.

### D. Hazard Extent for Flooding

Following information describes the magnitude and severity of each specified hazard.

Flooding in McGrath can affect the entire community. All structures in the community are within the floodplain and are in flood zones.

### E. Hazard Summary for Flooding

Following provides information on the probability of future events. In addition, the data provides an overall summary of the Jurisdiction's vulnerability and impact of each hazard.

McGrath's flood vulnerability is critical. The entire community is regularly affected by riverine flooding. Flood mitigation is a top priority for the community.

### F. Calculated Priority Risk Index for Flooding

The CPRI factors the elements of risk: Probability (P), Magnitude/Severity (M), Warning Time (WT) and Duration to create an index which allows for the prioritization of mitigation activities based on the level of risk.

Probability:	4	Highly Likely
Magnitude/Severity:	3	Critical
Warning Time:	3	6-12 Hours
Duration:	-	Not Specified -

$$\begin{array}{rcccccccc} \text{Probability} & + & \text{Magnitude} & + & \text{Warning} & + & \text{Duration} & = & \text{CPRI} \\ & & / \text{Severity} & & \text{Time} & & & & \\ \mathbf{4} \times .45 & + & \mathbf{3} \times .30 & + & \mathbf{3} \times .15 & + & \mathbf{0} \times .10 & = & \mathbf{3.15} \end{array}$$

## G. Vulnerability Analysis for Flooding

This section serves to identify each hazard confronting the community and its vulnerabilities to that hazard.

### a. Population

Approximately 100 percent of the community's population is vulnerable.

### b. Critical Facilities

(1) Approximately 100 percent of the community's critical facilities is vulnerable.

(2) The specific critical facilities vulnerable are:

All structures within the community are within the floodplain and are in flood zones. Please see uploaded files for a complete list of affected structures and their estimated values.

Because of extreme variability in flood events, including depth, current, weather, time of year, and other factors, specific losses for future events cannot be estimated with any degree of accuracy. However, community officials have provided the following statement to represent potential losses for a future event:

100-year Flood example (1991 Ice-Jam Flood had a reported loss of \$1,921.00)

Residences, out-buildings, contents, vehicles, etc. in 2007 dollars and based on what an average business or residence would have on their property today: 21 @ \$100,000  
TOTAL estimate: \$2,100,000.00

Commercial: 10 Commercial including contents

TOTAL estimate: \$2,900,000

4 @ \$500,000 = \$2,000,000

4 @ \$200,000 = \$ 800,000

2 @ \$50,000 = \$ 100,000

Public: TOTAL estimate \$2,900,000

NOTE: This loss estimate varies considerably from the "cost of structure" replacement values provided earlier this year. Only the replacement costs of a complete structure were stated previously (assuming 100% loss of structure that had to be reconstructed at today's cost), and based on the most recent construction, a modest house in McGrath completed by IRHA. It did not include contents, vehicles, equipment, fuel or fuel tanks, etc., which were included in this "repair/replace" of estimated actual losses that could occur with either flood or erosion.

100' and less

21 Residences

17 Outbuildings, sheds, workshops (numerous outbuildings have not been included)

10 Commercial

21+ Public infrastructure

Commercial:

1. Large shop (Ben Magnuson) 80'

2. Old Trading Post (unoccupied-Eep Anderson) 50'

3. Joe's Bar (Roadhouse) (Allie and Joe Dale) 50'

4. Alaska Commercial Co. - large store

5. Alaska Commercial Co. - warehouse 100'

6. Magnuson Air 100'
7. Joaquin Investments Hanger 100'
8. Joaquin Investments Office 100'
9. Ephrem's Logs and Firewood
10. Magnuson Sawmill

Public:

1. Cap'n Snow Center; 96' 9"
  - a. Water Treatment Plant and Office,
  - b. Washeteria and Showers,
  - c. State Troopers Offices and Holding Cell,
  - d. District Court,
  - e. City of McGrath Administrative offices,
  - f. Southcentral Foundation administrative offices,
  - g. McGrath Health Center (regional Clinic) and
  - h. Behavioral Health,
  - i. McGrath Volunteer Fire Dept. and
  - j. Kuskokwim Valley Rescue Squad (ambulance).
2. Water main under road - feeding uptown and downtown piped water loops. 57'
3. Water Storage Tanks 100',
4. Airport - N, S, E and W ends of runway
5. Community Park and Ball Park
6. City owned Commercial Lease Lots - Industrial Park
  - a. Coyle's Logs and Lumber
  - b. Equipment staging and storing
  - c. Limestone rock stockpile and equipment storage
7. Unauthorized and unimproved Barge Landing
8. Unimproved Boat Slip - AC Co.
9. Log Haul-out Ramp
10. Community Garden w/ water tank, storage shed and equipment
11. Streets running North and South: A, B, C, D, E, F, and G
12. Ease end of McGuire Drive
13. Takotna Avenue - entire length
14. Tonzona Avenue - entire length
15. Industrial Park Drive - entire length

Additional - to 500'

51 Residences

28 Outbuildings, sheds and workshops (numerous outbuildings have not been included)

13 Commercial

11 Public infrastructure

Commercial:

1. General Services Store (Ann Egrass)
2. Don Harris Shop (large log building) 143'
3. The Shoppe - general store (Shelborne) 180'
4. GCI Earth Station and satellite dish 300'
5. Pole Barn - equipment storage (Ben Magnuson)
6. Innoko Building - Office building and apartments (Joaquin Investments) 400'
  - a. Innoko Wildlife Refuge Offices
  - b. M.T.N.T. Limited Offices
  - c. McGrath Light and Power Co.
  - d. State of AK Fish and Game

- e. Two apartments
- 7. Crowley Tank Farm and Pumps 375'
- 8. McGrath Light & Power Co. Tank Farm 250'
- 9. McGrath Light & Power - Power Plant 275'
- 10. McGrath Light & Power - Warehouse 300'
- 11. McGrath Light & Power - Shop 175'
- 12. Hotel McGrath B&B - 200'
- 13. PenAir Station and Ticket Counter - 200'
- 14. M.T.N.T. Office Building - McGrath Native Village Council Offices 300'
- 15. M.T.N.T. Office Building - Borealis Broadband Internet Service 300'
- 16. McGuire's Tavern 400'
- 17. Alaska State Trooper Fish & Wildlife Protection bulk fuel tanks 200'

**Public:**

- 1. U.S. Post Office 250'
- 2. City of McGrath Bulk Fuel Tank Farm 140'
- 3. Chinana Avenue (McGrath's main road, Chapter paralleling Takotna Ave.) 500'
- 4. City Garage/Shop 200'
- 5. City storage building
- 6. City storage building
- 7. City storage building
- 8. City storage building
- 9. ARCS Satellite Dish @ Cap'n Snow Center
- 10. End of Joaquin Street - beginning of HUD Subdivision 480' from downriver end of oxbow
- 11. Native Allotments - between end of Joaquin St. and downriver end of oxbow

Measurements are estimates taken from the 1" = 100' scale shown on aerial photos of McGrath.

McGrath Water and Sewer System Master Plan,  
Ce2 Engineers, 2003.

**c. Non-Critical Facilities**

- (1) Approximately 100 percent of the community's non-critical facilities is vulnerable.
- (2) The specific non-critical facilities vulnerable are:  
All structures within the community are within the floodplain and are in flood zones. Please see uploaded files for a complete list of affected structures and their estimated values.

**H. Hazard Economic Loss Estimation for Flooding**

This section describes the potential economic losses due to each hazard confronting the community.

**a. Economic Loss**

The economic loss resulting from this hazard is approximately \$86,549,722.

**b. Structure Loss**

The loss from damage to structures from this hazard is approximately \$86,549,722.

**c. Following is the methodology for estimating losses**

Values of vulnerable structures were estimated by community officials.

## **I. Hazard Human Loss Estimation for Flooding**

This section describes the potential human loss due to each hazard confronting the community.

### **a. Fatalities**

The estimated number of fatalities resulting from this hazard is approximately 0.

### **b. Injuries**

The estimated number of injuries resulting from this hazard is approximately 0.

### **c. Displacees**

The estimated number of displacees resulting from this hazard is approximately 347.

### **d. Total Affected**

The estimated total number of people affected by this hazard is approximately 347.

### **e. Percentage of Population**

The estimated total percentage of the community's population at risk associated with this hazard is approximately 100%.

## **J. Vulnerability to Future Assets/Infrastructure for Flooding**

All future assets and infrastructure will be vulnerable to flood damages unless elevated or built outside of flood zones.

## **4. Severe Weather**

### **A. Hazard Definition for Severe Weather**

Severe weather can occur in the form of winter storms, heavy snow, extreme cold, ice storms, high winds, hail, thunderstorms, hail, dense fog, coastal storms, storm surges, or any combination of weather events that create a dangerous or destructive condition.

### **B. Previous Occurrences for Severe Weather**

Severe weather occurs regularly throughout Alaska. The McGrath area regularly experiences extreme cold, thunderstorms, high winds, winter storms, and heavy snow. Recent climate changes may result in more severe weather occurrences throughout the state, including extreme cold, heavy snow, and severe winter storms and drought. Severe weather can be expected at any time of year.

### **C. Geographic Location for Severe Weather**

Following information identifies the geographic area(s) affected by each specified hazard.

As a rural Alaska community, McGrath is vulnerable to threats to life and safety caused by extended periods of extreme cold, and by weather that prevents supplies and assistance from reaching the community.

## D. Hazard Extent for Severe Weather

Following information describes the magnitude and severity of each specified hazard.

Severe weather can cause power outages, disruptions in transportation and utilities services, and damage to structures and other property. Essential services are commonly interrupted by severe weather in McGrath, including frozen sewer lines throughout the city piped sewer system as well as individual water service lines that transport water from the main line to individual homes and structures. The electric utility tends to fail in extreme cold, causing power outages and causing the water intake pump to freeze in the river, interrupting water flow to the city's water treatment plant. Extreme cold can also contribute to an increase in home and structure fires, because residents tend to use alternative heat sources such as heat taping, space heaters, and wood stoves. Some severe weather can be life-threatening, especially if a sustained severe weather event, such as extreme cold, occurs in conjunction with an interruption in power, fuel, and other utilities.

Severe weather also contributes to other hazards; for instance, in years with particularly heavy rainfall, the water level on the river rises and the river's velocity may increase, increasing the rate of erosion and undercutting the bank, causing the bank to break and fall off into the river when the water finally does recede.

## E. Hazard Summary for Severe Weather

Following provides information on the probability of future events. In addition, the data provides an overall summary of the Jurisdiction's vulnerability and impact of each hazard.

Severe weather is an ever-present hazard in all Alaska communities. Effects on a community can range from mild to severe, and will usually affect the entire community. Special needs populations such as the elderly, the ill, those with chronic respiratory conditions, and the very young are particularly vulnerable to severe weather events. Severe weather can affect the economy of the entire community as residents struggle to keep up with fuel prices and mechanical repairs required during periods of extreme cold.

## F. Calculated Priority Risk Index for Severe Weather

The CPRI factors the elements of risk: Probability (P), Magnitude/Severity (M), Warning Time (WT) and Duration to create an index which allows for the prioritization of mitigation activities based on the level of risk.

Probability:	4	Highly Likely
Magnitude/Severity:	2	Limited
Warning Time:	1	24+ Hours
Duration:	4	> One Week

$$\begin{array}{rcccccccl} \text{Probability} & + & \text{Magnitude} & + & \text{Warning} & + & \text{Duration} & = & \text{CPRI} \\ & & / \text{Severity} & & \text{Time} & & & & \\ \mathbf{4 \times .45} & + & \mathbf{2 \times .30} & + & \mathbf{1 \times .15} & + & \mathbf{4 \times .10} & = & \mathbf{2.95} \end{array}$$

## **G. Vulnerability Analysis for Severe Weather**

This section serves to identify each hazard confronting the community and its vulnerabilities to that hazard.

### **a. Population**

Approximately 100 percent of the community's population is vulnerable.

### **b. Critical Facilities**

(1) Approximately 100 percent of the community's critical facilities is vulnerable.

(2) The specific critical facilities vulnerable are:

All community facilities are vulnerable to storm damages.

### **c. Non-Critical Facilities**

(1) Approximately 100 percent of the community's non-critical facilities is vulnerable.

(2) The specific non-critical facilities vulnerable are:

All community facilities are vulnerable to storm damages.

## **H. Hazard Economic Loss Estimation for Severe Weather**

This section describes the potential economic losses due to each hazard confronting the community.

### **a. Economic Loss**

The economic loss resulting from this hazard is approximately \$0.

### **b. Structure Loss**

The loss from damage to structures from this hazard is approximately \$0.

### **c. Following is the methodology for estimating losses**

Potential losses could range from inconvenient to critical, depending upon the type of storm/severe weather, the duration of the event, and the ability of the community to obtain supplies and support. The entire population of the community is at risk for potential damages and/or loss of life. Specific monetary damages are impossible to estimate with any degree of certainty because of the variable nature of weather and its impacts.

## **I. Hazard Human Loss Estimation for Severe Weather**

This section describes the potential human loss due to each hazard confronting the community.

### **a. Fatalities**

The estimated number of fatalities resulting from this hazard is approximately 0.

### **b. Injuries**

The estimated number of injuries resulting from this hazard is approximately 0.

### **c. Displacees**

The estimated number of displacees resulting from this hazard is approximately 347.

### **d. Total Affected**

The estimated total number of people affected by this hazard is approximately 347.



#### **e. Percentage of Population**

The estimated total percentage of the community's population at risk associated with this hazard is approximately 100%.

#### **J. Vulnerability to Future Assets/Infrastructure for Severe Weather**

All future assets and infrastructure will be vulnerable to storm damages.

### **5. Volcano**

#### **A. Hazard Definition for Volcano**

A volcano is a mountain that opens downward to a reservoir of molten rock below the surface of the earth. Unlike most mountains, which are pushed up from below, volcanoes are built up by an accumulation of their own eruptive products lava, ash-flows, and airborne ash and dust. When pressure from gases and the molten rock becomes strong enough to cause an explosion, eruptions occur. Gases and rock shoot up through the opening and spill over, or fill the air with lava fragments.

Alaska is home to 41 historically active volcanoes located across the entire southern portion of the state from the Wrangell Mountains to the Western Aleutian Islands. "Historically active" refers to actual eruptions that have occurred during Alaskan historic time; in general the time period in which written records have been kept. Alaska's written record begins in 1760.

An average of 1-2 eruptions per year occur in Alaska. The single greatest volcanic hazard in Alaska is airborne ash, fine fragments of rock blown high into the atmosphere during explosive volcanic eruptions. Coarse particles fall near the volcano but the fine particulates travel downwind as an eruption cloud posing a hazard to aircraft and populations even hundreds or thousands of miles away. Ash is extremely abrasive, does not dissolve in water, and is heavy and slippery when wet. Inhaling ash can be dangerous, especially for children, the elderly and those with breathing problems. Ash also affects machinery such as cars and electrical generators. Damages from volcanic eruptions can therefore be severe, and limitations on air travel resulting from airborne ash can isolate communities that lie off the road system, such as those in the Borough.

#### **B. Previous Occurrences for Volcano**

Volcanic hazards are ever-present in Alaska. An average of 1-2 eruptions per year occur in the state. McGrath itself has no record of direct effects from volcanoes.

#### **C. Geographic Location for Volcano**

Following information identifies the geographic area(s) affected by each specified hazard.

McGrath is not near any active volcanoes and is relatively safe from the direct effects of all but the most catastrophic eruptions. Isolation and interruptions in supplies and services is a significant concern for the community should an eruption occurs in another part of the state.

#### **D. Hazard Extent for Volcano**

Following information describes the magnitude and severity of each specified hazard.

Limitations on air travel resulting from airborne ash can isolate communities that lie off the road system, such as McGrath. The entire community would be affected by such an occurrence.

**E. Hazard Summary for Volcano**

Following provides information on the probability of future events. In addition, the data provides an overall summary of the Jurisdiction’s vulnerability and impact of each hazard.

McGrath is not in immediate danger from volcanic hazards, but should be prepared for occurrences that affect the rest of the state.

**F. Calculated Priority Risk Index for Volcano**

The CPRI factors the elements of risk: Probability (P), Magnitude/Severity (M), Warning Time (WT) and Duration to create an index which allows for the prioritization of mitigation activities based on the level of risk.

Probability: 2 Possible  
 Magnitude/Severity: 2 Limited  
 Warning Time: 1 24+ Hours  
 Duration: - Not Specified -

$$\begin{array}{rcccccccc}
 \text{Probability} & + & \text{Magnitude} & + & \text{Warning} & + & \text{Duration} & = & \text{CPRI} \\
 & & /\text{Severity} & & \text{Time} & & & & \\
 2 \times .45 & + & 2 \times .30 & + & 1 \times .15 & + & 0 \times .10 & = & 1.65
 \end{array}$$

**G. Vulnerability Analysis for Volcano**

This section serves to identify each hazard confronting the community and its vulnerabilities to that hazard.

**a. Population**

Approximately **100** percent of the community's population is vulnerable.

**b. Critical Facilities**

(1) Approximately **100** percent of the community's critical facilities is vulnerable.

(2) The specific critical facilities vulnerable are:

All community facilities are vulnerable to volcano damages or secondary effects. Direct damages are likely to be minimal.

**c. Non-Critical Facilities**

(1) Approximately **100** percent of the community's non-critical facilities is vulnerable.

(2) The specific non-critical facilities vulnerable are:

All community facilities are vulnerable to volcano damages or secondary effects. Direct damages are likely to be minimal.

## **H. Hazard Economic Loss Estimation for Volcano**

This section describes the potential economic losses due to each hazard confronting the community.

### **a. Economic Loss**

The economic loss resulting from this hazard is approximately \$0.

### **b. Structure Loss**

The loss from damage to structures from this hazard is approximately \$0.

### **c. Following is the methodology for estimating losses**

The primary effects of a volcanic eruption are not of significant concern to the community; however should a large eruption occur in another part of the state, the community may face extended periods of isolation and service interruption. If combined with a period of extreme weather, the community could experience serious consequences in the form of food shortages, inability to provide medical evacuations, and other problems. Specific financial damages are impossible to quantify with any degree of accuracy because of the variables involved.

## **I. Hazard Human Loss Estimation for Volcano**

This section describes the potential human loss due to each hazard confronting the community.

### **a. Fatalities**

The estimated number of fatalities resulting from this hazard is approximately 0.

### **b. Injuries**

The estimated number of injuries resulting from this hazard is approximately 0.

### **c. Displacees**

The estimated number of displacees resulting from this hazard is approximately 347.

### **d. Total Affected**

The estimated total number of people affected by this hazard is approximately 347.

### **e. Percentage of Population**

The estimated total percentage of the community's population at risk associated with this hazard is approximately 100%.

## **J. Vulnerability to Future Assets/Infrastructure for Volcano**

All future assets and infrastructure will be vulnerable to volcano damages and secondary effects.

## **6. Wildfires**

### **A. Hazard Definition for Wildfires**

Fire is a critical feature of the natural history of many ecosystems. It is essential to maintain the biodiversity and long-term ecological health of the land. The role of wildland fire as an

essential ecological process and natural change agent has been incorporated into the fire management planning process and the full range of fire management activities is exercised in Alaska to help achieve ecosystem sustainability, including its interrelated ecological, economic, and social consequences on firefighter and public safety and welfare, natural and cultural resources threatened, and the other values to be protected dictate the appropriate management response to the fire. In Alaska, the natural fire regime has a return interval of 50 to 200 years, depending on the vegetation type, topography, and location. Many wildland fires do not present a threat to people or property because they are in unpopulated parts of the state. This situation is changing as more development is occurring in wooded areas, placing people and property at risk.

The fire risk has also been increasing in recent years due to the spruce bark beetle infestation. The beetles lay their eggs under the bark of the trees and the emerging larvae eat the phloem, which is what trees use to transport nutrients from their needles to their roots. If the phloem loss is significant, the tree will die. The dead trees are very dry and therefore highly flammable. This will present an even bigger problem in the coming years as the trees start to fall, littering the forest floor with flammable material.

Wildland fires occur in every state in the country and Alaska is no exception. Each year, between 600 and 800 wildland fires, mostly between March and October, burn across Alaska causing extensive damage.

Given the history of wildland fires in Alaska the probability of future fires is high.

Fuel, weather and topography influence wildland fire behavior. Wildland fire behavior can be erratic and extreme. The speed, direction, and intensity of a fire is determined by the following factors:

Fuel, or what the fire consumes, determines how much energy the fire releases, how quickly the fire spreads, and how much effort is needed to contain the fire. The size of the fuel, its moisture content, and its density contributes to the temperature and intensity at which the fuel burns. Fuel conditions leading to high fire danger include unusually dry fuels, large amount of light fuels, fuels exposed to direct sunlight, fuels dried by prolonged drought, the presence of ladder fuels (fuels creating a "bridge" between surface fuels and aerial fuels), crown foliage dried by surface fire, and a high concentration of snags or standing dead trees.

Weather is the most variable factor in fire behavior. High temperatures and low humidity encourage fire activity while low temperatures and high humidity help retard fire behavior. Weather conditions can change quickly, leading to extreme fire behavior such as firestorms and "blowups." Weather conditions leading to high fire danger and/or extreme fire behavior include unusually high temperature and low relative humidity, thunderstorms, strong winds, sudden changes in wind velocity or direction, unusual surface winds, unexpected calm (may indicate a wind shift), and development of whirlwinds or "dust devils."

Topography directs the movement of air, which in turn affects fire behavior. When the terrain funnels air through canyons and ravines, it can lead to faster fire spread. Topography that may lead to high fire danger and/or extreme fire behavior include steep slopes; chutes, saddles, and box canyons; narrow canyons, and mountainous regions (may present risk of Foehn wind - a dry wind with strong downward components, characteristic of mountainous regions).

The wildland-urban interface exists wherever human development meets undeveloped wildlands. Wildland-urban interface fires are of particular concern because such fires can be

extremely dangerous and complex to fight, and can pose a tremendous threat to public and firefighter safety.

## **B. Previous Occurrences for Wildfires**

Wildland fires are common in the Interior of Alaska and McGrath has been threatened several times by large wildland fires. In 2002, the Vinasale fire burned about 200,000 acres near the community. McGrath is home to an Alaska Department of Natural Resources wildland firefighting base, due to its location near wildfires each season.

Poor air quality caused by airborne smoke and ash has been a serious concern in the community. Heavy, dense smoke from wildland fires as far away as Ft. Yukon on the Yukon River has remained in the McGrath area for weeks at a time and required those with chronic respiratory conditions to leave the community.

## **C. Geographic Location for Wildfires**

Following information identifies the geographic area(s) affected by each specified hazard.

McGrath is located in the Interior of Alaska, an area known for its vulnerability of wildland fire due to its topography and vegetation. Interior of Alaska has large swaths of spruce beetle-killed trees and black spruce, resulting in a heavy fire fuel load that, when ignited, can burn extremely fast and hot. The community also is heavily vegetated, with little defensible space between wooded areas and structures.

## **D. Hazard Extent for Wildfires**

Following information describes the magnitude and severity of each specified hazard.

The proximity of a wildland fire to the community can affect all residents and can impact air quality as well as the delivery of services and supplies. A fire that is significant enough to threaten the community will affect the entire community.

## **E. Hazard Summary for Wildfires**

Following provides information on the probability of future events. In addition, the data provides an overall summary of the Jurisdiction's vulnerability and impact of each hazard.

McGrath is significantly vulnerable to wildland fire hazards due to the high fire fuel load surrounding the community and the lack of defensible space around structures. Wildland fire mitigation is a top priority for the community.

## **F. Calculated Priority Risk Index for Wildfires**

The CPRI factors the elements of risk: Probability (P), Magnitude/Severity (M), Warning Time (WT) and Duration to create an index which allows for the prioritization of mitigation activities based on the level of risk.

Probability:	3 Likely
Magnitude/Severity:	4 Catastrophic
Warning Time:	4 < 6 Hours

Duration: - Not Specified -

$$\begin{array}{rcccccccc} \text{Probability} & + & \text{Magnitude} & + & \text{Warning} & + & \text{Duration} & = & \text{CPRI} \\ & & / \text{Severity} & & \text{Time} & & & & \\ \mathbf{3} \times .45 & + & \mathbf{4} \times .30 & + & \mathbf{4} \times .15 & + & \mathbf{0} \times .10 & = & \mathbf{3.15} \end{array}$$

## G. Vulnerability Analysis for Wildfires

This section serves to identify each hazard confronting the community and its vulnerabilities to that hazard.

### a. Population

Approximately **100** percent of the community's population is vulnerable.

### b. Critical Facilities

(1) Approximately **100** percent of the community's critical facilities is vulnerable.

(2) The specific critical facilities vulnerable are:

All structures within the community are vulnerable to wildfire danger because of the high fire fuel load within and surrounding the community.

### c. Non-Critical Facilities

(1) Approximately **100** percent of the community's non-critical facilities is vulnerable.

(2) The specific non-critical facilities vulnerable are:

All structures within the community are vulnerable to wildfire danger because of the high fire fuel load within and surrounding the community.

## H. Hazard Economic Loss Estimation for Wildfires

This section describes the potential economic losses due to each hazard confronting the community.

### a. Economic Loss

The economic loss resulting from this hazard is approximately **\$86,549,722**.

### b. Structure Loss

The loss from damage to structures from this hazard is approximately **\$86,549,722**.

### c. Following is the methodology for estimating losses

The community is extremely vulnerable to wildfire and could suffer a total loss should the community experience an extremely damaging fire. Community officials estimated values of vulnerable buildings.

## I. Hazard Human Loss Estimation for Wildfires

This section describes the potential human loss due to each hazard confronting the community.

### a. Fatalities

The estimated number of fatalities resulting from this hazard is approximately **0**.

#### **b. Injuries**

The estimated number of injuries resulting from this hazard is approximately 0.

#### **c. Displacees**

The estimated number of displacees resulting from this hazard is approximately 347.

#### **d. Total Affected**

The estimated total number of people affected by this hazard is approximately 347.

#### **e. Percentage of Population**

The estimated total percentage of the community's population at risk associated with this hazard is approximately 100%.

### **J. Vulnerability to Future Assets/Infrastructure for Wildfires**

All future assets and infrastructure will be vulnerable to wildfire damages unless specially constructed with mitigation measures.

## **4.3 Asset Inventory**

### **A. Processes and Sources for Identifying Assets**

#### **Processes and Sources for Identifying Assets:**

#### **Data Limitations:**

The list on the state's database is many years out of date, making it necessary to use local knowledge to update the lists below.

Community officials have provided the following lists of specific structures at immediate risk of erosion and flood damages:

#### **Critical Facilities List:**

This section outlines the resources, facilities and infrastructure that, if damaged, could significantly impact public safety, economic conditions, and environmental integrity of McGrath.

*Critical Facilities:* Those facilities and infrastructure necessary for emergency response efforts.

- McGrath Airport
- McGrath City Offices/Cap'n Snow Center
- McGrath Native Village Council Building
- McGrath Water Treatment Plant
- McGrath Light and Power
- State of Alaska shops
- State Troopers Office – Cap'n Snow Center
- Borealis Broadband, Alascom, GCI and UUI Building - Communications
- McGrath City Public Works Shop

- McGrath Health Center – Cap'n Snow Center
- Innoko Wildlife Refuge Building
- State of AK, Forestry-DNR Wildfire Center

*Essential Facilities:* Those facilities and infrastructure that supplement response efforts.

- Designated Shelters – Cap'n Snow Center, DNR & McGrath School
- City Buildings; VPSO Office Building
- Bulk Fuel Storage Tank Farms – City of McGrath and Crowley/ML&P

*Critical Infrastructure:* Infrastructure that provides services to McGrath.

- Telephone lines
- Power lines
- Water and Sewer mains
- Transportation networks
- McGrath City Sewer Lagoon
- McGrath Landfill
- U.S. Post Office

*Vulnerable Populations:* Locations serving population that have special needs or require special consideration.

- McGrath Head Start, Elementary, Middle and High School
- McGrath School Garage
- McGrath School Shop
- McGrath Teen Center



*Cultural and Historical Assets:* Those facilities that augment or help define community character, and, if lost, would represent a significant loss for the community.

- McGrath Community Library
- Tochak Historical Museum
- McGrath Cemetery
- Iditarod National Historic Trail
- Kuskokwim River (Watershed – Subsistence resources)

## **McGrath – Locations At Risk from Flooding and Erosion**

### **100' and less from riverbank**

#### **21 Residences**

**17 Outbuildings, sheds, workshops (numerous outbuildings have not been included)**

#### **10 Commercial**

#### **21+ Public infrastructure**

Commercial:

1. Large shop – equipment storage (Ben Magnuson) 80'
2. Old Trading Post (unoccupied-Eep Anderson) 50'
3. Joe's Bar (Roadhouse) (Alli and Joe Dale) 50'
4. Alaska Commercial Co. - large store
5. Alaska Commercial Co. - warehouse 100'
6. Magnuson Air 100'
7. Joaquin Investments Hanger 100'
8. Joaquin Investments Office 100'
9. Ephrem's Logs and Firewood
10. Magnuson Sawmill

Public:

1. Cap'n Snow Center; 96' 9"
  - a. Water Treatment Plant and Office,
  - b. Washeteria and Showers,
  - c. State Troopers Offices and Holding Cell,
  - d. District Court,
  - e. City of McGrath Administrative offices,
  - f. Southcentral Foundation administrative offices,
  - g. McGrath Health Center (regional Clinic) and
  - h. Behavioral Health,
  - i. McGrath Volunteer Fire Dept. and
  - j. Kuskokwim Valley Rescue Squad (ambulance).
2. Water main under road - feeding uptown and downtown piped water loops. 57'
3. Water Storage Tanks 100',
4. Airport - N, S, E and W ends of runway
5. Community Park and Ball Park
6. City owned Commercial Lease Lots - Industrial Park
  - a. Coyle's Logs and Lumber
  - b. Equipment staging and storing
  - c. Limestone rock stockpile and equipment storage
7. Unauthorized and unimproved Barge Landing
8. Unimproved Boat Slip - AC Co.
9. Log Haul-out Ramp

10. Community Garden w/ water tank, storage shed and equipment
11. Streets running North and South: A, B, C, D, E, F, and G
12. Ease end of McGuire Drive
13. Takotna Avenue - entire length
14. Tonzona Avenue - entire length
15. Industrial Park Drive - entire length

**Additional - to 500' from riverbank**

- 51 Residences
- 28 Outbuildings, sheds and workshops (numerous outbuildings have not been included)
- 13 Commercial
- 11 Public infrastructure

Commercial:

1. General Services Store (Ann Egrass)
2. Don Harris Shop (large log building) 143'
3. The Shoppe - general store (Shelborne) 180'
4. GCI Earth Station and satellite dish 300'
5. Pole Barn - equipment storage (Ben Magnuson)
6. Innoko Building - Office building and apartments (Joaquin Investments) 400'
  - a. Innoko Wildlife Refuge Offices
  - b. M.T.N.T. Limited Offices
  - c. McGrath Light and Power Co.
  - d. State of AK Fish and Game
  - e. Two apartments
7. Crowley Tank Farm and Pumps 375'
8. McGrath Light & Power Co. Tank Farm 250'
9. McGrath Light & Power - Power Plant 275'
10. McGrath Light & Power - Warehouse 300'
11. McGrath Light & Power - Shop 175'
12. Hotel McGrath B&B - 200'
13. PenAir Station and Ticket Counter - 200'
14. M.T.N.T. Office Building - McGrath Native Village Council Offices 300'
15. M.T.N.T. Office Building - Borealis Broadband Internet Service 300'
16. McGuire's Tavern 400'
17. Alaska State Trooper Fish & Wildlife Protection bulk fuel tanks 200'

Public:

1. U.S. Post Office 250'
2. City of McGrath Bulk Fuel Tank Farm 140'
3. Chinana Avenue (McGrath's main road, Chapter paralleling Takotna Ave.) 500'
4. City Garage/Shop 200'
5. City storage building
6. City storage building
7. City storage building
8. City storage building
9. ARCS Satellite Dish @ Cap'n Snow Center
10. End of Joaquin Street - beginning of HUD Subdivision 480' from down river end of oxbow
11. Native Allotments & land distributions - between end of Joaquin St. and downriver end of oxbow

Measurements are estimates taken from the 1" = 100' scale shown on aerial photos of McGrath.  
McGrath Water and Sewer System Master Plan,  
Ce2 Engineers, 2003.

### **C: Non-Critical Facilities:**

Approximately 100 percent of the community's non-critical facilities is vulnerable.

The specific non-critical facilities vulnerable are:

Structures nearest to the banks of the Kuskokwim River are in moderate danger of erosion damages. Estimated erosion damages are impossible to determine with significant accuracy; however community officials have provided the following statement to represent erosion losses:

The Erosion example used for upriver erosion loss including the two most vulnerable and probable areas. Erosion area #1 includes the NRCS footprint from the log haul-out to the end of Takotna Ave. at the Ivey residence. Erosion area #2 includes Tonzona Avenue from McGuire Drive to "B" Street.

Residences, outbuildings, contents, vehicles, etc.:

TOTAL estimate: \$1,600,000

30 @ \$50,000 = \$1,500,000 Area #1

2 @ \$50,000 = \$100,000 Area #2

Commercial, including outbuildings contents, vehicles, etc.

2 @ \$240,000 = \$480,000 Area #2

TOTAL estimate: \$480,000

Public: Areas #1 and #2 combined. This includes extensive infrastructure that is prone and vulnerable to severe damage caused by erosion. Roads, water treatment and distribution system, water tanks, bulk fuel tank farm, Multi-Use Facility (Cap'n Snow Center) occupants and structure all listed on the 100' Flood list and some listed on the 500' list, that would be affected by the losses on the 100' list.

TOTAL estimate: \$500,000,000

NOTE: This loss estimate varies considerably from the "cost of structure" replacement values provided earlier this year. Only the replacement costs of a complete structure were stated previously (assuming 100% loss of structure that had to be reconstructed at today's cost), and based on the most recent construction, a modest house in McGrath completed by IRHA. It did not include contents, vehicles, equipment, fuel or fuel tanks, etc., which were included in this "repair/replace" of estimated actual losses that could occur with either flood or erosion.

### **C. Facility Replacement Costs**

There have been no studies to confirm replacement costs. Additional financial assistance will be required to determine this. Local knowledge was used as the basis for the estimates given.

## **D. Future Development**

### **4.4 Analysis of Community Development Trends**

#### **McGrath**

A group of governmental and other agencies have formed a Community Collaboration Group for the purpose of formalizing and enhancing existing partnerships and collaborative relationships. One of the immediate goals is to form the McGrath Economic Development Council, which will serve to develop local resources, encourage business development and provide growth and sustainability to the community.

McGrath's Comprehensive Development Plan (1984), Long-Range Development Plan (1989) and Strategic Plan (2003) will be updated and compiled into a new Comprehensive Plan with the assistance of a VISTA volunteer under RurAL CAP's VCMP Program, beginning January 2008.

## **Section 5 Mitigation Strategy**

### **5.1 Summary of Mitigation Goals**

*(See 4 scanned pages below. The "Word" documents downloaded from [www.mitigationplan.com](http://www.mitigationplan.com) could not be copied and pasted in this "Word" document. When "pasted", they each contained the "number designations" instead of the STAPLE-E letter designations as seen below.)*

### 1.1.1.1 MITIGATION STRATEGY FOR EROSION

#### CRITERIA EVALUATION FOR HAZARD: EROSION

Mitigation Action Item	S	T	A	P	L	E	E
Structural reinforcement of unstable soils	SB	U	U	SB	I	U	U
Relocation of Infrastructure	U	U	U	U	I	U	U
Prioritize infrastructure with respect to relocation	SB	SB	SB	U	I	I	I
Create city fund for erosion control, recovery, and infrastructure	SB	I	SB	U	I	SB	I
Public Education	SB	I	I	I	I	I	I
Identify sources of funding for erosion control	SB	I	SB	SB	I	SB	I
Create local Erosion Task Force	SB	I	SB	U	I	SB	I
Prohibit new construction in erosion zones	U	SB	I	U	I	SB	I
Mapping of erosion zones	SB	SB	I	SB	I	I	I

The ratings for each hazard convert into numerical scores as follows:

#### CRITERIA ANALYSIS FOR HAZARD: EROSION

Mitigation Action Item	S	T	A	P	L	E	E	FINAL SCORE
Structural reinforcement of unstable soils	1	U	U	1	0	U	U	2
Relocation of Infrastructure	U	U	U	U	0	U	U	0
Prioritize infrastructure with respect to relocation	1	1	1	U	0	0	0	3
Create city fund for erosion control, recovery, and infrastructure relocation	1	0	1	U	0	1	0	3
Public Education	1	0	0	0	0	0	0	1
Identify sources of funding for erosion control	1	0	1	1	0	1	0	4
Create local Erosion Task Force	1	0	1	U	0	1	0	3
Prohibit new construction in erosion zones	U	1	0	U	0	1	0	2
Mapping of erosion zones	1	1	0	1	0	0	0	3

## Analysis:

The highest scoring mitigation action item is "identify sources of funding for erosion control." While sources of funding are an issue for most mitigation activities, the city has been pursuing erosion control funding for quite some time and is currently not making progress on that front. Therefore, the city may wish to consider moving to other mitigation strategies. The next highest scoring items all involve the collection of additional information. Given that there are a number of data gaps in the STAPLE+E data analysis tool, pursuing these mitigation measures will play a dual role; that of addressing the erosion problem in a progressive manner, and collecting additional information that can be used to further evaluate mitigation options. These items, all scoring a three, have a minimal amount of data gaps, indicating that these options have the most data available to support them.

Since federal action to install erosion control has been determined to be cost prohibitive for the community, it is important that the community identify its preferred method for mitigating the erosion problem and create a long-term plan to enact that method, whether it be by relocating affected infrastructure, or installing erosion control methods via local means, such as installing riprap.

The City of McGrath is pursuing strategies for funding flood and erosion protection and remediation. The city has requested appropriation of federal funds to provide a fiscally responsible, sustainable, and permanent solution for the community's erosion problem. Currently attempts to mitigate the flood and erosion problem have been stymied by the 50-50 cost share requirement to fund a feasibility study for erosion control and/or bank stabilization. The most recent appropriations request included a request for 100% funding because the community does not have these matching funds. It is unlikely that this request will be met.

The community must adopt a new strategy when planning to address the ongoing erosion problems. Congressional earmarks may be a thing of the past for Alaska communities, so McGrath, like other communities, must develop ways to fund erosion control and similar mitigation measures. A community-minded, sustainable, and future-oriented plan will ensure that the community is united in purpose and prepared for future occurrences.

### 1.1.1.2 MITIGATION STRATEGY FOR WILDFIRE

#### CRITERIA EVALUATION FOR HAZARD: WILDFIRE

Mitigation Action Item	S	T	A	P	L	E	E
Promote use of FireWise practices and concepts throughout the community	SB	SB	I	I	I	SB	I
Create defensible space around City infrastructure	U	SB	I	I	I	SB	I
Public Education	SB	I	I	I	I	SB	I
Wildfire evacuation plan	SB	I	I	I	SB	I	I
Require defensible space around structures	I	SB	I	U	U	I	I
Create firebreak around city	I	SB	I	U	U	SB	U

## CRITERIA ANALYSIS FOR HAZARD: WILDFIRE

Mitigation Action Item	S	T	A	P	L	E	E	FINAL SCORE
Promote use of FireWise practices and concepts throughout the community	1	1	0	0	0	1	0	3
Create defensible space around City infrastructure	U	1	0	0	0	1	0	2
Public Education	1	0	0	0	0	1	0	2
Wildfire evacuation plan	1	0	0	0	1	0	0	2
Require defensible space around structures	0	1	0	U	U	0	0	1
Create firebreak around city	0	1	0	U	U	1	U	2

### Analysis:

No wildfire mitigation item was found to have a Significantly Adverse effect on any of the STAPLE/E criteria. There are a few Unknowns, though, which indicate data gaps. Filling these gaps may result in the discovery of a few SA ratings. Since wildfire suppression and response fell mostly under State and Federal jurisdiction, most mitigation items involve methods for reducing damages within the community. Such methods are almost universally relatively inexpensive, easy to implement, and present a significant rate of return in regards to protection from damages.

### 1.1.1.3 MITIGATION STRATEGY FOR FLOOD

## CRITERIA EVALUATION FOR HAZARD: FLOOD

Mitigation Action Item	S	T	A	P	L	E	E
Relocate structures in flood zones	U	SB	I	U	U	SB	U
Flood control measures (dikes, etc.)	SB	U	I	SB	I	U	SB
Structural reinforcement (erosion control)	SB	U	I	SB	I	U	SB
Prohibit new construction in flood zones	SA	I	I	U	I	SB	SB
Map flood zones and designate hazard zones	SB	SB	I	SB	I	I	I

Elevate structures in flood zones	U	SB	I	U	I	SB	SB
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**CRITERIA ANALYSIS FOR HAZARD: FLOOD**

Mitigation Action Item	S	T	A	P	L	E	E	FINAL SCORE
Relocate structures in flood zones	U	1	0	U	U	1	U	2
Flood control measures (dikes, etc.)	1	U	0	1	0	U	1	3
Structural reinforcement (erosion control)	1	U	0	1	0	U	1	3
Prohibit new construction in flood zones	-1	0	0	U	0	1	1	1
Map flood zones and designate hazard zones	1	1	0	1	0	0	0	3
Elevate structures in flood zones	U	1	0	U	0	1	1	3

**Analysis:**

Significant data gaps regarding flooding exist for the McGrath area. Additional study is recommended to develop the most effective mitigation measures. In the meantime, though, simple measures such as prohibiting new construction or requiring new construction to be elevated above flood levels are reasonable ways in which to address the flood hazard while concurrently researching mitigation measures for existing structures.

Studies that address flood and erosion damages at the same time may be a cost effective way in which to fill existing data gaps.



## 1.1 Mitigation Strategy Menu

### 1.1.1 Existing Goals and Objectives

- 1.1.1.1. Goal: Reduce impacts of erosion on the community.
- 1.1.1.2. Objective: Develop a flood and all-hazards Mitigation Plan
- 1.1.1.3. Objective: Increase public awareness of erosion damage
- 1.1.1.4. Objective: Install erosion control
- 1.1.1.5.
- 1.1.1.6. Goal: Reduce community's vulnerability to wildfire
- 1.1.1.7. Objective: Develop and implement community contingency evacuation plan
- 1.1.1.8. Objective: Promote defensible space around structures in the community

### 1.1.2 New Goals and Objectives

- 1.1.1.9. Goal: Improve the community's vulnerability to wildfire hazards
- 1.1.1.10. Objective: Have a functional plan for immediate response to a wildfire
- 1.1.1.11. Task: Determine availability of heavy equipment for construction of firebreaks
- 1.1.1.12. Objective: Ensure that residents know who to call for help should a wildfire occur
- 1.1.1.13. Task: Post emergency contact telephone, email, and fax contacts in conspicuous locations in city offices and school
- 1.1.1.14. Task: Distribute emergency contact numbers to residents for their homes
- 1.1.1.15.
- 1.1.1.16. Goal: Establish and prioritize actions to reduce community's vulnerability to erosion
- 1.1.1.17. Objective: Establish alternatives to address the erosion danger in the community
- 1.1.1.18. Objective: Relocate infrastructure endangered by erosion.
- 1.1.1.19. Task: Determine feasibility of infrastructure relocation
- 1.1.1.20. Task: Prioritize infrastructure with respect to urgency of relocation
- 1.1.1.21. Task: Create a schedule for relocation of infrastructure based on Prioritization project.
- 1.1.1.22. Objective: Fund relocation and erosion protection efforts
- 1.1.1.23. Task: Create fund or line item in city budget to be used only for erosion control projects and/or as a match to federal or state grant funds for erosion control projects.
- 1.1.1.24.
- 1.1.1.25. Goal: Develop a community approach to the erosion and flooding problems
- 1.1.1.26. Objective: Increase community involvement
- 1.1.1.27. Task: Hold public meetings to disseminate information and to obtain public comments and ideas
- 1.1.1.28. Task: Create local Flood and Erosion Task Force to monitor, identify, and maintain maps and records of erosion and flooding problems and to identify potential solutions.

### 1.1.3 Existing Mitigation Projects

- 1.1.1.29. 1. Streambank protection features placed by the US Army Corps of Engineers in 2002
- 1.1.1.30. 2. Wildfire contingency evacuation plan

- 1.1.1.31. 3. Fire Line Remediation Project
- 1.1.1.32. 4. Community Awareness Project: *Accelerated Erosion: Taking our Roads, Homes and Water Supply Infrastructure*
- 1.1.1.33. 5. Takotna Avenue rebuilt as a dike to slow the progress of erosion
- 1.1.1.34. 6. Erosion-forced closure of Takotna Avenue to protect residents from injury or accident.

**Table 2** Mitigation Actions – Implementation and Administration

**Mitigation Actions – Implementation and Administration**

EROSION				
Mitigation Action	Responsible Agency	Cost	Possible Funding Sources	Estimated Timeframe
Structural reinforcement of unstable soils	City of McGrath	Staff time, materials, installation, future maintenance	City HMGP USCOE PDMG Nonprofit funding agencies	Ten years
Relocation of Infrastructure	City of McGrath	Staff time, construction, acquisition of new land, future maintenance	City HMGP USCOE PDMG Nonprofit funding agencies	Ten years
Prioritize infrastructure with respect to relocation	City of McGrath	Staff time	City	1 year
Create city fund for erosion control, recovery, and infrastructure	City of McGrath	Staff time	City	1 year
Public Education	City of McGrath	Staff time	City	1 year
Identify sources of funding for erosion control	City of McGrath	Staff time	City	1 year
Create local Erosion Task Force	City of McGrath	Staff time	City	1 year
Prohibit new construction in erosion zones	City of McGrath	Staff time	City	Two months
Detailed mapping of erosion zones	City of McGrath	Staff time, contractor, additional studies	City HMGP USCOE PDMG	1 year

<b>FLOODING</b>				
<b>Mitigation Action</b>	<b>Responsible Agency</b>	<b>Cost</b>	<b>Possible Funding Sources</b>	<b>Estimated Timeframe</b>
Relocate structures	City of McGrath	Staff time, design/build costs, material costs	City USCOE PDMG HMGP	Ten years
Elevate structures	City of McGrath	Staff time, design/build costs, material	City USCOE PDMG HMGP	Five years
Flood control measures	City of McGrath	Staff time, consultant fees, design/build	City USCOE PDMG HMGP	Five years
Structural reinforcement (erosion control)	City of McGrath	Staff time, consultant fees, studies, design/build	City USCOE PDMG HMGP	Ten years
Allow new construction only within NFIP Development Permit criteria	City of McGrath	Staff time	City	Two months
Map flood zones and designate hazard zones	City of McGrath	Staff time, consultant fees	City PDMG HMGP	One year

<b>WILDFIRE</b>				
<b>Mitigation Action</b>	<b>Responsible Agency</b>	<b>Cost</b>	<b>Possible Funding Sources</b>	<b>Estimated Timeframe</b>
Promote use of FireWise practices and concepts throughout the community	City of McGrath	Staff time, consultant fees	City PDMG HMGP	Three months
Create Community Wildfire Protection Plan	City of McGrath	Staff time, consultant fees	City Western States PDMG HMGP	One year
Create defensible space around city infrastructure	City of McGrath	Staff time, construction, future maintenance	City Homeowners Western States PDMG HMGP	One year
Public education	City of McGrath	Staff time, consultant fees	City	Three months (ongoing)
Wildfire evacuation plan	City of McGrath	Staff time, consultant fees	City HMGP PDMG	Six months
Require defensible space around structures	City of McGrath	Staff time	City	Three months
Create firebreak around city	City of McGrath	Staff time, design/build, future maintenance	City HMGP PDMG	One year

### 5.3 Mitigation Actions/Projects

This section serves to identify proposed projects in the community.

The Benefit-Cost Ratio uses the following equation to compare cost-effectiveness of mitigation projects.

$$\beta = \frac{\sum_{i=1}^N \frac{P_i}{100} (E_i + D_i)}{P}$$

Where B is the Benefit-Cost Ratio of the project, p is the mitigation effectiveness factor of the ith hazard, E is the economic loss of the ith Hazard, D is the structural damage loss of the ith hazard, and P is the total cost of the project.

This section serves to identify the proposed projects in the community by hazard.

### 5.4 Implementation Strategy and Analysis of Mitigation Projects

The mitigation strategy section outlines the City's overall strategy to reduce its vulnerability to the effects of the hazards studied.

Evaluating mitigation options is a difficult task. The Planning Team must balance the effectiveness of the mitigation action against cost, public opinion, effects on the environment, feasibility, and many other factors. Because of gaps in available data, any quantitative measurement will exhibit a certain amount of ambiguity. The Planning Team chose to use a system that would apply all available data while at the same time illustrating where data is insufficient to apply to the mitigation option as a criteria.

Mitigation Action Items were identified through brainstorming, outside contributions, mitigation projects in other communities, and public meetings. The mitigation strategy section includes a list of each mitigation option, its estimated cost, estimated timeframe, responsible agency, and potential sources of funding to evaluate and prioritize each mitigation action item.

The Planning Team chose the STAPLE+E method to establish ratings for each hazard based on the best available data. The STAPLE+E method is a planning tool recommended by FEMA that helps planner apply their existing knowledge and available data to each mitigation option during the prioritization process. Using STAPLE+E criteria, mitigation activities can be evaluated quickly by applying a systematic approach to the evaluation process. The STAPLE+E criteria requires each mitigation activity to be evaluated based on the (S)ocial, (T)echnical, (A)dministrative, (P)olitical, (L)egal, (E)conomic, and (E)nvironmental constraints and opportunities presented by the activity or action item. The STAPLE+E criteria are evaluated thusly:

(S)ocial: Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.

(T)echnical: Mitigation actions are most effective if they are technically feasible, provide long-term reduction of losses, and have minimal secondary adverse impacts.

(A)dministrative: Mitigation actions are easier to implement if the jurisdiction has the necessary staffing

and funding, and can provide the necessary maintenance requirements.

(P)olitical: Mitigation actions can truly be successful only if all stakeholders have been offered an opportunity to participate in the planning process and if there is sufficient political and public support for the action.

(L)egal: For proper implementation and enforcement of a mitigation action, it is critical that the jurisdiction or implementing agency have the legal authority to do so.

(E)conomic: Budget constraints can significantly deter the implementation of a mitigation action, therefore it is important to evaluate whether an action is cost-effective, if there are available funding sources, and if the action contributes to other community economic goals.

(E)nvironmental: Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with federal, state and local environmental regulations, and that are consistent with the community's' environmental goals, and have mitigation benefits while being environmentally sound.

A rating system is applied to the STAPLE+E criteria using the following ratings: Significantly Adverse, Insignificant, Significantly Beneficial, and Unknown. The ratings are then calculated using the following scale: SB = 1, I = 0, SA = -1. Ratings of "U" are left in place and are not applied to the numerical calculations. As such, they do not have any effect on the overall score of each item; however they do show a deficiency in data that, when overcome, may affect the overall priority of the mitigation action. Therefore the results of these calculations should be looked upon as preliminary data and should not be applied to long-term planning efforts until the data that is lacking can be applied.

## 5.5 Capability Assessment

**Table 3 Legal and Technical Capability**

Regulatory Tools (ordinances, codes, plans)	Local Authority (Y/N)	Comments (Year of most recent update; problems administering it, etc)
Building code	N	
Zoning ordinance	N	
Subdivision ordinance or regulations	Y	Subdivision and Land Use – McGrath Municipal Code; Last Update 1989. Provisions of the Flood & All Hazard Mitigation Plan will be added in 2009.
Special purpose ordinances (floodplain management, stormwater management, hillside or steep slope ordinances, wildfire ordinances, hazard setback requirements)	Y	NFIP Floodplain management McGrath Municipal Code; Last update 2002. The Emergency Phase requires a development permit but not an elevation certificate. The NFIP floodplain management, along with the Subdivision and Land Use chapter serves as one of two primary development regulatory codes in McGrath. Provisions of the Flood & All Hazard Mitigation Plan will be added in 2009.
Growth management ordinances (also called “smart growth” or anti-sprawl programs)	N	
Site plan review requirements	N *	It is recommended during the floodplain development permit, but not required.
Comprehensive Plan Strategic Plan	Y Y	1981 2003 This F&AH plan will be incorporated into future revisions and as an addendum prior to a revision.
A capital improvements plan	N	

An economic development plan	N *	A Collaboration Group has identified a goal for an Economic Development Plan to be developed by 2010
An emergency response plan	N	McGrath has a multi-agency emergency response plan that is updated annually during April by 8 local agencies. This plan will be included in the revision of the Comprehensive Plan once it is completed.
A post-disaster recovery plan	N	
A post-disaster recovery ordinance	N	
Real estate disclosure requirements	N	

**Table 4 Administrative and Technical Capability**

Staff/Personnel Resources	Y/N	Department/Agency and Position
City Administrator	Y	Under direction of the Mayor and City Council
City Clerk	Y	Serves as staff for the City Council
Public Works Foreman	Y	Is in charge of City water, sewer, washeteria/showers, landfill, facilities/grounds and roads
Librarian	Y	Position funded through McGrath Native Village Council
Volunteer Fire Chief and Volunteer Kuskokwim Valley Rescue Squad	Y	Volunteer teams working jointly and with an MOA with DNR. Worker's Comp covered under city's AML/JIA insurance.
Planner(s) or engineer(s) with knowledge of land development and land management practices	N	
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	N	
Planners or Engineer(s) with an understanding of natural and/or human-caused hazards	N *	*McGrath has extensive resources available through the AML/JIA.
Floodplain manager	Y	City Public Works Foreman serves as the NFIP manager.
Surveyors	N	
Staff with education or expertise to assess the community's vulnerability to hazards	N	
Personnel skilled in GIS and/or HAZUS	N	
Scientists familiar with the hazards of the community	N	
Emergency manager	Y	The State Troopers serve in the capacity of Incident Commander for the McGrath Emergency Response Team in conjunction with the Mayor,
Grant writers	Y	City Administrator serves as the city's grant writer

Environmental Advisory Council	Y	Public Works Committee – Advisory to the City Council and in collaboration with the McGrath Native Village Council Environmental Dept.
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**Table 5 Fiscal Capability**

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community Development Block Grants (CDBG)	Y
Capital improvements project funding	Y
Authority to levy taxes for specific purposes	Y
Fees for sewer, water, landfill, streetlights	Y
Impact fees for homebuyers or developers for new developments/homes	N
Incur debt through general obligation bonds	Y
Incur debt through special tax and revenue bonds	Y
Incur debt through private activity bonds	N

McGrath Capability Assessment (Adapted from MitigationPlan.com upload)

Storm Water Management Ordinances: **No**

Stream Maintenance Ordinances: **No**

Zoning Management Ordinances: **No**

Subdivision Management Ordinances: **Development, Yes**

Erosion Management Ordinances: **No**

Floodplain Management Ordinances: **No**

Fire Insurance Rating: **Class 7/9**

Floodplain Management Plan Published Date: **N/A**

Floodplain Management Last Delineation Date:

Elevation Certificates Maintained: **N/A**

National Flood Insurance Program Community: **Yes**

National Flood Insurance Program Join Date:

National Flood Insurance Program Number:

National Flood Insurance Program Rating: **Not yet mapped.**

National Flood Insurance Program Rating Date: **N/A**

National Flood Insurance Program Description:

Flood Insurance Claims: **0**

Land Use Plan: **Subdivision and Land Use & NFIP, McGrath Municipal Code**

Land Use Plan Last Update: **2002**

Community Zoned: **No**

Zoned Date: **N/A**

Established Building Codes: **No**

Building Codes Last Updated: **N/A**

Type of Building Codes: **N/A**

Local Electric Utilities: **McGrath Light & Power**

Local Water Utilities: **City of McGrath**

Local Sewage Treatment Utilities: **Individuals; City of McGrath**

Local Telephone Utilities: **United Utilities/GCI , Alascom**

Internet: **Borealis Broadband**

### **Associated Links and Files**

State of Alaska, Community Profile – McGrath

[http://www.commerce.state.ak.us/dca/commdb/CF\\_BLOCK.cfm?Comm\\_Boro\\_Name=McGrath&Data\\_type=Overview](http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.cfm?Comm_Boro_Name=McGrath&Data_type=Overview)

Flood Hazard Data-McGrath [www.poa.usace.army.mil/en/cw/fld\\_haz/mcgrath.htm](http://www.poa.usace.army.mil/en/cw/fld_haz/mcgrath.htm)

Flood and Erosion Photos, History & Data: [www.alaskaerosion.com](http://www.alaskaerosion.com)



**5.6 Estimated Replacement Costs** based on flooding from upriver side of McGrath based on today's current structures and values to repair and/or replace. Made by City of McGrath staff.

August 2007

**100-year Flood** example (although no historical records of losses/repair costs are available)

**Residences, out-buildings, contents, vehicles, etc.:** 21 @ \$100,000

**2 TOTAL ESTIMATE: \$2,100,000.00**

**Commercial:** 10 Commercial including contents

**TOTAL estimate: \$2,9000,000**

4 @ \$500,000 = \$2,000,000

4 @ \$200,000 = \$ 800,000

2 @ \$50,000 = \$ 100,000

**Public: TOTAL estimate \$2,900,000**

2.1 **Erosion** example used for upriver erosion loss including the two most vulnerable and probable areas. **Erosion area #1** includes the NRCS footprint from the log haul-out to the end of Takotna Ave. at the Ivey residence. **Erosion area #2** includes Tonzona Avenue from McGuire Drive to "B" Street.

**3 RESIDENCES, OUTBUILDINGS, CONTENTS, VEHICLES, ETC.:**

**4 TOTAL ESTIMATE: \$1,600,000**

5 30 @ \$50,000 = \$1,500,000 AREA #1

2 @ \$50,000 = \$100,000 Area #2

**Commercial, including outbuildings contents, vehicles, etc.**

2 @ \$240,000 = \$480,000 Area #2

**6 TOTAL ESTIMATE: \$480,000**

**Public: Areas #1 and #2 combined. This includes huge infrastructure that is prone and vulnerable to severe damage caused by erosion. Roads, water treatment and distribution system, water tanks, bulk fuel tank farm, Multi-Use Facility (Cap'n Snow Center) occupants and structure all listed on the 100' Flood list and some listed on the 500' list, that would be affected by the losses on the 100' list.**

**TOTAL estimate: \$500,000,000**

**NOTE:** This loss estimate varies considerably from the "cost of structure" replacement values provided earlier this year. Only the replacement costs of a complete structure were stated previously (assuming 100% loss of structure that had to be reconstructed at today's cost), and based on the most recent construction, a modest house in McGrath completed by IRHA. It did not include contents, vehicles,

equipment, fuel or fuel tanks, etc., which were included in this "repair/replace" of estimated actual losses that could occur with either flood or erosion.

**Earthquake:** Vulnerability and Probability in McGrath are somewhat low based on historical data, other than if a high vulnerability and probability location such as Anchorage were affected, which would in turn, affect us greatly. Judging from the 1964 earthquake, it would be assumed that with air travel (flow of people, goods, supplies, etc.) and most communication non-existent, McGrath would be temporarily impacted. The stores would sell out of everything within a couple of days, and survival commodities such as fuel supplies would be hoarded. No \$\$\$ loss value can be estimated, as we do not know how to figure that.

**Severe Winter Weather:** 100% vulnerability and probability. Each household, commercial and agency structure with electricity and water/sewer, a source of heat and contents that would freeze, would suffer considerable loss IF either or all water, sewer or electric power were disrupted. If electricity, that would affect the source of water and sewer service, possibly causing a permanent failure of the system that could not be recovered, with the exception of replacing the entire system. The individual homes would also experience the affects of frozen water and sewer systems if they rely on electricity within their homes to keep those utilities flowing. The city's circulating water system would freeze within only hours of experiencing loss of electric power to keep the water flowing and heated. Backup generators are available for all utilities, but are not designed to carry the full loads at extreme cold temperatures. Both the electric power utility and water/sewer utilities are extremely vulnerable to failures during periods of extreme cold temperatures.

**Residences:** Repair and/or replacement of plumbing system and further damage within each structure.  
180 @ \$10,000

**7 TOTAL ESTIMATE: \$1,800,000**

**Commercial/Public:** Repair and/or replacement of plumbing system and further damage within each structure.

28 (very small to very large range) @ \$20,000

**8 TOTAL ESTIMATE: \$560,000**

## **Section 6 Plan Maintenance**

### **6.1 Monitoring, Evaluating and Updating the Plan**

The McGrath Flood and All-Hazards Mitigation Plan includes information to assist city agencies and residents with planning to avoid potential future disaster losses. The plan provides information on hazards that affect the community and descriptions of past disasters, and lists activities that may help the community prevent disaster losses. The plan was developed to help the City of McGrath make decisions regarding natural hazards that affect the community.

The plan was designed and written beginning in the fall of 2006, first utilizing the State of Alaska's [www.mitigationplan.com](http://www.mitigationplan.com) planning tool, followed by updating and converting to a Microsoft Word format by the city administrator. The City of McGrath contracted a hazard mitigation consultant, Rural Alaska Mitigation Planning, to assist with the planning process including vulnerability assessment, public meeting facilitation, capability assessment, and preparation of prioritization criteria, mitigation prioritization, and cost/benefit analysis. The McGrath City Administrator, Natalie Baumgartner, oversaw the consultant's activities. The plan was developed utilizing existing City of McGrath plans and studies, outside information and research, and site visits conducted by the consultant.

Currently the plan includes mitigation strategy development for the top three hazards identified by the community: flooding, erosion, and wildfire. Mitigation strategy information about other hazards will be added as resources become available to do so.

#### **6.1.1 Continuing Review Process**

The McGrath City Council will be responsible for adopting the Flood and All-Hazards Mitigation Plan and all future updates and changes. This governing body has the authority to promote sound public policy regarding hazards. The Flood and All-Hazards Mitigation Plan will be assimilated into other City of McGrath plans and documents as they are developed and come up for review. The City Administrator will evaluate the McGrath Flood and All-Hazards Mitigation Plan on an annual basis to determine the effectiveness of programs and to reflect changes in land development, status, or other situations that make changes to the plan necessary. The City Administrator will review the mitigation action items to determine their relevance to changing situations in the community as well as in state or federal policy, and to ensure that mitigation continues to address current and expected conditions. The status of the action items will be presented to the Planning Commission and City Council as Agenda items on an annual basis during the month of March. The City Administrator will review the hazard analysis information to determine if this information should be updated or modified, given any new available data or changes in status. Should changes or updates be required, the City Administrator will present the updates to the McGrath City Council for adoption by Resolution at the April city council meeting.

The five-year evaluation will be overseen by the City Administrator and the 5-member Planning Commission during the regular meeting held in January 2014 and every five years thereafter. Any revision will be adopted by Resolution by the McGrath City Council no later than April of 2014 and every five years thereafter.

#### **6.1.2 Continued Plan Development**

The plan will continue to be developed as resources become available. Additional information will be added each year during plan review as the information becomes available or as the situation changes. Vulnerability assessment information, including more specific cost/benefit and monetary damages information will be clarified as additional studies are performed.

Currently, only very rough estimates for potential damages are available, and more study is necessary to refine this information.

The City Council will ensure that the plan is reviewed annually to determine NFIP status and any

changes that might affect the City's participation in NFIP. The City Administrator will be responsible for assuring that updating and maintaining the plan with respect to NFIP compliance is completed through presenting recommended updates and revisions to the City Council during the regular March city council meeting. Should the city council not adopt the recommended updates at that time, a work session will be called following that meeting and prior to the April city council meeting if necessary.

## **6.2 Implementation through Existing Programs**

This plan will become part of the public record for the city of McGrath and will be utilized in concert with existing plans and programs. Upon adoption, this plan will be implemented as a planning document for the city. Initial steps are being taken to provide updates and revisions of McGrath's Comprehensive Community Plan (1981) and this Flood and All Hazard Mitigation Plan will be incorporated within that plan along with the Emergency Plan (flood/erosion and wildfire). Provisions of this plan will also be added to Chapter 16.04 LAND USE AND SUBDIVISIONS and Chapter 16.05 NATIONAL FLOOD INSURANCE PROGRAM during FY10.

## **6.3 Continued Public Involvement**

### Description of Opportunities and Mechanisms for On-Going Public Involvement

The Flood and All-Hazards Mitigation Plan will be available to the public at any time and comments will be accepted through various means. The public has been invited to participate in the planning process by providing their comments to the City of McGrath. Any time the plan is to be reviewed or discussed, the public hearing is advertised on the McGrath Message Board, PSA aired on KSKO Radio and in the City Newsletter mailed to each resident. The City of McGrath holds annual Break-Up/ Emergency Response Public meetings. These meetings are held in late April and serve to bring agencies partnering in emergency response together to bring the collaborative plan up to date and to advise citizens of the dangers that may be faced due to flooding or other events.

During these public forums, copies of the flood and all hazards mitigation plan will be available for public review and continued comment. Any input from the public will be considered for incorporation into future updates of the plan.

The City Administrator is also developing a City web site. The plan will be posted to the web page for public perusal and comment.

The City is also committed to including the McGrath Native Village Council in all planning efforts. A copy of the draft Plan is available for public perusal at the city office.

## **Section 7 Glossary of Terms**

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

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

**Alluvial Fan** Area of deposition where steep mountain drainages empty into valley floors. Flooding in these areas often have characteristics that differ from those in riverine or coastal areas. (See Alluvial Fan Flooding)

**Alluvial Fan Flooding** Flooding that occurs on the surface of an alluvial fan (or similar landform) that originates at the apex of the fan and is characterized by high-velocity flows; active processes of erosion, sediment transport, and deposition; and unpredictable flow paths.

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

**Avalanche** Mass of snow and ice falling suddenly down a mountain slope and often taking with it earth, rocks, trees, and rubble of every description.

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

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

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

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

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

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

**Community Rating System (CRS)** The Community Rating System is a voluntary program that each municipality or county government can choose to participate in. The activities that are undertaken through CRS are awarded points. A community's points can earn people in their community a discount on their flood insurance premiums.

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

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

**Development** Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or of equipment or materials.

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

**Disaster Mitigation Act** DMA 2000 (public Law 106-390) is the latest legislation of 2000 (DMA 2000) to improve the planning process. It was signed into law on October 10, 2000. This new legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur.

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

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

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

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

**Federal Disaster Declaration** The formal action by the President to make a State eligible for major disaster or emergency assistance under the Robert T. Stafford Relief and Emergency Assistance Act, Public Law 93-288, as amended. Same meaning as a Presidential Disaster Declaration

**Federal Emergency Management Agency (FEMA)** A federal agency created in 1979 to provide a single point of accountability for all federal activities related to hazard mitigation, preparedness, response, and recovery.

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

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

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

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

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

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

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

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

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

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

### **Flood Zone Symbols**

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

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

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

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

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

B, X Area of moderate flood hazard.

C, X Area of minimal hazard.

D Area of undetermined but possible flood hazard.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**State Disaster Declaration** A disaster emergency shall be declared by executive order or proclamation of the Governor upon finding that a disaster has occurred or that the occurrence or the threat of a disaster is imminent. The state of disaster emergency shall continue until the governor finds that the threat or danger has passed or that the disaster has been dealt with to the extent that emergency conditions no longer exist and terminates the state of disaster emergency by executive order or proclamation.

Along with other provisions, this declaration allows the governor to utilize all available resources of the State as reasonably necessary, direct and compel the evacuation of all or part of the population from any stricken or threatened area if necessary, prescribe routes, modes of transportation and destinations in connection with evacuation and control ingress and egress to and from disaster areas. It is required before a Presidential Disaster Declaration can be requested.



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

To be officially Storm Ready, a community must:

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

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

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

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

**Vulnerability** Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. The vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power – if an electrical substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Other, indirect effects can be much more widespread and damaging than direct ones.

**Vulnerability Assessment** The extent of injury and damage that may result from hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.

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

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

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***end of Mitigation Plan***